



Australian Government

Infrastructure Australia

August 2021

Reforms to meet Australia's future infrastructure needs

2021 Australian Infrastructure Plan



Priorities and Reforms
to strengthen our
nation's future

Infrastructure Australia™ is an independent statutory body that is the leading source of research and advice for governments, industry and the community on nationally significant infrastructure needs.

Infrastructure Australia has a mandate to prioritise and progress nationally significant infrastructure investments. It leads reform on key issues including means of financing, delivering and operating infrastructure and how to better plan and utilise infrastructure networks.

Infrastructure Australia has responsibility to strategically audit Australia's nationally significant infrastructure, and develop 15-year rolling infrastructure plans that specify national and state level priorities.

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Acknowledgement of Country

Infrastructure Australia acknowledges the Traditional Custodians of Australia, and pays respect to their Elders past, present and emerging. We pay respect to their continuing connection to land, and the continuation of their cultural, spiritual and educational practices.

In preparing for the future of our infrastructure, we acknowledge the importance of looking beyond the immediate past to learn from Aboriginal and Torres Strait Islander people's unique history of land management and settlement, art, culture and society that began over 65,000 years ago.

Note on the artwork

The artwork *Moving Along Pathways* was created by Kamilaroi/Gamilaraay artist Dennis Golding, specifically for Infrastructure Australia's first Reconciliation Action Plan. The artwork depicts examples of Australia's first infrastructure.

Pathways and river systems are prominent in the artwork and reference the pathways First Nations peoples formed on land and water for transport and communication of knowledge and stories. Images of waterholes, campsites and boomerangs within the artwork acknowledge First Nations cultural practices, technology and places for gathering that continue to be operated today.

Chair's foreword

As Chair of Infrastructure Australia, I am immensely proud to present the *2021 Australian Infrastructure Plan*.

Expansive in both scale and scope, the *2021 Plan* is being delivered at a critical moment in Australia's history.

It is a time when Australians are recovering from the still-unfolding COVID-19 pandemic and the bushfires, drought, floods and cyber-attacks that tested our individual and collective resilience during 2020–2021.

Such a time demands an ambitious response.

With this landmark reform agenda, Infrastructure Australia aims to build a stronger, more secure country.

An Australia where access to high-quality infrastructure is equitably balanced across cities, regional centres and rural and remote areas.

An Australia where the infrastructure is resilient and adaptable in the face of changing trends and potential global shocks and stresses.

An Australia where the infrastructure sector has the capacity and capability to deliver on a record investment pipeline and continue supporting the national pandemic recovery.

This is a pragmatic, community-centred plan for reform. It will assist to grow the economy and jobs, maintain and enhance this country's enviable standard of living, and ensure our cities and regions remain world-class.

It acknowledges that, while infrastructure continues to be central to Australians' quality of life, user needs are evolving.

Around the country, communities are recovering from, and preparing for, new shocks and stresses, making their infrastructure needs more complex.

Tomorrow's infrastructure is likely to look very different to today's, and the way infrastructure is planned needs to embrace this uncertainty.

Historically, infrastructure planning has sought to project future conditions as an extension of today, then provided infrastructure to meet anticipated demand. In 2021 and beyond, the approach must be more robust.

“ This is a pragmatic, community-centred plan for reform. ”

Rather than simply projecting forward the status quo, infrastructure planning must set an ambitious vision for the country. It should anticipate and adapt to change, manage risk and deliver infrastructure that works towards — rather than against — the current and future needs of the community.

The *2021 Plan* supports this new approach by providing a reform pathway that responds to the 180 infrastructure challenges and opportunities identified in Infrastructure Australia's *2019 Australian Infrastructure Audit*.

It also responds to the infrastructure impacts of the pandemic, as examined in our *Infrastructure beyond COVID-19* report.

Each recommended reform in the *2021 Plan* prioritises community and user outcomes and balances them with implementation costs and risks.

To ensure our advice is practical and actionable across government and industry, every recommendation clearly identifies who is best-placed to implement that reform and own the interim outcomes and enabling activities.



Importantly, the *2021 Plan* aims to represent an industry consensus on what needs to be done to deliver quality, fit-for-purpose infrastructure for all Australians.

It has been informed by an extensive sector-specific engagement program that targeted more than 5,500 stakeholders, including industry experts, government agencies and academics.

Across the transport, energy, water, telecommunications, waste and social infrastructure sectors, Infrastructure Australia was privileged to work closely with skilled and passionate stakeholders who are working to drive reform and deliver better community outcomes.

Now the *2021 Plan* is published, we are focusing on collaborating with reform owners across industries and jurisdictions to provide guidance and support as the recommendations are adopted.

Infrastructure Australia is particularly well placed to drive these reforms.

As a priority, we will support collaboration in the three strategic focus areas that cut across all infrastructure sectors:

- unlocking the potential of every place
- embedding sustainability and resilience into infrastructure decision-making
- driving a step change in industry productivity and innovation.

As well as being more active reform advocates, we will move to a more organic development cycle of Audits and Plans for Australia's infrastructure networks.

In the future we will focus resources on where our unique perspective can guide responses to issues as they emerge.

By becoming more responsive, we will be able to highlight infrastructure challenges and opportunities in an increasingly uncertain world, and to better guide industry and government on necessary reforms.

I want to acknowledge the incredible contribution of the highly skilled team that developed the *2021 Australian Infrastructure Plan*, as well as our research partners, peer reviewers and industry experts. They were all instrumental in shaping the final document.

I am confident that by continuing to work closely with industry, governments and communities as the reforms in the *2021 Plan* are planned for and implemented, Infrastructure Australia can help to deliver better infrastructure and improved quality of life for all Australians.

Julieanne Alroe
Chair
Infrastructure Australia

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I. Executive summary

Infrastructure for a stronger Australia

The *2021 Australian Infrastructure Plan* is a practical and actionable roadmap for infrastructure reform. It is intended to deliver infrastructure for a stronger Australia, and support our national recovery from the still-unfolding COVID-19 pandemic, as well as the bushfires, drought, floods and cyber-attacks that have tested our resilience in recent years.

“By focusing on key areas for reform, we can imagine what a stronger Australia looks like in 2036.”

In addition to these significant shocks, the *2021 Plan* is delivered at a time of risk, change and uncertainty for the infrastructure sector. As highlighted in the *2019 Australian Infrastructure Audit*, long-term infrastructure planning and decision-making are increasingly complicated by the pace of technological change, shifting geopolitical relationships, new consumer expectations, a trend towards localisation and a changing climate.

Despite these challenges, Australia is well placed to take advantage of opportunities in the post-pandemic recovery phase.

Compared to other OECD countries:

- our economy has performed well
- our infrastructure networks have proven to be relatively resilient
- our service providers have shown that they are adaptable to community needs.

The *2021 Plan* details how we can build on these advantages and the lessons learned from the past year to build a stronger, more secure Australia. It prioritises community outcomes and outlines meaningful steps to grow Australia's economy, maintain and enhance people's standard of living and ensure every city and region delivers world-class infrastructure for all Australians.

Setting the vision for 2036

Infrastructure Australia's vision for 2036 is to have infrastructure that improves the sustainability of the country's economic, social, environmental and governance settings, builds quality of life for all Australians, and is resilient to shocks and emerging stresses.

It is an ambitious vision, but one that is achievable through the practical and actionable reform agenda detailed in the *2021 Plan*. Underpinning this agenda is a focus on population growth, adaptation to climate risk, building resilience, stimulating employment, driving economic productivity, embracing a diversity of places and social equity.

Overall, it is based on a rigorous evaluation of benefit, cost and risk. In addition, we have assessed each reform's potential impact on access, quality and cost of infrastructure services for individual and business consumers.

To test the sustainability of our proposed reforms, we put them through a 'quadruple-bottom-line' evaluation to ensure they balance social, economic, environmental and governance outcomes.

By focusing on key areas for reform, we can imagine what a stronger Australia looks like in 2036.

- 1. Place-based outcomes for communities — unlocking the potential of every location.** Each place's identity informs its infrastructure needs and priorities, enabling investment that builds on a location's competitive strengths or reduces place-based disadvantage.
- 2. Sustainability and resilience — balancing infrastructure outcomes in an uncertain future.** Communities are able to resist, absorb, accommodate, recover, transform and thrive in response to the effects of shocks and stresses in a timely and efficient manner, enabling sustainable economic, social, environmental and governance outcomes.
- 3. Industry productivity and innovation — facilitating a step change in productivity.** An infrastructure industry that is highly productive, efficient, effective, prepared and confident. An environment where industry can sustainably respond to government objectives and vision with capability, capacity and resources in line with Australia's best interests.
- 4. Transport — delivering an integrated network.** Transport services should seamlessly connect people and goods across a vast continent. From door-to-door urban journeys to paddock-to-plate and pit-to-port supply chains, transport should be reliable and simple to use.
- 5. Energy — enabling an affordable transition to a net zero future.** Australia should export clean energy to the world from its high-tech, low-cost, low-emissions energy system. Empowered consumers and businesses can manage their own energy costs and participate in an efficient, reliable grid.
- 6. Water — prioritising safety and security.** Resilient, safe, secure and quality water supplies are available for all Australians and create attractive, liveable and resilient communities.
- 7. Telecommunications and digital — ensuring equity in an era of accelerating digitalisation.** A fully connected Australia that offers resilient, superfast, equitable and wide coverage to everyone.
- 8. Social infrastructure — supporting economic prosperity and quality of life.** Quality, accessible, future-focused, multi-purpose and economically valued social infrastructure should support a strong, healthy and prosperous nation and ongoing quality of life for all Australians.
- 9. Waste — accelerating Australia's transition to a circular economy.** Shifting from a linear waste management model to a circular economy has transformed Australia from a world-leading waste generator to building new industries as a recycling and remanufacturing powerhouse.

Key themes in the 2021 Plan

Adapting to change and uncertainty

In this current environment of risk, change and uncertainty, there is an urgent need to rethink how Australian infrastructure is planned, delivered and operated.

The scale, pace and interconnectedness of the threats we face are more challenging than ever.

To counter the impact of global trends, shocks and stresses, along with a changing climate and extreme weather events, infrastructure must be resilient and adaptable.

This was clear even before the COVID-19 pandemic. Australia experienced a devastating range of natural disasters, including floods, drought, and one of the worst bushfire seasons on record. These emergencies impacted the reliability of telecommunications, energy, water and transport services and underlined the need for more resilient networks to keep communities safe.

Another ongoing risk is that Australia's urban water supply is highly dependent on rainfall. With likely shifts in rainfall patterns due to a changing climate, there needs to be a move away from sources that are climate-dependent to those that are secure and reliable.

To ensure infrastructure plays its role in protecting lives, enabling business continuity and preserving the natural environment, this country needs to embrace new practices.

A nationally consistent, systemic approach to understanding and quantifying risk is required to ensure all Australian assets, networks, systems, communities and places are resilient.

Harnessing transformative technology and digitalisation

Across all infrastructure sectors, Australia has a substantial opportunity to harness technology, innovation and digitalisation to grow new industries and drive service improvements.

“A more commercially and financially sustainable infrastructure industry is vital for Australia's social and economic wellbeing.”

In a highly connected and digitalised world, governments and industry must transition away from digital by exception towards digital by default.

This will unlock substantial productivity gains and efficiencies across infrastructure planning, delivery

and operations, ensuring the infrastructure sector has the capacity to accelerate Australia's post-pandemic economic recovery.

Emerging technologies such as 5G, smart cities and the Internet of Things (IoT) are already delivering significant benefits to communities, businesses and local economies. To ensure the opportunities these groundbreaking technologies present are fully realised, there must be better alignment across governments and industry as well as improved public understanding and adoption.

In social infrastructure sectors, the pandemic has demonstrated that agile, high-functioning infrastructure can quickly adapt to Australians' health, education and lifestyle needs. Harnessing innovation and technology even further will drive more cost-effective and sustainable infrastructure for the services communities value.

Delivering public value

A more commercially and financially sustainable infrastructure industry is vital for Australia's social and economic wellbeing.

To ensure major infrastructure investment delivers public value, governments must work with industry to drive long-term productivity, innovation and sustainability across the sector. The current focus on delivering infrastructure for the lowest cost must evolve into a more mature approach that considers value for money and optimum public value.

Record infrastructure investment is underway to support the national COVID-19 recovery. However, the ability to successfully deliver this ambitious infrastructure pipeline is constrained by current processes.

These include an over-emphasis on a project-to-project and contract-by-contract mentality, inappropriate apportionment of risk, and a sporadic uptake of best practice. If these processes and practices continue, less infrastructure will be built for the same money, and the infrastructure will not be as functional in the long-term.

Long-term thinking that considers the role of government in the next generation of infrastructure investments will be key, supported by improved focus on planning, portfolios and pipelines. Other key areas of opportunity include enhancing individual project outcomes and applying a digital by default approach.

Embracing a diverse geography

Welcoming the unique challenges and opportunities afforded by this country's diverse geography is critical for driving economic growth and unlocking the potential of every place.

A place-based approach needs to be embedded into infrastructure planning and decision-making. This will help determine what is needed to build on a location's strengths or address existing disadvantage, and enable appropriately targeted investment.

Australia's **Fast-growing Cities** need to provide a high standard of living to remain globally competitive and ensure equal access to services between suburbs.

The staged development of their major transport corridors and networks can establish a sustainable transport culture and ensure mobility services keep pace with community needs.

Demand-responsive services that are fully integrated into the public transport ecosystem will significantly improve access across the community.

To play their critical connecting role, **Smaller Cities and Regional Centres** need infrastructure that links them to larger cities. In **Small Towns, Rural Communities and Remote Areas**, minimum infrastructure standards will help these communities to thrive.

Targeted infrastructure investment in **Northern Australia and Developing Regions** is critical to enable the next wave of development to boost economic growth, security and natural resource exports.

Providing minimum service levels that support quality of life for all

It is vital to define acceptable minimum infrastructure standards and apply them to **Small Towns, Rural Communities and Remote Areas**. They should provide the basis for service provision in these areas, where some communities face significant infrastructure deficits in essential services such as transport, telecommunications and water.

Transport: Governments must set time-based access standards for passenger transport to meet the needs of people living in **Rural Communities and Remote Areas**.

Where road, rail and aviation operations meet these standards, people will be able to access essential services that are not available online, and return home, within a single day or comparable timeframe.

Telecommunications: There have already been improvements to the coverage, speed, and reliability of mobile and fixed telecommunications in regional and remote Australia.

With the increasing importance of telecommunications and the vast expanses of land involved, it is vital to find a sustainable investment model that supports new coverage for these areas.

Water: State and territory municipal services departments must genuinely commit to delivering

fit-for-purpose, fit-for-place and fit-for-people water services to Australians living in remote and isolated communities. This must be delivered through approaches that recognise and respond to the unique conditions in these parts of the country.

Empowering customers and leveraging data

Getting smarter about data presents a significant opportunity to empower Australians as infrastructure users.

Highly advanced computing, analytics and data processing methods are presenting business with some significant opportunities.

However, these technologies also bring inherent risks, such as the misuse of personal data and compromised privacy. To protect users, there needs to be stronger consumer protections, clearer legislation, and voluntary codes of practice across all industries.

In the **energy** sector, customers can combine technologies such as smart meters, rooftop solar, batteries and electric and zero emission vehicles with energy efficiency strategies to reduce electricity bills and drive transformation in the sector.

While uptake is increasing, more customers should be encouraged to adopt these technologies to unlock savings. Education is key to empowering customers to realise the opportunities for reducing their electricity bills.

The **waste** sector is constrained by insufficient, unreliable data. Better access to national data would support investment in domestic waste and resource recovery infrastructure.

Better data on the spatial impact of population changes will help governments with strategic planning that supports future liveability.

Developing the 2021 Australian Infrastructure Plan

The *2021 Plan* provides a reform pathway for responding to the 180 infrastructure challenges and opportunities identified in Infrastructure Australia's *2019 Audit*.

It also responds to the additional infrastructure impacts of the pandemic, including the six challenges and six opportunities identified in our December 2020 *Infrastructure beyond COVID-19* report, which preceded this Plan.¹

Each recommended reform prioritises community and user outcomes, balanced against costs and risks in implementation.

To ensure our advice is practical and actionable across government and industry, we have clearly identified who is best-placed to implement each reform and own the interim outcomes and enabling activities.

The COVID-19 pandemic and its continuing impacts have demonstrated how rapidly assumptions of what the future could look like can shift. At the same time, infrastructure is long-lived, so it must be planned, built and managed in a way that will continue to service communities under a range of likely future scenarios.

To take account of uncertainty, we tested the reforms against a range of future scenarios. They included:

- speed of recovery from the impacts of the COVID-19 pandemic
- adoption of technological change
- the role of an emerging regionalised Australia and how cities will adapt
- a destabilised world.

To develop the recommendations, we also examined progress against the 78 recommendations made in the *2016 Australian Infrastructure Plan*.

A summary of this review is available in the *Progress since the 2016 Australian Infrastructure Plan*,² which we commissioned from EY. While there has been significant progress, we have also identified unfinished reform and incorporated it into the new reform agenda in the *2021 Plan*.

An updated methodology since the last Plan

Infrastructure Australia has strengthened this edition of the Plan by applying best practice methodologies in developing and assessing our proposed reforms.

They include applying a **theory of change** framework to ensure our recommendations follow a structured pathway to achieve our vision for 2036. Initially developed by the social impact sector, theory of change applies critical systems thinking to the design, implementation and evaluation of policy initiatives. We have used it to identify the most effective reforms to overcome issues and achieve reform outcomes.

The **2021 Implementation Pathway** outlines actions for each identified reform owner over the 15-year horizon of the *2021 Plan*. These actions comprise recommendations, intermediate outcomes and clearly timed activities. The Implementation Pathway provides reform owners with a summary of the reforms needing their leadership.

Multi-criteria analysis is used to articulate the trade-offs and implementation challenges associated with the reforms. It will help to inform quantitative analysis (including regulatory impact statements) that is subsequently applied to the reform proposals.

We have used this model to qualitatively assess the impacts of policy recommendations across 33 criteria and 13 impact categories (such as impacts for service users, community sustainability, ease of implementation and risks). This impact assessment is in the **2021 Reform Priority List** that is published as part of the *2021 Plan* suite of documents

The 2021 Plan represents an industry consensus

Stakeholder engagement is a significant focus of the *2021 Australian Infrastructure Plan*.

Infrastructure Australia engaged with more than 5,500 individuals, including domestic and global policy leaders, to test our conclusions and identify reform opportunities.

By engaging with the experts who will ultimately implement the reforms, we have equipped our reform agenda with the best available evidence so we can provide stakeholders with tools that increase the chance of successful reform.

Each chapter of the *2021 Plan* has also been informed by an extensive sector-specific engagement program that targeted industry experts, government, and academia. These experts, our research partners and peer reviewers have all played a critical part in building a practical and evidence-based reform agenda across sectors.

In addition, we engaged extensively with stakeholders for the *2019 Audit* and ran a formal stakeholder submissions process. We received 151 formal submissions from government, industry and academia, as well as a small number of individuals.

All this feedback was considered when developing the *2021 Plan*.

How to read the 2021 Australian Infrastructure Plan

Infrastructure Australia has developed the *2021 Australian Infrastructure Plan* for a broad range of stakeholders.

Each stakeholder with a role in reform will be interested in different aspects of the *2021 Plan*.

To meet this need, we have produced the *2021 Plan* as a suite of documents that complement each other (see **Figure I.1**).

Each document guides different audiences towards the key pieces of information they need.



The document suite

2021 Australian Infrastructure Plan

This is the primary document and presents the reform recommendations that make up the *2021 Plan*. It is the starting point for all readers seeking to understand how Australia should address the key challenges and opportunities facing infrastructure over the next 15 years.

It provides 29 reform recommendations and outlines the activities needed to deliver each reform, as well as the stakeholders that are key to their delivery.

It explains why these reforms are critical priorities and presents evidence for how the reform will deliver the desired outcomes.

Executive Summary

The *Executive Summary* presents a concise view across all the reforms that make up the *2021 Plan*.

2021 Reform Priority List

The *2021 Reform Priority List* guides decision-makers on which reforms to focus on, based on a multi-criteria analysis of their strengths and trade-offs. It allows decision-makers to prioritise reforms based on which are best suited to meeting specific policy objectives.

We developed the multi-criteria analysis framework with community sustainability, user benefits, ease of implementation and risks in mind. The framework is tailored to assess the impact of the *2021 Plan's* reform recommendations.

The *2021 Reform Priority List* presents the impact of each recommendation in a one-page summary. This allows the reader to compare the relative impact of each recommendation.

It highlights reforms that have significant impact overall, those that are best suited for meeting specific policy priorities and those that perform well under different future scenarios.

2021 Implementation Pathway

The *2021 Implementation Pathway* is written for stakeholders who have a role in delivering reform. This is primarily targeted at the Australian Government and state and territory governments, but also includes local government, industry and community organisations that play a key part.

It identifies the role stakeholders have in delivering reform and outlines the specific activities that form part of their responsibility.

Its structure allows stakeholders to easily find all the activities where they are the key party responsible for delivery. It also presents the timeframe for implementation.

Detailed plans for each sector and strategic focus area

We have developed detailed plans for each of the six infrastructure sectors and three cross-sector themes. The plans are built around strategic focus areas for Infrastructure Australia.

These nine documents are intended for audiences that work in these sectors or have a deeper interest in the future of these sectors. They provide greater in-depth analysis, reasoning and evidence to support the need for reform and the activities that make up the 29 reform recommendations.

They include the analysis Infrastructure Australia undertook to develop the recommendations (using the theory of change and the multi-criteria analysis methods).

The detailed plans will be published after the release of the *2021 Australian Infrastructure Plan*.

Implementation support

Infrastructure Australia is also undertaking three projects that will support the adoption of best practice reforms to provide:

- **Regional Strengths and Infrastructure Gaps** – defining regional identity and localisation of *2019 Australian Infrastructure Audit* Challenges and Opportunities.
- **A Pathway to Infrastructure Resilience** – a roadmap to embed a systemic all hazards approach to resilience in infrastructure decision making.
- **Transforming Infrastructure Delivery** – a policy roadmap for working collaboratively across government and industry to improve the productivity, innovation and deliverability of infrastructure.

These reports will be published as separate reports in late 2021.

The 2021 Plan – a continuation of reform

The release of the *2021 Australian Infrastructure Plan* represents another step in the ongoing reform process.

The Australian Government has committed to respond to the *2021 Plan* and we will work alongside them in developing a response and moving into implementation.

Infrastructure Australia will work alongside Australia's governments and industry to facilitate the implementation of our recommendations, providing them with the pathway and tools they need to reform the sector.

As the nation's infrastructure advisor, we are particularly well placed to facilitate collaboration across industries and jurisdictions. As a priority, we will support collaboration in the three strategic focus areas that cut across all infrastructure sectors, as outlined in their chapters:

- Place-based outcomes for communities
- Industry productivity and innovation
- Sustainability and resilience.

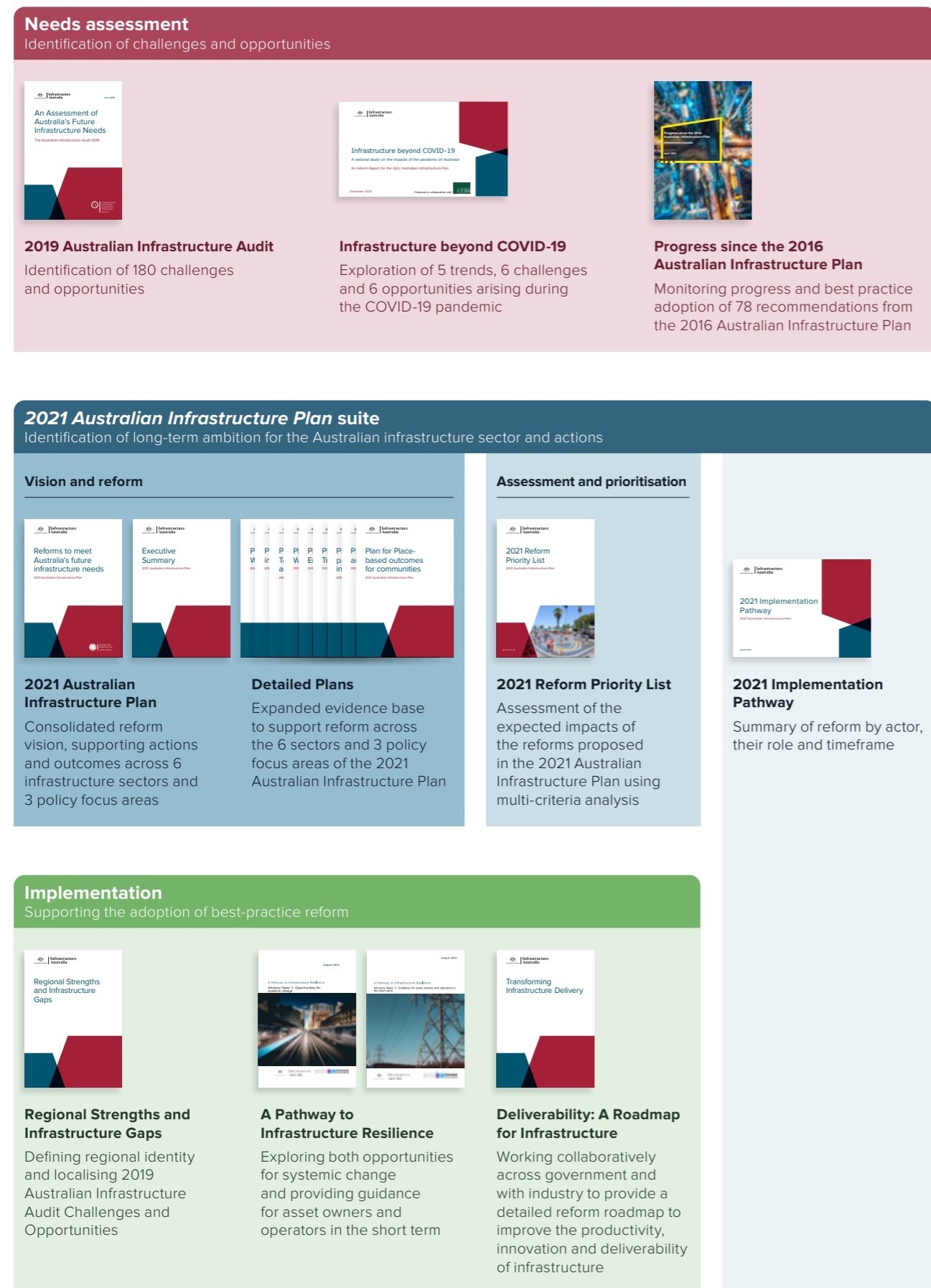
As Infrastructure Australia advocates more actively for the reforms in the *2021 Plan*, we will also move to a more organic cycle of developing Audits and Plans for Australia's infrastructure networks.

Rather than the existing model of providing five-yearly updates, we will seek to provide a unique, national perspective on issues as they emerge.

This will enable us to be more responsive in highlighting infrastructure challenges and opportunities in an increasingly uncertain world, and to guide industry and government on the necessary reform.



Figure I.1: 2021 Australian Infrastructure Plan suite of publications



How we move from advice to implementation

The *2021 Australian Infrastructure Plan* provides a platform for lasting reform in the infrastructure sector. It aims to enable a step change in the quality of life of Australians, improved infrastructure services and a more sustainable nation. The challenge of progressing the reforms outlined in the *2021 Plan* is a shared one.

In developing the *2021 Plan*, we have identified four key groups of stakeholders, each with a distinct role to play as we move from policy development to implementation. These are: **Infrastructure Australia, governments, industry, individuals and the community**.

The *2021 Implementation Pathway* identifies the actors from each of these stakeholder groups, who are responsible for implementing reform and the time period over which it should commence.

The *2021 Plan* has been developed principally for the **Australian Government**. As such, over half of the total reform effort is within its remit. However, as owners of many of the most significant infrastructure networks in the country and the most substantial clients for infrastructure delivery, around a third of reforms require action or ownership from state and territory governments.

Infrastructure Australia has not defined the funding or resource requirements for each of these 151 actors identified to implement the reforms. However, we will enable the success of reforms by facilitating and supporting conversations across government and industry.

The role of Infrastructure Australia

Infrastructure Australia's role, as the Australian Government's independent infrastructure advisor, is to **enable action from others to deliver lasting reform**.

Infrastructure Australia is committed to working in partnership with reform advocates across government, industry and the community to support the outcomes set out in the *2021 Plan*.

Key activities for Infrastructure Australia include:

- Collaboration and strategic support for the adoption of the reforms proposed in the *2021 Plan*.
- Coordination of working groups for individual reforms or across themes, allowing the sharing of best practice.
- Linking like-minded jurisdictions, departments, agencies and industry.
- Provision or co-development of tools and frameworks – including our newly developed multi-criteria analysis and theory of change guidance.
- Advocacy and education on the vision for reform, its benefits and trade-offs, as well as enabling actions.
- Regular, ongoing publishing of presentations, reports and support material³
- Development and release of data to build the evidence base for decision making⁴
- Progress reporting, leveraging the indicators and metrics contained within the *2021 Plan*.

The *2021 Plan* also identifies 4 outcomes and 28 activities for which Infrastructure Australia is best placed to steward or deliver reform. These areas will serve as priorities for the organisation over the years ahead.

Infrastructure Australia's ongoing role in the implementation program will be determined by the Australian Government's response to the *2021 Australian Infrastructure Plan* and the availability of resources to support change. To encourage alignment, Infrastructure Australia will support the development of the Australian Government's response, where required.

Infrastructure Australia will also support change within industry and the community. This will involve continuing to press for awareness of the challenges and opportunities identified by the *2019 Australian Infrastructure Audit* as well as the *Infrastructure Beyond COVID-19* report and presenting the case for the adoption of the best practice reform identified by the *2021 Plan*.

The role of government

Australian governments, at all levels, will need to take concerted action to deliver the outcomes set out in the *2021 Plan*.

Australian Government

Upon receipt of the *2021 Plan* in August 2021, the **Australian Government** has flagged its intention to work alongside the **Department of Infrastructure, Transport, Regional Development and Communications** to formally respond to Infrastructure Australia's reform recommendations. The Australian Government's response to the *2016 Australian Infrastructure Plan* was delivered 12 months after publication of the *2016 Plan*.

For those *2021 Plan* recommendations that are partially or wholly supported by the Australian Government, then the next steps would require sponsor and lead departments or agencies, to identify implementation plans and associated resource requirements.

The role of sponsor will be critical to ensure national consistency, collaboration across jurisdictions and common measurement of outcomes. The role of the lead agency involves ownership of outcomes and delivery of specific actions.

Although the analysis within the *2021 Plan* provides an important strategic assessment of national reform priorities, agencies should continue to employ best practice policy and regulation development. The Office of Best Practice Regulation has published a new Regulatory Impact Analysis Guide for Ministers' Meetings and National Standards Setting Bodies.⁵

Infrastructure Australia acknowledges that progress towards outcomes, or their associated activities, may not be possible within the existing funding. Progress will therefore be dependent on funding being reallocated within Australian government agencies.

Key activities for the Australian Government include:

- Delivery of the Australian Government's Response to the *2021 Australian Infrastructure Plan*.
- Development of policy documents to provide clear statements on government positions, including alignment to the advice of Infrastructure Australia.
- Identification and coordination of reform, including the preparation of Regulatory Impact Statements.
- A plan to drive change in industry and community behaviours, including communication and education campaigns.
- Implementation frameworks to support inter-jurisdiction and industry collaboration.



State and territory governments

Across the breadth of reforms, **state and territory governments** will be responsible for the implementation of specific reforms, many of which are unique to individual places and enable the more efficient delivery of infrastructure projects.

Furthermore, some jurisdictions may also have existing initiatives to address specific reforms. Infrastructure Australia acknowledges the pre-existing progress in many areas from individual governments and points to the opportunity for those jurisdictions to demonstrate best practice and share this experience with others. This provides an opportunity for communities of practice and centres of excellence to develop around the reforms proposed in the *2021 Plan*.

State and territory infrastructure bodies

Since the development of the *2016 Plan*, the number of **independent state and territory infrastructure bodies**, or dedicated infrastructure functions, has increased substantially. Each state and territory now have jurisdiction-wide infrastructure plans.

Infrastructure Australia has already commenced engagement with these bodies to support the incorporation of common reform agendas. This has included shared research, methodologies and data.

Infrastructure Australia acknowledges the opportunity to continue to collaborate with state and territory infrastructure bodies and to embed shared reforms in future Australian Infrastructure Plans and State Infrastructure Strategies (or equivalent). This will require enduring collaboration. Infrastructure Australia will maintain an active collaborator through regular engagement.

Local government

Local governments play a critical role in the *2021 Australian Infrastructure Plan* as active owners of transport, water, digital and social infrastructure. Councils are a vital link to the local community through land use and investment planning.

Specific reforms have been identified for local governments that will require higher levels of collaboration across local government boundaries, and with other levels of government.

The role of industry

Infrastructure Australia has identified a clear role for **industry** in the *2021 Plan*. This includes the infrastructure sector committing to reforms that support better project outcomes, as well as an openness to greater collaboration with government.

Thousands of private sector organisations are engaged in the Australian infrastructure sector. The role of these organisations is diverse, covering planning, construction and operations. Many organisations are engaged solely within the infrastructure sector. Others have a wide range of services and priorities in other markets that all compete for resources.

Industry should engage with government to demonstrate best practice in the infrastructure sector, support the value of reform and identify opportunities to implement change.

Outside of the infrastructure sector, business leadership is needed to support Environment, Social and Governance (ESG) practices and reporting. The *2021 Reform Priority List* adopts aspects of the ESG approach through the community sustainability metrics within the multi-criteria analysis.

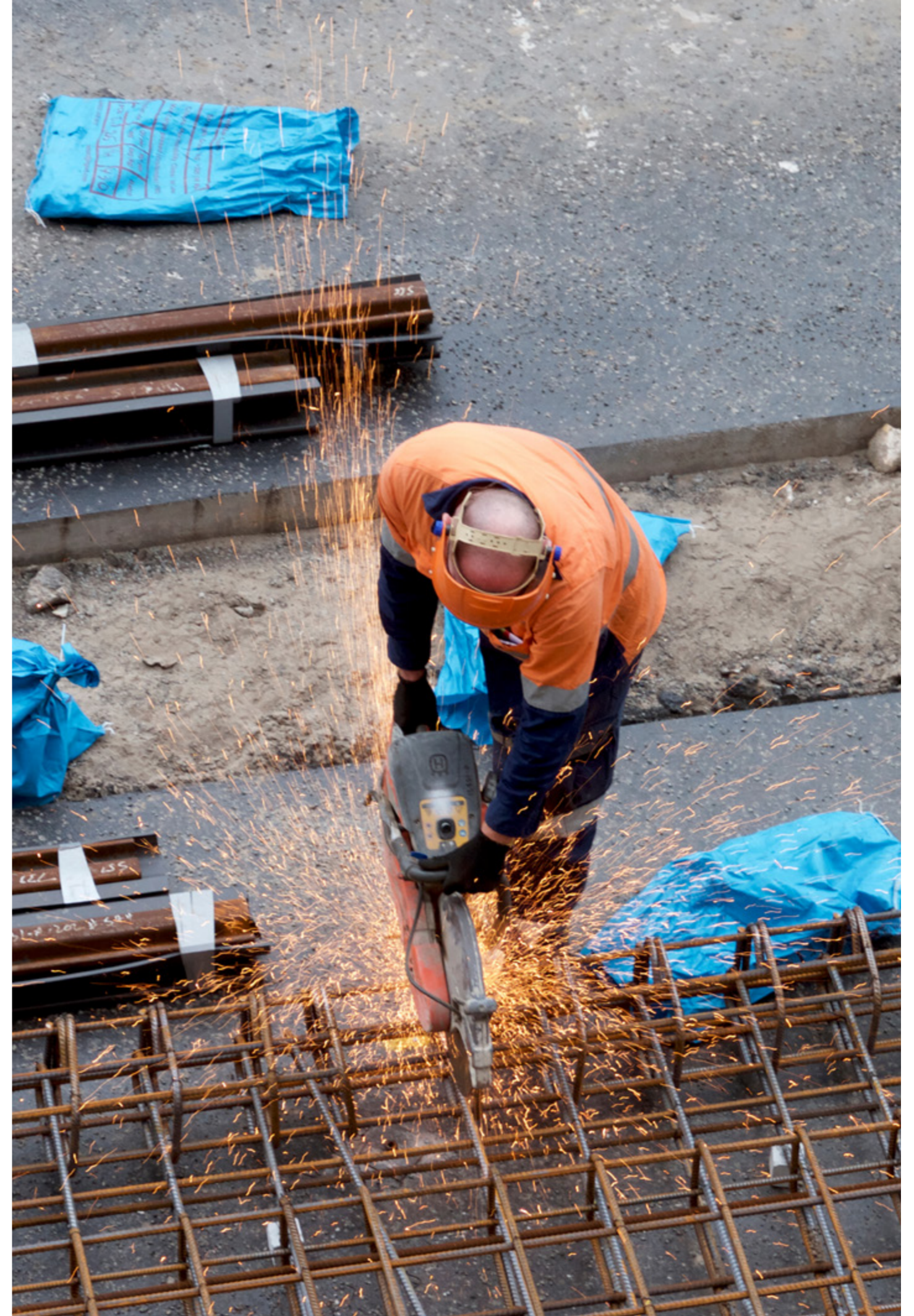
Infrastructure Australia welcomes engagement with industry through submissions to the *Infrastructure Priority List*, and the provision of best practice case-studies that would add to our evidence base.

The role of individuals and the community

The health of the Australian infrastructure sector is dependent on the behaviours of **individuals and the community**. All Australians have a role to play in improving the affordability, quality and access to infrastructure services based on engagement, education and selection of the options available, and changing usage patterns and behaviours.

The *2021 Plan* has identified reforms to empower consumers and deliver better access to services. This includes improved community engagement throughout infrastructure planning processes, and a step change in ownership over consumption patterns across the transport, energy, water and waste sectors. Key to achieving better outcomes for communities is a culture shift towards limiting waste and promoting efficiency.

Individuals and community groups must also engage actively in the infrastructure planning process. Active engagement in the early stages of planning can improve services for the community, reduce resistance to project delivery and reduce the risk of costly changes later in the process.



Summary of chapters

1. Place – unlocking the potential of every place

This chapter is based on common needs identified across four community types:

- Fast-growing Cities (Sydney, Melbourne, Brisbane, Perth)
- Small Cities and Regional Centres
- Small Towns, Rural Communities and Remote Areas
- Northern Australia and Developing Regions.

It is built around three overarching themes:

- Address disparities in the relative competitiveness of regions and provide access to infrastructure and services that reflect community need.
- Take a network view of place for a more balanced Australia, leading to a higher overall quality of life and greater economic and environmental resilience.
- Reflect the Australian Government's priorities for infrastructure to deliver social and economic benefits, shape productive and liveable cities and provide connectivity to regional and remote Australia.

Vision for 2036

Each place's identity informs its infrastructure needs and priorities, enabling investment that builds on a location's competitive strengths or reduces place-based disadvantage.

What are the underlying issues that make this chapter important?

- The Australian Government's Centre for Population has projected Australia's population is still growing and is expected to reach 28 million during 2028–2029, three years later than if the COVID-19 pandemic had not occurred.⁶
- 1 in 10 Australian workers will likely increase their pattern of working from home to 2-3 days per week.⁷ This will increase the attractiveness of Smaller Cities and Regional Centres and the outer suburbs.
- There was a 200% increase in net growth to regional centres and regional areas during the COVID-19 pandemic.⁸

Place reform

Unlock the full potential of Australia's diverse community types by recognising and developing each place's identity and uniqueness then prioritising and delivering the required infrastructure.

- 1. Place-based approach — cross-sectoral view.** Infrastructure identification and prioritisation should reflect a place-based approach that takes a cross-sectoral view of the interrelated infrastructure and amenity needs of a location.
- 2. Consistent national guidelines — identify needs.** There are currently no consistent national guidelines for infrastructure needs assessments and place-based model agreements, creating inconsistencies in planning and delivery.
- 3. Strategic planning — population shifts.** Governments need a process that supports more responsive strategic planning for future liveability, informed by better data on the spatial impact of population changes.
- 4. Closing the Gap — towards targets.** A place-based approach to infrastructure planning that engages Aboriginal and Torres Strait Islander communities can help meet *Closing the Gap* targets.
- 5. Quality of life — globally competitive.** Fast-growing cities need to provide a high standard of living to remain globally competitive.
- 6. Regional Centres — a connecting role.** To carry out their critical connecting role, Smaller Cities and Regional Centres need infrastructure that links them to Fast-growing Cities and their catchment areas.
- 7. Minimum standards — lift access.** Minimum infrastructure standards should be applied to Small towns, Rural Communities and Remote Areas facing significant infrastructure deficits.
- 8. Northern Australia — unlocking potential.** Targeted infrastructure investment in Northern Australia and Developing Regions will enable the next wave of development to boost economic growth, security and natural resource exports.

Challenges to change

- Providing greater residential choice in Fast-growing Cities by planning and delivering high-quality medium density residential areas through well-sequenced infrastructure investment.
- Ensuring most Australians who reside in Smaller Cities are within three hours of an aviation gateway connected to a Fast-growing City by applying movement data to help prioritise investment in regional airport infrastructure.
- Ensuring nationally consistent governance arrangements for municipal and essential services in remote areas through engagement with the Department of Prime Minister and Cabinet.
- Ensuring communities in Small Towns, Rural Communities and Remote Areas have access to infrastructure services to meet basic requirements.

Agents of change

- Australian Bureau of Agricultural and Resource Economics and Sciences
- Australian Bureau of Communications, Arts and Regional Research
- Australian Bureau of Infrastructure and Transport Research Economics
- Australian Bureau of Infrastructure, Transport and Regional Economics
- Australian Department of Agriculture, Water and the Environment
- Australian Department of Education, Skills and Employment
- Australian Department of Foreign Affairs and Trade
- Australian Department of Industry, Science, Energy and Resources
- Australian Department of Infrastructure, Transport, Regional Development and Communications
- Australian Department of Prime Minister and Cabinet
- Centre for Population

- Cooperative Research Centre for Northern Australia
- CSIRO
- Department of Finance
- Digital Transformation Agency
- Geoscience Australia
- Infrastructure Australia
- Northern Australia Infrastructure Facility
- Local governments
- National Faster Rail Agency
- National Indigenous Australians Agency
- NBN Co
- Office of Northern Australia
- Regional development bodies
- Services Australia
- South Australian Department of Premier and Cabinet
- South Australian Office of Local Government
- State and territory:
 - Aboriginal and Torres Strait Islander affairs
 - Demographers
 - Education departments
 - Government property agencies
 - Industry Departments
 - Infrastructure delivery agencies
 - Infrastructure departments
 - Planning and regional development agencies
 - Planning departments
 - Regional service agencies
 - Resources departments
 - Telecommunications and digital agencies
 - Training and workforce departments
 - Transport departments
 - Treasuries



2. Sustainability and resilience – balancing infrastructure outcomes in an uncertain future

The compounding impact of the disasters that Australia has experienced over the last two years is a warning sign for the uncertainty and risk that lies ahead.

The scale, pace, interconnectedness and uncertainty of change today is unique and more threatening than ever.

A nationally consistent, systemic approach to understanding and quantifying risk is required to ensure Australia's assets, networks, systems, communities and places are resilient.

Vision for 2036

Communities are able to resist, absorb, accommodate, recover, transform and thrive in response to the effects of shocks and stresses in a timely, efficient manner, enabling positive sustainable economic, social, environmental and governance outcomes.

What are the underlying issues that make this chapter important?

- The average annual cost of natural disasters is projected to rise from \$18.2 billion to \$39.3 billion in 2050.⁹
- Since 2017, no infrastructure project assessed by Infrastructure Australia has applied our guidance on climate risk.¹⁰
- The infrastructure sector accounts for about 70% of Australia's emissions and must be a leading adopter of low carbon technology.¹¹

Sustainability and resilience reform

During 2019–2021, Australia has responded to the COVID-19 pandemic, a record-breaking bushfire season, geopolitical risks, extensive flooding and drought, and cyber-attacks on critical infrastructure networks.

These events demonstrated how critical infrastructure is for maintaining community safety, biodiversity and a functional economy. Shocks and stresses are growing more frequent, interconnected and severe.

There is an opportunity to take stock of lessons learned and make communities more resilient and sustainable.

1. National leadership – prioritising resilience.

In a time of rapid change, uncertainty and risk, new practices are needed to ensure infrastructure plays an enabling role in contributing to community resilience. This requires a nationally consistent approach to resilience with clear, cross-sector policy priorities to inform resilience planning and prioritisation of policy and reform decisions.

2. A systemic approach – coordinating responsibility.

An all-hazards systemic approach to resilience considers the interrelationship between shocks, stresses and future trends while identifying infrastructure interconnections, interdependencies and vulnerabilities. Effective governance will coordinate and allocate responsibility to build resilience across assets and networks, places and systems.

3. Valuing resilience – evidence-based investment decisions.

To make more informed decisions, the value placed on resilience through the infrastructure lifecycle must be consistent. A national approach to quantifying the risks, costs, benefits and performance of resilient assets would embed the economic case into the business case for investment, along with commercial whole-of-life cost considerations.

4. Community trust – a vital ingredient for change.

The ability to deliver change is highest when communities trust government and institutions. Reform during periods of complexity and uncertainty will only be accepted and effective where citizens trust decision-makers to act on their behalf and in their best interests. Doing this requires successful engagement and effective, transparent decision-making.

5. Sustainability – an inter-generational commitment.

Integrating sustainability into planning and decision-making will allow Australia to meet present needs without compromising the ability of future generations to meet theirs. A sustainable approach to infrastructure with a focus on economic, social, environmental and governance outcomes is outlined in *Infrastructure Australia's Approach to Sustainability*¹² and embedded throughout the *2021 Australian Infrastructure Plan*.

6. Long-lived infrastructure – contribution to a net-zero future.

Infrastructure is long-term. Investments made today must consider a net zero future, including investing in technology that enables it. A more comprehensive understanding of each sector's emissions profile will help to coordinate national action, identify opportunities and plot a comprehensive short- and long-term emissions reduction pathway.

7. Creating certainty – supporting private investment.

Certainty about policy settings help investors to see value. Being clear that Australia is prioritising long-term sustainability outcomes will attract investment that supports new and emerging industries, create jobs, and assist the nation's recovery from the pandemic.

Challenges to change

- There is a lack of access to quality and timely data about the needs, preferences and aspirations of communities to inform early infrastructure decision-making.
- It is difficult to encourage communities and people from diverse backgrounds, experiences and perspectives to participate in engagement processes.
- The need for national climate risk scenarios to be used as a foundational concept in infrastructure investment and land use settlement decisions.
- Preferences and expectations often evolve ahead of government policy and regulation and political cycles and processes, creating challenges to ensuring the changes benefits all communities.
- Reduced long-term confidence in the viability of existing infrastructure due to an increased understanding of resilience.
- Community disruption due to mandated land sales and land reservation that enables increased corridor protection.

Agents of change

- Assessment agencies
- Assurance process owners
- Australian Transport Assessment and Planning Steering Committee Secretariat
- Australian Climate Service
- Australian Department of Agriculture, Water and the Environment
- Australian Department of Home Affairs
- Australian Department of Industry, Science, Energy and Resources
- Australian Department of Infrastructure, Transport, Regional Development and Communications

- Australian Department of Prime Minister and Cabinet
- Australian Treasury
- Building Ministers Meeting
- Bureau of Meteorology
- Climate and Resilience Services Australia
- CSIRO
- Industry groups and associations
- Infrastructure Australia
- Infrastructure investment assurance and infrastructure bodies
- Infrastructure owners and operators
- Local governments
- National Recovery and Resilience Agency
- Project proponents
- Regional development bodies
- State and territory:
 - Climate policy agencies
 - Departments of energy
 - Education departments
 - Emergency management agencies
 - Environment departments
 - Finance departments
 - Health infrastructure agencies
 - Housing departments
 - Infrastructure bodies
 - Property agencies
 - Planning departments
 - Resilience bodies
 - Social housing providers
 - Social infrastructure owners
 - Transport departments
 - Treasury departments



3. Industry productivity and innovation — facilitating a step change in industry productivity

The 2019 *Australian Infrastructure Audit* identified that economic and social infrastructure accounts for close to 20% of Australia's gross domestic product (GDP).

However, the infrastructure industry performs relatively poorly compared to other industry sectors when measured for efficiency, productivity, innovation, digitisation, sustainability, industrialisation and value for money.

A global pandemic, natural disasters and geopolitical shifts have added resiliency challenges to this mix.

To create a step change in outcomes, there needs to be transformational reform to see how the sector operates.

Vision for 2036

An infrastructure industry that is highly productive, efficient, effective, prepared and confident.

An environment where industry can sustainably respond to government's objectives and vision with capability, capacity and resources in line with Australia's best interests.

What are the underlying issues that make this chapter important?

- The lack of infrastructure and construction sector diversity:
 - gender pay gap is twice the national average¹³
 - female representation is 2.5 times less than the national average¹⁴
 - suicide caused by mental health issues is six times more likely than an onsite fatality.¹⁵
- Low levels of productivity compared to other similar countries — focusing on 'industrialisation', digitisation, modern construction methods, greater supply chain engagement and embracing innovation could result in a potential 60% uplift.¹⁶
- Inconsistent use of due diligence and front-end planning across the sector — applying it consistently could lead to:
 - 30% reduction in capital costs
 - 17% reduction in overall project timeline
 - 160% increase in user satisfaction and functionality.^{17,18}
- The need to reduce the sector's carbon footprint — embedding sustainability goals in all infrastructure procurement could lead to a 55% reduction.¹⁹

Industry productivity and innovation reform

The infrastructure industry and its performance is now a critical and strategic part of the economy. Taxpayers and governments depend on it to enable great community outcomes.

Improving outcomes will rely on all parties to engage, plan, design, procure, deliver, operate and maintain infrastructure differently.

- Investment worthiness — good governance.** Governments should mature their approach from 'shovel worthy' announcements to ensuring each project is 'investment worthy'.
- Productivity expectations — government-led step change.** Governments can unlock a step change in productivity by transitioning towards industrialising the sector, adopting portfolio management, expecting a digital by default approach, providing resources for front-end engagement and rewarding innovation.
- Sector stewardship — government sponsorship.** All tiers of government must be model clients, champion industry health and productivity, and reward industry members that actively respond to gender pay gaps, mental health, diversity and inclusion.
- Asset management — upgrade rather than build.** Upgrading existing assets can be a better idea than developing new infrastructure, which is becoming increasingly expensive to deliver due to the sector's stagnating productivity.
- Strategic partners — industry and government.** Industry and government must work together to ensure the sector can be viewed as a strategic asset and long-term viable partner. The sector needs support to become resilient to shifting priorities and to be willing to engage in outcome-based procurement, as well as being able to balance risks, invest confidently in innovation and deliver capability when needed.

Challenges to change

- Retention of existing government procurement practices will likely continue to deliver similar results and driving change will need leadership from all government procurement agencies.
- The ability of governments and industry to attract funding may be eroded as the industry becomes less globally competitive.
- Good governance requires investment in capability, so it may take time to deliver results.

Agents of change

- Asset Management Council of Australia
- Australasian Procurement and Construction Council
- Australia New Zealand Spatial Information Council
- Australian Constructors Association
- Australian Cost Engineering Society
- Australian Human Rights Institute
- Australian Institute of Project Management
- Australian Institute of Quantity Surveyors
- Australian Owned Contractors
- Australian Risk Engineering Society
- BuildingSMART
- Business Council of Australia
- Consult Australia
- Australian Department of Finance
- Australian Department of Infrastructure, Transport, Regional Development and Communications
- Facility Management Association of Australia
- Industry
- Infrastructure Australia
- Infrastructure Partnerships Australia
- Institution of Civil Engineers
- Insurance Council of Australia
- IoT Alliance Australia
- Infrastructure and Project Financing Authority
- National Association of Women in Construction
- National Skills Commission
- NATSPEC
- NBS
- prefabAUS
- Public sector skills commissions
- Smart Cities Council of Australia and New Zealand
- Social Procurement Australasia
- Social Traders
- Society of Construction Law Australia
- State and territory:
 - Infrastructure bodies
 - infrastructure delivery agencies
 - Insurance policy-holders and their insurers
 - Treasuries



4. Transport – all moving parts working as one to deliver door-to-door connectivity

The Australian transport landscape has been transforming in the face of changing customer needs and public expectations, community pressures, technology innovations and booming business opportunities.

Reforming the way Australia plans, delivers, uses and pays for transport over the next 15 years will enable transport networks to respond to these changes. Automation, connectivity, fleet sharing, electrification and the legacy impacts of the COVID-19 pandemic will all be factors for a highly connected world.

The pandemic has revealed much about the movement of people and freight and uncovered some challenges:

- getting the most out of transport investment
- connecting regional and remote Australia
- making mobility choice possible
- charging a fair price for every journey.

Vision for 2036

Transport services should seamlessly connect people and goods across our vast continent. From door-to-door urban journeys to paddock-to-plate and pit-to-port supply chains, transport should be reliable and simple to use.

What are the underlying issues that make this chapter important?

- Over half the infrastructure stimulus funding governments provided as the pandemic took hold was available to transport projects.²⁰ The enduring transport benefits of these investments must be captured beyond providing an immediate boost for the construction industry. Transport investment must be tied to long-term plans that lay down specific, place-based targets for freight productivity, access to jobs and services, and population change.
- The past five years have seen a significant upswing in Australians pursuing a regional lifestyle as technology changed work/life balance and normalised working from home. This trend was further accelerated by the pandemic.²¹ Growing regions could take pressure off congested cities and benefit the bush, and it is now time to bring these centres closer together through better regional transport – including air and rail.

- During the pandemic, walking and biking boomed. In some areas, cycling doubled year-on-year.²² Making active travel safe and fun for all will drive more growth. Combining these travel modes with mass transit for long-distance journeys and demand-responsive last-mile bus services will create a new form of urban living where people do not rely on car use.
- Before the *2021 Plan* is halfway through its 15-year timespan, petroleum fuel excise could be half what it was 20 years ago and vehicles could be travelling double the kilometres.^{23,24} Australia's population is less than one tenth that of the United States, but it maintains nearly twice the length of existing road for every person.²⁵ Without first reforming transport pricing to achieve a step change in productivity, this country cannot afford to keep expanding the national transport network.

Transport reform

- 1. Transport – the great enabler.** Transport shapes communities, so Australia must build, operate and maintain transport infrastructure that supports the places Australians want to live, work, play, visit and invest in. There must be consistent national movement and place standards to set a clear and transparent framework for achieving the expected funding outcomes.
- 2. Regional connectivity – making the case.** Improving the local accessibility of Smaller Cities and Regional Centres will support their economic diversification and sustainable population growth, adding weight to the case for progressive faster rail improvements. Integrated into a 'hub-and-spoke' network, regional passenger transport services can do a better job of connecting rural and remote communities to essential services in larger centres.
- 3. Door-to-door journeys – part of the norm.** With more people walking, cycling or using a micromobility device as part of their daily travel routine, prioritising and accelerating investment in active travel will pay health dividends for individuals and create less congested urban communities. Demand-responsive services that are fully integrated into the public transport ecosystem will significantly improve access for people with disability. Providing demand-responsive public transport and connected pathway networks in the early days of new suburbs can break the link between greenfield development and car dependence and build critical mass for public transport.

4. Valued supply chains – connected markets.

Targeted improvements will leverage new data and technology to enable smoother supply chain access to key domestic markets and export gateways, reducing operator costs.

5. Staged outcomes – based on strategic place-based goals.

Working within an overarching vision, the staged development of major transport corridors and networks can establish a sustainable transport culture and ensure mobility services keep pace with user needs.

6. Connected, autonomous, electric and shared vehicles – the revolution is happening.

Bringing forward new mobility technologies means redesigning cities and towns to make electric vehicle recharging easy and commonplace and road networks ready for connected and autonomous fleets.

7. Pricing overhaul – all modes, for a more efficient network.

A fair pricing regime will visibly dedicate transport revenues to transport outcomes and protect disadvantaged users from an undue cost burden. It will pass on to road users the direct costs of transport infrastructure and services and the external costs of their travel choices, such as emissions, collisions and congestion. Distance-based road-use pricing reforms for all vehicles could build on current heavy vehicle initiatives and other proposals by individual jurisdictions and be incrementally rolled out nationwide.

Challenges to change

Tying intergovernmental funding agreements to specific movement outcomes will take a concerted effort by all levels of government

Regional rail investment relies on having strategic alignment across population growth, the role of

places, the strategic value of regional connectivity, and on commitments being maintained over multiple electoral cycles.

Transport network pricing reforms will involve changing the familiar and established – but inefficient – ways that people pay for mobility.

Agents of change

- Attorney-General's Department
- Australian Department of Industry, Science, Energy and Resources
- Australian Department of Infrastructure, Transport, Regional Development and Communications
- Australian Department of Social Services
- Australian Transport Assessment and Planning Steering Committee Secretariat
- Australian Building Codes Board
- Australian Competition and Consumer Commission
- Australian Renewable Energy Agency
- Australian Treasury
- Austroads
- CSIRO
- Infrastructure Australia
- Local governments
- National Disability Insurance Agency
- National Transport Commission
- Office of Road Safety
- Transport operators
- State and territory:
 - Planning departments
 - Transport departments
 - Treasuries



5. Energy — enabling an affordable transition to a net zero future

Energy technology is moving fast. Australia needs a high-tech, low-cost, low-emissions energy system to power the future — from efficient homes to clean exports.

Consumers and businesses will benefit from a planned and proactive transition that prioritises value creating change.

Vision for 2036

Australia exports clean energy commodities and value-added products to the world from its high-tech, low-cost, low-emissions energy system. Empowered households and businesses use smart technology to manage their own energy costs and participate in an efficient, reliable grid.

What are the underlying issues that make this chapter important?

- Australia's residential energy intensity lags the world and is in the same place it was 20 years ago. By comparison, the United Kingdom and France have reduced energy intensity by 30% over the same period.²⁶
- Australia is leading the world in decentralised energy resources — one in four households currently have rooftop solar systems.²⁷
- With our top energy trading partners (Japan, China, and South Korea) that have committed to being net zero, Australia needs clean exports to remain a supplier of choice and protect and create jobs, particularly in the regions. Australia has world-leading renewable energy resources, with the highest average solar radiation per square metre of any continent.²⁸
- Every million dollars of government funding spent on renewable energy or energy efficiency creates three times as many jobs as spending the same amount on fossil fuels.²⁹

Energy reform

- 1. A new model — roles reset.** The energy sector is undergoing unprecedented change that will have a lasting impact on the sector and Australia. It will fundamentally shift the sector's infrastructure needs, fuel types, generation locations, demand patterns and economic fundamentals.
- 2. Electricity — economic lifeblood.** Getting the energy transformation right is critical to Australia's future. Energy, particularly electricity, is fundamental to the Australian way of life and underpins the economy.

3. Transformation — continuous change. The energy transformation has been, and will continue to be, the centre of discussions and programs of works across all levels of government, energy market bodies, the energy regulator and industry bodies.

4. Infrastructure Australia — focused advice. Infrastructure Australia's approach is to not reinvent the wheel. We have avoided areas where an additional perspective could create uncertainty. Where appropriate, we complement and build on the existing energy transition work programs undertaken by the Australian, state and territory energy departments, energy market bodies and the energy regulator.

5. Customer focus — bill savings. Driving affordability across Australia by equipping customers with knowledge and tools that unlock bill savings, while ensuring vulnerable customers are not worse off and receive tailored support to reduce their electricity bills.

6. Grid for the future — smart and affordable. The future grid, which is the essential backbone for delivering electricity to customers, will be a smart and affordable enabler of the Australian way of life. It will also support the uptake of zero emission vehicles across Australia at scale and cost-effectively.

7. Energy exports — emerging opportunities. Australia, with its abundant natural energy resources such as solar and wind, can enjoy the benefits of low-cost, low-emission energy sources. This is a pivotal time for securing Australia's future by pivoting fossil fuel energy exports and domestic energy demand to low-emission energy sources.

Challenges to change

There has been mixed outcomes to date with smart meter deployment in some part due to limited active energy management.

Time-of-use tariffs are politically sensitive as they will create winners and losers. There will need to be measures to protect vulnerable consumers.

Agents of change

- The Australian Academy of Technology and Engineering
- Australian Department of Industry, Science, Energy and Resources
- Australian Energy Market Commission
- Australian Energy Market Operator
- Australian Energy Regulator
- Australian Renewable Energy Agency
- Australian Treasury

- State and territory:
 - Clean Energy Finance Corporation
 - Consumers
 - Distribution owners
 - Electricity generators
 - Energy departments
 - Energy Security Board
 - Property industry
 - Transmission owner



6. Water — prioritising safe, secure, resilient water into the future

Generally, Australia's water infrastructure works well. It delivers reliable and affordable services that make the nation's cities and towns more liveable by providing a high quality of life. This is an achievement in a country characterised by droughts and floods, but must not be taken for granted.

However, being so reliant on rainfall means changing weather patterns will make it increasingly difficult to provide all Australians with a reliable, resilient water supply. This is concerning given the vital contribution it makes to people's health and lifestyles and its enabling role in the national economy.

The reforms in the *2021 Plan* will provide confidence that Australia can continue to deliver safe and secure water resources into the future in a way that boosts urban liveability and resilience, supports economic growth and ensures quality of access for all.

Vision for 2036

Resilient, secure and quality water supplies are available for all Australians and create attractive, liveable and resilient communities.

What are the underlying issues that make this chapter important?

- The majority (82%) of Australia's urban water supply is from surface water, which is highly dependent on rainfall. As shifts in rainfall patterns due to changes in climate are likely, a move beyond climate-dependent water sources is needed. All water supply options must be on the table.
- By 2031, Australia's population is expected to reach close to 29 million.³⁰ Currently, more than 70% of people live in cities,³¹ so demand on existing water and wastewater infrastructure will grow, and so will pressure on the waterways that receive treated effluent.
- Population growth will also increase demand for water-reliant features in the urban environment, including green and blue infrastructure, which support human health and wellbeing.
- A focus on liveability and resilience to future stresses will be critical to maintain cities as major economic generators — Australia's major cities contribute nearly 80% of the national GDP.³²
- Governments must accelerate progress towards better integrating water management, clarifying roles and responsibilities, and establishing sustainable funding arrangements based on water cycle and circular economy principles.

- The *2019 Audit* identified that urban water and wastewater infrastructure is deteriorating and ageing. Ensuring knowledge is shared across the sector and having access to these resources through greater collaboration is key to managing ageing assets and meeting future expectations.
- As outlined in the *2019 Audit*, the commitment to provide safe drinking water has not been achieved in many remote communities. Governments must deliver fit-for-purpose, fit-for-place and fit-for-people water services to Australians living in remote and isolated communities using approaches that recognise and respond to the specific conditions in these parts of the country.
- Although reactive initiatives that respond to drought and other scarcity events are effective in rapidly reducing water use, they are less effective in creating lasting changes in behaviour. Communities that understand the full value of water will drive efficient behaviours and attitudes, not just when water is scarce, but also when it is plentiful.

Water reform

- 1. Valuing water — critical precious resource.** Water must be regarded as a critical precious resource for liveable communities, healthy environments and economic growth.
- 2. Reliable water and wastewater services — a human right.** All Australians have a right to safe, reliable water and wastewater services.³³ This is not only essential to meet basic human needs, but critical for strengthening outcomes for health, wellbeing, economic prosperity and sustainable development.
- 3. Water security — under increasing threat.** The security of Australia's water resources is under increasing threat from climate change, weather extremes, population growth, changing user expectations and ageing infrastructure. Securing it demands a consistent and clear national approach.
- 4. Change agents — efficient behaviours and attitudes.** By working together, the water sector, communities, businesses and governments can shift how Australians view and value water and encourage the right behaviours when water is plentiful and when it is scarce.
- 5. Water cycle management — diversified water supply portfolio.** Governments must remove outdated regulations to enable water supply portfolios to include alternative water supplies, which will improve their diversification and reduce risk.

Challenges to change

- It is challenging for parts of the community to embrace purified recycled water for drinking purposes, even though it is a safe, climate-resilient and economically efficient source.
- Ensuring all water sources are on the table for consideration and that they are assessed equally, based on their full merits for meeting long-term needs.
- Leveraging the success of drinking recycled water in Perth and the regional New South Wales town of Orange to develop a public dialogue that educates the community through words and images that avoid causing stigma or an emotional response.

Agents of change

- Aboriginal Land Councils
- Australian Communities
- Australian Department of Agriculture, Water and the Environment
- Communities
- Department of Health
- Local councils
- Local governments
- National Indigenous Australians Agency
- Water Services Association of Australia
- Water utilities
- State and territory:
 - Aboriginal and Torres Strait Islander policy departments
 - Essential service pricing regulators
 - First Minister's departments
 - Health departments
 - Municipal services departments
 - Water planning departments



7. Telecommunications and digital — ensuring resilience and equality in an era of accelerating digitalisation

Telecommunications and digital services continue to innovate and play a more important role in Australians' lives. Being able to access, afford and use them is now essential to fully participate in society.

Digital infrastructure not only keeps Australians connected, it underpins the economy, encourages innovation, and supports people in their everyday lives including access to better health, education and services.

Australia's networks need to become more widely available in the regions and more reliable, faster and inclusive in more places.

New technology must be fully enabled to encourage the introduction of new capabilities that will boost economic growth across Australia's industries.

Vision for 2036

A fully connected Australia that offers resilient, superfast, equitable and wide coverage to everyone.

What are the underlying issues that make this chapter important?

- Improving network resilience. In a single week in 2020, 1,406 telecommunications facilities went offline because of bushfires, jeopardising the safety of many thousands of people.³⁴
- The ability to meet changing demand. During the initial COVID-19 pandemic lockdown in April 2020, demand on the National Broadband Network (NBN) increased by an average of 71% during busy hours.³⁵ Video conference operators reported an 85% rise in adoption rates.
- Over 30% of remote or very remote Aboriginal and Torres Strait Islander households have no internet access and the majority are still without basic telephony services,³⁶ so the digital divide needs to close.
- Tackling the digital divide. In 2020, people in the bottom quintile for household income had a digital inclusion score (a measure of internet engagement) of 44, some 30 points lower than those in top-quintile high-income households.³⁷
- Making sure all the economic benefits are realised. If it is fully enabled, 5G technology will yield a productivity benefit of 0.2% each year, equating to more than \$50 billion in the first decade.³⁸ This is equivalent to between \$1,300 and \$2,000 per person in additional GDP.³⁹

Telecommunications and digital reform

- 1. COVID-19 response — fast, affordable, and reliable internet.** The COVID-19 pandemic marked a new era in many Australians' relationship with technology. There was a growing reliance on digital services and an unprecedented shift to digital channels for interaction. It is essential Australia's digital infrastructure is built to be resilient to ensure everyone can access fast, affordable and reliable internet.
- 2. Service resilience — a comprehensive response to natural disasters.** Even before the COVID-19 pandemic, Australia experienced a devastating range of natural disasters across 2019 and 2020. Each emergency impacted the reliability of telecommunications services, underlining the need for more resilient networks and comprehensive redundancy options.
- 3. Digital inclusion — access for all Australians.** Across every part of society, the ability to access, afford and use digital services is now essential for full participation. However, there is still a digital divide across demographics, and many Australians risk being left behind because they are not online. Australia needs a comprehensive roadmap to improve digital inclusion across society.
- 4. Uniform minimal service levels — delivered to end customers.** Major improvements in the reach, speed and reliability of the NBN kept Australia connected during the pandemic. Despite significant improvements, a small number of NBN users on specific access technologies such as Fibre to the Node (FTTN) and Fixed Wireless (FW) still have issues with slower data speeds. These end customers require prioritised upgrades with clear dates to provide consistent service and ensure uniform minimal service levels.
- 5. Regional Australia — a sustainable investment model.** Regional and remote Australians have experienced significant investment and improvements to the coverage, speed and reliability of both mobile and fixed telecommunications. The Australian Government has invested significantly in areas where private sector network growth is inhibited by having no commercial business case. With the growing importance of telecommunications and the vast expanse of land involved, it is vital to find a sustainable model for ongoing investment in networks and assets for regional Australia to provide coverage to growing communities where and when it is needed.

6. Enabling the future — 5G, smart cities and IoT.

Emerging technologies such as 5G, smart cities and the IoT are already delivering significant benefits to communities, businesses and local economies. To ensure the potential of these groundbreaking technologies is fully enabled, the Australian Government needs to improve alignment across the industry, open a public dialogue about the growing need for technology, and tackle the misinformation that risks its acceptance.

7. Privacy and risk — protecting the consumer.

Significant business opportunities are emerging from highly advanced computing, analytics and data processing methods. However, these technologies also have inherent risks such as the misuse of personal data and compromised privacy. Improved consumer protections, clearer legislation and voluntary codes of practice across industry are required to ensure personal data and privacy is protected.

Challenges to change

- Providing access to real-time, two-way data may create concerns about jeopardising sensitive data.
- Many local governments benefit from revenue from hardware site rentals. 5G requires thousands of new sites, many of which will be street furniture that houses small 5G cells while improving public amenity. This could lead to objections from people who are opposed to 5G installations.

Agents of change

- Telecommunications network operators — fixed and mobile
- Australian Communications and Media Authority
- Australian Competition and Consumer Commission
- Australian Cybercrime Centre
- Critical Infrastructure Centre
- Australian Department of Home Affairs
- Department of Infrastructure, Transport, Regional Development and Communications
- Digital Technology Taskforce
- National Recovery and Resilience Agency
- NBN Co
- State and territory:
 - Attorney-General
 - Emergency services
 - Planning departments
 - Resilience agencies



8. Social infrastructure — supporting economic prosperity and quality of life

This is the first time the *Australian Infrastructure Plan* has included social infrastructure such as schools, hospitals, parks, community centres and social housing.

The sector's inclusion acknowledges the critical role these physical spaces and assets play in supporting the nation's wellbeing and making Australia a great place to live.

A growing and ageing population, technological advances and life-changing events (such as natural disasters and the COVID-19 pandemic) are changing how Australians live and work, highlighting the value of social infrastructure in supporting viable communities.

By providing high levels of amenity and quality of life, these facilities and the services they deliver attract people to live in an area and enable them to stay there through all stages of life. Yet the substantial contribution social infrastructure makes to local and national economies is not fully recognised.

A robust, nationally consistent framework is required to capture and measure its real economic value and drive effective and balanced investment in facilities.

Vision for 2036

Quality, accessible, future-focused, multi-purpose and economically valued social infrastructure that supports a strong, healthy and prosperous nation and ongoing quality of life for all Australians.

What are the underlying issues that make this chapter important?

- Australia's social infrastructure challenges are complex and increasing. For example, government health expenditure per person is expected to double over the next 40 years.⁴⁰ School infrastructure is ageing and not meeting demand in Fast-growing Cities.⁴¹ Access and quality to social infrastructure is inequitable and digital technology should be better leveraged.
- Social infrastructure represented only 4% of nationally significant projects in the Infrastructure Priority List.⁴² Cross-portfolio, high-value programs must be developed that share investment, land and facilities to deliver economically beneficial projects and the integrated services that communities need.
- Over the next 15 years, it is projected Australia will need almost 730,000 new social housing properties.⁴³ Currently, only 4% of Australia's housing stock is social housing, compared to the OECD average of 6%.⁴⁴

Investment in quality social housing should be a central part of a sustainable, inclusive economic recovery, including job creation.

- The health and education sectors made up 13% of Australia's GDP in 2020.⁴⁵ Strategic investment in health, education and research precincts can support higher wages and skilled jobs, attract global investment and have a multiplier effect on the economy.

Social infrastructure reform

- 1. Valuing social infrastructure — national consistency.** Social infrastructure connects people and communities to services and opportunities that enhance their quality of life, enable them to live together and help each other, keep them safe and healthy and boost national productivity. To drive more appropriate and effective investment, Australia needs a consistent national framework for valuing social infrastructure.
- 2. Uniform access — healthy and prosperous communities.** Australians expect high-quality social infrastructure that is easy to access, but experiences differ depending on where people live. Alternative models of funding and delivery will enable more well-located, maintained and fit-for-purpose facilities.
- 3. Embracing technology — optimised delivery.** The COVID-19 pandemic has demonstrated that agile, high-functioning social infrastructure can quickly adapt to the health, educational and social needs of our communities. Innovation and technology should be harnessed to drive more cost-effective and sustainable infrastructure and services that communities value.
- 4. Education hubs — contemporary learning.** The quality, functionality and accessibility of public education infrastructure is inconsistent and does not meet population and technology demands. There must be increased funding for maintenance, design and renewal to provide contemporary, fit-for-purpose education facilities that support the skills of the future and become hubs for lifelong learning.
- 5. Housing stock — addressing the shortfall.** The quality, supply and design of social housing across the country is inadequate. There needs to be more investment to improve the standard of dwellings, address the growing shortfall and provide a greater range of housing types. Better financial cases for social and affordable rental housing must be tested and applied consistently.

6. Valuing our culture — enhancing liveability.

Arts, culture and recreation facilities define Australian cultural identity. Along with public green and blue spaces (such as parks and waterways), they improve physical and mental health and make communities more livable. All levels of government should collectively plan to bring these areas to life by including them in transport planning and precinct development and renewal.

7. Co-location and precincts — driving better outcomes.

Collaborative partnerships will create shared, well-used facilities and enable the co-location of health, education and other social facilities in mixed-use precincts (where residential, commercial, retail and community facilities co-exist). This will drive collaboration, job creation, learning and innovation.

Challenges to change

- Establishing a consistent and agreed national valuation framework, a significant but essential task that will inform and balance investment in the sector and support ongoing national prosperity.
- Shifting entrenched, siloed approaches to planning and delivery. Enduring governance models must be established to drive long-term change and provide co-located, flexible and shared-use facilities as 'business as usual'. Government champions will be required to drive the necessary reform.

Agents of change

- Arts, cultural, recreational and tourism agencies
- Australian Children's Education and Care Quality Authority
- Australian Department of Agriculture, Water and the Environment
- Australian Department of Education, Skills and Employment

- Australian Department of Health
- Australian Department of Infrastructure, Transport, Regional Development and Communications
- Australian Department of Prime Minister and Cabinet
- Australian Department of Social Services
- Australian Digital Health Agency
- Australian Treasury
- Community housing providers
- Health districts and Primary Health Networks
- Industry and industry representative groups
- Infrastructure Australia
- Local governments
- National Housing Finance and Investment Corporation
- Peak community bodies
- State-run VET providers
- State and territory:
 - Arts, cultural, recreational and tourism departments
 - Economic and regional development departments
 - Education departments
 - Environment departments
 - First Minister's departments
 - Health departments
 - Housing departments
 - Infrastructure bodies
 - Infrastructure delivery agencies
 - Planning departments
 - Resilience departments
 - Treasuries



9. Waste — accelerating Australia's transition to a circular economy

Responding to significant changes in the sector, the *2021 Plan* includes waste for the first time.

Australia is one of the world's largest waste generators per capita,⁴⁶ yet waste infrastructure has traditionally been a peripheral consideration in land use planning, zoning and design. Waste management is not considered an essential public service like energy and water and the sector's performance is opaque.

The sector is undergoing a major transformation because of changing global market dynamics, the National Federation Reform Council (NFRC) waste export ban and the impacts of the pandemic.

These are acting as a catalyst for short-term reform. However, other challenges such as increasing resource consumption and the link between waste generation and greenhouse gas emissions support the case for greater change.

Moving to a circular economy, where waste is designed out of the system and resources are valued, will bring down business costs, support new industries and jobs, reduce greenhouse gas emissions and increase efficient use of natural resources such as water and energy.

To support this transition, Australia needs an integrated, secure and cost-effective waste infrastructure that is fully transparent and meets the long-term needs of its people.

Vision for 2036

Australia's waste management is transformed by embedding a circular economy waste management model and creating a recycling and manufacturing powerhouse that supports new industries.

What are the underlying issues that make this chapter important?

- The COVID-19 pandemic has reversed a long-term trend, increasing household waste by 20% during 2020.⁴⁷
- Each year, an estimated 1.5–3 million tonnes of waste is transported significant distances, dumped, stockpiled or mislabelled to reduce or avoid state levies.⁴⁸
- Between 2006–2007 and 2018–2019, construction and demolition waste in Australia increased by 32% per capita.⁴⁹
- Approximately 6.7 Mt of organics go to landfill each year, producing methane-heavy greenhouse

gases as they decompose.⁵⁰ Diverting organics from landfill will reduce both the significant proportion of waste that ends up in landfill and Australia's carbon emissions.

Waste reform

1. Sector transformation – creating a new industry.

The waste sector is being transformed by new market dynamics, with the waste export ban a catalyst for short-term reform. Challenges such as increasing resource consumption, waste generation and greenhouse gas emissions further support the case for change. The transformation presents compelling opportunities for cost reduction and new business creation.

2. Building community understanding – personal ownership.

Improving awareness and understanding of the circular economy will help to transform Australia's relationship with resources and increase individual and community responsibility.

3. Nationally consistent policy – harmonisation.

Inconsistent and unclear policy is a barrier to state and territory collaboration and further investment in resource recovery solutions. To meet the long-term needs of all Australians, Australia needs a nationwide approach to developing integrated, secure and cost-effective waste infrastructure.

4. Investing in Australia's market – new jobs, and less resources.

Investing in domestic waste and resource recovery infrastructure would stimulate local economic activity by creating new jobs, products and revenue streams. It would also retain valuable resources within the local economy and reduce Australia's reliance on virgin materials.

5. Change through collaboration – a common approach.

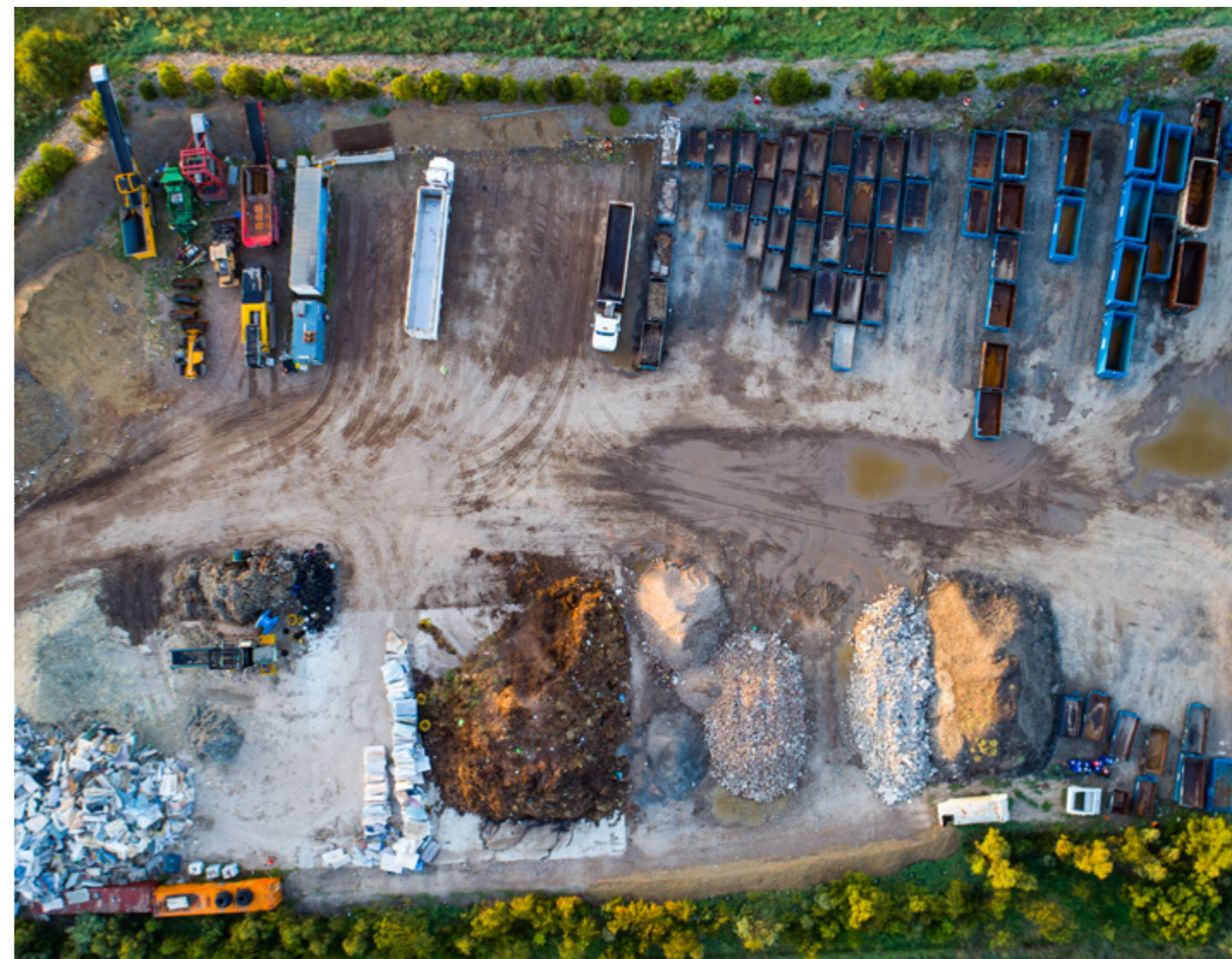
Australia's waste crisis can only be solved if multiple stakeholders work to change the whole system rather than addressing individual parts of it in isolation.

Challenges to change

- Increasing landfill diversion, which will require developing a waste levy pricing strategy and national levy protocols.
- Supporting the circular economy by developing procurement targets and timelines for incorporating increasing percentages of recycled materials in government infrastructure projects.
- Reducing organic waste to landfill, which can be tackled by investing in organics processing facilities and mandating local council Food Organics and Garden Organics (FOGO) collection services.

Agents of change

- Australian Department of Agriculture, Water and the Environment
- Australian Department of Industry, Science, Energy and Resources
- Australian Department of Infrastructure, Transport, Regional Development and Communications
- Local governments
- CSIRO
- State and territory:
 - Chief Engineers
 - Environment protection agencies
 - Environment departments
 - Infrastructure departments
 - Planning departments
 - Treasuries
 - Waste departments



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II. Recommendations

1 Place-based outcomes for communities

1.1 Rethinking our Fast-growing Cities

1.1 Recommendation

Deliver globally competitive quality of life in Fast-growing Cities by growing economies and populations, enabled by place-centric infrastructure investment and reform.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

When this should impact:

- 0-5
- 5-10
- 10-15
- 15+

Where this should impact:



0-5 1.1.1 Improve cooperation between all levels of government by jointly developing a clear vision for each Fast-growing City that underpins land use, infrastructure and planning strategies.

Proposed lead: State and territory planning departments
Supported by: Department of Infrastructure, Transport, Regional Development and Communications, local governments

0-5 Build buy-in for each city's vision through industry and community engagement.

Proposed lead: State and territory planning departments
Supported by: Department of Infrastructure, Transport, Regional Development and Communications, local government

0-5 Embed priority quality of life outcomes for each Fast-growing City in a refreshed Smart Cities Plan.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Benchmark performance of each city against the Australian Government's policy priorities through the National Cities Performance Framework.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Harmonise local character and neighbourhood plans within each city's vision to:

- account for local identity and assets
- guide timing and scope of current and proposed projects
- embed cultural considerations in planning, based on local demographics
- address disparities in infrastructure provision within and across Fast-growing Cities
- address community resilience, including behaviour changes associated with the COVID-19 pandemic.

Proposed lead: Local governments
Supported by: State and territory planning departments

0-5 1.1.2 Incorporate diverse approaches and innovation in urban policy through collaboration between government, industry and academia.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Invigorate the Cities Reference Group to provide an interface between government, academia and industry on urban policy, including:

- updated terms of reference that focus on quality of life and support population and economic growth

- renewed membership to ensure broad representation from all levels of government, the infrastructure sector and industry representatives.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 1.1.3 Maximise the impact of city-shaping infrastructure delivery and operations through collaborative place-based governance models.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory planning departments, local governments

5-10 Meet community needs by improving physical and digital connectivity through place-based approaches to infrastructure planning and governance:

- Support the vision for a city by developing planning strategies focused on physical and digital connectivity that link places within cities, and their satellite areas.
- Connect assets to communities by defining a spectrum of appropriate governance models for places of different scale.
- Prioritise industry specialisations, innovation precincts and activity centres through infrastructure distribution decisions.
- Share best practice in planning and deliver place-based projects between state, territory and local governments.

Proposed lead: State and territory planning agencies
Supported by: State and territory infrastructure delivery agencies and local governments

0-5 Identify local priorities and support efficient place-based planning and delivery by using community-led governance groups.

Proposed lead: Local governments

0-5 Effectively deliver Australian Government-funded major infrastructure by developing a spectrum of place-based governance, financial and reporting models, including:

- managing the interface of federal assets and land holdings with neighbouring state, territory and local government infrastructure through asset or precinct specific models
- aligning city-shaping investment with supporting reforms and infrastructure provision through City Deal models
- driving targeted economic development of Fast-growing Cities by creating innovation districts and activity centres.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Infrastructure and Project Financing Authority

5-10 1.1.4 Ensure city-shaping infrastructure projects deliver value for money and amenity by applying place-based considerations to funding assessments.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure departments

5-10 Support a coordinated approach to developing Fast-growing Cities by requiring funding applications to demonstrate their strategic fit with the vision and priorities identified at the local, state and territory and federal level.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure departments

0-5 Ensure business case development incorporates a place-based approach when a project will create or cause material impacts on adjacent infrastructure.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure departments

- 5-10** **1.1.5 Provide greater residential choice by planning and delivering high-quality medium-density residential areas alongside well-sequenced infrastructure investment.**

Proposed lead: State and territory planning departments
Supported by: Local governments
- 0-5** Support amenity and infrastructure access for communities undergoing densification by developing local character plans to define expectations for the size and scale of infrastructure that will be provided.

Proposed lead: State and territory planning departments
Supported by: Local governments
- 0-5** Encourage a diversity of housing forms by revising planning codes to embrace a diversity of housing options, including explicitly supporting medium-density development.

Proposed lead: State and territory planning departments
Supported by: Local governments
- 0-5** Support local government decision-making by linking local character definitions to planning codes for medium-density forms.

Proposed lead: State and territory planning departments
Supported by: Local governments
- 5-10** Explicitly consider provision of affordable housing when planning medium density residential areas.

Proposed lead: State and territory planning departments
Supported by: Local governments
- 5-10** Effectively provide for infrastructure enhancement in brownfield communities undergoing step changes in densification by developing a transparent framework for population and activity levels, value-sharing funding mechanisms and associated infrastructure investment.

Proposed lead: State and territory planning departments
Supported by: Local governments



1.2 Strengthening Smaller Cities and Regional Centres

1.2 Recommendation

Attract growth to Smaller Cities and Regional Centres while maintaining quality of life by enhancing local identity, leveraging social infrastructure and improving digital and economic connectivity to Fast-growing Cities and neighbouring regions.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: Department of Industry, Science, Energy and Resources

When this should impact: 0-5 5-10 10-15 15+ **Where this should impact:**

- 0-5** **1.2.1 Identify infrastructure needs by developing a regional strengths and gaps infrastructure prioritisation framework, supported by a classification of the geography of regional Australia.**

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure departments, Regional development bodies
- 0-5** Build the infrastructure pipeline by identifying and prioritising regional infrastructure gaps, based on existing regional development strategies across government, and industry and community consultation.

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure departments, Regional development bodies
- 5-10** Inform investment priorities by undertaking regional infrastructure needs assessments on a rolling basis.

Proposed lead: State and territory infrastructure departments
Supported by: Regional development bodies
- 5-10** Attract and retain residents and businesses by identifying and sequencing appropriate infrastructure requirements according to local community characteristics.

Proposed lead: State and territory planning departments
Supported by: State and territory infrastructure departments, Regional development bodies
- 0-5** **1.2.2 Benchmark performance of Smaller Cities and Regional Centres by defining a consistent set of urban data for provision by state, territory and local governments as a condition for funding projects identified by the needs assessment.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: Bureau of Infrastructure and Transport Research Economics
- 0-5** Inform urban policy by publishing the data within the National Cities Performance Framework and Progress in Australia's Regions dashboard.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
- 0-5** Monitor performance through bi-annual reporting on trends.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

- 0-5** **1.2.3 Support employment and population growth in Smaller Cities and Regional Centres by identifying and delivering enabling infrastructure.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Bureau of Infrastructure and Transport Research Economics, state and territory infrastructure departments, state and territory transport departments
- 0-5** Inform business case development for major projects by analysing data about settlement patterns (including Aboriginal and Torres Strait Islander settlement patterns), employment availability and variety, business locations and housing and infrastructure access.

Proposed lead: State and territory planning departments
- 0-5** Identify transport options by reviewing current and future movement between Smaller Cities and Regional Centres and Fast-growing Cities.

Proposed lead: Bureau of Infrastructure and Transport Research Economics

Supported by: State and territory transport departments and Department of Infrastructure, Transport, Regional Development and Communications
- 0-5** Support efficient planning and delivery by taking a staged approach to connectivity, identifying enabling infrastructure projects and accessibility improvements, basing decisions on current and forecast movement and embedding changes in land use and planning decision-making.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Faster Rail Agency
- 0-5** Facilitate more Australians living within three hours of an aviation gateway connected to a Fast-growing City by using movement data to prioritise investment in regional airport infrastructure.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
- 0-5** Support pandemic recovery by developing industry strategies for sectors that will deliver employment opportunities and growth.

Proposed lead: State and territory industry departments
- 5-10** Support growth and incumbent industries in each region by establishing a framework to sequence infrastructure investment based on industry-specific, place-based infrastructure needs assessments.

Proposed lead: Infrastructure Australia

Supported by: Department of Industry, Science, Energy and Resources
- 0-5** **1.2.4 Ensure existing and planned digital infrastructure will meet the changing requirements of users in Smaller Cities and Regional Centres by reviewing infrastructure rollout plans.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: NBN Co
- 0-5** Address capacity constraints in high-growth Smaller Cities and Regional Centres by targeting investment at established data-intensive industries.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: NBN Co
- 0-5** Support greater wholesale and retail competition by facilitating greater sharing of physical infrastructure and infrastructure corridors servicing regional centres.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: NBN Co, state and territory transport departments, state and territory planning departments

1.3 Lifting access in Small Towns, Rural Communities and Remote Areas

1.3 Recommendation

Support a better quality of life by aligning funding and minimum standards with principles for sustainable infrastructure delivery in Small Towns, Rural Communities and Remote Areas.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory regional service agencies

When this should impact:

0-5
5-10
10-15
15+

Where this should impact:

- 5-10** **1.3.1 Ensure communities in Small Towns, Rural Communities and Remote Areas have access to infrastructure services in line with defined minimum standards.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory regional service agencies
- 0-5** Based on community size, demographics and location, define minimum standards across economic infrastructure sectors (transport, energy, water, telecommunications and waste).

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory regional service agencies
- 5-10** Based on community size, demographics and location, define minimum standards across social infrastructure.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory regional service agencies
- 5-10** Manage potential future population and economic growth by developing staged land use plans that accommodate infrastructure and land use requirements.

Proposed lead: State and territory planning departments

- 5-10** Identify demand pressures by monitoring and forecasting population and service density for infrastructure services for small towns.

Proposed lead: State and territory demographers

Supported by: State and territory regional service agencies
- 0-5** Ensure nationally consistent governance arrangements for municipal services in remote areas by including the Anangu Pitjantjatjara Yankunytjatjara (APY) Lands in the South Australian Government's Municipal Services (MUNS) program.

Proposed lead: Office of Local Government South Australia

Supported by: South Australian Department of Premier and Cabinet
- 5-10** **1.3.2 Improve the transparency and effectiveness of Community Service Obligations by redesigning them to include robust criteria, be cost-neutral and reflect community priorities.**

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory regional service agencies
- 0-5** To ensure Community Service Obligations are delivering public value, establish an interdepartmental taskforce to review their performance and identify potential improvements.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

- 0-5** Improve understanding of costs and benefits of Community Service Obligations through mandatory public reporting on their performance.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory regional service agencies.
- 5-10** Ensure assets are culturally responsive and will be well-utilised by undertaking service design for Community Service Obligations in partnership with Aboriginal and Torres Strait Islander communities.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Indigenous Australians Agency, state and territory Aboriginal and Torres Strait Islander affairs departments, state and territory regional service agencies
- 0-5** **1.3.3. Facilitate sharing of infrastructure services and resources between communities and individuals by enabling the sharing economy.**

Proposed lead: Department of Transport, Infrastructure, Regional Development and Communications

Supported by: Geoscience Australia, Digital Transformation Agency, Department of Finance, Services Australia, state and territory government property agencies
- 0-5** Ensure infrastructure assets in Small Towns, Rural Communities and Remote Areas are understood and used by incorporating them in the Digital Atlas of Australia.

Proposed lead: Geoscience Australia

Supported by: Office of the National Data Commissioner, Digital Transformation Agency
- 5-10** Support service provision and sharing of Community Service Obligation benefits by integrating their funding arrangements with place-centric asset-sharing platforms tailored to Small Towns, Rural Communities and Remote Areas.

Proposed lead: Department of Finance

Supported by: Services Australia, Digital Transformation Agency
- 0-5** Provide services efficiently by optimising investment in built assets and social infrastructure through developing integrated infrastructure strategies across governments.

Proposed lead: Department of Finance

Supported by: State and territory government property agencies



1.4 Unlocking opportunity in Northern Australia and Developing Regions

1.4 Recommendation

Ensure Northern Australia and Developing Regions fulfil their economic role, attract and retain skilled workers and enable participation of Aboriginal and Torres Strait Islander people through greater collaboration between governments on infrastructure needs across the region.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

When this should impact:



Where this should impact:



- 0-5** **1.4.1 Improve investor certainty by collecting and publishing better data on the region's characteristics and infrastructure.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Foreign Affairs and Trade, state and territory infrastructure departments, state and territory economic development departments
- 0-5** Support informed decision-making, identify gaps and determine priorities for data collection and research through the creation of a cross-jurisdictional agency collaboration group to lead an audit of data availability and adequacy.

Proposed lead: Office of Northern Australia

Supported by: Infrastructure Australia, Bureau of Infrastructure and Transport Research Economics, Bureau of Communications, Arts and Regional Research, Australian Bureau of Agricultural and Resource Economics, ATAP Steering Committee Secretariat, CSIRO: Commonwealth Scientific and Industrial Research Organisation, Department of Agriculture, Water and the Environment, National Indigenous Australians Agency, state and territory planning departments, state and territory infrastructure agencies, state and territory regional development agencies
- 0-5** Reduce investor uncertainty and improve decision-making by identifying, creating and publishing place and network-centric data, including assessing natural resource endowments.

Proposed lead: Cross-jurisdictional collaboration group led by Office of Northern Australia

Supported by: Department of Foreign Affairs and Trade, Australian Bureau of Agricultural and Resource Economics, Department of Agriculture, Water and Environment, CSIRO: Commonwealth Scientific and Industrial Research Organisation, Geoscience Australia, state and territory infrastructure departments, state and territory planning departments, state and territory economic development departments, state and territory resources departments
- 0-5** Better meet the current and future needs of users by undertaking a new Northern Australia Infrastructure Audit.

Proposed lead: Infrastructure Australia
- 0-5** **1.4.2 Support industry development by developing place and network-based infrastructure strategies linked to incumbent and emerging growth industries.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Office of Northern Australia and state and territory infrastructure departments

- 0-5** Identify potential growth industries and growth patterns in key industries through a renewal of the Northern Australia Agenda.

*Proposed lead: Office of Northern Australia
Supported by: State and territory economic development departments*

- 0-5** Meet the requirements of growth industries by undertaking place-based assessment of digital adequacy, accessibility and affordability.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Telecommunications network operators - fixed and mobile, state and territory digital economy departments

- 0-5** Identify opportunities for shared infrastructure and reduced costs by undertaking joint assessment of enabling infrastructure requirements for major industry developments.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Office of Northern Australia, state and territory infrastructure departments

- 0-5** Reduce business costs by improving supply chain efficiency and reliability through the inclusion of end-to-end key supply chain strategies that connect productive regions with domestic markets and export gateways in the National Freight Strategy.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Foreign Affairs and Trade, Cooperative Research Centre for Northern Australia, state and territory transport departments

- 0-5** Support the infrastructure pipeline delivery for Northern Australia and grow key industries such as major resources, energy and agribusiness by developing a skills formation and attraction plan assessing skills requirements, skills training capability and liveability factors.

Proposed lead: Department of Education, Skills and Employment

Supported by: Infrastructure Australia

- 5-10** Attract and retain a skilled workforce by supporting liveability through investment in social infrastructure and connectivity.

*Proposed lead: Office of Northern Australia
Supported by: State and territory infrastructure departments, Department of Infrastructure, Transport, Regional Development and Communications*

- 5-10** Facilitate local workforce participation by identifying opportunities for developing innovation or specialisation precincts alongside major infrastructure.

Proposed lead: Department of Education, Skills and Employment

Supported by: State and territory industry departments, state and territory education and training departments

- 5-10** **1.4.3 Support participation of Aboriginal and Torres Strait Islander enterprises and individuals in infrastructure planning and delivery by developing joint programs for agencies leading the planning, delivery and operation of infrastructure.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Indigenous Australians Agency, Office of Northern Australia, state and territory Aboriginal and Torres Strait Islander affairs agencies, state and territory infrastructure departments

- 0-5** Ensure infrastructure delivers improved social and economic outcomes for communities by aligning major infrastructure investment with the objectives of the Northern Australia Indigenous Development Accord and Closing the Gap targets.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Indigenous Australians Agency

- 5-10** Support Aboriginal and Torres Strait Islander participation in the Northern Australia economy, including infrastructure delivery, by assessing and prioritising investment in enabling digital and transport connectivity in partnership with local First Nations communities.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Indigenous Australians Agency, Northern Australia Infrastructure Facility, Office of Northern Australia, state and territory infrastructure departments

- 0-5** Build the capability of Aboriginal and Torres Strait Islander entrepreneurs and traditional owners to participate in the economic development process through financial and technical support to map the commercial potential of their land and water assets, and develop feasibility studies and commercial partnerships with project proponents.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Indigenous Australians Agency

- 0-5** Improve the consistency and effectiveness of Aboriginal and Torres Strait Islander procurement policies by standardising monitoring and performance reporting across jurisdictions.

Proposed lead: Department of Prime Minister and Cabinet

Supported by: National Indigenous Australians Agency, Northern Australia Infrastructure Facility, state and territory finance departments, state and territory Aboriginal and Torres Strait Islander affairs agencies

- 10-15** Sustain local community employment in infrastructure delivery and other projects by developing an essential skills training academy building infrastructure delivery skills and knowledge.

Proposed lead: Department of Education, Skills and Employment

Supported by: Department of Infrastructure, Transport, Regional Development and Communications, National Indigenous Australians Agency, state and territory infrastructure departments



2 Sustainability and resilience

2.1 Infrastructure planning for an uncertain future

2.1 Recommendation

Build community resilience to all hazards by considering systemic risks, interdependencies and vulnerabilities in infrastructure planning and decision-making.

Proposed sponsor: National Recovery and Resilience Agency

Supported by: Department of Home Affairs, state and territory resilience agencies, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies, state and territory environment departments and asset owners and operators

When this should impact:

- 0-5
- 5-10
- 10-15
- 15+

Where this should impact:



0-5 2.1.1 Create an environment for consistent action by establishing clear cross-sector policy priorities to inform resilience planning, policy prioritisation and reform decisions.

Proposed lead: National Recovery and Resilience Agency

0-5 Improve strategic oversight and coordination of resilience outcomes across sectors and jurisdictions by establishing nationally consistent scenarios and common policy priorities.

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Prime Minister and Cabinet, Australian Treasury, Department of Home Affairs, Department of Agriculture, Water and the Environment, state and territory resilience agencies, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies and state and territory environment departments

0-5 2.1.2 Improve community resilience and coordinated action through a consistent, nationwide, systemic approach to risk identification.

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Home Affairs and Australian Climate Service

0-5 Facilitate collaboration across sectors, layers of government, asset owners and operators, businesses and communities by creating formal governance arrangements, resourcing and a convening authority in line with the *National Disaster Risk Reduction Framework*.

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Home Affairs, state and territory resilience agencies, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies, regional development bodies and state and territory environment departments

0-5 Enable timely information exchange and build accountability by expanding participants to the Trusted Information Sharing Network, sharing information and best practice and developing connections and ongoing relationships.

Proposed lead: Department of Home Affairs

Supported by: National Recovery and Resilience Agency, asset owners and operators, industry representative groups, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies and state and territory environment departments

0-5 Inform decisions on risk reduction options and approaches, and enable data driven decision-making by standardising and sharing data about disasters, hazards and asset and network interdependency.

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Home Affairs, Australian Climate Service, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies and state and territory environment departments

0-5 Improve place-based and network-based systemic risk assessment and decision-making by producing local hazard maps for asset owners and operators and communities.

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Home Affairs, Australian Climate Service, Department of Agriculture, Water and the Environment, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies, state and territory environment departments and asset owners and operators

0-5 Inform decisions to increase the resilience of a place, network or asset across Australia by identifying cascading systemic failures, interdependencies and interconnections and local vulnerability of all sectors' assets and networks.

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Home Affairs, Australian Climate Service, Department of Agriculture, Water and the Environment, local governments, state and territory departments of local government, asset owners and operators, and communities

10-15 Better predict and mitigate major hazards and risks with a national risk and disaster probability model for all hazards.

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Home Affairs, Australian Climate Service, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies and state and territory environment departments

0-5 Ensure a systemic approach to resilience is established and considered by place-based resilience bodies, such as Resilience Sydney.

Proposed lead: Local governments

Supported by: State and territory departments of local government and National Recovery and Resilience Agency

0-5 2.1.3 Facilitate joint action by establishing a common, long-term understanding of the potential impacts of climate change, both nationally and locally, that informs land use and infrastructure planning and decision-making.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: Australian Climate Service, National Recovery and Resilience Agency and state and territory environment departments

0-5 Enable consistent planning, shared responsibility and joint action by establishing long-term (2035, 2050 and 2100) Australian national climate scenarios. These should be based on possible climate futures that align with different Representative Concentration Pathways, and projections and forecasts for economic activity, energy use and land use patterns.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: CSIRO: Commonwealth Scientific and Industrial Research Organisation, Bureau of Meteorology and Australian Climate Service

0-5 Establish a national understanding of climate adaptation risk assessment by publishing and communicating the scenarios. Target communities with differing levels of scientific and technical expertise, from technical roles to decision-makers and the broad community. Ensure the tools and data are accessible and increase understanding.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: CSIRO: Commonwealth Scientific and Industrial Research Organisation, Bureau of Meteorology and Australian Climate Service

0-5 Support cross-sector coordination and shared responsibility by undertaking and publishing an annual assessment of the consideration and effectiveness of climate risk and resilience in infrastructure planning and decision-making.

Proposed lead: Infrastructure Australia

Supported by: State and territory infrastructure bodies and industry representative groups

0-5 Embed climate risk considerations into land use and infrastructure planning and decision-making by developing a training program, tools and guidance materials.

Proposed lead: Infrastructure Australia

Supported by: National Recovery and Resilience Agency, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies, state and territory environment departments, state and territory infrastructure bodies and asset owners and operators

0-5 Ensure existing and future asset planning considers climate risk by conducting climate adaptation risk assessments, developing strategic planning and policy decisions, and designing and approving future assets using climate scenarios, tools and guidance.

Proposed lead: Infrastructure Australia

Supported by: National Recovery and Resilience Agency, state and territory infrastructure bodies, industry representative groups, asset owners and operators, infrastructure investment assurance and assessment agencies and state and territory treasuries

10-15 Ensure climate risk is incorporated into infrastructure projects and services by mandating the consideration of climate risk in project assessment.

Proposed lead: Infrastructure investment assurance and assessment agencies

Supported by: State and territory treasuries, state and territory infrastructure bodies and industry representative groups

0-5 **2.1.4 Ensure infrastructure decisions consider resilience through clear and harmonised guidance on how projects can address risks and value resilience.**

Proposed lead: State and territory infrastructure bodies

Supported by: Infrastructure investment assurance and assessment agencies, state and territory treasuries, industry representative groups, Coalition for Climate Resilient Investment and National Recovery and Resilience Agency

0-5 Ensure infrastructure assessment frameworks, and associated tools and guidance, including the *Australian Transport Assessment and Planning Guidelines*, consider risks and resilience by incorporating future scenarios and hazard information.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Infrastructure Australia, state and territory infrastructure bodies, infrastructure investment assurance and assessment agencies, state and territory treasuries and ATAP Steering Committee Secretariat

0-5 Support land use and strategic planners, infrastructure and emergency planners and local governments to develop state and territory, regional and local plans by enhancing infrastructure assessment frameworks and associated climate and disaster risk tools and guidance.

Proposed lead: State and territory planning departments

Supported by: Australian Climate Service, National Recovery and Resilience Agency, Infrastructure Australia and state and territory infrastructure bodies

0-5 Value resilience in infrastructure investment by developing a training program and guidance materials on how to value resilience in decision-making through the infrastructure lifecycle.

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies, industry representative groups and Coalition for Climate Resilient Investment



2.2 Technology-led sustainability

2.2 Recommendation

Meet Australia's present and future needs by establishing the quadruple bottom line as a goal for all infrastructure policy and investment.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory environment departments

When this should impact:



Where this should impact:



0-5 2.2.1 Achieve consistency and shared ownership through embedding the quadruple-bottom-line into infrastructure decision-making frameworks.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Infrastructure investment assurance and assessment agencies, state and territory treasuries and state and territory infrastructure bodies

0-5 Ensure consistent understanding by adopting the quadruple-bottom-line definition of sustainability.

Proposed lead: State and territory environment departments

Supported by: State and territory infrastructure delivery agencies, state and territory infrastructure bodies and state and territory treasuries

0-5 Meet Australia's commitments to net zero through long-term sector-specific plans that set interim emissions reduction targets and strategies that prioritise infrastructure investments and services.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory environment departments, industry representative groups

0-5 Ensure consistent application of the quadruple-bottom-line at the strategic proposal development phase by embedding sustainability guidelines in investment frameworks and guidance materials. These should include considering

sustainability when identifying problems, developing options and undertaking economic analysis.

Proposed lead: State and territory treasuries

Supported by: Infrastructure investment assurance and assessment agencies and state and territory infrastructure bodies

0-5 Facilitate national and cross-sectoral consistency by using quadruple-bottom-line guidelines to develop complementary, sector-specific sustainability principles and frameworks.

Proposed lead: Infrastructure Australia

Supported by: State and territory infrastructure bodies, infrastructure investment assurance and assessment agencies, state and territory treasuries and industry representative groups

0-5 Support common approaches to assessment, cross-sector collaboration, shared responsibility and best practice, and develop connections and networks, by forming a cross-jurisdictional sustainability group.

Proposed lead: Infrastructure Australia

Supported by: State and territory infrastructure bodies, infrastructure investment assurance and assessment agencies, state and territory infrastructure bodies, state and territory treasuries and industry representative groups

0-5 2.2.2 Deliver cost-effective emissions reduction and broad sustainability benefits consistent with the quadruple-bottom-line by prioritising energy efficiency in the built environment and social infrastructure.

Proposed lead: State and territory social housing providers

Supported by: Community housing providers, state and territory education departments and state and territory housing departments

0-5 Identify potential to embed quadruple-bottom-line outcomes in social infrastructure assets by auditing existing social infrastructure assets and using Green Building Council of Australia's Green Star rating system, Infrastructure Sustainability Council of Australia IS Rating Scheme and NABERS tools.

Proposed lead: State and territory infrastructure departments

0-5 Ensure quadruple-bottom-line outcomes by introducing procurement standards. These should mandate sustainable performance, including energy efficiency measures and the electrification of appliances, for government-owned social infrastructure.

Proposed lead: State and territory infrastructure departments

0-5 Ensure quadruple-bottom-line outcomes by accelerating performance upgrades to social infrastructure, including schools, hospitals and public and community housing stock. Prioritise the increased installation of solar PV, storage and smart meters in social housing.

Proposed lead: State and territory housing departments, state and territory health infrastructure agencies, state and territory education departments

0-5 Improve energy efficiency and reduce emissions from new social infrastructure by increasing performance standards and updating the National Construction Code in line with the *Trajectory for Low Energy Buildings*.

Proposed lead: Building Ministers Meeting
Supported by: State and territory housing departments, Australian Building Codes Board, state and territory health infrastructure agencies, state and territory education departments, and state and territory government property agencies

0-5 Support ongoing monitoring and improvements in social housing by creating and implementing a work program for updating energy performance standards that streamlines approval processes and conducts regular reviews.

Proposed lead: State and territory energy departments

0-5 Ensure the built environment's emissions reduction pathway is understood and coordinated by establishing collaborative sectoral leadership groups, similar to the Better Buildings Partnership or the Materials and Embodied Carbon Leaders' Alliance.

Proposed lead: State and territory environment departments

Supported by: State and territory energy departments and state and territory transport departments

0-5 2.2.3 Deliver cost-effective emissions reduction and broad sustainability benefits consistent with the quadruple bottom line by managing zero emissions vehicle uptake and vehicle standards.

Proposed lead: Department of Industry, Science, Energy and Resources

0-5 Ensure the uptake of electric vehicles at the right scale and time to optimise quadruple-bottom-line benefits by delivering a national electric vehicle strategy through the expansion of the Future Fuels Strategy.

Proposed lead: Department of Industry, Science, Energy and Resources

0-5 Facilitate cost-effective emissions reductions by aligning vehicle emission standards with global best practice and requiring manufacturers to reduce emissions over vehicle portfolios.

Proposed lead: Department of Industry, Science, Energy and Resources

0-5 Ensure national consistency and coordination by aligning state and territory strategies and actions to the national strategy, including targets and timelines for transitioning all government fleet vehicles to electric vehicles whenever they are fit-for-purpose.

Proposed lead: State and territory finance departments

Supported by: Australia, state and territory government fleet managers, and state and territory transport departments

2.3 Transparency and collaboration build trust in decisions

2.3 Recommendation

Build community trust in infrastructure decision-making and institutions by ensuring infrastructure decisions are transparent, and reflect place-based community needs and preferences.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Infrastructure investment assurance and assessment agencies, state and territory treasuries and state and territory infrastructure bodies

When this should impact:



Where this should impact:



0-5 2.3.1 Improve community sustainability and build trust by embedding the quadruple bottom line in government decision-making and assessment.

Proposed lead: State and territory planning departments

Supported by: State and territory infrastructure bodies

0-5 Facilitate participatory community engagement and build trust by clarifying consistent engagement and reporting requirements, resourcing plans and measurement mechanisms.

Proposed lead: State and territory planning departments

0-5 Ensure consideration of the quadruple bottom line by adding engagement standards across assurance process stages.

Proposed lead: Infrastructure investment assurance and assessment agencies

Supported by: State and territory treasuries and state and territory infrastructure bodies

0-5 Increase transparency and maintain social licence by reporting on activities as part of Environmental, Social and Governance and Corporate Social Responsibility reporting processes using existing standards and measures.

Proposed lead: State and territory treasuries

0-5 Improve the business case for community engagement by conducting research on the benefits of effective engagement.

Proposed lead: State and territory planning departments

0-5 Understand the effectiveness of engagement activities in meeting quadruple-bottom-line outcomes, including equity and accessibility, by producing public reports on the impact of community feedback on decisions.

Proposed lead: State and territory planning departments

0-5 2.3.2 Make more transparent and consistent decisions throughout infrastructure projects and services by responding to, and understanding, place-based community needs and preferences at state and territory, regional and local government levels.

Proposed lead: State and territory planning departments

0-5 Align decision-making with community needs and preferences by incorporating decision-makers, communities, infrastructure owners and operators into early strategic planning stages. Collect information by conducting audits, assessing place-based community data and publicly releasing findings.

Proposed lead: State and territory planning departments

Supported by: Local governments and state and territory infrastructure bodies

0-5 Facilitate transparent place-based decisions by creating a framework to support the collection and public release of reliable, meaningful and comparable data across agencies and local governments.

Proposed lead: State and territory planning departments

Supported by: Local governments and state and territory infrastructure bodies

0-5 2.3.3 Build community trust by providing transparent, timely and clear information about infrastructure decision-making and post completion assessments.

Proposed lead: State and territory planning departments

Supported by: Infrastructure investment assurance and assessment agencies, state and territory treasuries and state and territory infrastructure bodies

0-5 Increase transparency by committing to, developing and releasing post completion reviews. Establish delivery dates for staged reviews when the project begins. Include information on whether the economic case in the project's business case was realised, lessons learnt, and whether the project was on time and within budget.

Proposed lead: State and territory planning departments

0-5 Improve transparency and community trust and understanding by publicly releasing key information supporting infrastructure decisions, subject to privacy and data sovereignty considerations.

Proposed lead: The Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory infrastructure departments

0-5 Encourage national consistency and cross-sector coordination by developing a national report highlighting best practice, including case studies based on publicly released data.

Proposed lead: Infrastructure Australia

Supported by: State and territory infrastructure bodies, infrastructure investment assurance and assessment agencies, state and territory treasuries and industry representative groups

0-5 2.3.4 Improve community certainty and confidence and meet long-term community needs by sequencing infrastructure delivery.

Proposed lead: State and territory planning departments

0-5 Ensure the acquisition and management of corridors in the long-term interests of users and taxpayers by identifying high-value corridors, conducting corridor feasibility studies and establishing joint funding and governance arrangements.

Proposed lead: State and territory planning departments

0-5 Allow infrastructure co-location, precinct development and agency cost-sharing by centrally managing land acquisition and management.

Proposed lead: State and territory government property agencies

0-5 Meet infrastructure costs while maintaining community support by developing transparent, hypothecated levies on adjacent land and infrastructure service catchments, such as the Western Australian Government's Metropolitan Region Improvement Tax.

Proposed lead: State and territory treasuries

3 Industry productivity and innovation

3.1 Improving planning, portfolios and pipelines

3.1 Recommendation

Improve industry productivity and value for money by having a coordinated project pipeline with a mature approach to procurement and risk management.

Proposed sponsor: State and territory treasuries

Supported by: State and territory infrastructure delivery agencies

When this should impact:



Where this should impact:



0-5 3.1.1 Improve industry capacity and capability by prioritising procurement and portfolio management and increasing pipeline transparency, certainty and confidence.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure delivery agencies

0-5 Ensure active management of project procurement within the pipeline and help industry to actively manage its capacity and risk exposure by strengthening portfolio management capabilities within the public service.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure delivery agencies, state and territory public service commissions

0-5 Develop a jurisdiction-wide, cross-sectoral infrastructure project pipeline that actively tracks progress of projects throughout their lifecycle while considering critical inputs, constraints and risks that influence their deliverability.

Proposed lead: State and territory infrastructure bodies and state and territory treasuries
Supported by: State and territory infrastructure delivery agencies, and asset owners and operators

0-5 Provide annual jurisdiction-wide pipeline briefings that provide industry with a clear macro-level view of expected procurements and act as a forum to provide feedback on pipeline risk.

Proposed lead: State and territory infrastructure bodies and state and territory treasuries
Supported by: State and territory delivery agencies and industry representative groups

0-5 Ensure future infrastructure investment and project delivery commitments are regularly reviewed and considered against the jurisdiction-wide, cross-sectoral infrastructure project pipeline and industry capacity forecasts.

Proposed lead: State and territory infrastructure delivery agencies
Supported by: Infrastructure Australia, state and territory treasuries, Department of Infrastructure, Transport, Regional Development and Communications and industry representative groups

5-10 3.1.2 Create a step change in infrastructure productivity by industrialising the sector.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: State and territory treasuries and Business Council of Australia

5-10 Develop and implement infrastructure productivity roadmaps supported by adopting modern methods of construction, including design reuse, standardised design elements, earlier supply chain involvement, digitalisation, modularisation, prefabrication, offsite construction, frame agreements and bulk procurement.

Proposed lead: State and territory infrastructure bodies, state and territory treasuries
Supported by: State and territory infrastructure delivery agencies and industry representative groups, such as prefabAUS.

0-5 Create a positive change culture by ensuring public sector project professionals are empowered and the organisation leadership is incentivised to be innovative and adopt best practices.

Proposed lead: State and territory public service commissions and the Australian Public Service Commission
Supported by: State and territory infrastructure delivery agencies

10-15 Create, embed and pursue sector-wide efficiencies by developing and implementing project processes, templates and assurance activities that prioritise industrialisation.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: State and territory infrastructure delivery agencies and industry representative groups, such as prefabAUS

0-5 3.1.3 Ensure the industry is a sector of choice for employees and can meet current and future workforce demands by introducing cultural reform that embraces diversity and inclusion.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: State and territory treasuries

5-10 In partnership with industry, deliver a workforce attraction and retention strategy that navigates current workforce challenges and sets out tangible and achievable solutions that create a sector of choice for current and future talent.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: National Skills Commission and industry representative groups

5-10 Foster a new model of collaboration between governments and industry by developing and implementing an infrastructure industry culture commitment and industry policy aimed at improving project delivery.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: State and territory infrastructure bodies, state and territory infrastructure delivery agencies, industry representative groups, inclusive of National Association of Women in Construction and Australian Constructors Association

0-5 Embed the infrastructure sector culture commitment through existing social procurement frameworks and pre-qualification schemes.

Proposed lead: State and territory treasuries
Supported by: industry representative groups, inclusive of Social Procurement Australasia and Social Traders

0-5 Improve the productivity and attractiveness of the sector by adopting and promoting a five-day working week, working hour limits, and job-sharing practices across the public and private sectors.

Proposed lead: State and territory infrastructure delivery agencies
Supported by: Industry representative groups

3.2 Enhancing project outcomes

3.2a Recommendation

Improve value for money and reduce risk by consistently adopting appropriate best-practice front-end due diligence for projects.

Proposed sponsors: State and territory infrastructure delivery agencies

When this should impact:



Where this should impact:



0-5 3.2a.1 Reduce risk, improve competition, lower bid costs and improve project outcomes by consistently applying due diligence activities to the front-end of all infrastructure projects.

Proposed lead: State and territory infrastructure delivery agencies

Supported by: Industry representative groups

0-5 Uplift quality of infrastructure decision-making through the development and delivery of training for key decision-makers on due diligence and de-risk, construction innovation, timing of project announcements, commercial and legal, and project governance.

Proposed lead: State and territory infrastructure bodies and Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory public service commissions and industry representative groups

0-5 Increase maturity and reporting of project planning and design through public-facing annual reports of de-identified Australian Government funded projects.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Office of the National Data Commissioner

0-5 Improve value for money and reduce risk by prioritising resources and time to develop business cases, create reference designs and undertake comprehensive due diligence processes.

Proposed lead: State and territory treasuries

Supported by: Industry representative groups

0-5 Ensure a strategic view of risk is appropriately translated to project procurement by developing and applying mature risk allocation processes that comprehensively assess and validate risk and uncertainty and fairly apportion them to the parties best-placed to manage them.

Proposed lead: State and territory infrastructure delivery agencies

Supported by: Industry representative groups

0-5 3.2a.2 Improve infrastructure value for money by applying whole-of-life cost, scheduling and risk management best practices, processes and systems.

Proposed lead: State and territory treasuries

5-10 Improve consistency, efficiency and transparency of project decision-making by developing and promoting nationally consistent project information structures.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Australian Cost Engineering Society, Australian Institute of Quantity Surveyors, NATSPEC, NBS and BuildingSMART

0-5 Ensure a consistent focus on value for money by developing in-house capabilities, in areas such as cost management systems and processes, scheduling, risk management, estimating and project controls.

Proposed lead: State and territory infrastructure bodies

Supported by: Industry representative groups, inclusive of Australian Cost Engineering Society and Australian Risk Engineering Society

0-5 Enhance the quality of decision-making by developing a nationally consistent whole-of-life infrastructure cost and schedule benchmarking tool and mandate its use on all nationally significant projects.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Infrastructure Australia, industry representative groups, inclusive of Australian Cost Engineering Society, Asset Management Council of Australia and Australian Institute of Quantity Surveyors

3.2b Recommendation

Reduce uncertainty for industry and improve value for money by improving engagement with industry and the supply chain.

Proposed sponsor: State and territory treasuries

Supported by: State and territory infrastructure delivery agencies

When this should impact:



Where this should impact:



0-5 3.2b.1 Reduce risk and improve value for money by using common and best practice commercial arrangements, standard contract forms and delivery approaches to infrastructure.

Proposed lead: State and territory treasuries

Supported by: State and territory infrastructure delivery agencies and industry representative groups, such as Institution of Civil Engineers

0-5 Unlock market equality and lower risk by utilising more collaborative commercial models that facilitate value for money and smaller engagements directly with contractors and consultants.

Proposed lead: State and territory treasuries

Supported by: State and territory delivery agencies and industry representative groups, such as Consult Australia, Australian Contractors Association and Australian Owned Contractors

0-5 Apply appropriate consistency and improve certainty in procurement by developing a procurement decision-making tool to more effectively understand and allocate scope in line with project fundamentals.

Proposed lead: Department of Finance

Supported by: State and territory treasuries, Australasian Procurement and Construction Council and Infrastructure Australia

0-5 Improve consistency, certainty and value for money by developing and implementing a new nationally consistent contract suite to support a spectrum of procurement models.

Proposed lead: Department of Finance

Supported by: State and territory treasuries, industry representative groups, inclusive of Institution of Civil Engineers and Society of Construction Law Australia

0-5 Maintain a viable, competitive industry and supply chain by ensuring insurance is available for consultants, contractors and sub-contractors involved in major projects. This may include brokering insurance on behalf of industry on a pro rata basis and changing existing policies on retention or insurance limits.

Proposed lead: State and territory insurance policy-holders and their insurers

Supported by: State and territory insurance agencies and industry representative groups, including Insurance Council of Australia, Enginsure and Consult Australia

0-5 Increase competition in the industry by developing guidelines and training programs on market engagement best practices that are accessible to all project practitioners. Cover topics such as multi-stage bidding, fair risk appropriation processes, bidding requirements at each gate, receiving industry feedback, using nationally consistent contract forms and the supporting procurement decision-making tool.

Proposed lead: Australasian Procurement and Construction Council

Supported by: Industry, state and territory treasuries, and state and territory infrastructure delivery agencies

0-5 Maintain the financial health of the supply chain by reviewing payment certainty and payment security legislation in light of current practice. Focus on compliance with requirements and consider whether the scope of these frameworks sufficiently addresses poor practices.

Proposed lead: State and territory treasuries

Supported by: Industry representative groups

5-10 **3.2b.2 Create a culture of genuine innovation by clarifying the desired project outcome innovation criteria in bid requirements, including outcomes, value for money, risk and embedding successful innovation in future projects.**

Proposed lead: State and territory infrastructure delivery agencies

Supported by: Australasian Procurement and Construction Council

5-10 Normalise risk appetite and use of innovation by aligning innovation criteria in bid assessment with project and organisational needs, including tangible measurable outcomes that are owned by a project leader.

Proposed lead: State and territory delivery agencies

Supported by: Australasian Procurement and Construction Council

0-5 Reduce risk and lower the likelihood of variations by conducting constructability, operability and maintainability reviews on projects. Repeat reviews at multiple stages of each project's lifecycle, particularly in the early stages before awarding main works contracts.

Proposed lead: State and territory infrastructure delivery agencies

Supported by: Industry representative groups, including Facility Management Association of Australia, Asset Management Council of Australia and Australian Constructors Association



3.3 Digital by default

3.3 Recommendation

Increase productivity and embed a culture of innovation in the infrastructure sector by adopting an evidence-based digital by default approach to infrastructure planning, delivery and operations.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

When this should impact:



Where this should impact:



5-10 **3.3.1 Increase the productivity of the infrastructure sector by increasing digital adoption in infrastructure planning, delivery and operations.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Smart Cities Council of Australia and New Zealand, Australasian Procurement and Construction Council and Australia New Zealand Spatial Information Council

5-10 Create ownership and vision for digital approaches to infrastructure planning, delivery and operations by establishing a national office for digital by default in infrastructure.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Smart Cities Council of Australia New Zealand and Australian Smart Communities Association

5-10 Increase the adoption of, and create greater national consistency for, digital approaches to infrastructure planning, delivery and operations by developing a national digital infrastructure roadmap.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Smart Cities Council of Australia and New Zealand and Australian Smart Communities Association

0-5 Kick-start digital by default in infrastructure by verifying all federally funded projects adopt innovative approaches across their lifecycle, including Building Information Modelling, digital engineering, embedded sensors and digital asset management. Strengthen nationally consistent guidance, tools and templates to match these objectives.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australasian BIM Advisory Board and industry representative groups, including BuildingSMART Australasia, IoT Alliance Australia and Asset Management Council of Australia

0-5 Improve knowledge-sharing about digital approaches to infrastructure planning, delivery and operations and promote more consistent approaches between jurisdictions by establishing a national digital infrastructure network.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Smart Cities Council of Australia and New Zealand and Australian Smart Communities Association

5-10 3.3.2 Accelerate the adoption of digital approaches to infrastructure planning, delivery and operations by coordinating jurisdictions and achieving national consistency.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Smart Cities Council of Australia and New Zealand and Australian Smart Communities Association

5-10 Increase productivity by implementing the national digital infrastructure roadmap to establish an Intelligent Infrastructure Innovation Scheme across all levels of government.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 3.3.3 Embed a digital by default approach to infrastructure delivery and operations by significantly scaling up related capabilities, resources and activities.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure delivery agencies and industry representative groups, including Smart Cities Council of Australia and New Zealand and Australasian Procurement and Construction Council

5-10 Increase digital adoption in infrastructure and develop jurisdiction-wide digital twins of the built environment by creating or strengthening related capabilities and cross-departmental functions.

Proposed lead: State and territory treasuries
Supported by: State and territory delivery agencies and industry representative groups, including Smart Cities Council of Australia and New Zealand, Australian Smart Communities Association and Australia New Zealand Spatial Information Council

5-10 Embed a digital by default approach by creating and implementing a smart infrastructure policy in each jurisdiction that uses technology and data to drive economic success and social inclusion.

Proposed lead: State and territory treasuries

Supported by: State and territory infrastructure delivery agencies and industry representative groups, including Smart Cities Council of Australia and New Zealand, Australian Smart Communities Association and Australia New Zealand Spatial Information Council

5-10 Create accountability for quality digital asset management through the asset lifecycle by appointing digital asset champions on all projects, and consider the use of digital estate management contracts. Ensure the owner maintains control of the physical and digital asset.

Proposed lead: State and territory infrastructure delivery agencies

Supported by: Industry representative groups, including BuildingSMART Australasia

0-5 Digitise all major projects by applying contemporary digital engineering practices that leverage proven technologies and processes, such as Building Information Modelling.

Proposed lead: State and territory infrastructure delivery agencies

Supported by: Industry representative groups, including BuildingSMART Australasia

3.4 Next generation infrastructure investment

3.4 Recommendation

Deliver a greater return on investment by ensuring governments act as model clients and custodians of industry health and productivity.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Finance

When this should impact:



Where this should impact:



5-10 3.4.1 Improve user and community outcomes by aligning investment and reforms with a unified and central vision for future Australian infrastructure.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, inclusive of Australian Constructors Association, Business Council of Australia, Consult Australia and Infrastructure Partnerships Australia

5-10 Increase clarity and confidence for industry, governments and community practice by creating a common national infrastructure vision with a commitment to principles, strategic focus areas, objectives and performance metrics.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 Expand and promote new and existing industry and jurisdictional reforms and best practices by establishing a government and industry collaborative leadership group.

Proposed lead: Infrastructure Australia
Supported by: Department of Infrastructure, Transport, Regional Development and Communications, and industry representative groups, including identified leaders of change

5-10 Provide a consistent view on the maturity of major project decision-making by refreshing and reporting against the Infrastructure Decision-making Principles.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Infrastructure Australia

0-5 3.4.2: Optimally allocate and invest in infrastructure with the Australian Government progressing towards a mature and informed investor.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 Strengthen the Australian Government's project delivery capabilities, processes and systems by establishing an office focused on infrastructure project delivery excellence.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Australian Institute of Project Management

0-5 Ensure Australian taxpayer interests are well-represented and drive national consistency in project delivery by appointing experienced senior responsible officers to all major federally funded projects.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Significant Project Investment Delivery Office

- 5-10** Safeguard community interests and taxpayer funding by ensuring all proposed investments demonstrate an assessment of non-build solutions.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Infrastructure Australia, state and territory treasuries, infrastructure investment assurance and assessment agencies
- 5-10** Provide a pathway for prospective bidders to submit proposals that align with federal infrastructure policy priorities by developing an Australian Government market-led proposals framework that integrates with jurisdictional guidance.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Infrastructure and Project Financing Authority, Infrastructure Australia and industry representative groups, including Infrastructure Partnerships Australia
- 5-10** Ensure funding and finance decisions for nationally significant projects reflect best practice by updating the *Commonwealth Procurement Guidelines*, including a clearer and broader definition of value for money.

Proposed lead: Department of Finance

Supported by: Infrastructure and Project Financing Agency
- 0-5** Strengthen asset management by ensuring asset registers include condition, use and quality, facilitated by a community of practice between governments, industry and academia promoting excellence in capabilities, processes, audits and systems.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Asset Management Council of Australia



4 Transport

4.1 Getting the most out of our transport investments

4.1 Recommendation

Maximise the overall benefits of transport investments by aligning transport programs with place-based objectives.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory planning departments, state and territory transport departments, state and territory infrastructure bodies, local governments

When this should impact:



Where this should impact:



- 5-10** **4.1.1 Maximise the place-shaping impacts of transport investment by linking transport infrastructure funding decisions to published population and land use objectives.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Centre for Population, state and territory planning departments, state and territory transport departments, state and territory demographers
- 0-5** Enable a consistent approach by all jurisdictions to the development of nationally significant transport infrastructure proposals by specifying the use of:

 - an agreed and consistent set of land use and transport modelling tools that meet minimum functional standards
 - common inputs, including population scenarios.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Centre for Population
- 5-10** Prepare place-based visions that identify credible population and land use scenarios. Incorporate measurable objectives for proposed transport projects to contribute to the sustainability of community and user outcomes for a defined area.

Proposed lead: State and territory planning departments

Supported by: State and territory transport departments
- 5-10** Align investment with place-based objectives by requiring that the proponents of nationally significant transport infrastructure projects reference a published place-based vision for the relevant linear corridor or broader geographic area in their business cases.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 4.1.2 Ensure the most cost-effective mobility and land use outcomes from transport expenditure by tying transport budgets to the achievement of specified movement and place performance standards.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: ATAP Steering Committee Secretariat, Austroads, state and territory transport departments, local governments

0-5 Enable the achievement of consistent and predictable results from transport expenditure by developing a nationally uniform movement and place framework and associated performance standards for the function of links in a multimodal transport network hierarchy.

- Ensure the movement and place framework aligns with the *National Service Level Standards Framework for Roads*.
- Specify performance standards in the *Australian Transport Assessment and Planning Guidelines*.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: ATAP Steering Committee Secretariat, state and territory transport departments

0-5 Ensure that road authorities select, design, manage and operate road projects in line with their function under a uniform movement and place framework by updating the *Guide to Traffic Management* to incorporate nationally consistent performance standards.

Proposed lead: Austroads

Supported by: State and territory transport departments

5-10 Maximise the benefits of public expenditure by making the allocation of all Australian Government transport program funds to jurisdictions subject to the demonstrated achievement of specified and agreed movement and place outcomes.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 Apply nationally consistent performance standards by aligning the administrative classification of existing roads with their movement and place role.

Proposed lead: State and territory transport departments

Supported by: Local governments

5-10 4.1.3 Bring forward the benefits of transport investments, in a context of uncertain and changing user needs, by promoting and facilitating the incremental delivery of transport services, corridors and networks as separable stages.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: ATAP Steering Committee, Centre for Population, Infrastructure Australia, state and territory infrastructure bodies, state and territory transport departments

0-5 Ensure the economic analysis of proposed transport investments, and other infrastructure decision-making processes, take account of significant shifts in user preferences and travel behaviours, by updating the *Australian Transport Assessment and Planning Guidelines* to:

- reflect changes to settlement and working patterns catalysed by the COVID-19 pandemic
- consider the impacts of new transport technologies and business models (including Mobility as a Service) on how people travel and freight is transported
- facilitate incremental investment in transport services, corridors and networks.

Proposed lead: ATAP Steering Committee Secretariat

Supported by: Centre for Population, state and territory transport departments, state and territory demographers

0-5 Promote the staged delivery of major transport corridor projects by updating assurance frameworks as required to assess business cases for multi-modal investment programs and monitoring their implementation.

Proposed lead: Infrastructure Australia

Supported by: State and territory infrastructure bodies

5-10 Support incremental and demand-led transport network development, including the staged introduction of different public transport modes to cost-effectively grow the patronage base for these services, by executing new and updated Australian Government funding instruments with state and territory jurisdictions that commit to a multi-year staged funding approach. Take this approach under Federation Funding Agreements and place-based agreements.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments

0-5 4.1.4 Increase the combined impact of existing transport funding allocations on safety, capacity, accessibility, connectivity and user experience outcomes by coordinating discrete maintenance and upgrade programs for roads, pathways and interchanges.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 To ensure available funding delivers the greatest possible user and local economic activity benefits, identify and address multimodal transport network gaps under partnership programs that integrate periodic maintenance with the completion of minor missing links.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 For urban areas, deliver quick wins for users and relieve pressures on congested roads by prioritising minor 'missing link' projects that upgrade walking and cycling networks and improve the accessibility and amenity of public transport interchanges.

Proposed lead: State and territory transport departments

Supported by: Local governments

5-10 4.1.5 Maximise the collective benefits from local governments' transport investments by reorienting funding programs towards specified end-to-end journey outcomes.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

0-5 Where required, bring forward the completion of cross-boundary local transport networks that meet users' short journey needs and prioritise funding support under place-based agreements for partnerships of two or more councils working together.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

0-5 Help councils to develop their capabilities in planning, prioritising and procuring local transport infrastructure and services that enable increased public transport and active travel use.

Proposed lead: State and territory transport departments

Supported by: Local governments

5-10 Help councils to accelerate the delivery of public transport and active travel infrastructure early in the life of new urban areas by ensuring timely access to developer contributions, value-sharing mechanisms and/or low-cost borrowing facilities.

Proposed lead: State and territory transport departments

Supported by: Local governments

4.2 Connecting regional and remote Australia

4.2 Recommendation

Improve the liveability and economic sustainability of regional, rural and remote areas by developing, maintaining and operating integrated freight and passenger transport networks that meet end-to-end access needs.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

When this should impact:



Where this should impact:



5-10 4.2.1 Maintain reliable access for supply chains under all conditions by coordinating technological, operational and infrastructure improvements delivered under the National Freight and Supply Chain Strategy.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Industry, Science, Energy and Resources, CSIRO: Commonwealth Scientific and Industrial Research Organisation, National Transport Commission, state and territory transport departments, local governments, airport operators, port operators

0-5 Identify supply chain improvement opportunities across multiple commodities and geographies by developing and applying the TraNSIT model. Drive more responsive supply chain management decision-making by making this evidence accessible to governments, industry and other stakeholders through the National Freight Data Hub.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: CSIRO: Commonwealth Scientific and Industrial Research Organisation, National Transport Commission

5-10 Deliver local safety, environmental and economic benefits for regional, rural and remote communities by identifying and prioritising freight intermodal projects that promote shifting from road to Inland Rail and other freight rail services for targeted commodities.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

5-10 Develop and implement place-based action plans for Fast-growing City port and airport precincts, through government, industry and community partnerships, that align with the National Urban Freight Planning Principles. Improve the efficiency of export- and tourism-oriented corridors by implementing actions that reduce friction between freight operations and dense land uses.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments, airport operators, port operators

5-10 Enable remote area supply chain cost savings by increasing domestic freight operators' access to alternative fuels, including hydrogen produced under initiatives that are currently oriented towards overseas customers and/or non-transport heavy industrial uses such as mining.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Industry, Science, Energy and Resources

10-15 4.2.2 Support the growth and diversification of Smaller Cities and Regional Centres by investing in their local accessibility and connectivity and progressively upgrading transport connections to Fast-growing Cities.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Faster Rail Agency, Australian Treasury, state and territory transport departments, local governments

0-5 Improve connectivity in and around Smaller Cities and Regional Centres by investing in multimodal transport interchanges integrated with mixed land uses that are adjacent to the train station or (for locations without a train service) the central business district.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 Improve public transport access to the heart of Smaller Cities and Regional Centres from their suburban and rural catchments by supporting the operation of flexible and demand-responsive services.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 Promote active travel for tourism, recreation and local access in and around Smaller Cities, Regional Centres, Small Towns, Rural Communities and Remote Areas by investing in the adaptive reuse of disused railways and integrating these with other linear open space corridors and low-traffic rural roads to provide connected networks.

Proposed lead: State and territory transport departments

Supported by: Local governments

5-10 Strengthen the connection of Smaller Cities and Regional Centres to Fast-growing Cities by progressively upgrading existing regional passenger rail services. Make services more comfortable and reliable, and grow the patronage base for public transport, by investing in customer experience improvements such as new rolling stock and in track projects that maximise the separation of freight and passenger movements.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Faster Rail Agency, state and territory transport departments

5-10 To improve the connectivity and economic performance of outer-urban areas, ensure regional rail service improvements improve accessibility outwards from Fast-growing Cities, and better connect outer-urban areas to their larger regional catchment as well as making established central business districts more accessible to Regional Centres.

Proposed lead: State and territory transport departments

Supported by: National Faster Rail Agency, local governments

10-15 Support regional growth by prioritising faster rail, fast rail and high-speed rail investments based on credible scenarios for population change and using nationally consistent decision-making processes. These should include models and assumptions that are updated to evaluate project benefits and costs across wide geographic areas and over the full life of rail assets.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australian Treasury, National Faster Rail Agency

10-15 Maximise economic, productivity and safety benefits from governments' fast rail, faster rail and high-speed rail investments. Invest in the timely preservation of surface corridors. Ensure the cross-border interoperability of projects is advanced in different locations.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Faster Rail Agency, state and territory transport departments

5-10 **4.2.3 Ensure equitable access to essential services for Small Towns, Rural Communities and Remote Areas by coordinating passenger transport investments and operations.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, airport operators

0-5 Develop and adopt nationally consistent performance standards for Small Towns, Rural Communities and Remote Areas to physically access essential services that cannot be effectively provided online. Articulate standards in terms of the total time taken by people in a rural or remote area to travel to and access the education, health or other services offered by a Smaller City or Regional Centre, and then return home.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 Align spending and service delivery across transport modes with performance standards for Small Town, Rural Community and Remote Area access. Enable the greatest possible proportion of the population of these communities to access centre-based services cost-effectively within a day-return or other reasonable specified timeframe.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments

5-10 Ensure long-distance passenger travel needs are serviced cost-effectively and in line with access performance standards. Do this by integrating regional aviation infrastructure and services programs with land transport services under a multimodal hub-and-spoke network model.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, airport operators



4.3 Mobility choice made possible

4.3 Recommendation

Free people from relying on driving for door-to-door mobility by ensuring urban transport services are managed as an integrated, inclusive, user-responsive and smart transport system.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

When this should impact:



Where this should impact:



5-10 **4.3.1 Relieve congestion growth at the start of the urban development lifecycle by making active and public transport first and last mile networks the first transport projects completed in the local catchment of emerging and new centres.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

0-5 Pre-empt local congestion growth by identifying and delivering active and public transport networks around urban centres at the same time that they are designated as future mass transit station locations.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 Maximise the accessibility of new mass transit services by active travel and local public transport and reduce reliance on the provision of commuter car parking by requiring mass transit corridor proposals to incorporate a first- and last-mile service delivery plan that addresses:

- active travel modes
- bus priority access
- demand-responsive services
- Mobility as a Service subscription models
- multimodal interchanges connecting first- and last-mile choices to mass transit services.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

5-10 Promote the emergence of sustainable travel patterns in new communities by facilitating the operation of bus services that offer an attractive and reliable alternative to the purchase of multiple cars by a single household.

Proposed lead: State and territory transport departments

Supported by: Local governments

5-10 Enable the use of innovative funding mechanisms such as developer contributions to meet some of the operating costs of frequent scheduled or demand-responsive services during the first three to five years of people settling in greenfield urban areas.

Proposed lead: State and territory planning departments

Supported by: State and territory transport departments, local governments

5-10 Improve the attractiveness of public transport compared to car use in new release areas by ensuring the design and construction sequencing of road networks enable direct, frequent and efficient bus routes and services between separate subdivisions.

Proposed lead: Local governments

0-5 **4.3.2 Accelerate the trend towards people using their cars less in established urban areas and grow a sustainable patronage base for public transport use for all passenger journey needs by bringing forward traditional and demand-responsive road-based transport products as alternatives to car use for door-to-door suburban travel.**

Proposed lead: State and territory transport departments

Supported by: National Transport Commission, Austroads, local governments, Mobility as a Service operators

0-5 Meet existing and emerging travel demand during the project development phase for mass transit corridors within urban areas by ensuring frequent bus services are operational on parallel roads or preserved corridors (where these are available) before new mass transit projects are announced.

Proposed lead: State and territory transport departments

0-5 Support the timely deployment of transport products that offer a lower-impact alternative to motor vehicle use for urban passenger and freight transport by ensuring traffic control systems, kerbside parking regimes, multimodal interchanges, commuter car parking, bus stops and access pathways are designed to integrate with and support demand-responsive bus, minibus, rideshare, micromobility device sharing and/or microfreight operations, as required.

Proposed lead: State and territory planning departments, state and territory transport departments

Supported by: Local governments

5-10 Enable all jurisdictions to support efficient Mobility as a Service operations that provide users with seamless journey outcomes by developing and implementing a coordinated national position that addresses common definitions, data standards and system specifications.

Proposed lead: National Transport Commission
Supported by: Austroads, state and territory transport departments, Mobility as a Service operators

5-10 To optimise door-to-door outcomes for users in lower-demand markets, ensure contracting models enable the integration of traditional and demand-responsive services under area-based public transport operating contracts.

Proposed lead: State and territory transport departments

5-10 **4.3.3 Ensure all people in Australia enjoy equivalent accessibility outcomes by investing in transport infrastructure and services in line with the Disability Discrimination Act 1992 (Cth),¹ Disability Standards for Accessible Public Transport 2002² and broad objectives for universal access to services.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Attorney-General's Department, Department of Social Services, National Disability Insurance Agency, state and territory transport departments, local governments, transport service operators

0-5 Ensure reformed *Disability Standards for Accessible Public Transport 2002* include minimum required feedback mechanisms for people with disability to hold transport service providers accountable for accessibility outcomes throughout the operating life of transport assets.

Proposed lead: Attorney-General's Department
Supported by: Department of Infrastructure, Transport, Regional Development and Communications, Department of Social Services

0-5 Increase the transparency of jurisdictional actions to address the travel needs of people with disability by reporting accessibility outcomes annually using nationally consistent and user-oriented measures. Provide information on changes in door-to-door accessibility outcomes as experienced by different groups of users over the reporting period and specify user-oriented improvements for the coming two years.

Proposed lead: Attorney-General's Department
Supported by: Department of Infrastructure, Transport, Regional Development and Communications, state and territory transport departments, local governments, transport service operators

0-5 Develop and specify nationally consistent performance requirements for accrediting demand-responsive service providers as accessible. In the reformed *Disability Standards for Accessible Public Transport 2002*, include new performance requirements for 12-seater minibuses that are not currently covered by these standards, ensuring vehicles and associated customer interfaces meet the needs of people with disability.

Proposed lead: Attorney-General's Department
Supported by: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Ensure all jurisdictions' mobility service support programs collectively provide efficient coverage for people with disability by ensuring mobility service providers' alignment with a national accreditation framework and empowering program participants to purchase services from accredited rideshare operators through a single point of access.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: Department of Social Services, National Disability Insurance Agency, state and territory transport departments

0-5 Invest in the capacity of operators to provide demand-responsive and rideshare services to improve access for people with disability in Small Towns, Rural Communities and Remote Areas where there is not the collective density of demand to support commercial operations.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: State and territory transport departments

0-5 Address the needs of older Australians, women, children and people who speak or read a language other than English by developing nationally consistent performance requirements for transport services that meet diverse user needs for safe, convenient and easy-to-navigate travel. Only invest in transport proposals that include a plan to meet these requirements.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: State and territory transport departments

5-10 Reduce dependence on car use for a growing population of pet-owners by developing and implementing performance requirements for public transport networks to meet the mobility needs of people travelling with companion animals, in addition to assistance animals.

Proposed lead: State and territory transport departments

0-5 **4.3.4 Enable every person who wants to walk, ride a bike or use a micromobility device for a local journey or last-mile freight delivery to do so safely by completing continuous separated active travel networks.**

Proposed lead: State and territory transport departments
Supported by: Office of Road Safety, Austroads, National Transport Commission, local governments

0-5 Ensure active travel education for road users of all abilities and ages has an elevated profile in the updated *National Road Safety Strategy*. Address the needs of people walking, bike-riding and using micromobility devices, including e-bikes and e-scooters.

Proposed lead: Office of Road Safety
Supported by: State and territory transport departments

0-5 Develop, implement and support councils' adoption of standardised designs for separated facilities that use temporary barriers or other quickly installed features. These will widen the choice of simplified, user-friendly, safe, lower-cost and cost-effective infrastructure solutions and accelerate the completion of gap-free networks.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 Support councils' installation and management of small local freight depots on the edge of central business districts. These will enable the use of low-impact microfreight modes for last-mile deliveries in congested areas.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 Ensure technical resources support the prioritisation of investments that enable increased travel on foot, by bicycle or wheelchair, or using a micromobility device. Update the *Guide to Road Design* to include lower-cost and cost-effective active travel facilities and promote access to best practice data collection and modelling for active travel projects through updated *Australian Transport Assessment and Planning Guidelines*.

Proposed lead: Austroads

Supported by: State and territory transport departments

0-5 Optimise access for pedestrians, bike-riders, microfreight operators and people using a wheelchair or micromobility device by facilitating the revision of the *Australian Road Rules* to remove regulatory anomalies or obstacles to these outcomes in all jurisdictions:

- the use of lower-cost and cost-effective active travel infrastructure designs
- footpath access for micromobility devices.

Proposed lead: National Transport Commission

Supported by: State and territory transport departments

0-5 Provide an improved and safer active travel experience ahead of the completion of active travel infrastructure improvements by reducing the speed limit on roads that are identified as links in cycling and micromobility networks, where the existing speed limit is greater than 40 km/h.

Proposed lead: Local governments

Supported by: State and territory transport departments

5-10 **4.3.5 Ensure all road users can experience the benefits of world's best practice transport technologies by establishing a single national market for electric, connected and autonomous vehicles.**

Proposed lead: National Transport Commission

Supported by: Department of Infrastructure, Transport, Regional Development and Communications, Department of Industry, Science, Energy and Resources, Department of Home Affairs, Australian Building Codes Board, Austroads, state and territory transport departments, local governments

0-5 Enable the longer-term rollout of fleets of electric vehicles that can both return power to, and draw it from, the grid by ensuring the National Construction Code formalises requirements and specifications for providing and operating next-generation two-way charging facilities and associated signage in multi-residential, commercial, industrial and public buildings, including bus depots.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: Australian Building Codes Board, Austroads

5-10 Facilitate the use of both privately owned and shared fleets of light electric vehicles and micromobility devices by ensuring standard and/or two-way charging facilities are installed at kerbside locations, and in public parking areas by the developers of off-street destinations such as shopping centres and long-term car parks.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 To bring down purchase costs for bus and truck operators and speed up the rollout of new fleets, develop Australian Design Rules and common cross-jurisdictional technical specifications for zero-emission heavy vehicles that assist Australian manufacturers and importers in achieving economies of scale.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Transport Commission

5-10 Ensure that fast-charging facilities for buses (and other zero-emission heavy vehicles) funded under the Future Fuels Strategy are subject to compliance with new cross-jurisdictional technical specifications.

Proposed lead: Australian Renewable Energy Agency

5-10 Facilitate the uptake of new transport technologies by developing nationally uniform standards for the design and operation of road and digital assets used by Level 4 and 5 connected and autonomous vehicles. For all new road and major maintenance projects, immediately adopt and implement standards that offer 'no-regrets' benefits for existing and Level 3 vehicle operations, including line marking and digital speed zone standards.

Proposed lead: National Transport Commission

Supported by: Austroads, state and territory transport departments

5-10 Ensure the data-sharing framework and associated digital infrastructure for gathering and using connected and autonomous vehicle-generated data are designed to support the separate administration of a national distance-based road user charging regime. Also ensure they align with privacy and cyber security requirements.

Proposed lead: National Transport Commission

Supported by: Department of Home Affairs, state and territory transport departments



4.4 A fairer price for every journey

4.4 Recommendation

Ensure the price paid for mobility supports the efficient movement of people and goods by leading the transition to a nationally coordinated and multimodal transport network pricing regime.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, state and territory treasuries

When this should impact:



Where this should impact:



0-5 4.4.1 Meet community and stakeholder expectations for transparency and fairness by establishing a nationally consistent governance framework for transport network pricing reforms.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australian Treasury, state and territory transport departments

0-5 Increase confidence in the fairness of the transport network pricing reform process by specifying the minimum level of protection that will be in place during the reform implementation period for users who are at risk of disadvantage for financial or geographic reasons. Reinforce this by nominating the independent agency that will monitor the rollout of user protections in each jurisdiction.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments

0-5 Increase confidence in the user benefits of transport network pricing reforms by developing and seeking National Cabinet endorsement for hypothecation principles. Under these principles, road and public transport revenues will fund integrated and multimodal programs that deliver sustainable mobility outcomes based on projected user needs.

Proposed lead: Australian Treasury

Supported by: Department of Infrastructure, Transport, Regional Development and Communications, state and territory transport departments, state and territory treasuries

0-5 Demonstrate a collaborative approach to the implementation of transport network pricing reforms by developing and seeking National Cabinet endorsement for the principles that jurisdictions will follow when taking the lead in implementing reforms. These will include a commitment to timely information sharing that facilitates the cross-jurisdictional co-delivery of reforms.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments

5-10 4.4.2 Ensure users pay for the true costs of mobility by implementing transport network pricing reforms.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australian Treasury, Department of Home Affairs, National Transport Commission, Australian Competition and Consumer Commission, state and territory transport departments

0-5 Develop state and territory capability to administer an equitable and efficient user-pays charging regime for all vehicle types. Adopt and work towards this objective through the implementation of Heavy Vehicle Road Reform by participating jurisdictions.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Transport Commission, state and territory transport departments

0-5 Support the efficient operation of urban transport networks in Fast-growing Cities by developing and implementing policy frameworks that impose an additional price on vehicle parking and use in areas affected by peak period congestion. Ensure revenues support the provision of alternative travel choices.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 Develop a national distance-based road user charging regime for all types of vehicles. Ensure the design of the regime addresses risks to privacy and cyber security.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australian Competition and Consumer Commission, Department of Home Affairs, state and territory transport departments

5-10 Maintain at least the level of revenue received from current road user taxes and charges by implementing a national distance-based road user charging regime, with associated changes to the fixed costs of vehicle ownership.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments

0-5 Review and reconfigure city public transport networks to optimise the number of users who can access centre-based jobs and services within a 30-minute or better performance standard.

Proposed lead: State and territory transport departments

0-5 Review and adjust public transport fares to ensure they reflect the quality of travel experience provided and promote efficient network use. To make fares equitable, reduce the cost of journeys requiring:

- modal transfer, relative to 'single-seat' journeys
- the use of on-road public transport services, relative to rail
- the use of non-peak relative to peak services.

Proposed lead: State and territory transport departments

0-5 Develop and implement strategies to upgrade legacy rail networks in Fast-growing Cities and Smaller Cities by increasing revenues from non-transport activities and development outcomes that benefit from proximity to urban rail services.

Proposed lead: State and territory transport departments

5-10 Increase the per-kilometre cost of using regional rail services between Fast-growing Cities and Smaller Cities or Regional Centres when these services are upgraded. Allocate the additional revenue directly to further service improvements.

Proposed lead: State and territory transport departments

5 Energy

5.1 Putting customers first

5.1 Recommendation

Help households and businesses reduce electricity bills by making sure they have the right information and incentives.

Proposed sponsor: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

When this should impact:



Where this should impact:



0-5 **5.1.1 Help residential energy customers invest in products and services that reduce their energy bills through education campaigns and tools that help them access the right information when they need it.**

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

0-5 Reduce household energy bills (and improve residential energy efficiency) through the broader promotion of easily accessible information and education campaigns (leveraging websites like Energy Made Easy and Your Home), and supporting residential customers to:

- invest in the energy efficiency of their homes, renovations and appliances
- understand and manage their energy consumption
- choose their retailer.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: Australian Energy Regulator, state and territory energy departments

0-5 Reduce energy bills and improve health and wellbeing for vulnerable and low-income customers by delivering funding assistance programs to support energy audits and energy productivity upgrades for public and community housing, low-income households and associated rental properties with poor energy performance.

Proposed lead: Department of Industry, Science, Energy and Resources,

Supported by: State and territory energy departments, Energy Consumers Australia, Australian Council of Social Services, Department of Social Services, Services Australia

0-5 **5.1.2 Help buyers and renters make informed decisions by mandating energy efficiency disclosure for residential dwellings at time of sale or lease and raising minimum energy efficiency standards for rental properties.**

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

0-5 Inform home owners, buyers and tenants of the energy performance of their home through the development and application of a national residential energy performance rating scheme for all homes (new and existing) consistent with the *Trajectory for Low Energy Buildings* and *Report for Achieving Low Energy Existing Homes*.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

0-5 Improve the energy efficiency, health and comfort of rental properties by implementing a national minimum energy efficiency standard, including mechanisms for tenants to initiate energy efficiency upgrades of rental properties. This should build on work already underway to set out considerations for development of rental standards through the *Trajectory for Low Energy Buildings* and *Report for Achieving Low Energy Existing Homes*.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

5-10 **5.1.3 Give energy customers clear and consistent incentives to take up energy efficiency opportunities by harmonising energy efficiency obligation schemes across jurisdictions.**

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

5-10 Give energy customers clear and consistent incentives to take up energy efficiency measures by harmonising jurisdictional energy efficiency obligation schemes into a national scheme, or otherwise harmonising schemes, incentives and standards across jurisdictions in line with *National Energy Productivity Plan* goals.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

0-5 Ensure widespread access to energy efficiency schemes throughout states and territories by introducing nationally harmonised schemes where they do not already exist.

Proposed lead: State and territory energy departments

0-5 **5.1.4 Help businesses lift energy productivity through targeted information, communications and education alongside direct incentives to invest in energy productivity upgrades.**

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

0-5 Improve the energy efficiency and productivity of businesses through targeted communications and education campaigns, and connecting businesses with expert advice to help them identify and implement upgrades to equipment and modernise processes.

- Include programs that specifically target manufacturing, energy-intensive small to medium enterprises and large energy users to assess and report on their opportunities for improving energy efficiency, in the style of the Energy Efficiency Opportunities program and building on the Business Energy Advice Program.
- These tools and touchpoints should help businesses take advantage of opportunities at key points of decision and investment (through major purchases or at tax time) and comply with obligations under harmonised national energy efficiency obligation schemes.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments, industry representative groups

0-5 Give businesses a direct short-term incentive to implement energy efficiency measures and lift energy productivity by extending the instant asset write-off scheme to energy efficiency upgrades of up to \$150,000.

Proposed lead: Australian Treasury

Supported by: Department of Industry, Science, Energy and Resources

5.2 A smart, affordable, reliable grid

5.2 Recommendation

Transition to a smart, affordable, reliable future grid by implementing regulatory reforms, introducing incentives for customer participation in energy system management and planning cross-sector integration.

Proposed sponsor: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments, Australian Energy Market Commission, Australian Energy Regulator

When this should impact:



Where this should impact:



0-5 5.2.1 Enable customers to manage their energy bills by incentivising smart meter installation, reforming pricing, and empowering them with the right information and tools.

Proposed lead: State and territory energy departments

0-5 Accelerate smart meter uptake and enable customers to access emerging energy management technologies by subsidising smart meters, where not already mandatory or provided for free by the retailer as part of an electricity plan.

Proposed lead: State and territory energy departments

0-5 Empower customers to harness information from the smart meter to reduce their electricity bills by mandating that retailers accompany smart meter installation with the tools customers need to get the most out of them.

- Include free, user-friendly digital and mobile tools that integrate with home energy management systems, give customers transparent real-time access to their energy data, and enable customers to share their data in accordance with the Consumer Data Right for energy.
- Retailers and energy agencies should educate customers on the benefits of smart meters and provide support on how to use energy management tools.

- Retailers and energy agencies should provide free, timely advice on the benefits of an energy management system at the time of installation and whenever customers switch providers.
- Tools and information should be nationally consistent.

Proposed lead: State and territory energy departments
Supported by: Australian Energy Regulator

0-5 Enable customers to actively participate in the energy system and reduce their long-run costs by agreeing a transition towards default time-of-use tariffs for all customers with smart meters.

- State energy departments should mandate that retailers transfer customers with smart meters (including customers who have moved to a premise with a smart meter) to the default time-of-use tariff without any charges, except when the customer opts out or is a vulnerable customer and will be worse off on the time-of-use tariff based on historic consumption patterns.
- Retailers and energy agencies should provide free, timely advice on the long-term benefits for all energy users participating more actively in the system whenever customers switch tariff or providers.

Proposed lead: State and territory energy departments

0-5 5.2.2 Enable the orderly uptake of zero-emission vehicles by undertaking national cross-sector coordination planning.

Proposed lead: Department of Industry, Science, Energy and Resources

0-5 Enable the electrification of transport by forming a long-term national planning working group. This should build on the work by the Distributed Energy Integration Program Electric Vehicle Grid Integration Working Group on improving data access and data standards that help allow for effective national planning.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: Office of Future Transport Technology

0-5 Integrate zero-emission vehicles into the grid safely and cost-effectively by developing an electric vehicle integration strategy.

- This should build on the work by the Distributed Energy Integration Program Electric Vehicle Taskforces, and include the incorporation of demand management, increasing charging infrastructure visibility and ensuring uptake of smart charging and smart metering.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: Distributed Energy Integration Program, Energy Networks Australia, Australian Energy Market Operator, Australian Energy Market Commission

0-5 Enable the better understanding of locational electric vehicle charging patterns and facilitate efficient distribution grid investment by mandating electric vehicle charging infrastructure be added to the Distributed Energy Resource portal.

Proposed lead: Australian Energy Market Commission

Supported by: Australian Energy Market Operator

5-10 Secure electric vehicle adoption across the distribution grid and reduce user and taxpayer costs by providing network businesses with limited flexibility to invest in at-risk distribution grids for locations with high electric vehicle uptake.

Proposed lead: Australian Energy Regulator

10-15 5.2.3 Safeguard the reliability and security of electricity supply by implementing electricity transmission reforms.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: Australian Energy Market Commission

0-5 Enable new renewable energy to connect to the grid by implementing the Energy Security Board Renewable Energy Zones reform framework.

Proposed lead: State and territory energy departments

0-5 Ensure transmission interconnector costs are allocated to the beneficiaries and help new generation connect to the grid more efficiently by implementing transmission access reform.

Proposed lead: Australian Energy Market Commission

Supported by: Energy Security Board

10-15 Fully realise the market opportunity of renewable electricity generation and increase certainty for investors and contractors by implementing the *Integrated System Plan* and reducing the risk and time for grid connections.

Proposed lead: Australian Energy Market Operator

Supported by: Transmission network service providers, state and territory energy departments

0-5 5.2.4 Reduce electricity network project delivery timeframes by streamlining the Regulatory Investment Test for Transmission (RIT-T) and Regulatory Investment Test for Distribution (RIT-D).

Proposed lead: Australian Energy Regulator
Supported by: Australian Energy Market Commission

0-5 Reduce project delivery timeframes and regulatory duplication by exempting planned component upgrades and renewals or projects with unviable non-network options that are included in approved five-year regulated revenue determinations from the Regulatory Investment Tests for transmission and distribution.

Proposed lead: Australian Energy Market Commission
Supported by: Australian Energy Regulator

0-5 Focus regulatory scrutiny on higher-value projects by reviewing the cost threshold for the Regulatory Investment Tests for transmission and distribution with a view to increasing the threshold to only capture material investment.

Proposed lead: Australian Energy Regulator



5.3 Powering a cheaper, cleaner future

5.3 Recommendation

Transition Australia's exports and domestic energy demand to high-tech, low-cost, low-emission energy sources through a coordinating national strategy.

Proposed sponsor: Department of Industry, Science, Energy and Resources

When this should impact:



Where this should impact:



0-5 5.3.1. Ensure Australia remains an energy export supplier of choice in decarbonised global supply chains by coordinating national development of low-emission energy sources.

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments

0-5 Enable collaboration opportunities, shared infrastructure and regulatory consistency across jurisdictions by coordinating a national approach to energy planning.

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments

0-5 Support the development of clean energy export supply chains by identifying key precincts for new low-emission energy export hubs and developing enabling infrastructure plans.

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments

0-5 Grow new export industries and jobs in clean energy commodities and value-added products such as aluminium, green steel, technology and services by developing coordinated clean energy industry strategies.

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments, state and territory industry departments

0-5 Increase investor certainty and enable emerging industries by developing clear, outcome-focused legislation and regulation for emerging low-emission energy technology.

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments

0-5 5.3.2 Transition Australia to a high-tech, low-cost, low-emission energy system by implementing appropriate regulatory and legislative environments, identifying opportunities to transition assets, and continuing to fund new energy technology development and adoption.

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments, Australian Energy Market Operator, Australian Renewable Energy Agency

0-5 Increase investor certainty by restating commitment to collaboration through the national governance frameworks that support the National Electricity Market.

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments

6 Water

6.1 Securing our water future

6.1 Recommendation

Secure long-term water supply for urban, rural, environmental and cultural users by developing a national approach to water security, including independent national ownership.

Proposed sponsor: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

When this should impact:

0-5

5-10

10-15

15+

Where this should impact:

- 0-5** Make the electricity market framework fit for purpose for a decentralised, renewable system by implementing a future market design that builds on the post-2025 work by the Energy Security Board and market bodies.

Proposed lead: Australian Energy Market Commission

Supported by: State and territory energy departments, Energy Security Board, Australian Energy Regulator, Australian Energy Market Operator

0-5 Ensure new sources of gas and hydrogen help provide reliable and affordable energy to Australian homes and businesses by reviewing the application of a nationally consistent policy on potential reservation or prioritisation of new gas sources and hydrogen for domestic consumption.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

0-5 Maintain electricity market reliability by developing and implementing a trigger-based electricity market review mechanism that is undertaken at key policy trigger points such as announcement of accelerated retirement of thermal electricity generators.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: Australian Energy Market Operator

0-5 Give rural and remote communities access to clean, reliable and affordable energy by implementing an appropriate regulatory and legislative environment and funding that supports standalone power systems and micro-grids.

 - State and territory governments should accelerate the amendment of jurisdictional regulation and legislation to enable the implementation of standalone power systems.
 - ARENA should maintain funding for low-emissions standalone power systems and micro-grids.

Proposed lead: State and territory energy departments

Supported by: Australian Renewable Energy Agency

0-5 Get the most out of existing and shared gas infrastructure by enhancing *Integrated System Plan* modelling to co-optimize gas and electricity systems. This will include consideration of the potential for existing gas infrastructure to transition to renewable sources, such as hydrogen or biogas.

Proposed lead: Australian Energy Market Operator



- 5-10** **6.1.1 Achieve a common approach to water security planning by developing a new National Water Initiative incorporating a national water security framework. A national water security framework must include an agreed definition of ‘water security’ within a whole-of-system context and provide an approach to assessing risks and opportunities.**

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

- a definition of ‘water security’ within a whole-of-system context (including urban and rural systems), with reference to: safety, quality, quantity and for meeting users’ needs over time on an economic, environmental, social (including cultural) and governance basis
 - a method to measure the water security of a place or catchment over time and incorporate best available demographic, scientific and economic data. This method should also be capable of identifying water deficits or surpluses.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Ensure a consistent national approach to water security by developing and committing to a renewed National Water Initiative that incorporates a national water security framework.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Improve reliability of water accounting within the total system by maintaining registers of all water entitlements and allocations aligned to the renewed National Water Initiative. Mineral and petroleum industries should also be incorporated within entitlement and planning arrangements under a renewed National Water Initiative.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Ensure long-term water security challenges and risks are understood and opportunities identified on a nationally consistent basis by developing a national water security framework. A national water security framework must include:

5-10 Meet the needs of water users into the future and ensure long-term water security objectives are considered in strategic decision-making. This includes:

- incorporating the national water security framework into business case development for state, territory and nationally significant water infrastructure proposals
- incorporating the national water security framework into existing national infrastructure investment assessment frameworks, including the *Infrastructure Australia Assessment Framework* and the *National Water Grid Investment Framework*.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments, Infrastructure Australia, National Water Grid Authority

0-5 Ensure ongoing commitment and application of the national water security framework by assigning independent ownership of the National Water Initiative, including the national water security framework.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments, National Water Grid Authority

0-5 **6.1.2 Normalise water-efficient practices and decisions by increasing water literacy in communities and businesses.**

Proposed lead: Communities

Supporting by: Department of Agriculture, Water and the Environment, water utilities

0-5 Champion water-wise behaviours and increase water literacy. This includes water-wise campaigning and voluntary reporting of water use in business processes.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: Communities

0-5 Support community and businesses to embed a water-wise culture. This includes ongoing public education to improve water literacy and rebates on water-efficient products. Regulatory bodies must implement pricing structures that signal the full value of water and an economic water conservation method backed by community engagement.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Increase transparency of water consumption and dependency (water footprint) by disclosing meaningful water data in environmental, social and governance (ESG) reporting.

Proposed lead: Professional associations, such as Australian Institute of Company Directors, Governance Institute of Australia, CPA Australia, Chartered Accountants ANZ

Supported by: Department of Finance, Australian Prudential Regulation Authority, Australian Securities Investment Commission, Australian Stock Exchange

5-10 **6.1.3 Meet users' long-term water needs by ensuring that all options are fully evaluated in infrastructure planning.**

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments, state and territory planning departments

0-5 Strengthen resilience of water supply infrastructure and meet outcomes for users' long-term needs by:

- removing policies that unnecessarily restrict water supply options, including bans that prevent suitably treated wastewater or stormwater from augmenting potable water supplies, and bans that prevent the urban use of rural water
- removing mandates, targets and subsidies for the use of certain types of water, including recycled water
- removing regulatory barriers that discourage recycled water investments

- ensuring that water infrastructure planning decisions consider all options for expanding water supply fully and transparently. This includes determining the optimal mix of water supply options with consideration given to the national water security framework.

Proposed lead: Department of Agriculture, Water and the Environment.

Supported by: State and territory water departments, state and territory planning departments, state and territory essential service economic regulators

0-10 Ensure water infrastructure decisions meet users' long-term needs through removing community perception barriers to the use of alternative water sources, particularly recycled water for drinking, by:

- publicising a position of support for alternative water sources, especially recycled water for drinking
- running public education and engagement campaigns on the benefits and risks of recycled water for drinking, including how water travels through the water cycle. Public education campaigning must be based on recognised positive messaging and avoid language or images that might cause stigma or negative reactions
- partnering with influential community representatives or businesses to champion the use of recycled water for drinking.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments, water utilities

0-5 **6.1.4 Improve the long-term reliability of water infrastructure to meet future needs and expectations by advancing whole-of-life asset management and preventative maintenance.**

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Support maturity for water service providers in asset management and long-term planning by coordinating a national centre of excellence for resource sharing, and coordination of partnerships.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Coordinate asset management planning and support progression towards whole-of-life asset management in regional water utilities by facilitating regional partnerships or alliances (collaborative arrangements). Collaborative arrangements must support members to achieve predictive asset management plans through addressing skill shortages, sharing resources and improving data collection.

Proposed lead: State and territory water departments



6.2 Valuing water to create liveable communities

6.2 Recommendation

Value water in communities by prioritising a whole-of-water-cycle management approach and applying fit-for-purpose, fit-for-place and fit-for-people approaches.

Proposed sponsor: Department of Agriculture, Water and the Environment

Supported by: State and territory planning departments

When this should impact:



Where this should impact:



10-15 **6.2.1 Provide enhanced community benefits, including water security, public health, environmental health and urban resilience, by integrating management of water infrastructure throughout the whole water cycle.**

Proposed lead: Local governments, water utilities

Supported by: Department of Agriculture, Water and the Environment, state and territory water departments, state and territory essential service economic regulators

0-5 Clarify roles and responsibilities by reviewing stormwater infrastructure management, including governance, regulatory, pricing, physical and operational constraints.

Proposed lead: State and territory water departments

Supported by: State and territory essential service economic regulators, water utilities, local governments

5-10 Establish a national stormwater management framework that includes:

- objectives and principles for total water cycle management, including urban amenity and community and waterway health
- guidelines on roles and responsibilities for planning, operation and maintenance
- cost recovery mechanisms.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

5-10 Assess existing stormwater infrastructure condition, capacity, location and management, and assess integration options.

Proposed lead: State and territory water departments

Supported by: Local governments, water utilities

5-10 Integrate potable water, wastewater, and stormwater infrastructure planning by assigning a single planner across the water cycle for greenfield development sites.

Proposed lead: State and territory planning departments

Supported by: Local governments, water utilities

10-15 Formalise roles and responsibilities for integrated water cycle management in established urban areas in alignment with a national stormwater management framework.

Proposed lead: State and territory water departments

Supported by: Local governments, water utilities

10-15 Establish sustainable and community-driven recovery of efficient costs, such as value sharing or levies, for stormwater infrastructure management. This should include urban waterway enhancements and re-naturalisation in alignment with a national stormwater management framework.

Proposed lead: State and territory water departments

Supported by: State and territory essential service economic regulators, local governments, water utilities

5-10 Embed a whole-of-water cycle management approach into long-term, large-scale (city or catchment – including both metropolitan and regional settings) urban planning by defining and implementing community-driven outcomes for public health, environmental (including ecological) health, amenity and urban resilience:

- Define clear community-driven objectives for water cycle management over the long term.
- Align long-term growth planning to community objectives.
- Ensure long-term growth plans recognise the value of water within the entire water cycle and identify dependencies of urban growth on water by incorporating best available data and water modelling.
- Identify water security risks and growth opportunities by applying the national water security framework.

Proposed lead: State and territory planning departments

Supported by: Department of Agriculture, Water and the Environment, state and territory water departments, water utilities, local governments

0-5 Embed whole-of-water cycle management at the commencement stage of local land-use planning through formal arrangements between land-use planners and the water cycle planner.

Proposed lead: State and territory planning departments

Supported by: Local governments

10-15 **6.2.2 Deliver safe, high-quality, secure, sustainable and fit-for-purpose water and wastewater services to remote and isolated communities by partnering with communities and water utilities, developing a funding pathway and monitoring strategies.**

Proposed lead: Department of Agriculture, Water and the Environment

Supporting agencies: State and territory municipal services departments, local governments, water utilities

0-5 Deliver secure, sustainable water and wastewater services to remote and isolated communities by implementing a funding pathway that considers whole-of-life cycle infrastructure and whole-of-water-cycle services.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Develop a comprehensive understanding of community dynamics that relate to water consumption, including access, use and preferences, as well as an assessment of water and wastewater infrastructure performance and condition. This should be done by undertaking a whole-of-service assessment.

Proposed lead: State and territory municipal services departments

Supported by: State and territory planning departments, local governments, water utilities, communities, local Aboriginal land councils

5-10 Deliver resilient and sustainable water and wastewater infrastructure that meets communities' needs by applying fit-for-purpose, fit-for-place and fit-for-people approaches that directly respond to whole-of-service assessments.

Proposed lead: State and territory municipal services departments

Supported by: State and territory planning departments, local governments, water utilities, communities, local Aboriginal land councils

10-15 Improve community health outcomes and introduce a total water cycle approach, including fit-for-purpose water use, by including sewerage services alongside potable water as part of minimum service standards for settlements in Remote Areas.

Proposed lead: State and territory first minister's departments

Supported by: State and territory planning departments, state and territory health departments, local governments, water utilities, communities, local Aboriginal land councils

5-10 Deliver co-designed, co-delivered water education and demand management strategies focusing on outdoor water use by partnering with community leaders and Aboriginal land councils. Education strategies should be delivered through schools and key community forums, incorporating preferred language and traditional knowledge.

Proposed lead: State and territory municipal services departments

Supported by: State and territory planning departments, state and territory health departments, local governments, water utilities, communities, local Aboriginal land councils, state and territory Aboriginal and Torres Strait Islander affairs agencies

10-15 Ensure community outcomes are being met consistently by implementing ongoing risk-based monitoring strategies.

Proposed lead: State and territory municipal services departments

Supported by: State and territory planning departments, state and territory health departments, local governments, water utilities, communities, local Aboriginal land councils, state and territory Aboriginal and Torres Strait Islander affairs agencies



7 Telecommunications and digital

7.1 Improving the resilience of Australia's telecommunications

7.1 Recommendation

Ensure every Australian can rely on digital services by providing transparency of the resilience of Australia's telecommunications infrastructure.

Proposed Sponsor: Department of Infrastructure, Transport, Regional Development and Communications

When this should impact:



Where this should impact:



- 0-5** **7.1.1 Enable emergency services and network operators to better respond to emergencies by classifying telecommunications as an essential service and continue to develop management policies such as infrastructure protection, risk planning and vegetation management.**
Proposed lead: Department of Home Affairs
Supported by: State and territory emergency services, telecommunications network operators – fixed and mobile
- 0-5** Create a clear legislative framework for improved policies and processes for state and territory governments and network operators to plan, manage and provide resilient services by consistently classifying telecommunications as an essential service in state and territory emergency management legislation.
Proposed lead: State and territory Attorneys-General
Supported by: State and territory resilience agencies
- 0-5** Increase preparedness for dealing with outages caused by natural disasters with clearly defined plans to address power resilience and back-up power for telecommunications sites.
Proposed lead: National Recovery and Resilience Agency
Supported by: State and territory resilience agencies

- 0-5** Protect communities from lost power and communications outages caused by emergencies, with a roadmap for Australia's energy networks to introduce more power line shielding and line undergrounding in areas at high risk of disaster.
Proposed lead: Critical Infrastructure Centre and Department of Home Affairs
- 0-5** **7.1.2 Empower and educate consumers by providing easy-to-understand information about the reliability and performance of all fixed and mobile networks through a public web portal, with scores available at point of sale.**
Proposed lead: Australian Competition and Consumer Commission
- 0-5** Give consumers and businesses comprehensive, easy-to-understand information about network reliability and other key network features by further improving the Measuring Broadband Australia tool to include more reliability measures and simplifying the format of measurements presented as a grading system.
Proposed lead: Australian Competition and Consumer Commission

0-5 **7.1.3 Protect communities from emergencies by developing a comprehensive response and recovery plan, investing in tools, hardware and networks for use by state and territory governments, emergency services and industry.**

Proposed lead: State and territory resilience departments

0-5 Protect lives in high-risk bushfire areas with improved cut-through for emergency alert warning system national emergency broadcast messages through the introduction of Emergency Cell Broadcasting across all mobile operators.

Proposed lead: Australian Communications and Media Authority

Supported by: Telecommunications network operators – mobile

0-5 Enable network operators and state and territory emergency services to better respond and make better decisions during emergencies by creating a system that enables two-way, real-time access to emergency data and standardised network asset information.

Proposed lead: Telecommunications network operators – fixed and mobile

Supported by: State and territory emergency services

0-5 Improve resilience and coverage in high-risk areas and along evacuation routes with new investment in programs such as the Mobile Black Spot Program and the Mobile Network Hardening Program. The investment should prioritise improved mobile coverage and mobile network resilience in areas prone to natural disasters such as bushfires.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Telecommunications network operators – mobile

5-10 Provide emergency services with more coverage and more capability for national public safety networks through a coordinated network expansion plan and capability strategy for improving coverage, capacity and the ability to transmit data.

Proposed lead: State and territory resilience agencies

Supported by: Department of Home Affairs



7.2 Putting customers at the heart of digital infrastructure

7.2 Recommendation

Give Australians improved telecommunications coverage, quality and access by taking strategic actions to improve digital inclusion, regional telecommunications and broadband quality levels.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

When this should impact:



Where this should impact:



0-5 **7.2.1 Connect regional Australians by improving the coverage, quality and reliability of telecommunications, through continued government investment in infrastructure outcomes that are not commercially viable in Rural Communities and Remote Areas.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 Empower customers by stipulating clear performance levels for data speed, reliability and key processes such as installation or repair times in the Statutory Infrastructure Provider Regime. The Regime should clarify and publish basic performance levels and ensure these evolve to include specific targets for repair times and service uptime.

Proposed lead: Australian Communications and Media Authority

0-5 Deliver increased mobile coverage to regional communities under a future approach to funding for mobile telephony in regional areas, to succeed the Mobile Black Spot Program after its sixth round.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

10-15 **7.2.2 Reduce the digital divide in Australian society by launching a national digital inclusion strategy and a rolling national study on key affected groups**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 Close the gap in digital inclusion with a national strategy and roadmap for digital access, affordability, ability and accessibility. A national program should drive a clear strategy for inclusion, set objectives, run studies, develop roadmaps and allocate funding to initiatives.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 **7.2.3 Ensure the NBN delivers against the customer needs set out in its Statement of Expectations by continuing to invest in upgrade pathways and ensuring basic performance standards are met for all end users.**

Proposed lead: NBN Co

0-5 Deliver improved coverage, speed and reliability to all Australian broadband customers under a published Minimum NBN Customer Charter that obliges all companies involved in delivering a connection (Statutory Infrastructure Providers and retail service providers) to meet a basic guarantee for the end-to-end customer experience. The Charter should include speed (relative to plan selected), reliability, installation times, repair times and rebates.

Proposed lead: NBN Co
Supported by: Australian Communications and Media Authority

0-5 Ensure NBN end users with slower-performing lines are covered by a prioritised upgrade plan for fixed-line and fixed wireless services, under a published suburb-level plan to upgrade copper lines that are unable to consistently deliver 25 Mbps upstream and 5 Mbps downstream speeds.

Proposed lead: NBN Co
Supported by: Department of Infrastructure, Transport, Regional Development and Communications



7.3 Enabling Australia's digital future

7.3 Recommendation

Fully realise the digital economic dividend by better enabling emerging technologies such as 5G, the Internet of Things and smart cities across Australia through regulation, investment and coordination.

Proposed sponsor: Australian Communications and Media Authority

When this should impact:



Where this should impact:



5-10 **7.3.1 Ensure Australian communities and businesses can rapidly access competitive, sustainable and contiguous 5G coverage in urban centres across Australia by increasing spectrum flexibility, ensuring sustainable pricing and simplifying planning processes.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Enable maximum contiguous coverage of Australia's emergent 5G networks by creating more affordable ways for network operators to locate 5G small cells on public assets (such as street furniture, public buildings and road trenches) in a way that resembles the arrangements made for other major utilities, with nominal or zero rental costs and wider facility-sharing of public infrastructure.

Proposed lead: state and territory planning departments
Supported by: State and territory transport departments, local governments

0-5 Provide communities with commercially viable, unobtrusive and contiguous coverage across Australia's suburbs by encouraging local governments to build telecommunications towers and poles (for network operators to mount small cells) for the public good in key suburbs and precincts.

Proposed lead: State and territory planning departments
Supported by: Local governments

0-5 Facilitate the introduction of 5G to regional areas by giving flexibility to operators to utilise any low-band spectrum to roll out 5G coverage in these areas.

Proposed lead: Australian Communications and Media Authority

0-5 Consider adding the adoption of 5G technology to the evaluation criteria for regional Mobile Black Spot Program funding applications.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Increase access to choice in connectivity for mobile and smart applications by accelerating the rollout of Open Radio Area Network technology, including by prioritising this technology in regional connectivity programs and 5G pilot programs.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 **7.3.2 Improve the sustainability, liveability and efficiency of Australian communities by adopting a strategic approach to smart cities and the Internet of Things that facilitates investment and enables scalable projects.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: Australian Communications and Media Authority

8 Social infrastructure

8.1 Transforming social infrastructure to enhance quality of life

8.1 Recommendation

Support Australians to enjoy a healthier, safer, more connected and fulfilled quality of life by facilitating targeted investment in the right physical and digital social infrastructure.

Proposed sponsors: Department of Health, Department of Education, Skills and Employment, Department of Social Services, Australian Treasury

Supported by: State and territory health departments, state and territory social housing providers, community housing providers, state and territory education departments

When this should impact: 0-5 5-10 **10-15** 15+

Where this should impact:

10-15 **8.1.1 Improve equity of access and facilitate safe, high-value, high-quality care for all Australians by accelerating the transition to digital health service delivery. This will help to achieve National Health Reform Agreement 2020–2025 goals.**

Proposed lead: Department of Health
Supported by: State and territory health departments

5-10 Accelerate the adoption of high-quality virtual care across Australia by identifying and examining existing platforms, sharing successful digital health technologies, educating platform users and developing behaviour change programs based on learnings and practices.

Proposed lead: Department of Health
Supported by: State and territory health departments

5-10 Improve the value and quality of virtual health care services by developing digital health infrastructure transformation plans that identify and prioritise enhancements to existing hospitals, health services and primary care services.

Proposed lead: State and territory health departments
Supported by: Local health districts, primary health networks

10-15 Enable different digital health systems to work together and share meaningful information by developing a collaborative work program that integrates health services to provide targeted, patient-centred care across human services sectors, including disability, aged care and community welfare services.

Proposed lead: Department of Health
Supporting agencies: State and territory health departments, Australian Digital Health Agency

5-10 Provide seamless connections to existing state and territory digital health capabilities through a program to increase primary health providers' digital capability.

Proposed lead: Department of Health
Supported by: State and territory health departments, Digital Technology Taskforce, Australian Digital Health Agency, primary health networks

5-10 Improve digital health literacy for citizens and the health workforce through targeted education programs, with a particular focus on vulnerable communities.

Proposed lead: Department of Health
Supported by: State and territory health departments, Australian Digital Health Agency, primary health networks

0-5 Enable a smart infrastructure step-change by adopting best-practice policies that reduce friction and increase interoperability at a place level, including policies addressing:

- shared applications
- systems and processes
- capabilities
- data exchange, storage and federation.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Local governments, state and territory planning departments

0-5 Accelerate the delivery of smart places through a refresh of the Smart Cities and Suburbs Program to focus on co-funding high initial cost, yet scalable, regional initiatives that align with the national digital infrastructure roadmap.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory planning departments

5-10 **7.3.3 Protect and educate all corners of society to become more digitally confident as new technology continues to evolve, with the launch of national initiatives addressing health concerns, data privacy, technology risks, cybercrime and digital confidence.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australian Cyber Security Centre

5-10 Ensure the Australian Privacy Principles are ready to deal with an entirely new generation of processing capabilities, with a review of the *Privacy Act 1988* (Cth) to consider the risks presented by artificial intelligence, quantum computing and machine learning.

Proposed lead: State and territory Attorneys-General

Supported by: Office of the Australian Information Commissioner

0-5 Protect the public from misinformation and cyber risks by investing in public education and communication programs addressing 5G health concerns, data privacy, technology risks and cybercrime. The engagement should extend previously successful public education and engagement campaigns around digital innovation.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australian Communications and Media Authority, Australian Radiation Protection and Nuclear Safety Agency, Department of Health, Office of the Australian Information Commissioner



5-10 8.1.2 Ensure Australia is always fully prepared for pandemics across all jurisdictions by preparing an effective national pandemic health infrastructure response program.

Proposed lead: Department of Health

Supported by: State and territory health departments

5-10 Ensure consistent readiness for pandemics by retaining and continuously improving COVID-19 pandemic infrastructure planning and preparations for emergency response hospitals, and make ongoing national arrangements to access private hospital infrastructure during pandemics.

Proposed lead: Department of Health

Supported by: State and territory health departments

5-10 Ensure appropriate supply of emergency facility materials by establishing national contracts with major supply chain providers for personal protective equipment (PPE), critical medical devices and other essential facility materials.

Proposed lead: Department of Health

Supported by: State and territory health departments

5-10 Progress the recommendations in the *National Review of Hotel Quarantine* to ensure Australia has appropriate quarantine infrastructure to respond to emergency situations, emergency evacuations or urgent scalability needs.

Proposed lead: Department of Health (or other to be determined by National Cabinet)

5-10 8.1.3 Deliver higher-quality school and early childhood education facilities that are well maintained and readily accessible to their communities by embedding place-based planning and asset management best practice.

Proposed lead: State and territory education departments

Supported by: Department of Education, Skills and Employment

0-5 Enable more equitable access to early childhood education centres by facilitating cross-sectoral partnerships between centre operators and planning and transport departments to support better access and transport connectivity, especially in the planning of new centres.

Proposed lead: State and territory education departments

Supported by: State and territory planning departments, state and territory transport departments

5-10 Continue to develop state asset registers that identify the quality, condition and performance of early childhood education facilities, including best-practice asset performance methodology (such as a Value Rating Tool), to inform evidence-based decision-making on future infrastructure investment.

Proposed lead: State and territory education departments

Supported by: Department of Education, Skills and Employment

5-10 Extend the longevity of existing school infrastructure through long-term asset management plans to progressively address maintenance and refurbishment needs.

Proposed lead: State and territory education departments

Supported by: State and territory treasuries

10-15 8.1.4 Ensure Vocational Education and Training (VET) aligns with industry-specific skills building and jobs growth objectives by designing, delivering and operating VET infrastructure appropriately.

Proposed lead: State and territory education departments

Supported by: Vocational Education and Training providers, Department of Education, Skills and Employment

10-15 Provide contemporary education facilities by investing in VET facilities that are appropriately located, integrated into the local area, fit-for-purpose and digitally enabled, and include contemporary industry equipment.

Proposed lead: State and territory education departments

Supported by: State and territory treasuries

5-10 Deliver industry-specific VET skills training and tertiary programs in targeted industry precincts by developing and implementing more industry partnerships and programs that share infrastructure and learning spaces.

Proposed lead: State and territory economic development departments

Supported by: Vocational Education and Training providers, universities

5-10 Ensure enduring skills development opportunities and jobs are created in line with the infrastructure pipeline by continuing to mandate industry-relevant onsite training facilities and skills legacy initiatives in infrastructure development programs.

Proposed lead: State and territory economic development departments

Supported by: State and territory infrastructure departments

5-10 Support workplace-based learning accreditation schemes in industry precincts by actively participating in developing micro-credential curricula and accreditation.

Proposed lead: Vocational Education and Training providers

Supported by: Industry representative groups

5-10 8.1.5 Enable greater social and economic participation by designing programs to increase the supply and improve the quality of social and affordable rental housing.

Proposed lead: State and territory social housing providers, community housing providers, National Housing Finance and Investment Corporation

Supported by: Department of Social Services, Australian Treasury

5-10 Expand the pipeline of well-located, high-quality social and affordable rental housing by prioritising and implementing efficient medium- to long-term financing programs.

Proposed lead: National Housing Finance and Investment Corporation, state and territory social housing providers, community housing providers

Supported by: Australian Treasury, Department of Social Services

5-10 Improve housing quality by developing and implementing innovative efficient programs to reduce the maintenance backlog of social

dwellings within their remaining economic life while recycling stock that has reached or passed the end of its economic life.

Proposed lead: State and territory social housing providers, community housing providers

Supported by: Department of Social Services, National Housing Finance and Investment Corporation, Australian Treasury

5-10 Meet the *Closing the Gap* target for 88% of Aboriginal and Torres Strait Islander peoples to be living in appropriately sized housing by 2031 by:

- addressing maintenance and utility deficiencies for existing and future housing stock
- renewing life-expired housing stock and developing new housing stock
- addressing tenure issues
- providing infrastructure to prepare for land development.

Proposed lead: State and territory social housing providers, community housing providers,

Department of Social Services, Coalition of Peaks
Supported by: National Indigenous Australians Agency

5-10 Support community housing providers by continuing to develop and implement programs that build capacity and capability.

Proposed lead: State and territory social housing providers, National Housing Finance and Investment Corporation

Supported by: Department of Social Services, Australian Treasury

0-5 8.1.6 Support mental and physical health through appropriate investment in green and blue and recreational infrastructure.

Proposed lead: State and territory planning departments

Supported by: Local governments

0-5 Improve health and wellbeing by developing an appropriate methodology for analysing public space performance, including green and blue infrastructure. Review methodologies used in Australia and develop place-based access benchmarks across geographies.

Proposed lead: State and territory planning departments

Supported by: Local governments

8.2 Partnerships to build communities

8.2 Recommendation

Maximise social and economic community benefits by supporting shared use of social infrastructure through future agreements and capital funding programs prioritising shared use of facilities.

Proposed sponsors: Department of Health, Department of Education, Skills and Employment, Australian Treasury

Supported by: State and territory treasuries, state and territory planning departments, state and territory health departments, state and territory education departments

When this should impact:



Where this should impact:



5-10 8.2.1 Allow community access outside core operating hours by developing shared-use plans for new and upgraded social infrastructure such as health facilities, schools, VET, TAFE, universities and sporting facilities.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure bodies

5-10 Support shared use of social infrastructure by establishing national principles for place-based, cross-agency infrastructure governance.

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies

5-10 Promote shared use of social infrastructure by developing incentives and measures that support agencies to implement shared-use arrangements and place-based, collaborative planning and delivery.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure bodies

0-5 Increase community access to social infrastructure by benchmarking, compiling and sharing best-practice examples of shared-use models that could be adapted or scaled nationally.

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies

5-10 Enable place-centric TAFE developments by developing principles to support this approach, including collaborative and shared-use opportunities. Review existing TAFE assets against these principles and migrate new or refurbished assets where there are benefits.

Proposed lead: State and territory education departments and state and territory planning departments
Supported by: State and territory treasuries

0-5 Enable the use of infrastructure during crises by identifying and funding fit-for-purpose facilities that would be available for rapid multi-purposing and shared use at these times.

Proposed lead: State and territory emergency management agencies
Supported by: State and territory treasuries

5-10 Support third-party use by establishing insurance and security arrangements, payment systems and associated services.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure bodies

5-10 Enable a shift in agencies adopting shared-use models by including principles for maximising shared use and associated community outcomes in business case policies.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure bodies

5-10 8.2.2 Increase economic and social benefits by implementing strategic planning governance structures for health and education precincts, and innovative procurement and delivery models. Specialised agencies should also be established to deliver major social infrastructure capital projects.

Proposed lead: State and territory health departments, state and territory education departments, state and territory treasuries, state and territory first minister's departments

Supported by: Department of Health, Department of Education, Skills and Employment, Department of the Prime Minister and Cabinet, universities, local governments, local health districts, local education officers

5-10 Drive the development of health and education precincts and innovation districts by developing and implementing place-based governance agreements that involve associated local institutions and community representatives.

Proposed lead: State and territory health departments, state and territory education departments
Supported by: State and territory planning departments, universities

5-10 Yield the benefits of innovation districts by adopting a precinct maturity model to:

- assess the maturity of existing health and education precincts
- prioritise precincts to move along the precinct maturity pathway
- develop investment attraction strategies, master plans and incentives to attract aligned industry sectors into precincts
- include social and affordable rental housing in innovation districts.

Proposed lead: State and territory treasuries
Supported by: State and territory health departments, state and territory education departments, state and territory economic development departments, universities

5-10 Promote and accommodate innovative approaches to procuring social infrastructure delivery services, including updating existing Public Private Partnership guidelines and models.

Proposed lead: State and territory treasuries
Supported by: Infrastructure Australia

5-10 Deliver better capital outcomes by establishing standalone infrastructure agencies and major project offices for significant social infrastructure sector portfolios.

Proposed lead: State and territory first minister's departments
Supported by: State and territory health departments, state and territory education departments



8.3 Social infrastructure is economic infrastructure too

8.3 Recommendation

Support economic development by recognising the value of investment in social infrastructure.

Proposed sponsor: Infrastructure Australia

Supported by: State and territory infrastructure bodies, Australian Treasury

When this should impact:



Where this should impact:



5-10 **8.3.1 Guide better social infrastructure investment by developing a consistent, national valuation framework that captures, measures and assesses the quadruple-bottom-line benefits of social infrastructure.**

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies

0-5 Guide social infrastructure investment by establishing a cross-jurisdictional, multi-sector panel to lead the collaborative development of an overarching social infrastructure valuation framework. This will strengthen existing approaches and draw on expertise from government, industry, environmental, First Nations and community leaders.

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies

0-5 Support the effective evaluation of the economic contribution of social infrastructure by developing associated tools, methodology and guidance materials that can be used by infrastructure providers.

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies

5-10 Enhance investment decisions by continuously improving and updating the framework by sharing information and best practice. Support the development of evaluation approaches for specific social infrastructure sectors to fill out the framework.

Proposed lead: State and territory infrastructure bodies

Supported by: State and territory treasuries, state and territory education departments, state and territory health departments, state and territory housing departments, state and territory justice departments

5-10 **8.3.2 Support healthy and productive futures for all Australians by establishing a consistent approach to capturing, measuring and assessing the quadruple-bottom-line benefits of social and affordable rental housing.**

Proposed lead: National Regulatory System for Community Housing, state and territory social housing providers, community housing providers, Department of Social Services, Australian Treasury

Supported by: Australian Institute of Health and Welfare, Australian Bureau of Statistics, Infrastructure Australia

0-5 Assess the quadruple-bottom-line benefits of social and affordable rental housing by building on existing frameworks and developing an agreed, consistent approach to measuring its economic impact. Use the approach to inform and support the national valuation framework.

Proposed lead: Department of Social Services, state and territory social housing providers, community housing providers

Supported by: State and territory treasury departments, Australian Institute of Health and Welfare, Australian Bureau of Statistics, National Regulatory System for Community Housing

0-5 Harmonise the collection and availability of data across different government departments and housing sectors by developing a housing and homelessness reporting process and dataset that are comprehensive and consistent.

Proposed lead: Department of Social Services, state and territory social housing providers, community housing providers, Australian Treasury

Supported by: State and territory treasuries, Australian Institute of Health and Welfare, Australian Bureau of Statistics, National Regulatory System for Community Housing

5-10 Deliver improved social and affordable rental housing outcomes by adopting the quadruple-bottom-line approach to prioritise investment.

Proposed lead: State and territory social housing providers, community housing providers, National Housing Finance and Investment Corporation, Australian Treasury

Supported by: Department of Social Services

5-10 **8.3.3 Drive economic growth and improve social cohesion and liveability by establishing a consistent approach to capturing, measuring and assessing the quadruple-bottom-line benefits of arts, culture, green, blue and recreational infrastructure.**

Proposed lead: State and territory treasuries
Supported by: State and territory arts, cultural, recreational and tourism departments, local governments

0-5 Improve growth and liveability by assessing the quadruple-bottom-line of arts, culture, green, blue and recreation infrastructure, building on existing frameworks and developing an agreed, consistent approach to measuring its economic impact. Use the approach to inform and support a national valuation framework.

Proposed lead: State and territory arts, cultural, recreational and tourism departments, state and territory planning departments

Supported by: Local governments, communities

5-10 Catalyse economic development by using the new framework to collaboratively plan, develop and invest in arts, cultural, green, blue and recreational infrastructure that enhances unique regional identities and brands. Apply this approach when planning new precincts and renewal projects. Update existing plans every five years.

Proposed lead: State and territory arts, cultural, recreational and tourism departments, state and territory planning departments, state and territory economic development departments

Supported by: Local governments, communities

5-10 **8.3.4 Support and protect economic growth and the environment by valuing Australia's significant natural assets and their quadruple bottom line benefits.**

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory environment departments

0-5 Inform and prioritise investment by developing a framework to assess the quadruple bottom line of significant natural assets, building on existing frameworks and developing an agreed, consistent approach to measuring their economic impact. Use the approach to inform and support a national valuation framework.

Proposed lead: State and territory environment departments

Supported by: Department of Agriculture, Water and the Environment

0-5 Inform decision-making by developing an agreed and integrated register of significant natural assets, with a stocktake undertaken by individual levels of government.

Proposed lead: State and territory environment departments

Supported by: Department of Agriculture, Water and the Environment

9 Waste

9.1 Valuing resources to enable a circular economy

9.1 Recommendation

Avoid waste, improve resource recovery and build demand and markets for recycled products by integrating the circular economy in national waste policy and infrastructure projects.

Proposed sponsor: Department of Agriculture, Water and the Environment

Supported by: Department of Industry, Science, Energy and Resources

When this should impact:



Where this should impact:



0-5 9.1.1. Increase understanding of the role of consumers in the circular economy through community education on responsible waste behaviour.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory environment departments

0-5 Increase understanding and compliance through community education which highlights the benefits of landfill diversion and the importance of correct separation of materials for household waste collection services.

Proposed lead: State and territory environment departments

Supported by: Local governments

0-5 Increase consumer understanding by reviewing the effectiveness of current recycling labels.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory environment departments

0-5 Increase consumer participation in product stewardship by applying these recycling label insights to a broader range of materials and products.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory environment departments

0-5 9.1.2. Reduce the impact of plastic on the environment by implementing the National Plastics Plan.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory waste departments

0-5 Increase plastic recycling by providing guidance on aligning requirements and timeframes between state and territory governments and industries.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory waste departments

5-10 9.1.3 Build support for the circular economy and embed circular practices by developing a circular economy roadmap for the infrastructure sector, including annual progress reports.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: Department of Infrastructure, Transport, Regional Development and Communications, CSIRO: Commonwealth Scientific and Industrial Research Organisation, Department of Industry, Science, Energy and Resources

5-10 Improve uptake and consistency in the use of recycled and recyclable materials in infrastructure and construction projects by incorporating targets in building and design codes.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Industry, Science, Energy and Resources

0-5 Ensure greater use of recycled materials within government infrastructure projects by developing procurement targets and timelines.

Proposed lead: State and territory infrastructure departments

Supported by: State and territory chief engineers

0-5 Support the piloting and early deployment of innovative technologies and processes through structured co-investment programs for products incorporating recycled materials.

Proposed lead: State and territory infrastructure departments

Supported by: State and territory chief engineers

5-10 9.1.4 Support co-location of circular economy facilities by undertaking collaborative land-use planning.

Proposed lead: State and territory planning departments

Supported by: Local governments

5-10 Improve waste infrastructure in Rural and Remote Areas by developing land-use plans that include resource recovery facilities.

Proposed lead: State and territory planning departments

Supported by: Local governments

5-10 Improve levels of service in Rural Communities and Remote Areas by identifying locations for hub-and-spoke models of waste management services.

Proposed lead: State and territory planning departments

Supported by: Local governments

5-10 9.1.5. Reduce organic waste to landfill through mandating local council food organics and garden organics (FOGO) collection services.

Proposed lead: State and territory waste departments

5-10 Reduce waste to landfill and emissions by introducing FOGO collection and processing for households when renewing existing waste management contracts.

Proposed lead: Local governments

Supported by: State and territory place management agencies

0-5 Increase uptake of FOGO services and encourage positive waste behaviours by implementing ongoing education and communications with households before and during the life of the collection service.

Proposed lead: Local governments

0-5 Account for local factors such as geography, climate and storage when developing place-based guidance on FOGO implementation for local government.

Proposed lead: State and territory waste departments

Supported by: Local governments

5-10 Enable FOGO collection in apartments by amending complying development provisions to allow retrofitting for facilities in existing apartments, and by incorporating FOGO and other collections in the design of new builds.

Proposed lead: State and territory planning departments

Supported by: Local governments

5-10 Reduce mixing of waste by commercial and industrial operators by creating an opt-in program to separate organic waste into a different stream

Proposed lead: State and territory waste departments

0-5 Develop end markets for reprocessed organics by developing a FOGO recovery strategy that tests new uses for recovered materials.

Proposed lead: State and territory waste departments, state and territory industry departments

Supported by: Department of Agriculture, Water and the Environment

0-5 Improve distribution of FOGO material to regional areas for further processing and use by consolidating collected FOGO material.

Proposed lead: State and territory waste departments

Supported by: Local governments

0-5 Avoid food waste across the supply chain by working with industry to connect with alternate markets for the quick and direct sale and redistribution of FOGO.

Proposed lead: State and territory waste departments



9.2 Waste data to drive innovation

9.2 Recommendation

Encourage market development through government and industry partnerships to accelerate and extend the implementation of the *National Waste Policy's* data actions and bring national consistency to the household waste collection and landfill levy system.

Proposed sponsor: Department of Agriculture, Water and the Environment

When this should impact:



Where this should impact:



0-5 **9.2.1 Support coordinated policy through an integrated whole-of-life waste data strategy for priority resources.**

Proposed lead: Department of Agriculture, Water and the Environment

0-5 Enable nationally consistent reporting of waste data by developing a common approach to standards and definitions.

Proposed lead: Department of Agriculture, Water and the Environment

0-5 Improve decision-making and investor confidence by implementing an integrated data strategy that leverages agreed definitions.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory waste departments, local governments

5-10 **9.2.2 Create a high-quality recycling system with lower processing costs by developing common benchmarks for each material stream, consolidating services and targeting infrastructure investment.**

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory waste departments, local governments

5-10 Support efficient resource recovery by prioritising investment in separation and processing infrastructure by material volumes.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Create clarity for consumers and industry by implementing common benchmarks between states and territories for the collection, transportation and sorting of each material stream.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory waste departments, local governments

0-5 Reduce contamination of material streams through correct disposal and improved source separation by standardising household bins for each material type within states and territories.

Proposed lead: State and territory waste departments

Supported by: Local governments

0-5 Reduce congestion, amenity and road safety impacts by consolidating services to minimise transport congestion impacts.

Proposed lead: Local governments

0-5 **9.2.3. Increase landfill diversion by developing a waste levy pricing strategy and national levy protocols.**

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory environment departments, state and territory treasuries

References

- 1 *Disability Discrimination Act 1992* (Cth), available via: www.legislation.gov.au/Details/C2016C00763
- 2 *Disability Standards for Accessible Public Transport 2002* (Cth), available via: www.legislation.gov.au/Details/F2005B01059

0-5

Address cross-border waste issues by developing national levy protocols that define which wastes should be levied, levy liabilities, levy administration and maximum transportation limits.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory environment departments, state and territory treasuries

0-5

Increase resource recovery by introducing a national levy pricing strategy to minimise interstate levy differences.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory environment departments, state and territory treasuries





III. Introduction

At a glance

- The *2021 Australian Infrastructure Plan* is a **practical and actionable roadmap for reform**. It prioritises community outcomes and outlines meaningful steps to grow Australia's economy, maintain and enhance our standard of living and ensure every city and region is serviced by world-class infrastructure.
- The *Australian Infrastructure Plan* plays a key role in driving change in the infrastructure sector. While there has been significant progress since the *2016 Australian Infrastructure Plan*, there remains **unfinished reform** that has been carried over into this new edition.
- The *2021 Plan* is being delivered at a time of **significant uncertainty and disruption** that is having a major impact on the health of Australian communities, environment and economies.
- The community has experienced **significant shocks**, including the COVID-19 pandemic and the drought, bushfires and flooding that marked 2019–2020. In addition, there have been **growing stresses** that complicate conditions for long-term planning and decision-making. They include the increased pace of technological change, shifting geopolitical relationships, increased localisation and changing climatic patterns.
- The COVID-19 pandemic has demonstrated how quickly Australia's **infrastructure services can adapt** to deliver services in new ways as community needs change.
- The *2021 Australian Infrastructure Plan* responds to the six challenges and six opportunities identified in the *Infrastructure beyond COVID-19 report*¹ and the 180 challenges and opportunities of the *2019 Australian Infrastructure Audit*.²

Introduction

Our vision for 2036

Infrastructure Australia's vision for 2036 is to have infrastructure that improves the sustainability of the country's economic, social, environmental and governance settings, improve quality of life for all Australians, and is resilient to shocks and emerging stresses.

The *2021 Australian Infrastructure Plan* sets out the reforms needed over the next 15 years to achieve this.

The *2021 Plan* is a practical and actionable roadmap for reform that prioritises community outcomes and the delivery of affordable, high-quality infrastructure services across Australia's diverse geographies.

It outlines meaningful steps to grow the economy, maintain and enhance people's standard of living and ensure every city and region delivers world-class infrastructure for all Australians.

This edition of the *2021 Australian Infrastructure Plan* is being published as recent extreme events have had a significant impact on the health of Australian communities, environment and economies.

During 2020 and 2021, drought, floods, bushfires and the COVID-19 pandemic all impacted how Australians use and value infrastructure, and the demand for the services it delivers.

Reflecting this, the *2021 Australian Infrastructure Plan* focuses on adaptability and how the infrastructure

sector can best support the national recovery from recent shocks.

While recent events have tested the ability of Australia's infrastructure sector to handle shocks and stresses, they have also highlighted the resilience and adaptability of the sector.

It is possible to build on the lessons learned to create a more resilient Australia and embed them into a new way of operating.

Infrastructure sustainability is another key focus of the *2021 Plan*. In our *2021 Sustainability Principles*, Infrastructure Australia defines 'sustainable infrastructure' as 'the network and system, equipment and assets designed to meet the population's essential service needs'.³

This means infrastructure is planned, designed, constructed and operated to optimise social, economic, environmental and governance outcomes over the life of an asset.

Sustainable infrastructure does not stop at building new projects. It also includes rehabilitating, reusing and optimising existing infrastructure.

The *2021 Plan* aspires to support community needs by balancing the sustainability, affordability and accessibility of infrastructure services.

Within this focus on user and community outcomes, we have identified unifying themes across each area covered in the Plan — see **Table III.1**.

Table III.1: The *2021 Plan's* focus areas and themes respond to Australians' changing needs

Focus area	Outcome
Place-based outcomes for communities	Unlocking the potential of every place.
Sustainability and resilience	Balancing infrastructure outcomes in an uncertain future.
Industry productivity and innovation	Facilitating a step change in industry productivity.
Transport	Delivering an integrated transport network.
Energy	Enabling an affordable transition to a net zero future.
Water	Prioritising safe and secure water.
Telecommunications and digital	Ensuring equality in an era of accelerating digitalisation.
Social infrastructure	Supporting economic prosperity and quality of life.
Waste	Accelerating Australia's transition to a circular economy.

The time is right for reform

The impacts of the COVID-19 pandemic have been devastating. They have also provided an opportunity to do things differently as Australians move to a new normal.

This country is well-placed to take advantage of opportunities in the post-pandemic recovery phase. Compared to other OECD countries, Australia's infrastructure networks have been relatively resilient, and service providers rapidly adjusted their operations to meet community needs.

Being able to continue infrastructure construction across major projects has been a key source of economic activity and employment during the pandemic.

Australia's governments should seize on the current opportunities for reform.

The *2021 Plan* maps out practical ways to move beyond traditional design of many infrastructure services while meeting the needs of all Australians.

Across the infrastructure sectors and the cross-sector strategic focus areas, Infrastructure Australia has identified pragmatic steps that can and should be taken now to usher in a new era for infrastructure enabled productivity and quality of life.

A clear path to a stronger Australia

Australia's response to the recent natural disasters, pandemic, global economic change and geopolitical shifts have demonstrated how this country has the economic strength and institutional robustness to respond positively, and the infrastructure capability to adapt to a new normal.

Australians are living in a period of unprecedented uncertainty. For this reason, our reforms are based on scenarios developed that factor uncertainty and account for multiple futures.

This approach ensures that, wherever possible, the reforms offer a clear path to an Australia that is economically and socially stronger.

To build a stronger Australia, infrastructure planning and policies must incorporate the distinct geographies, demographics and localised needs of diverse communities.

We have therefore considered three cross-sectoral themes in the *2021 Plan*: Place-based outcomes for communities; Sustainability and resilience; and Industry productivity and innovation. These support a more holistic vision for infrastructure development.

The *2021 Plan* also considers for the first time the critical sectors of social infrastructure and waste.

It does not attempt to cover all aspects of the infrastructure sector. Rather, reforms are focused on the most pertinent issues, as identified in our *2019 Australian Infrastructure Audit* and through extensive stakeholder consultation.⁴

A period of uncertainty and disruption

The *2019 Audit* identified that Australia is in an unprecedented period of uncertainty.

It highlighted several driving factors, including a changing climate, the re-ordering of the world economy, and increasing political polarisation that is reshaping global institutions and norms.

Also, as Australia's population grows, community needs are evolving, economic structures are shifting, and extreme weather events and rapidly changing technology will continue to transform people's day-to-day lives.

Extreme weather events and a changing climate

The scale and risk of this uncertainty was evident in 2019 and 2020.

During 2019, Australia experienced its warmest year on record, with the annual national mean temperature 1.52°C above average.

In the same year, national rainfall fell to 40% below average. This extraordinarily low rainfall period is comparable to that seen in the driest periods in Australia's recorded history, including the Federation Drought 1895–1903 and the Millennium Drought 1997–2009.⁵

Figure III.1 shows how Australia's drought levels and patterns have changed over the past two decades.

In addition, the national annual accumulated Forest Fire Danger Index in 2019 was the highest since 1950, when national records began.⁶

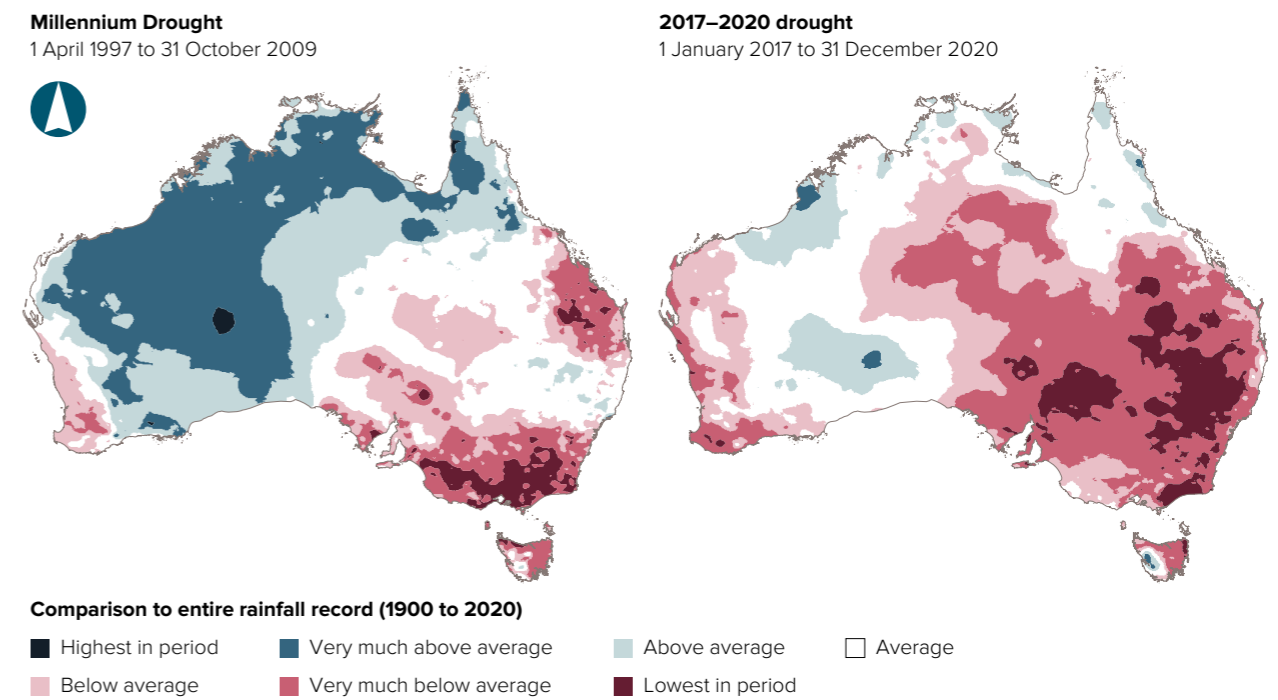
The 2019–2020 bushfire season burned over 17 million hectares of land across New South Wales, Victoria, Queensland, the ACT, Western Australia and South Australia.

This was larger than the combined area burned in the Black Saturday bushfires in 2009 and the Ash Wednesday bushfires in 1983.

During the 2019–2020 bushfires, 33 people lost their lives, including nine firefighters and were the largest in terms of area burned.⁷

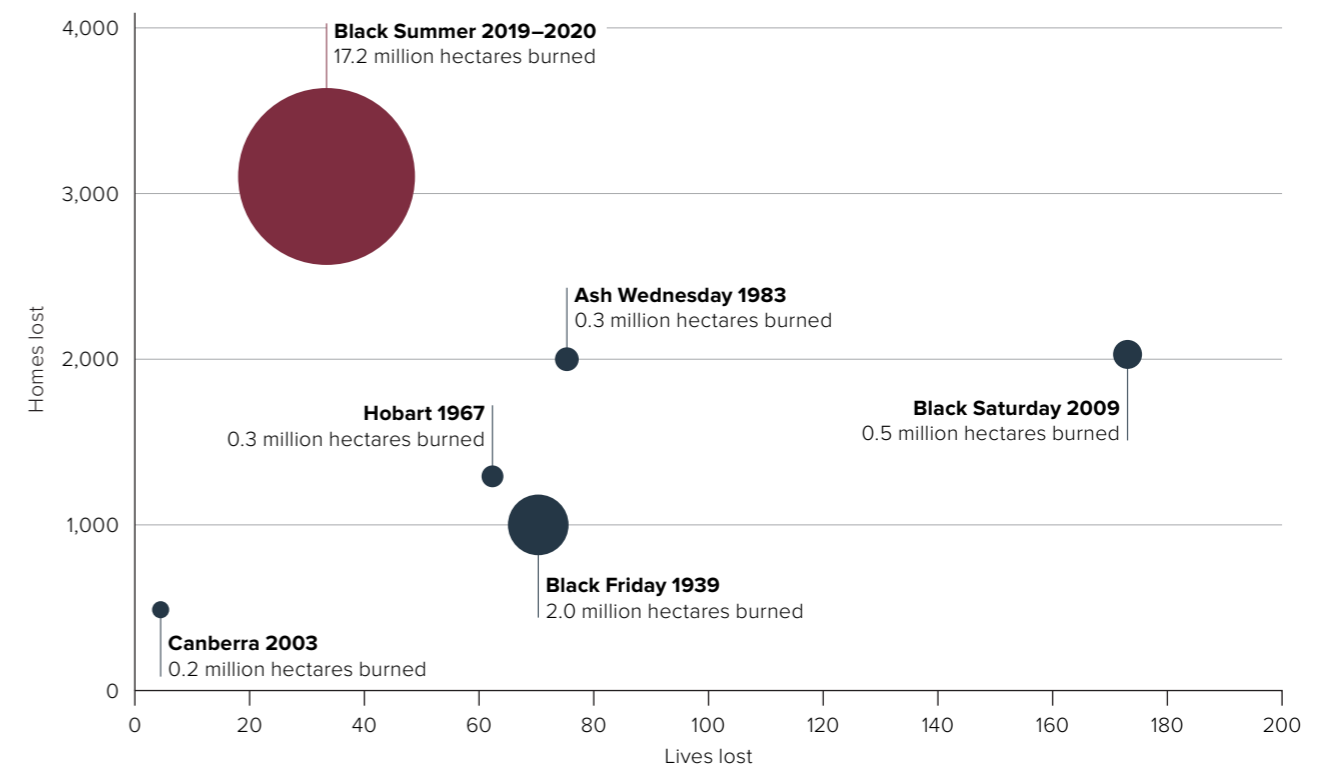
Figure III.2 shows Australia's bush fire events have increased in size in recent years.

Figure III.1: Australia was drier in 2017–2020 than during the Millennium Drought



Rainfall deciles from April 1997 to October 2009 (left) and from January 2017 to December 2020 (right). These maps show where rainfall was above average, average or below average for the period compared to the entire national rainfall record from 1900 to 2020. Source: Bureau of Meteorology (2021)⁸

Figure III.2: Some of Australia's worst bushfires have occurred in recent years



Note: The size of each circle represents the total area burned. Source: CSIRO (2020)⁹

The pandemic disrupted how Australians use infrastructure

In addition to the extreme weather events that marked 2019 and 2020, the COVID-19 pandemic had, and is continuing to have, an enormous impact on the lives of all Australians.

The pandemic has impacted how Australians use and consume infrastructure.

People travelled significantly less during the lockdowns, relied more on local infrastructure and shifted from physical interaction to virtual interaction.

Many of these changes are likely to remain as the pandemic eases, contributing to a new way of living and, as a result, of delivering services.

Education and transport are two examples of infrastructure sectors that experienced extreme behaviour change during this time, and where the impact is still being felt.

Travel bans during the pandemic almost stopped the arrival of international students completely, with enrolments dropping from 144,000 students in July 2019 to 40 students in July 2020.¹⁰

This significantly reduced the number of higher education enrolments, 32% of which were made up by international students in 2019, so there were repercussions for the Australian economy. Before the pandemic, the international education sector contributed over \$40 billion annually, with over half this amount (\$22.8 billion) spent in the wider economy.^{11,12}

The transport sector suffered similar disruption. In the peak of COVID-19, there were dramatic reductions in public transport use as people opted to use personal vehicles. Public transport in most cities fell to 10–30% of pre-pandemic levels in the initial lockdown period before settling at around 60–70% in the second half of 2020.¹³

New trends demonstrate infrastructure adaptability and resilience

The COVID-19 pandemic has demonstrated how quickly Australia’s infrastructure services can adapt to significant change and rapidly shift to meet community needs.

While this did not prevent the pandemic from having major impacts on all Australians, it revealed the infrastructure sector’s resilience and adaptability and presented opportunities to deliver services differently.

New trends emerged in infrastructure operation and service delivery and, in some cases, existing trends were accelerated.

Digitalisation, decentralisation, localism, innovation and adaptability were seen across all the major infrastructure sectors.¹⁴

While some trends may be temporary, becoming less important as Australia progresses through the recovery phase, other trends will be embedded and normalised.

The **social infrastructure** sector demonstrated strong adaptability. The health system rapidly repurposed intensive care unit capacity and adopted technology for service delivery, including telehealth.

The **education** sector also pivoted rapidly from face-to-face to online services, while taking a significant economic hit from the sharp decline in international students accessing higher education.

The **telecommunications and digital sector** quickly adopted decentralised operations as it responded to both lockdowns and to population shifts from big cities to smaller towns and regional areas. The sector’s response included increasing the adoption of digital collaboration tools and investing more in cloud-based systems and cyber security.

During lockdown periods, patterns of **energy** consumption became more decentralised, with household use increasing while business use decreased. Lockdowns also strengthened trends towards onsite energy generation and demand for small-scale solar generation.

While impacts on the **water** sector were less pronounced, consumption patterns became more decentralised as housing demand shifted from inner city areas to the regions.¹⁵

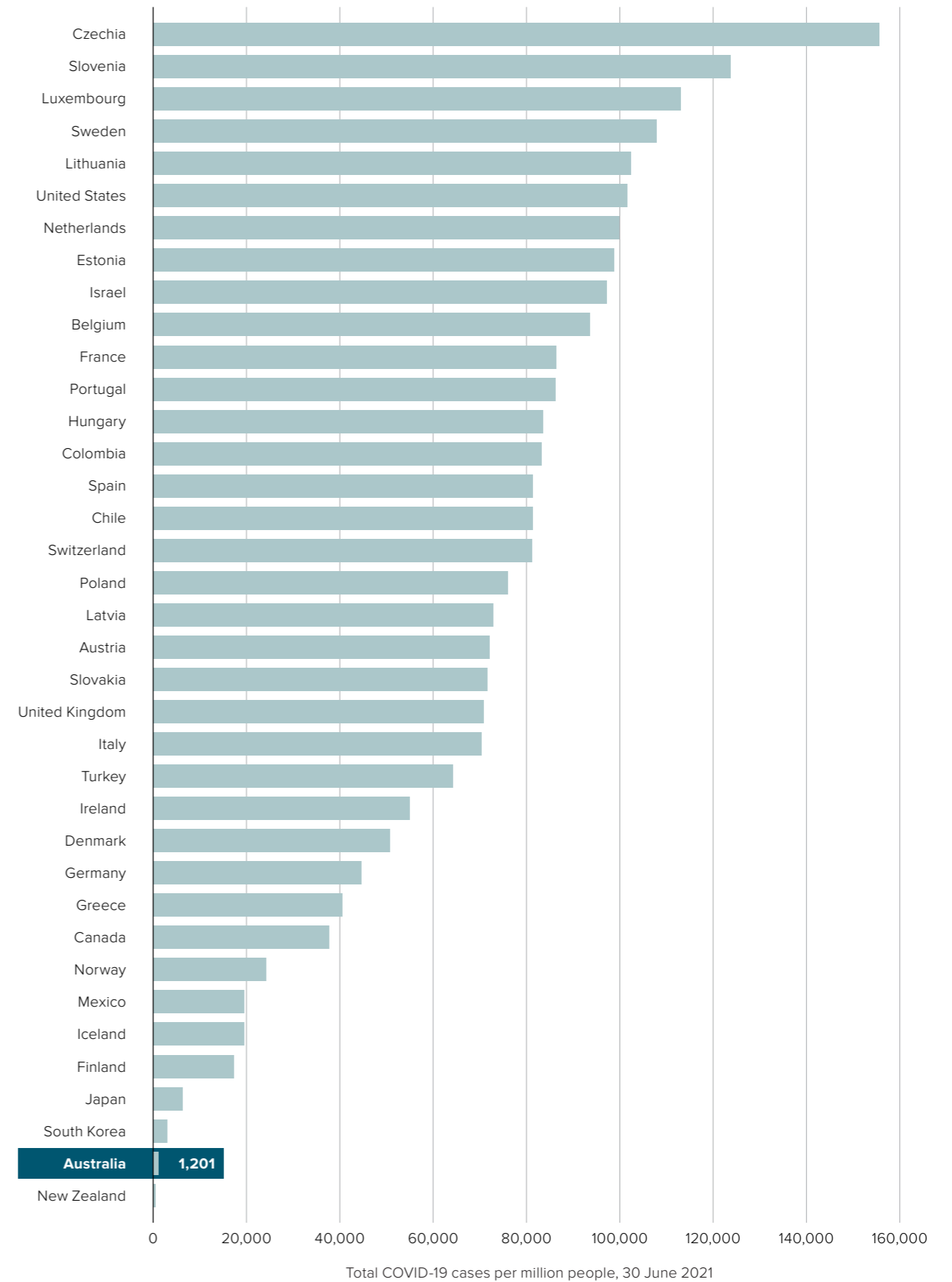
For more detail about these and other impacts of the pandemic, see the relevant sector chapters of this Plan and Infrastructure Australia’s *Infrastructure beyond COVID-19* report.¹⁶

Australia has a post-pandemic recovery advantage

While the impacts of the COVID-19 pandemic have been devastating, Australia has largely escaped high infection and death rates (see **Figure III.3**).

It is widely acknowledged that much of this result is attributable to Australia’s national and state governments acting early in the pandemic by introducing travel bans, lockdowns, border controls and support for domestic supply chains.

Figure III.3: Australia has had relatively low case numbers compared to other OECD countries



Source: Johns Hopkins University (2021)¹⁷

According to the World Health Organisation (WHO), there have been close to 130 million confirmed cases of COVID-19 worldwide, including nearly 3 million deaths.¹⁸

Tens of millions of people have lost their jobs or had their working hours reduced. The International Labour Organisation (ILO) estimates that the working hours lost in 2020 (compared to pre-pandemic levels) were equivalent to 255 million full-time jobs, resulting in around \$3.7 trillion in lost labour income.¹⁹

Australia has fared well relative to other countries, but the pandemic and the resulting lockdowns have still had a major impact on people's lives.

In late January 2020, Australia started to record a small but steady stream of COVID-19 cases, reaching its highest number of reported cases per day in early August 2020 (see **Figure III.4**).

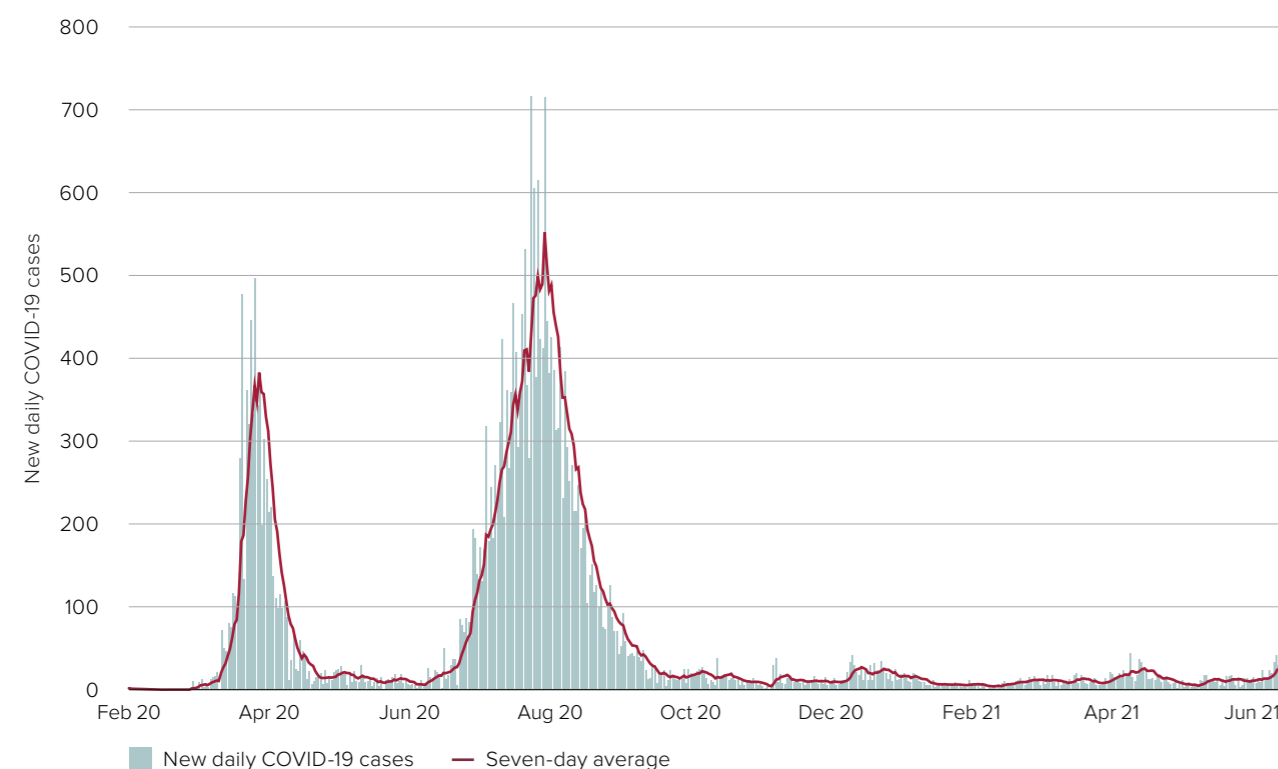
As of June 2021, Australia has recorded 30,610 cases of COVID-19, including 910 deaths.²⁰ At June 2021, over 20 million tests had been conducted nationally, with 0.1% testing positive.

The relatively low number of cases and deaths here mean that, as the world begins to emerge from the impacts of the pandemic, Australia will have a head start on the post-pandemic economic recovery.

Having lower levels of infection compared to other countries is likely to make Australia an attractive option for international students and tourists, and will support the reopening of industries that can safely deliver stimulus projects.

This will put the Australian infrastructure sector at a global advantage when accessing skills, assets and supply chains.

Figure III.4: Australia recorded several peaks in COVID-19 cases in 2020



Source: Johns Hopkins University (2021)²¹

The economy is already recovering from the pandemic

Since the COVID-19 crisis began, global Gross Domestic Product (GDP) has fallen by 4.2%.²²

In its March 2021 interim report, the Organisation for Economic Co-operation and Development (OECD) stated that world economies are showing signs of rebounding from the pandemic faster than expected.²³

Significant progress with vaccine production and deployment is a key driver for this recovery, along with significant stimulus packages in the US.

In the same report, the OECD stated it expects Australia's economy to grow by 4.5% through 2021, increasing from the 3.2% it forecast in December 2020.²⁴

The last time Australia's economy grew this quickly was over a decade ago, when the economy emerged from the financial crisis on the back of low interest rates and a mining construction boom.²⁵

Economic recovery from the COVID-19 pandemic, including boosting employment and consumer confidence, is strongly related to the success of bringing the virus under control.

The vaccine plays a significant role in a country's ability to do this,^{26 27 28} so it is relevant that a significant proportion of Australian's population are planning on getting the COVID-19 vaccination.²⁹

The role of the 2021 Plan

Through this Plan, Infrastructure Australia is setting an ambitious roadmap for reform across the infrastructure sector.

The levers for implementing reform are shared across governments, so we are committed to working alongside the Australian Government to plan for reform and drive progress towards it. This will include partnering with states and territories and collaborating with industry and local government.

All states and territories now include a dedicated function to support infrastructure reform and best practice project delivery. Whether it is through an independent infrastructure body or by incorporating a purposeful function within government, long-term infrastructure planning and enhancements to governance and project delivery are now seen as critical.

Infrastructure Australia will work with state and territory agencies, local government and industry to support and promote the implementation of the reforms outlined in the *2021 Plan*.

Reflecting the views of the broader infrastructure industry

Infrastructure Australia made collaboration a significant focus for the *2021 Plan*, which we developed following an extensive stakeholder engagement program for the *2019 Audit*.

Prior to publishing the *2019 Audit*, we received feedback from more than 4,000 stakeholders.

Our approach included several briefing sessions, such as government drop-in sessions and targeted industry briefings, and key stakeholders received advance copies.

There was also a formal submissions process for the *2019 Audit*, which attracted 151 submissions from government, industry, academia and a small number of private individuals.

Generally, the feedback was positive, with 44% of submissions offering favourable feedback and half providing balanced feedback.

A small number of submissions included factual corrections, which were limited to the water sector. A minor number included negative sentiments about the Audit's findings or methodology.

All these views have helped to shape this Plan.

Each chapter has also been informed by an extensive sector-specific engagement program that targeted industry experts, government and academics.

Changes since the 2016 Australian Infrastructure Plan

Infrastructure Australia's last Plan, the *2016 Australian Infrastructure Plan* was a significant driver of national infrastructure reform. It provided a vision and roadmap to address the priority infrastructure gaps at that time.

Since it was released, Australia has witnessed significant positive shifts in the way infrastructure is planned and managed.

The reforms in the *2016 Plan* were guided by four headline aspirations: Productive cities, productive regions; Efficient infrastructure markets; Sustainable and equitable infrastructure; and Better decisions and better delivery.

For the *2019 Audit*, we focused on places and infrastructure services for users, a move away from the focus on markets and assets in the *2016 Plan*.

Our recommendations for the *2021 Plan* are presented through a series of sector-specific chapters: Transport, Telecommunications and digital, Energy, Waste, Water, and Social infrastructure.

The *2021 Plan* also includes three cross-sector infrastructure chapters: Place-based outcomes for communities; Industry productivity and innovation; and Sustainability and resilience.

The role of the 2019 Audit

The *2019 Audit* was Infrastructure Australia's second national Audit. It examined the major challenges and opportunities facing Australia's infrastructure over the next 15 years.

The *2019 Audit* covered five infrastructure sectors: transport, energy, water, telecommunications and digital, and — for the first time — social infrastructure. Across these sectors 180 challenges and opportunities were identified.

It stated that Australia faces an 'unprecedented period of uncertainty'.

The compounding issues of a changing climate, global economic trends and political polarisation were some of the uncertainties it highlighted.

The *2019 Audit* has played a fundamental role in informing our recommendations for the *Infrastructure Priority List* and is the primary evidence base for the *2021 Plan*.

The future is uncertain

Population and climate forecasts, evolving community needs, and how and where people live and work are just some influences that infrastructure planners must consider.

Yet it is impossible to accurately predict how these factors will change over time — the impact of the COVID-19 pandemic shows that.

It is a clear demonstration of how rapidly assumptions about the future can shift, and how challenging it is to predict the likelihood and timing of extreme events that can influence daily behaviours, health and economic conditions.

However, determining likely future scenarios based on the best available information is critical to infrastructure planning to ensure the outcomes are fit for the future.

As Australia's infrastructure is long-lived, the decisions we make now impact on the quality of service communities receive into the future. This means that infrastructure must be planned, built and managed to adapt to a range of likely future scenarios.

The new normal for Australia's infrastructure

The *2021 Plan* calls on government and industry to rise to the challenges and opportunities of the present so Australian communities can continue to thrive and prosper.

This means understanding which recent changes are fleeting and which might be permanent.

In our recent *Infrastructure beyond COVID-19* report, Infrastructure Australia identified these permanent changes and whether they represented new challenges or new opportunities. The recent changes that are likely to be permanent and will impact infrastructure planning include:

- **adapting to different work choices**, such as more remote working
- **reflecting a new role for Smaller Cities and Regional Centres** in a more balanced and diverse Australia
- **a new focus on resilience and sustainability**, so infrastructure can withstand ongoing shocks
- **a revised definition of success** that requires infrastructure to respond to the needs of all Australians, irrespective of their location and demographic.

To understand more about these changes, see the *Infrastructure beyond COVID-19* report, which was produced with L.E.K. Consulting.

An evidence-based central case

Infrastructure Australia has developed baseline assumptions of what the future is likely to look like using best available information. These included climate data, community research and the *2020 Infrastructure beyond COVID-19* report.

Setting baseline assumptions of a likely future, such as climate and economic conditions, has ensured the *2021 Plan* reforms are targeted and that outputs will match intended outcomes.

Baseline assumptions also provide a consistent basis for predicting the performance of our recommended reforms under the baseline case, and under a range of alternative scenarios.

Infrastructure Australia's baseline assumptions cover aspects of Australia's future state, including: living standards, the cost of living, population growth, climatic projections and international mobility and economic conditions.

The baseline assumptions we used are in the methodology section of the *2021 Plan*. The methodology section also includes further information on alternative scenarios and modelled performance for our recommendations under these scenarios.

Population defines infrastructure demand

Population dynamics such as growth, age and movement play a significant role in the demand for infrastructure services.

Australia's people are diverse and where they choose to live is changing. The population is getting older and settlements are densifying and urbanising, particularly in Fast-growing Cities.

However, while cities and several small towns are experiencing growth, the number of people living in some rural and remote areas is declining.

These shifts create decisions around how to align employment locations with the needs of a changing economy, increase network capacity and shape growth, without compromising service delivery, liveability and environmental health.

Ensuring infrastructure responds to constantly changing demographics is therefore a major challenge for its planners.

One example is the impact of the pandemic on net immigration figures. The Centre for Population estimates the national border closures will see a net reduction of 1.1 million overseas migrants into Australia between 2019-20 and 2028-29.³⁰

It expects population growth to fall to 0.2% in 2020–2021 and to 0.4% in 2021–2022, the slowest growth in over a century.^{31 32}

Another factor is movement. While most of Australia's population growth will continue to occur in cities, the population is rapidly increasing in some small towns.

For some communities, this is putting pressure on existing infrastructure. The challenge has been compounded by the COVID-19 pandemic, which sparked additional growth in many small towns as people left big cities to work remotely and enjoy a different lifestyle.

Relatively small population increases in small towns can have significant impacts on local economies and infrastructure. Infrastructure can be quickly overwhelmed if population growth outpaces its existing capacity.

Assessing progress against the 2016 Plan

The *2016 Australian Infrastructure Plan* made 78 recommendations, guided by four headline aspirations: More productive cities and regions; efficient markets; sustainable and equitable infrastructure; and better decision-making and delivery.

The recommendations were aspirational, and we considered many would be challenging for government and industry.

Despite this, the sector's progress in meeting reform outcomes over the past five years has demonstrated how well the *2016 Plan's* recommended reforms reflected the infrastructure sector's priorities, and that there is significant capacity within government and industry to enact positive change.

In 2020, Infrastructure Australia commissioned EY Australia to review the infrastructure industry's progress against delivering reforms and prepare the *Progress since the 2016 Australian Infrastructure Plan* report.³³

EY categorised the recommendations into ten broad assessment categories: Productivity, population, connectivity, regional, funding, competitive markets, sustainability and resilience, remote and First Nations communities, governance and best practice.

Their report found governments across Australia were at varying stages of progress against the recommendations in the *2016 Plan*. The report found substantial progress had been made on the majority of the recommendations of the 15-year *2016 Plan*, within its first five years.





The 2016 Plan catalysed some reforms

Our recommendation to deliver long-term infrastructure plans in every state and territory is complete.

In addition, long-term planning and community engagement is now well-embedded within Australian governments.

The formation of dedicated infrastructure bodies in each state and territory has fundamentally progressed reform and provided a strategic focus for infrastructure planning and project evaluation.

There has also been considerable activity in developing and using infrastructure planning and development assessment frameworks. While this has led to overall improvements in transparency, clarity around delivering against commitments in published plans remains patchy.

The area of reform where there has been most progress is the recommendation that infrastructure investment should respond to the needs of regional communities. So far, progress has focused on economic development that activates regions rather than on delivering affordable infrastructure.

Implementing best practice is a continual challenge

Despite strong progress, several recommendations for best practice reform in the *2016 Plan* are still a priority for the infrastructure sector.

Post-completion reviews: One such area is for governments to fund nationally significant projects if proponents agree to develop a post-completion review. While there is high level of support across the sector, in practice, these reviews are not consistently completed.

Skills plan: Another area where progress has been slow, but remains a high priority, is for an infrastructure skills plan to ensure Australia has the right people with the right skills to deliver infrastructure to 2031 and beyond.

Infrastructure Australia has been tasked by the First Secretaries Group of the National Cabinet to report on the capacity and capability of the market to deliver the forward infrastructure pipeline. This will help the industry to better plan future resourcing and skills needs.

Digitalisation: The Australian infrastructure sector lags the broader economy in productivity. It continues to undertake largely bespoke, project-to-project design and delivery and has been slow to adopt the digitalisation of construction that is increasing efficiency and productivity overseas.

With one in every five dollars spent in the economy linked to infrastructure, the opportunity to reform the sector to support economic productivity remains substantial.

Government intervention has delayed some market-based reforms

Government investment in infrastructure has reached record levels in response to the COVID-19 pandemic. The sector has been stretched to deliver the future project pipeline.

This strong focus on delivery has delayed or limited the reform of existing assets and markets, because the need for change has been masked by a thriving sector.

Transport: One example is transport network pricing reform. The *2016 Plan* recommended the Australian Government initiate an inquiry into the potential benefits and impacts of road market reform, with a view to transitioning to a fairer and more efficient user-pays approach.

Energy: Australia's electricity sector has undergone a series of reforms over the past three decades. Public sector monopoly assets have been progressively separated into corporatised generation, retail and network components. Some state assets have been transferred to private ownership.

The *2016 Australian Infrastructure Plan* found that reform of the electricity sector in Australia was incomplete and needed to continue.

Water: The *2016 Plan* recommended that stronger market characteristics should be developed in the urban water sector to meet significant challenges over coming decades.

How to read the 2021 Australian Infrastructure Plan

Infrastructure Australia has developed the *2021 Australian Infrastructure Plan* for a broad range of stakeholders.

Each stakeholder with a role in reform will be interested in different aspects of the *2021 Plan*.

To meet this need, we have produced the *2021 Plan* as a suite of documents that complement each other (see Figure III.5).

Each document guides different audiences towards the key pieces of information they need.

The document suite

2021 Australian Infrastructure Plan

This is the primary document and presents the reform recommendations that make up the *2021 Plan*. It is the starting point for all readers seeking to understand how Australia should address the key challenges and opportunities facing infrastructure over the next 15 years.

It provides 29 recommendations and outlines the activities needed to deliver each reform, as well as the stakeholders that are key to their delivery.

It explains why these reforms are critical priorities and presents evidence for how the reform will deliver the desired outcomes.

Executive Summary

The *Executive Summary* presents a concise view across all the reforms that make up the *2021 Plan*.

2021 Reform Priority List

The *2021 Reform Priority List* guides decision-makers on which reforms to focus on, based on a multi-criteria analysis of their strengths and trade-offs. It allows decision-makers to prioritise reforms based on which are best suited to meeting specific policy objectives.

We developed the multi-criteria analysis framework with community sustainability, user benefits, ease of implementation and risks in mind. The framework is tailored to assess the impact of the *2021 Plan's* reform recommendations.

The *2021 Reform Priority List* presents the impact of each recommendation in a one-page summary. This allows the reader to compare the relative impact of each recommendation.

It highlights reforms that have significant impact overall, those that are best suited for meeting specific policy priorities and those that perform well under different future scenarios.

2021 Implementation Pathway

The *2021 Implementation Pathway* is written for stakeholders who have a role in delivering reform. This is primarily targeted at the Australian Government and state and territory governments, but also includes industry and community organisations that play a key part.

It identifies the role stakeholders have in delivering reform and outlines the specific activities that form part of their responsibility.

Its structure allows stakeholders to easily find all the activities where they are a key party responsible for delivery. It also presents the timeframe for implementation.

Detailed plans for each sector and strategic focus area

We have developed detailed plans for each of the six infrastructure sectors and three cross-sector themes. The plans are built around strategic focus areas for Infrastructure Australia.

These nine documents are intended for audiences that work in these sectors or have a deeper interest in the future of these sectors. They provide greater in-depth analysis, reasoning and evidence to support the need for reform and the activities that make up the 29 recommendations.

They include the analysis Infrastructure Australia undertook to develop the recommendations (using the theory of change and the multi-criteria analysis).

The detailed plans will be published after the *2021 Australian Infrastructure Plan*.

Implementation support

Infrastructure Australia is also undertaking three projects that will support the adoption of best-practice reforms:

- **Regional Strengths and Infrastructure Gaps** – defining regional identity and localisation of the *2019 Australian Infrastructure Audit* Challenges and Opportunities.
- **A Pathway to Infrastructure Resilience** – a roadmap to embed a systemic all-hazards approach to resilience in infrastructure decision making.
- **Transforming Infrastructure Delivery** – a policy roadmap for working collaboratively across government and industry to improve the productivity, innovation and deliverability of infrastructure.

These reports will be published as separate reports in late 2021.

The 2021 Plan – a continuation of reform

The release of the *2021 Australian Infrastructure Plan* represents another step in the ongoing reform process.

The Australian Government has committed to respond to the *2021 Plan* and we will work alongside them in developing a response and moving into implementation.

Infrastructure Australia will work alongside Australia's governments and industry to facilitate the implementation of our recommendations, providing them with the pathway and tools they need to reform the sector.

As the nation's infrastructure advisor, we are particularly well placed to facilitate collaboration across industries and jurisdictions. As a priority, we will support collaboration in the three strategic focus areas that cut across all infrastructure sectors, as outlined in their chapters:

- Place-based outcomes for communities
- Industry productivity and innovation
- Sustainability and resilience.

As Infrastructure Australia advocates more actively for the reforms in the *2021 Plan*, we will also move to a more organic cycle of developing Audits and Plans for Australia's infrastructure networks.

In the future, we will focus resources on providing a unique, national perspective on issues as they emerge.

This will enable us to be more responsive in highlighting infrastructure challenges and opportunities in an increasingly uncertain world, and to guide industry and government on the necessary reform.

What's next


The Australian Government has committed that it will provide a response to the *2021 Australian Infrastructure Plan*, as occurred in 2016 following the last Plan. The response should consider the 29 recommendations within the *2021 Plan*, acknowledging the intent of the Australian Government to pursue, or otherwise.

While the Australian Government has committed to respond to the *2021 Plan*, responsibility for enacting reform is shared with state, territory and local government, as well as the industry and community. The *2021 Implementation Pathway* provides a roadmap for collaboration and sharing of responsibilities among these agencies to progress common goals for infrastructure reform.

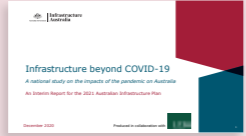


Figure III.5: 2021 Australian Infrastructure Plan suite of publications


Needs assessment
Identification of challenges and opportunities



2019 Australian Infrastructure Audit
Identification of 180 challenges and opportunities




Infrastructure beyond COVID-19
Exploration of 5 trends, 6 challenges and 6 opportunities arising during the COVID-19 pandemic




Progress since the 2016 Australian Infrastructure Plan
Monitoring progress and best practice adoption of 78 recommendations from the 2016 Australian Infrastructure Plan

2021 Australian Infrastructure Plan suite
Identification of long-term ambition for the Australian infrastructure sector and actions

Vision and reform




2021 Australian Infrastructure Plan
Consolidated reform vision, supporting actions and outcomes across 6 infrastructure sectors and 3 policy focus areas




Detailed Plans
Expanded evidence base to support reform across the 6 sectors and 3 policy focus areas of the 2021 Australian Infrastructure Plan

Assessment and prioritisation




2021 Reform Priority List
Assessment of the expected impacts of the reforms proposed in the 2021 Australian Infrastructure Plan using multi-criteria analysis




2021 Implementation Pathway
Summary of reform by actor, their role and timeframe


Implementation
Supporting the adoption of best-practice reform



Regional Strengths and Infrastructure Gaps
Defining regional identity and localising 2019 Australian Infrastructure Audit Challenges and Opportunities



A Pathway to Infrastructure Resilience
Exploring both opportunities for systemic change and providing guidance for asset owners and operators in the short term



Deliverability: A Roadmap for Infrastructure
Working collaboratively across government and with industry to provide a detailed reform roadmap to improve the productivity, innovation and deliverability of infrastructure



Executive summary
 Introduction
 1. Place
 2. Sustainability
 3. Industry
 4. Transport
 5. Energy
 6. Water
 7. Telecommunications and digital
 8. Social infrastructure
 9. Waste
 Methodology and results
 Next steps

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1

Place-based outcomes for communities



What you will read in this chapter

- **Reform 1.1: Rethinking our Fast-growing Cities** – Delivering globally competitive liveability through population and economic growth.
- **Reform 1.2: Strengthening Smaller Cities and Regional Centres** – Supporting regionalisation through better prioritisation of infrastructure.
- **Reform 1.3: Lifting access in Small Towns, Rural Communities and Remote Areas** – Putting community needs at the centre of infrastructure planning.
- **Reform 1.4: Unlocking opportunity in Northern Australia and Developing Regions** – Ensuring Northern Australia fulfils its economic role.

Key messages

- Infrastructure identification and prioritisation should **reflect a place-based approach that takes a cross-sectoral view** of the interrelated infrastructure and amenity needs of a location.
- A lack of **consistent national guidelines** for infrastructure needs assessments and **place-based model agreements** has created inconsistencies in planning and delivery.
- Governments need a process that supports **strategic planning for future liveability, informed by better spatial data** on the impact of population changes.
- A **place-based approach to infrastructure planning that engages Aboriginal and Torres Strait Islander communities** can help meet *Closing the Gap* targets.
- Fast-growing Cities** need to provide a high standard of living to **remain globally competitive**, which is complicated by uneven access to services between suburbs.
- To play their critical connecting role, **Smaller Cities and Regional Centres** need infrastructure that **links them to Fast-growing Cities** and their catchment area.
- Minimum infrastructure standards** should be applied to **Small Towns, Rural Communities and Remote Areas** facing significant infrastructure deficits.
- Targeted infrastructure investment in Northern Australia** will ensure the next wave of development supports economic growth, security and natural resource exports.

Introduction to Place

Place-based outcomes for communities

To unlock the full potential of Australia’s diverse geographies, we must harness the identity and uniqueness of each place. This will enable targeted and holistic infrastructure investment decisions that build on a location’s competitive strengths and reduce place-based disadvantage.

“Australia is a landscape of interconnected yet diverse places.”

Australia is a landscape of interconnected yet diverse places. Highly urbanised, Fast-growing Cities, Smaller Cities and Regional Centres act as hubs for their local economies, supporting a far-flung network of smaller communities. These places are often separated by vast geographic distances.

Infrastructure Australia’s approach to place aims to reflect and celebrate this context. It recognises geographic diversity as a national strength and core to Australia’s identity.

Place

Place is best defined in collaboration with local people to identify a geographical area that is meaningful to them on an economic, social, governance or environmental level.

In regional development settings, a ‘place’ might be a region or a larger area where economic, social governance or environmental trends interact (for example, South East Queensland).¹

At a localised level, a place might be a suburb or area that crosses defined administrative boundaries, but where locals feel connected to what happens there (such as border communities).²





Infrastructure Australia has identified four geographic types that frame the Plan’s place lens (see **Table 1.1**).

Defining Australia’s geographic diversity

This chapter is defined by four geographic types identified by Infrastructure Australia in the *2019 Australian Infrastructure Audit*.³

While the experience of individual communities varies, we have identified some generally shared traits between settlements of similar sizes (see **Table 1.1**).

Table 1.1 Each geographic type has different characteristics and needs

	Population	Growth rate	Economic activity	Infrastructure service markets	Construction market
 Fast-growing Cities (Brisbane, Sydney, Melbourne and Perth)	>2 million	Expected high growth rate post-pandemic	Diverse, dynamic industries	Highly competitive markets for most services	High levels of activity Constraints on access to skills Shortage of specialist skills, but labour markets are attractive to skilled people
 Smaller Cities and Regional Centres	>10,000	Mixed growth, with some communities growing more quickly	Smaller cities: Collaborative metropolitan economy, with several established industries Regional centres: Small number of dominant industries, often functioning as independent regional hubs	Smaller cities: Competitive markets for most services, with some gaps Regional centres: Supported or subsidised markets for many services	Smaller cities: Variable activity levels, with some parts of market experiencing high levels of activity Regional centres: Skills shortages in many parts of sectors Regional centres: Varied activity, more limited in most cases Skills and resource gaps, labour surplus
 Small Towns, Rural Communities and Remote Areas	<10,000	Low growth, with many communities consolidating into regional centres	No dominant industries, or just one	Rely on Community Service Obligations for many services	Varied, small-scale activity levels Skills, resource and labour shortages
 Northern Australia and Developing Regions	Varied size of population across locations throughout Northern Territory, and the northern parts of Western Australia and Queensland	Mixed growth, with some centres experiencing high growth	Emerging	Mixed, with more competition in urban areas	Limited activity Skills, resource and labour shortages

These definitions recognise that each place has specific needs, and access to infrastructure varies widely between users, based on their location. However, many infrastructure needs are shared across Australia, including:

- physical and digital connections between places
- evenly distributed infrastructure access
- efficient use of existing infrastructure
- planning that accounts for future populations.

The size of this country and its diverse community needs make it difficult to ensure all Australians receive accessible, affordable and good-quality infrastructure services.

As a result of changes in population flows, accelerated by the COVID-19 pandemic, the next five years offer the opportunity to implement reforms to support a higher and more consistent quality of life.⁴

Taking a place-based approach has multiplier benefits for the community

A place-based approach

A place-based approach aims to connect infrastructure decision-making with the needs of a community at a local level. It takes a cross-sectoral view of the interrelated infrastructure and amenity needs of a place and identifies how and when these should be delivered.⁵

Making place the starting point for infrastructure planning provides a clear lens for identifying the different needs of Australia's communities, highlighting how integrated planning will benefit particular locations and initiatives.

This increases governments' capacity to deliver targeted infrastructure that meets specific local needs while creating wider opportunities for productivity, growth and high quality of life.

Communities benefit directly because place-based infrastructure should offer value for money, is well-used and meets local needs. In addition, place-based infrastructure generally delivers multiple benefits beyond its primary purpose in the form of compounding impact, or collective impact.

For example, a new railway might allow for increased housing density near train stations. To support this increased density, these homes then require supporting infrastructure, such as schools, hospitals, parks, telecommunications and municipal services

such as water, waste and electricity. If these are all planned together using place-based principles, the pace and benefits of growth will be magnified.

Another example is planning that incorporates future needs by reserving land within, or near, housing for anticipated future schools, public transport and social infrastructure. This mitigates the need to disrupt communities and pay elevated rates to secure the same land in the future.

The Victorian Government's Framework for Place-based Approaches

A framework for place-based approaches outlines a common language and methodology to embed the concept of place across Victorian Government programs.

The *Framework* champions the role of place as a focal point for government that can help:

- support civic engagement by focusing effort on communities and their strengths
- develop evidence-based policy that is holistic by breaking down barriers between sectors and portfolios
- support preventative, cost-effective responses as investment can be targeted to where it will have the greatest impact.⁶

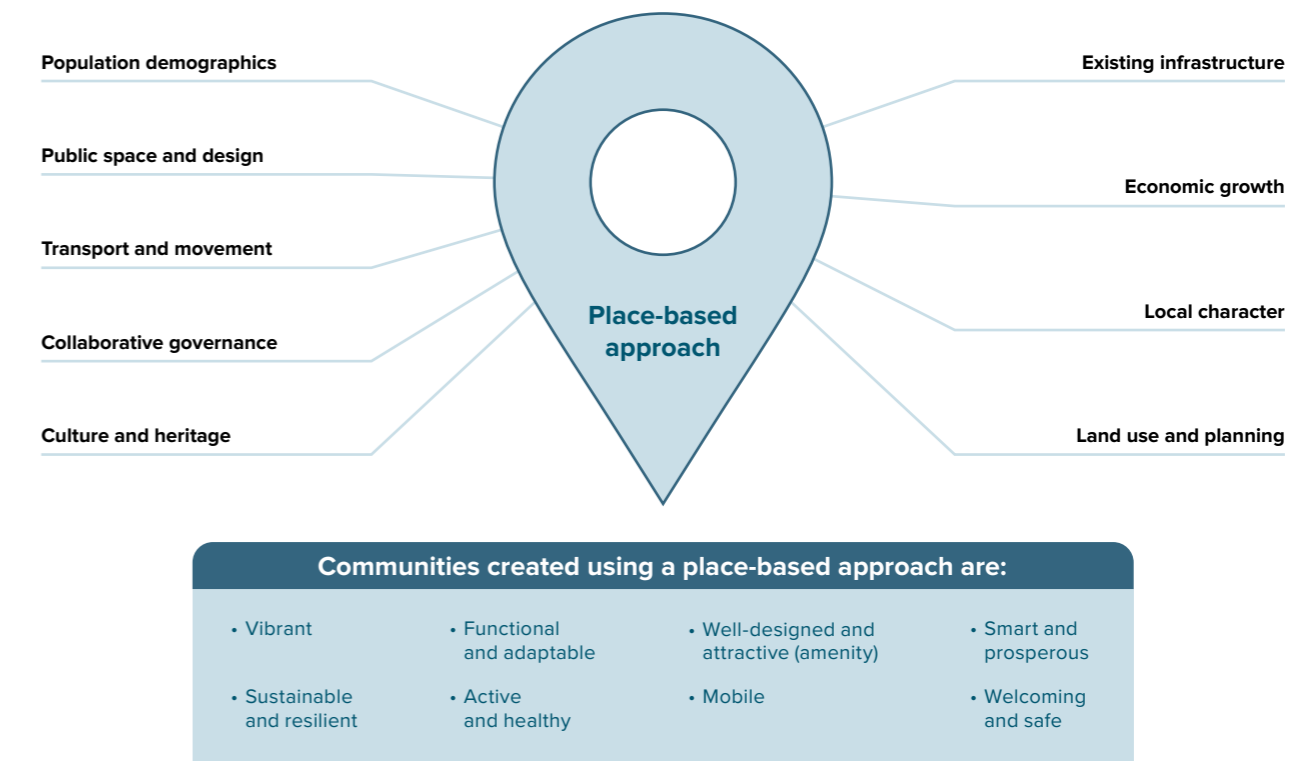
Figure 1.1 outlines some of the key components of taking a place-based approach to infrastructure, showing how it creates vibrant and sustainable communities that people want to live in.

To reach its full potential, place-based planning must begin with a shared vision that is developed jointly between current and future stakeholders, including the local community. The vision should then be managed through collaborative governance.

This vision should be based on a holistic picture of interrelated elements in that place. Elements might include its growth potential, public spaces and design, local character, land use and planning, population demographics, movement and transport, and critical social infrastructure.

Beyond its immediate impact on planning and development decisions, the concept of putting place first informs a recommended overall approach to, and central reference point for, sector-based reforms. It has been applied throughout the *2021 Plan*, both in the proposed reforms and in the supporting narrative, particularly in the **Sustainability and resilience**, **Transport** and **Social infrastructure** chapters.

Figure 1.1: Putting place at the centre of infrastructure planning creates more liveable communities



Elevating place in the planning hierarchy

Place is emerging as one of the key factors that must be considered when planning community-centric, high-value infrastructure.

Infrastructure projects deliver a broad range of benefits to enable better outcomes for people and places.

State and territory governments are increasingly focusing on specific places for renewal and regeneration, either establishing place-centric development corporations or providing existing agencies with clear, place-based priorities.

A growing awareness of the transformational potential of putting place first is reflected in the institution of place-based planning in most jurisdictions. As **Figure 1.2** shows, this ranges in scale and focus.

In New South Wales, for example, Placemaking NSW is managing multiple diverse precincts in areas such as The Rocks and Sydney Olympic Park, as well as the Hunter and Central Coast, while the Greater Sydney Commission focuses on metropolitan Sydney.

In addition, the remit of government land organisations around brownfield developments (land that has already been developed and has infrastructure) is being tightened. They are

increasingly tasked with improving housing affordability and fostering urban renewal, in line with state planning strategies.

This work is underscored in Movement and Place frameworks in New South Wales⁷ and Victoria,⁸ which put places (and the local community) at the centre of planning transport infrastructure. This focus on the user, and the catalysing role of infrastructure at a place level, is a departure from the traditional 'predict and provide' approach to planning based on extrapolating past trends.

“Infrastructure projects deliver a broad range of benefits to enable better outcomes for people and places.”

The **Transport chapter** details a commitment to a cross-sector, place-based approach to integrating land use and transport. This kind of planning is informed by the relationship between population flows, spatial structure in towns and cities, and emerging mobility patterns and behaviours.

Infrastructure Australia supports a spectrum of place-based assessments and governance structures. This approach mirrors the varying degrees of complexity and coordination required to realise place-based outcomes in a specific location.

Figure 1.2: A place-based approach is evident across different levels of the planning hierarchy



Source: Adapted from the Australian Sustainable Built Environment Council (2015)⁹

Place-based outcomes for Aboriginal and Torres Strait Islander communities

Taking a place-based approach is not a new idea in Australia. Infrastructure Australia acknowledges the foundation of place-based approaches in many Aboriginal and Torres Strait Islander communities.

Place is an essential organising feature of Australia’s Aboriginal and Torres Strait Islander economy and communities, with attachment to land, kinship relationships and cultural heritage all important considerations for infrastructure planning.¹⁰

This approach also highlights how the challenges and opportunities in Aboriginal and Torres Strait Islander communities are shaped by place, and should form the basis of policies and programs.¹¹

Place-based approaches should reflect the diversity of Aboriginal and Torres Strait Islander communities. The largest populations are found in urban areas such as Western Sydney and also comprise a significant proportion of the population in many Small Towns, Rural Communities and Remote Areas.¹²

In this context, a place-based approach built on genuine community engagement that respects a community’s cultural identity and existing strengths offer a powerful tool for improving quality of life and opportunity for Aboriginal and Torres Strait Islander peoples.

A policy and planning approach that embraces a holistic view of community needs has been identified as a critical factor in progressing the Australian Government’s *Closing the Gap* targets.¹³ This has been formalised as an important goal in its own right. For example, *Closing the Gap* Priority Reform One is that ‘Aboriginal and Torres Strait Islander people are empowered to share decision-making authority with governments to accelerate policy and place-based progress on *Closing the Gap* through formal partnership arrangements.’¹⁴

The reforms in this chapter reflect *Closing the Gap* priority outcomes. In particular, those that relate to: involving Aboriginal and Torres Strait Islander communities in formal partnerships; shared decision-making that responds to local priorities; and improving shared access to data and information.

A place-based approach to infrastructure planning, investment and delivery that engages Aboriginal and Torres Strait Islander communities can help meet *Closing the Gap* targets in a range of areas, including housing, health and workforce participation. This should include developing an understanding of community needs and aspirations, systems in place and the role of place in design and delivery.

It is important that where infrastructure planning processes impact Aboriginal and Torres Strait Islander communities, data used to inform these processes includes disaggregated data for these individuals and communities.

The *2021 Plan* includes a number of reforms that will improve quality of life and economic opportunity for Aboriginal and Torres Strait Islander peoples, including active involvement in infrastructure planning and delivery.

A networked view of infrastructure to deliver sustainable growth

In cities, users typically have access to high-quality infrastructure at affordable costs. However, the pace of growth and change in Australia’s Fast-growing Cities has put many legacy networks under strain. This is leading to a risk of increasing congestion costs, crowding and diminishing green space in many suburbs.

“The pace of growth and change in Australia’s Fast-growing Cities has put many legacy networks under strain.”

While governments are investing heavily in new infrastructure to meet demand, these changes will threaten liveability and productivity if these risks are not adequately addressed.

Service quality in Small Towns, Rural Communities and Remote Areas has often lagged behind cities, with limited access to services and a single or small number of providers for essential needs such as telecommunications and electricity.

Improvements in digital connectivity — notably the National Broadband Network (NBN) rollout — have helped by increasing access to essential services such as health care and education as well as providing greater economic opportunities.

Despite this effort, many areas outside cities still suffer substandard service quality and reliability. Failure to address these service gaps could drive growing inequality and undermine quality of life in some small towns and rural communities.

National competitiveness will be critical to Australia’s post-pandemic recovery, but not all regions are equipped to contribute.

Australia has consistently experienced strong growth, particularly in our major cities.¹⁵ Some satellite cities adjacent to Fast-growing Cities, such as Geelong, the Gold Coast and the Sunshine Coast have also averaged annual population growth of over 2.3%.¹⁶

Concentrated population growth in our cities has attracted jobs and delivered high levels of economic growth and productivity. But it has also heightened existing pressures on housing, services and the environment.¹⁷

As **Figure 1.3** demonstrates, significant regional discrepancies exist in infrastructure and service access, with the majority of the most competitive regions clustered in or near the capital cities and coastal areas.

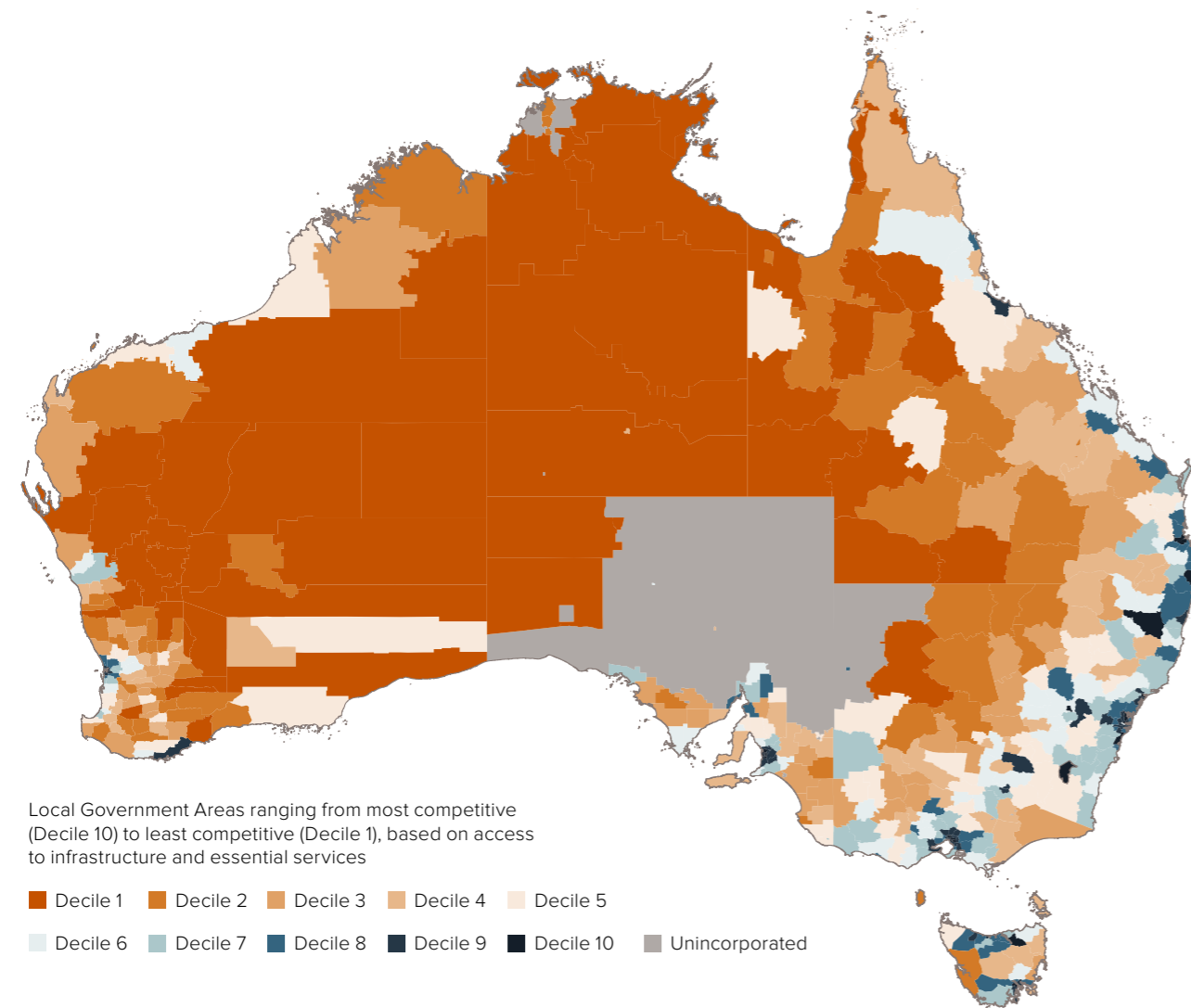
To tackle this challenge, this chapter outlines a reform pathway to making each of the four geographic

community types more productive, with higher levels of access to infrastructure and services.

These reforms propose a consistent national approach to assessing infrastructure needs across each community type that reflects their connected and mutually reinforcing nature.

This will create a balanced Australia, where participation, population and productivity are more evenly distributed, leading to a higher overall quality of life and greater economic and environmental resilience.

Figure 1.3: Access to infrastructure and essential services affects national competitiveness



Note: This map is based on ten indicators that cover access to transport, education and health infrastructure. Decile 1 shows the 10% of LGAs with the lowest level of access, while Decile 10 shows the 10% of LGAs with the highest level of access.¹⁸

Source: Regional Australia Institute (2021)¹⁹

Population planning has become a major focus since 2016

Since the *2016 Australian Infrastructure Plan*²⁰, Australia's actual population growth has exceeded projections, with the exception of Darwin.²¹

Governments have also developed policy plans to encourage greater population growth. All state and territory governments have delivered long-term infrastructure plans that include analysis of population growth and associated infrastructure implications.

The Australian Government has implemented initiatives that support infrastructure reform in urban planning and operation in response to population growth:

Centre for Population: Launched in 2019, the Centre works with state, territory and local governments to better understand Australia's population growth patterns and likely implications for governments at all levels. Establishing the Centre was an important step towards the vision of creating stronger links between population growth, land use and infrastructure needs outlined in the *2016 Plan*.

City and Regional Deals: These Deals brings together all levels of government with communities or industry to stimulate growth in individual cities and regions by making them more liveable and sustainable, with infrastructure planning and delivery a major component.

In Australia's regions, the COVID-19 pandemic has accelerated the trend towards regionalisation, with more people choosing to leave cities for regional cities and towns, and more residents choosing to stay there.²²

This increase is emphasising the need to ensure regional infrastructure is prioritised in areas of current and potential population growth. Currently, there is significant activity in regional infrastructure planning, but approaches are inconsistent across jurisdictions and government agencies.

This is hindering the creation of the efficient, liveable and productive regional hubs that could act as national economic assets.

There needs to be a more consistent approach to ensure regional infrastructure plans are integrated with wider decision-making processes.



The 2019 Australian Infrastructure Audit established place as a priority

People live in diverse areas across Australia, from Fast-growing Cities to Remote Areas and Developing Regions. Reflecting this, Infrastructure Australia's 2019 Audit signalled a shift in focus from comparing jurisdictions to instead considering the distinct and unique geographies at work across Australia.

In adopting this lens, the 2019 Audit found that infrastructure accessibility, quality and cost differs for users in different places. It reported that people rated the quality of infrastructure services as high for most Australians in urban areas but that population growth is impacting some services.

The 2019 Audit also found that in low-density areas, the needs of emerging industries and lower socio-economic groups are not being met, while some remote areas lacked access to basic services such as clean drinking water.²³

Access to choice in infrastructure services has improved since the 2019 Audit, largely due to new technology. While service choice is strongest in Fast-growing Cities, it is weaker in other areas and for people from lower socio-economic and diverse backgrounds.²⁴

Population growth impacts are being felt in Fast-growing Cities as infrastructure is placed under pressure, including public transport crowding and road congestion, which is expected to cost the economy \$38.8 billion by 2031.²⁵

Additionally, some remote parts of Australia still do not have access to high-speed internet, reliable mobile coverage or clean drinking water and sanitation.²⁶

The impacts of the COVID-19 pandemic and associated recovery strategies vary greatly between different communities.

Fast-growing Cities are being challenged by the changing role of their central business districts and mode shift from public transport back to private vehicles, while many Smaller Cities and Regional Centres have experienced population increases, leading to worsening housing affordability and availability challenges in some areas.

Communities in Small Towns, Rural Communities and Remote Areas have experienced a widening digital divide, as the move towards online delivery of services during COVID-19 exposed existing deficits in digital accessibility, affordability and availability.

How we developed the Plan for Place-based Outcomes for Communities

Informed by our place-focused research

This chapter builds on the findings of previous Infrastructure Australia publications including the 2019 Audit,²⁷ *Infrastructure beyond COVID-19: A national study on the impacts of the pandemic on Australia*²⁸ and *Planning Liveable Cities*.²⁹

Acknowledgements

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- Airlie Asia
- Australian Sustainable Built Environment Council's Cities and Infrastructure Task Group
- Business Council of Australia
- Centre for International Economics
- Department of Infrastructure, Transport, Regional Development and Communications
- Klok Advisory
- National Farmers' Federation
- National Indigenous Australians Agency
- Office of Northern Australia
- Regional Australia Institute
- Regional Development Australia
- Smart Cities Council Australia New Zealand
- State infrastructure bodies and planning authorities.





1.1 Rethinking our Fast-growing Cities

Key messages

- Retaining and enhancing quality of life for people in Fast-growing Cities is a **complex and multifaceted task**, with every level of government playing an essential role.
- Cities make **an essential contribution to Australia's wealth and Gross Domestic Product (GDP)**, with the financial, services and knowledge sectors benefiting from agglomeration and access to international markets.
- The global status, growing size and diversity of Australia's cities necessitates **multi-dimensional governance and planning** that integrates place, movement, networks and network interdependency and resilience.
- The COVID-19 pandemic has disrupted the longstanding growth trajectory of Australia's largest cities by pausing historical growth rates and **shifting activity from the urban core to the suburbs and surrounding regions**.
- The pandemic provides an **opportunity to rethink the role of cities** by reshaping planning for the future.

Seizing the COVID-19 pandemic recovery opportunity

Australia's Fast-growing Cities (Brisbane, Sydney, Melbourne and Perth) play an important role in this country. They are characterised by their scale, dynamism and unique identities.

Their size supports industry clustering and skills concentration, delivering strong competitive advantages and a significant contribution to Australia's GDP. Their success has attracted millions of residents, drawn by the prospect of employment and a high quality of life.

However, despite unprecedented levels of infrastructure investment, each city faces enduring challenges, including congestion, housing affordability and other pressures of growth.

While the long-term impacts of the pandemic are far from decided, it has highlighted that the one constant in cities is change, and that change is accelerating.

The pandemic has changed behaviours

The impacts of the COVID-19 pandemic have been most pronounced in Australia's largest cities. The international connectivity of Melbourne, Sydney and Brisbane have made them focal points for returning travellers, with related transmission risks.

“The one constant in cities is change, and that change is accelerating.”

These direct impacts, including associated community anxiety, have affected movement patterns and social interactions. Their impact has been compounded by border closures, social distancing and other policy measures constraining growth across all cities.

Such government interventions are likely to have enduring impacts on infrastructure use in cities, with movement more localised, interaction more digital and municipal services more suburban.³⁰

These behaviour changes present new challenges and opportunities for cities as they start their economic recovery.

1.1 Recommendation

Deliver globally competitive quality of life in Fast-growing Cities by growing economies and populations, enabled by place-centric infrastructure investment and reform.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

When this should impact:



Where this should impact:



0-5 **1.1.1 Improve cooperation between all levels of government by jointly developing a clear vision for each Fast-growing City that underpins land use, infrastructure and planning strategies.**

Proposed lead: State and territory planning departments

Supported by: Department of Infrastructure, Transport, Regional Development and Communications, local governments

0-5 Build buy-in for each city's vision through industry and community engagement.

Proposed lead: State and territory planning departments

Supported by: Department of Infrastructure, Transport, Regional Development and Communications, local government

0-5 Embed priority quality of life outcomes for each Fast-growing City in a refreshed Smart Cities Plan.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Benchmark performance of each city against the Australian Government's policy priorities through the National Cities Performance Framework.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Harmonise local character and neighbourhood plans within each city's vision to:

- account for local identity and assets
- guide timing and scope of current and proposed projects
- embed cultural considerations in planning, based on local demographics
- address disparities in infrastructure provision within and across Fast-growing Cities
- address community resilience, including behaviour changes associated with the COVID-19 pandemic.

Proposed lead: Local governments

Supported by: State and territory planning departments

0-5 **1.1.2 Incorporate diverse approaches and innovation in urban policy through collaboration between government, industry and academia.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Invigorate the Cities Reference Group to provide an interface between government, academia and industry on urban policy, including:

- updated terms of reference that focus on quality of life and support population and economic growth
- renewed membership to ensure broad representation from all levels of government, the infrastructure sector and industry representatives.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 **1.1.3 Maximise the impact of city-shaping infrastructure delivery and operations through collaborative place-based governance models.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory planning departments, local governments

5-10 Meet community needs by improving physical and digital connectivity through place-based approaches to infrastructure planning and governance:

- Support the vision for a city by developing planning strategies focused on physical and digital connectivity that link places within cities, and their satellite areas.
- Connect assets to communities by defining a spectrum of appropriate governance models for places of different scale.
- Prioritise industry specialisations, innovation precincts and activity centres through infrastructure distribution decisions.
- Share best practice in planning and deliver place-based projects between state, territory and local governments.

Proposed lead: State and territory planning agencies

Supported by: State and territory infrastructure delivery agencies and local governments

0-5 Identify local priorities and support efficient place-based planning and delivery by using community-led governance groups.

Proposed lead: Local governments

0-5 Effectively deliver Australian Government-funded major infrastructure by developing a spectrum of place-based governance, financial and reporting models, including:

- managing the interface of federal assets and land holdings with neighbouring state, territory and local government infrastructure through asset or precinct specific models
- aligning city-shaping investment with supporting reforms and infrastructure provision through City Deal models
- driving targeted economic development of Fast-growing Cities by creating innovation districts and activity centres.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Infrastructure and Project Financing Authority

5-10 **1.1.4 Ensure city-shaping infrastructure projects deliver value for money and amenity by applying place-based considerations to funding assessments.**

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure departments

5-10 Support a coordinated approach to developing Fast-growing Cities by requiring funding applications to demonstrate their strategic fit with the vision and priorities identified at the local, state and territory and federal level.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure departments

0-5 Ensure business case development incorporates a place-based approach when a project will create or cause material impacts on adjacent infrastructure.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure departments

Measuring progress



Affordability

Housing affordability

Housing costs as percentage of gross household income (UN SDG 11.1 Safe and affordable housing)³¹

Target: 12%

Timeframe: 0-5 5-10 10-15 15+



Governance

City vision

Shared vision for each Fast-growing City developed that allows performance benchmarking

Target: 100%

Timeframe: 0-5 5-10 10-15 15+



Quality

UN Human Development Index

Ranking for standard of living measures assessing quality of life³²

Target: Top 3

Timeframe: 0-5 5-10 10-15 15+

5-10 1.1.5 Provide greater residential choice by planning and delivering high-quality medium-density residential areas alongside well-sequenced infrastructure investment.

Proposed lead: State and territory planning departments

Supported by: Local governments

0-5 Support amenity and infrastructure access for communities undergoing densification by developing local character plans to define expectations for the size and scale of infrastructure that will be provided.

Proposed lead: State and territory planning departments

Supported by: Local governments

0-5 Encourage a diversity of housing forms by revising planning codes to embrace a diversity of housing options, including explicitly supporting medium-density development.

Proposed lead: State and territory planning departments

Supported by: Local governments

0-5 Support local government decision-making by linking local character definitions to planning codes for medium-density forms.

Proposed lead: State and territory planning departments

Supported by: Local governments

5-10 Explicitly consider provision of affordable housing when planning medium density residential areas.

Proposed lead: State and territory planning departments

Supported by: Local governments

5-10 Effectively provide for infrastructure enhancement in brownfield communities undergoing step changes in densification by developing a transparent framework for population and activity levels, value-sharing funding mechanisms and associated infrastructure investment.

Proposed lead: State and territory planning departments

Supported by: Local governments



Planning that maintains quality of life

Australia ranks well internationally across a range of quality-of-life measures, ranking second in 2020 in the Organisation for Economic Development (OECD) *Better Life Index*. The Index uses a multi-dimensional assessment of over 80 wellbeing factors (such as environmental quality and personal security) to assess whether the lives of citizens in OECD countries are improving.³³

Despite this high ranking, Australia ranked below average in the *Better Life Index* against social inequality and work-life balance metrics.

In 2018, Australia ranked third in the United Nations *Human Development Index*, which includes standard of living measures. By 2020, it had fallen five places.³⁴ This indicates that overall, quality of life for Australians has gone backwards compared to some other similar countries.

Australia's position is being threatened by a combination of stagnating wage growth and escalating living costs, particularly for housing and energy, on top of the visible impacts of congestion.

The rankings for all these tables are formed using relatively common criteria. They include health care,

education, infrastructure, economy and jobs, stability, crime, community, culture, environment and the cost of living. For Australia to retain a high ranking, governments will need to prioritise action in these areas.

Creating Fast-growing Cities that are highly attractive places to live in the face of accelerating change and complexity is increasingly challenging for governments. A key aspect of this attraction is the access to economic opportunity and amenity city residents enjoy, however infrastructure delivery and equity of access vary across different suburbs, with outer suburbs typically having less access.

Strategic plans for our Fast-growing Cities must start with place, then consider supporting mobility and transport solutions, not vice versa. The solutions must also align with the changing nature of these cities, especially demographics and how places are developing.

Support future-focused employment growth

A fundamental reason people choose to live in cities is access to employment, especially the kinds of jobs available in Fast-growing Cities. Employment is a significant driver of intrastate, interstate and overseas migration.

To remain globally competitive, governments must work together with stakeholders to grow industries and sectors that support future employment patterns.

Focusing effort on specialised activity centres is one example. Because of their size and ability to attract international talent, Fast-growing Cities are particularly well-placed to develop economic activity that is relevant to future markets, such as biotechnology and advanced manufacturing industries. This economic activity benefits both local economies and the rest of the country.

Invest in improved infrastructure access

To ensure a high quality of life, Australian governments must provide access to infrastructure and services of all kinds.

Access means different things in different sectors. It can be measured using a range of metrics, such as commute times, children per class size, National Assessment Program – Literacy and Numeracy (NAPLAN) results and hospital emergency department waiting times.

Education: Researchers have repeatedly demonstrated that education is the bedrock on which great cities grow and prosper. Any measure of quality of life must include access to a choice of high-quality education pathways.

Health care: Affordable, accessible health care is increasingly difficult to deliver but is essential to wellbeing. Australia enjoys a sophisticated, high standard of health care by world standards, but with pressures on affordability.

Water, waste and energy: Apart from during droughts, most Australians in Fast-growing Cities take for granted their easy access to energy, potable water and waste services (garbage collection and processing and sewage treatment). Maintaining these services in a resilient and sustainable way can be challenging and costly. For example, energy prices for households have risen significantly — between 2008 and 2018, they increased by 57%.³⁵

Telecommunications: The combination of NBN deployment and widespread mobile voice and data networks has improved internet access in Fast-growing Cities. Service availability is a significantly lesser issue than service affordability, with 44% of consumers rating fixed broadband as expensive.³⁶ However, it is uncertain whether Australia's Fast-growing Cities are prepared for the introduction of 5G, and delivering globally competitive internet speeds will need to remain a focus due to the rapid pace of change.

Arts and culture: A defining characteristic of Fast-growing Cities is a population size large enough to offset the high fixed costs of cultural, sporting and artistic infrastructure. Historic development patterns mean art galleries, theatres, major sporting stadia and other significant institutions are concentrated in established suburbs in the inner city. To ensure equitable access, the location and development of future institutions should better reflect population distribution and the geographic centre of Fast-growing Cities.

Housing: Access to affordable, good-quality housing is essential to wellbeing. Housing availability and affordability for both renters and owners in Australia's Fast-growing Cities are well-documented challenges, with house prices in cities rising rapidly in recent years.³⁷

For more information about access issues in education, health, housing and arts and culture, refer to the **Social infrastructure chapter**. To learn more about water and waste challenges, see **Water** and **Waste chapters**.



The return to the neighbourhood

The COVID-19 pandemic has changed people's relationship with their local neighbourhoods.

Infrastructure Australia's *Infrastructure beyond COVID-19* report shows that four million people were working from home during the pandemic (about one third of the workforce) and there is a strong desire to increase traditional working from home patterns by at least once a week.³⁸

With significant numbers of people still working from home, the in-person experiences of the workplace are being replaced with localised in-person experiences with family and neighbours. This is putting infrastructure and services under strain in some places.

“ The COVID-19 pandemic has changed people's relationship with their local neighbourhoods. ”

Many city neighbourhoods have thrived through the pandemic. This is particularly true of those that invite walking and cycling and are near green and blue urban spaces that support local retail, services and recreation facilities. However, urban fringe areas, which are highly car-dependent, have not fared as well.

It is essential to ensure that what has been learned during the pandemic is applied to future and regenerated neighbourhoods, and that infrastructure projects reflect this redistribution of activity. Concepts such as the '20-minute neighbourhood', where people can meet most of their daily needs within a 20-minute walk from home, with cycling and public transport options, are increasingly relevant to planning decisions.³⁹

Align priorities for localised infrastructure development

Aligning the priorities for future neighbourhood planning and infrastructure investments between all these levels of government is critical. This is what will drive the successful development of appropriate infrastructure. The 20-minute neighbourhood complements a 30-minute city focus for major services, education and employment.

Some jurisdictions have already responded to the challenge by providing targeted neighbourhood infrastructure project funding. They are investing in small-scale projects such as improving walkability and enhancing local activity centres and public spaces.

Other jurisdictions are using infrastructure to drive neighbourhood outcomes at a much larger scale.

In Sydney, for example, the North West Metro should result in significant urban renewal and development around new underground rail stations.

However, funding needs for projects between \$1 million and \$20 million often fall between two levels of government. They are unaffordable for local government and administratively difficult or expensive to coordinate for state and territory government agencies.

To overcome this obstacle so neighbourhood infrastructure projects can be deployed, there is a clear need to develop new funding models for these programs, which are essential for improving local amenity and liveability.

Support increased social cohesion

With more people working from home, social connection has increased across neighbourhoods because more local residents are spending time at home during the day.

Research over the last decade from the UK on the resilience of places and how they recover from shocks, shows social cohesion and the social economy are just as important as other elements of the economy.⁴⁰

The OECD *Better Life Index 2020* report indicated that 94.6% of the surveyed Australian group 'believed that they know someone they could rely on in time of need'. This is more than the OECD average of 89%.⁴¹

Governance regimes and funding community infrastructure that encourage ongoing neighbourhood social connectivity and cohesion will enhance our Fast-growing Cities by making them more attractive places to live in.

Integrating place and mobility

Planning must support resilient and sustainable communities, and accommodate movement of people and goods in the most efficient and productive manner possible. In addition, it should provide increasing levels of amenity and service delivery and exhibit good spatial and architectural design.

Most of all, it has to be capable of adapting to changing needs, such as the new ways Australians think about resilience and mobility as a result of the impact of the COVID-19 pandemic.

Tackle congestion

As **Figure 1.4** shows, Australians rely on car travel. Before the pandemic, city congestion was a significant problem and is likely to worsen in coming years.⁴² Infrastructure Australia's modelling

in 2019 estimated road congestion and public transport crowding cost the Australian economy \$19 billion in 2016. It also showed that, without continued infrastructure investment, the cost would more than double by 2031 to reach \$39.8 billion.⁴³

The pandemic drastically reduced city congestion as people stayed at home in large numbers. Now the Australian recovery is underway, the same challenges are returning at an even more rapid pace.

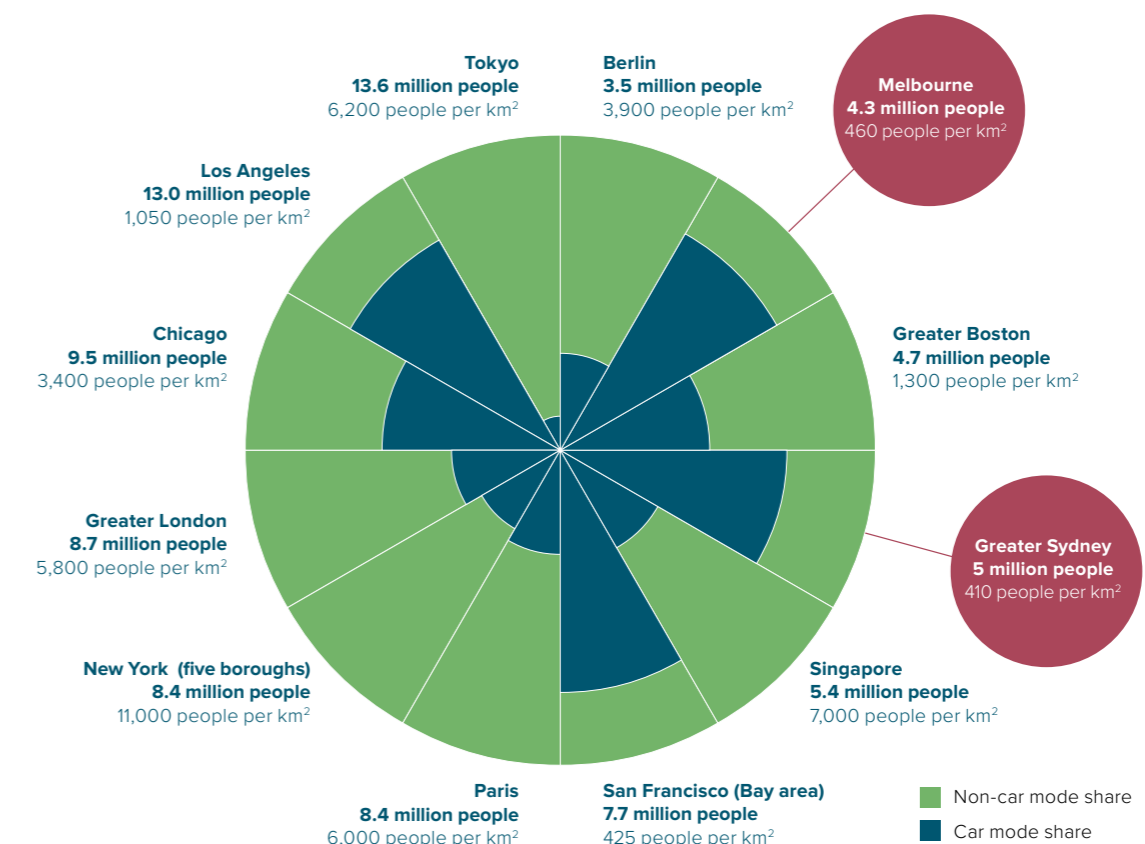
To mitigate the impacts of congestion now and in the future, governments must use a combination of strategies. These should include strategic land use planning, investment in mass transit solutions, and pricing urban mobility to better reflect the network impacts of individual choices. For more information on these reforms, see the **Transport chapter**.

Review commuter patterns

Nationally, pre-pandemic growth in public transport use over the last decade was in the 0.83%–2.55% a year range.⁴⁴ However, lockdowns in 2020 substantially reduced demand across all modes of public transport.⁴⁵

The occupations that can most readily work from home skew to those in office-based roles that are normally based in the CBD. These workers use public transport much more than other modes of transport to commute to work. In future, state and territory governments will need to adapt to people's changing commuting patterns.

Figure 1.4: Car use is high by global standards in Australia's largest cities



Source: Adapted from Transport for NSW (2018)⁴⁶

Capitalise on active travel popularity

The popularity of walking, cycling and using micromobility devices (such as scooters) rose noticeably in 2020 as many people took advantage of fewer cars on the road and focused on their health and fitness. Cycling increased 270% in Melbourne, and Sydney City Council reported 25-50% increases.

Brisbane City Council data shows an extra one million bikeway trips between March and December 2020.⁴⁷

Local governments responded rapidly, installing pop-up cycleways and fast-tracking bike lane projects. This experience demonstrates how agile project deployments can be applied to small-scale infrastructure projects.

Local authorities in Fast-growing Cities should retain these new cycling infrastructures to encourage people to shift from cars to active transport.

Walking also grew significantly as Australians flocked to public parks and pathways during lockdowns and this trend has continued.

Strategic planning must focus on walkability, whether it supports green and blue urban spaces for recreation, commuting to work or accessing local amenity. For more information on encouraging active transport, see the **Transport chapter**.

Change how cities are planned, governed and developed

Focus on collaborative governance

The *2019 Audit* highlighted that planning, delivering and operating Australia's infrastructure is being made more complex by an increased understanding of the interdependencies between social, economic and environmental domains.

In addition, citizens' expectations and demands on governments are growing, and are often evolving faster than governments can accommodate.

Planning and infrastructure governance needs to carefully reflect the nature and defining characteristics of the city or infrastructure project and meet community expectations.

Cities also need governance models that incorporate meaningful engagement, and include the views of all levels of government, business and community.

Meet the needs of the outer suburbs

Previous Infrastructure Australia research and the *2019 Audit* highlight the disparities of infrastructure provision in the outer suburbs of Australia's Fast-growing Cities. These suburbs can be significantly disadvantaged, particularly when it comes to public transport access.⁴⁸

Whether they are brand new suburbs or substantially densified existing suburbs, disparate forms of development yield different experiences for residents. The significant governance challenges in managing such a wide range of developments, and community reactions to it, do not allow for a one-size-fits all approach. However, it is possible to apply general principles to meet a specific challenge or need.

If they are to thrive, outer suburbs must be supported by appropriate infrastructure that is delivered in alignment with development.

For example, transport agencies must routinely think beyond standard routes that link suburbs with CBDs areas to non-radial connections between outer urban

agglomerations. These should match how people in these suburbs move around, helping cities to function efficiently.

“ If they are to thrive, outer suburbs must be supported by appropriate infrastructure that is delivered in alignment with development. ”

This approach requires 'joined-up' planning and delivery across multiple levels of government so it considers the needs of all stakeholders.

Earlier Infrastructure Australia reform recommendations remain relevant today, including:⁴⁹

- establishing better strategic planning processes that align with future population growth
- ensuring that in high-growth areas, the full range of economic and social infrastructure is planned and delivered in a place-centric manner
- implementing governance arrangements that translate strategic plans into tangible local outcomes through appropriate funding, resourcing and accountability and that better engage communities
- enhancing incentives for improved governance and better collaboration between levels of government, including local and state infrastructure funding mechanisms
- making better use of existing assets, including promoting shared-use arrangements, non-capital delivery options, addressing maintenance backlogs and better use of technology.

Improving asset and network quality, timeliness, capacity and use will result in optimised infrastructure use and better investment decisions for new infrastructure.

Boost the economy through specialised innovation districts

Globally, activity centres and innovation districts are emerging as major drivers of economic growth for cities, particularly when supported by a place-centric approach to infrastructure planning. By bringing together related industries, government agencies, educational institutions and research organisations in one zone, they commercialise knowledge through collaboration and create great places for people to live and work. They also result in new jobs that are aligned with future industries and global trends.⁵⁰

Significant activity centres and innovation districts are developing in Australia's Fast-growing Cities, such as in Parkville (Victoria), Fishermans Bend (Victoria) and Parramatta/Westmead (New South Wales).

Some centres and districts are the result of deliberate planning, others have grown organically. Global case studies reinforce the need for more specialisation in Australia's largest cities, and for all levels of government to map a pathway for success by agreeing what those specialisations should be.

Not every innovation district can support every type of economic activity, so there must be a coordinated, place-based approach across every level of government to ensure the desired economic use is supported by:

- appropriate investment attraction
- government capability
- economic development support
- delivery of fit-for-purpose physical spaces
- transport and mobility services
- supporting services
- appropriate overarching governance.

The greater collaboration driven by these specialised industry agglomerations will ensure Australia's cities keep pace with similar cities such as Auckland, Lyon and Vancouver. To read more about the potential for sector-specific innovation centres, see the **Energy** and **Social Infrastructure chapters**.

Address the missing middle

Development in Australia's Fast-growing Cities, particularly residential and mixed-use development, has been polarised. On the one hand, there are single- or dual-level detached houses on the urban fringes and on the other, tall infill developments such as large apartment blocks.

These two-speed development approaches are happening at scale despite positive regulatory reforms in many jurisdictions to encourage a greater variety of housing choices. There is a need to review the appropriate densities and land use mixes for different parts of our cities.

Multi-unit developments, which are typically much taller than existing residential structures, are also increasingly being built further away from the CBD. Urban Development Institute of Australia data from 2020 shows that in Perth, Melbourne and Sydney, large numbers of substantial multi-storey apartment developments are being built significant distances from the centre of these cities.⁵¹ Between 15% and 30% of such developments have occurred within 5 km of their respective city centres.⁵²

There is a clear need to develop more stock in the 'missing middle' of housing development. This presents an opportunity for governments to target

the construction of a broader range of residential dwellings to diversify the supply and harmonise with suburbs' existing local character.

Increasing the volume of townhouses, terraces and similar small-footprint developments will diversify dwelling sizes in and around existing urban areas and activity centres, supporting value for money infrastructure, appropriately spaced buildings and ample public spaces.

Take a network view of place

Mixed-use urban areas that combine residential, commercial and community uses come in many forms in cities, from CBDs to urban shopping centres and major social infrastructure. To function at their best, people need to be able to travel around and between them.

“ Planning and building place-centric activity centres and their infrastructure must take a strong network approach that ties different transport hubs together effectively. ”

It is equally important to connect big cities with smaller satellite cities in their orbit so they can benefit from each other's strengths. In this networked view, Geelong has a mutually beneficial relationship with Melbourne, the Gold Coast with Brisbane, and Newcastle and Wollongong with Sydney.

While Fast-growing Cities offer amenity and economic opportunity, Smaller Cities can provide industry specialisation, affordability, have swifter processes, and provide 'easier demonstration of large-scale, whole city impacts of particular technologies or innovations that can then be scaled up or applied to other places.'⁵³

Planning and building place-centric activity centres and their infrastructure must take a strong network approach that ties different transport hubs together effectively, enabling people and goods to move around easily.

These connections must operate between activity centres, between Fast-growing Cities, and between these cities and adjacent Smaller Cities.

There are also important Fast-growing Cities and satellite city pairings that cross jurisdictional borders. They include Adelaide-Melbourne, Launceston-Melbourne, Albury-Melbourne, Canberra-Sydney and Tweed-Brisbane. The Australian Government and relevant state and territory governments can play an important role in facilitating cross-border connectivity for these communities.

1.2 Strengthening Smaller Cities and Regional Centres

Key messages

- Strong and vibrant Smaller Cities and Regional Centres will **enable national economic growth** by relieving the pressure of population growth on Fast-growing Cities and developing key industries.
- Smaller Cities and Regional Centres must be **highly accessible to communities** within the catchment of the services they host and better connected to Fast-growing Cities.
- Improved infrastructure services and their associated amenity are **critical for accelerating regionalisation and driving sustainable development** of Smaller Cities and Regional Centres.
- Place-based coordination and governance of major infrastructure planning and delivery will **unlock the multiplier benefits of infrastructure investment** for these communities.
- Future infrastructure planning and delivery should be supported by **an updated evidence base for population flows**, particularly those driven by the COVID-19 pandemic.

Delivering infrastructure that supports further regionalisation

Australia's Smaller Cities and Regional Centres have unrealised growth potential.

With improved access to employment, education, services, housing and community facilities, many could accommodate further sustainable population and economic growth. This would support a future population settlement pattern that is more widely distributed across the country, benefiting all Australians.

The need for a strategic approach to regionalisation has increased in importance in the past year. Since the impacts of the COVID-19 pandemic in Australia began to be experienced from the March 2020 quarter, indexed net regional migration has increased 66% within a year.⁵⁴ This includes both people departing capital cities for regional areas, and people already in regions choosing to remain.⁵⁵ This is being driven by different factors, including relative housing affordability, a preference to 'remain in place' during times of uncertainty and greater flexibility to work remotely, allowing people to make lifestyle-related decisions about where to base themselves.⁵⁶

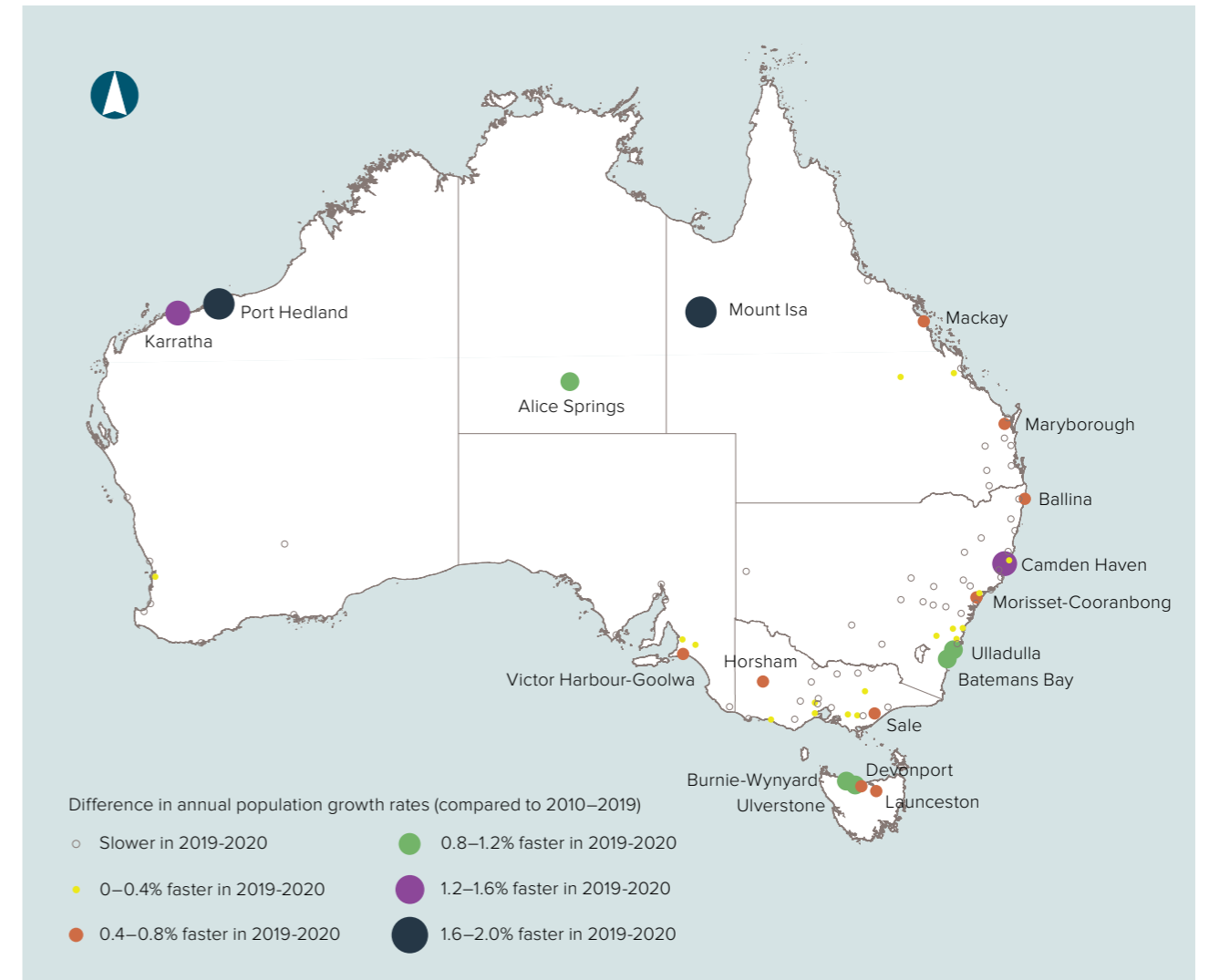
Many Smaller Cities and Regional Centres have been trying to attract growth for some time, and are experiencing higher than average levels of historical growth (see **Figure 1.5**). Emerging trends relating to communities experiencing population growth include locations with a high number of fly-in-fly-out workers, and high-population coastal centres close to capital cities, with the Gold Coast the most popular

relocation choice for capital city residents, followed by the Sunshine Coast, Greater Geelong, Wollongong and Newcastle.⁵⁷

The recent increase in net population growth in regional Australia presents an opportunity to lock in accelerating regionalisation. Currently, regionalisation is uneven, with some communities such as Noosa and Southern Downs in Queensland and Port Macquarie in New South Wales experiencing significant population increases,⁵⁸ while simultaneously others are experiencing labour shortages.⁵⁹

Strategic planning is key to ensuring the benefits of larger regional populations do not compromise affordability and amenity.⁶⁰ A key reason for capital city residents to relocate is the relative housing affordability offered by Smaller Cities and Regional Centres, however population increases have resulted in median house prices in regional Australia increasing at a higher rate than in capital cities, with demand outstripping supply and a scarcity of available dwellings and diverse stock (for example, a shortage of larger homes to accommodate families and working from home arrangements).⁶¹ Many of these Smaller Cities and Regional Centres, including Hobart, Greater Adelaide and Canberra, were already classified as unaffordable or moderately unaffordable prior to the pandemic.⁶²

Figure 1.5: Some Smaller Cities and Regional Centres are experiencing faster than usual growth during the COVID-19 pandemic



Source: Australian Bureau of Statistics (2021)⁶³



1.2 Recommendation

Attract growth to Smaller Cities and Regional Centres while maintaining quality of life by enhancing local identity, leveraging social infrastructure and improving digital and economic connectivity to Fast-growing Cities and neighbouring regions.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Industry, Science, Energy and Resources

When this should impact:



Where this should impact:



0-5 **1.2.1 Identify infrastructure needs by developing a regional strengths and gaps infrastructure prioritisation framework, supported by a classification of the geography of regional Australia.**

Proposed lead: Infrastructure Australia

Supported by: State and territory infrastructure departments, Regional development bodies

0-5 Build the infrastructure pipeline by identifying and prioritising regional infrastructure gaps, based on existing regional development strategies across government, and industry and community consultation.

Proposed lead: Infrastructure Australia

Supported by: State and territory infrastructure departments, Regional development bodies

5-10 Inform investment priorities by undertaking regional infrastructure needs assessments on a rolling basis.

Proposed lead: State and territory infrastructure departments

Supported by: Regional development bodies

5-10 Attract and retain residents and businesses by identifying and sequencing appropriate infrastructure requirements according to local community characteristics.

Proposed lead: State and territory planning departments

Supported by: State and territory infrastructure departments, Regional development bodies

0-5 **1.2.2 Benchmark performance of Smaller Cities and Regional Centres by defining a consistent set of urban data for provision by state, territory and local governments as a condition for funding projects identified by the needs assessment.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Bureau of Infrastructure and Transport Research Economics

0-5 Inform urban policy by publishing the data within the National Cities Performance Framework and Progress in Australia's Regions dashboard.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Monitor performance through bi-annual reporting on trends.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 **1.2.3 Support employment and population growth in Smaller Cities and Regional Centres by identifying and delivering enabling infrastructure.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Bureau of Infrastructure and Transport Research Economics, state and territory infrastructure departments, state and territory transport departments

0-5 Inform business case development for major projects by analysing data about settlement patterns (including Aboriginal and Torres Strait Islander settlement patterns), employment availability and variety, business locations and housing and infrastructure access.

Proposed lead: State and territory planning departments

0-5 Identify transport options by reviewing current and future movement between Smaller Cities and Regional Centres and Fast-growing Cities.

Proposed lead: Bureau of Infrastructure and Transport Research Economics

Supported by: State and territory transport departments and Department of Infrastructure, Transport, Regional Development and Communications

0-5 Support efficient planning and delivery by taking a staged approach to connectivity, identifying enabling infrastructure projects and accessibility improvements, basing decisions on current and forecast movement and embedding changes in land use and planning decision-making.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Faster Rail Agency

0-5 Facilitate more Australians living within three hours of an aviation gateway connected to a Fast-growing City by using movement data to prioritise investment in regional airport infrastructure.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Support pandemic recovery by developing industry strategies for sectors that will deliver employment opportunities and growth.

Proposed lead: State and territory industry departments

5-10 Support growth and incumbent industries in each region by establishing a framework to sequence infrastructure investment based on industry-specific, place-based infrastructure needs assessments.

Proposed lead: Infrastructure Australia

Supported by: Department of Industry, Science, Energy and Resources

0-5 **1.2.4 Ensure existing and planned digital infrastructure will meet the changing requirements of users in Smaller Cities and Regional Centres by reviewing infrastructure rollout plans.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: NBN Co

0-5 Address capacity constraints in high-growth Smaller Cities and Regional Centres by targeting investment at established data-intensive industries.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: NBN Co

0-5 Support greater wholesale and retail competition by facilitating greater sharing of physical infrastructure and infrastructure corridors servicing regional centres.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: NBN Co, state and territory transport departments, state and territory planning departments

Measuring progress



Governance

Regional Infrastructure plans

Regional Infrastructure plans for Smaller Cities and Regional Centres

Target: 95 plans

Timeframe: 0-5 5-10 **10-15** 15+



Economic

Regional Centre jobs growth

Jobs growth in Smaller Cities and Regional Centres

Target: Equal to national average

Timeframe: 0-5 5-10 **10-15** 15+



Economic

Regional Centre GDP growth

Average GDP growth in Smaller Cities and Regional Centres

Target: Equal to Fast-growing Cities average

Timeframe: 0-5 5-10 **10-15** 15+



Supporting sustainable growth with place-based coordination and governance

Recognising and developing a place's unique identity, competitive advantages and constraints is particularly important for Smaller Cities and Regional Centres.

“ Greater place-based coordination and governance across levels of governments and between agencies is needed. ”

These communities face service demands from neighbouring Small Towns, Rural Communities and Remote Areas, and overflows from Fast-growing Cities. At the same time, they lack the critical mass and structural advantages of larger settlements.

Greater place-based coordination and governance across levels of governments and between agencies is needed.

This will help ensure that, throughout their lifecycle, infrastructure projects are planned and delivered in a way that accounts for their wide-ranging impact on adjacent places and industries, creating opportunities for clustering and co-location.

Develop collaborative frameworks

Well-structured governance frameworks will encourage collaboration, knowledge, capability and resource-sharing.

When they are applied effectively, these frameworks can harness local government strengths (such as understanding community needs) and bring together adjacent councils while helping to minimise their potential limitations in funding and project delivery capabilities. They can be scaled to reflect the complexity of the planning process being undertaken and reflect network and systemic approaches.

“ For Smaller Cities and Regional Centres to grow and achieve their potential, a consistent national approach is needed to the planning and delivery of infrastructure. ”

Expanding and further developing the successes of the City and Regional Deals model of cross-government collaboration would be one way to deliver benefits to a broader range of settlements across Australia.

Introduce a uniform approach to decision-making

For Smaller Cities and Regional Centres to grow and achieve their potential, a consistent national approach is needed to the planning and delivery of infrastructure.

Many regional councils struggle to fund infrastructure maintenance from their rate-base.⁶⁴ This is exacerbated by established funding models, which may not reflect the role they play in providing a range of infrastructure, facilities and services to a broader number of people in neighbouring centres, beyond their local ratepayers.⁶⁵

Additionally, some regional centres find it difficult to identify the return on investment for infrastructure spending because of project risks or because benefits may accrue over time.

To realise a vision for a strong regional Australia, it is essential to invest in infrastructure projects that will 'create an environment for people to invest in, stay in or learn in.'⁶⁶ This will allow a build-up of people, skills and capability that will continue to unlock long-term economic benefits.

In addition, infrastructure investment must target regions with strong and established prospects for economic growth so their population growth potential is matched by an available workforce.

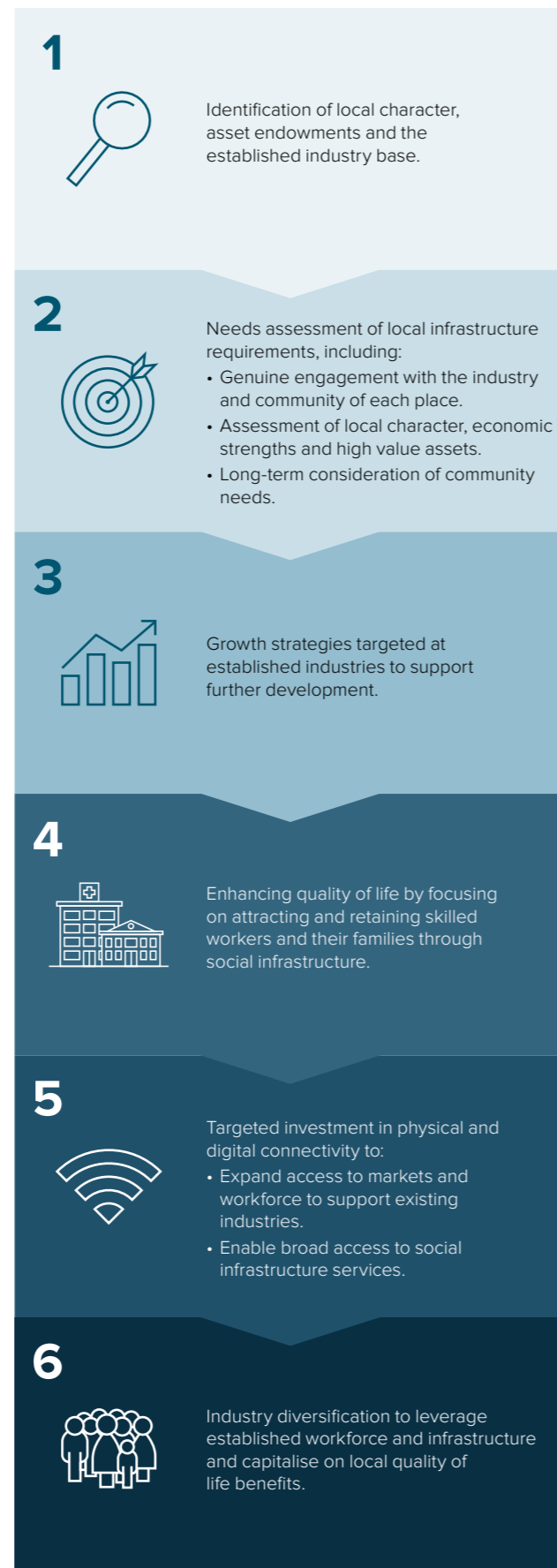
Ensuring infrastructure investment is both equitably targeted at a community level and delivers for the nation will require a consistent approach across the country to assessing infrastructure needs and determining funding.

Infrastructure Australia proposes the settlements shown in **Figure 1.6** to support Smaller Cities and Regional Centres to grow and achieve their potential.

To further increase their funding options and the broader value of the proposed infrastructure, these places should identify opportunities to align investment proposals with national policy priorities when they seek Australian government funding.

In considering these national priorities, the Australian Government and state and territory governments should consider local attributes when directing funding to regions. It is important to value each settlement's unique series of features, many of which will ultimately support national objectives.

Figure 1.6: A staged approach to regional investment will optimise economic and social outcomes



Improve data to support better infrastructure planning

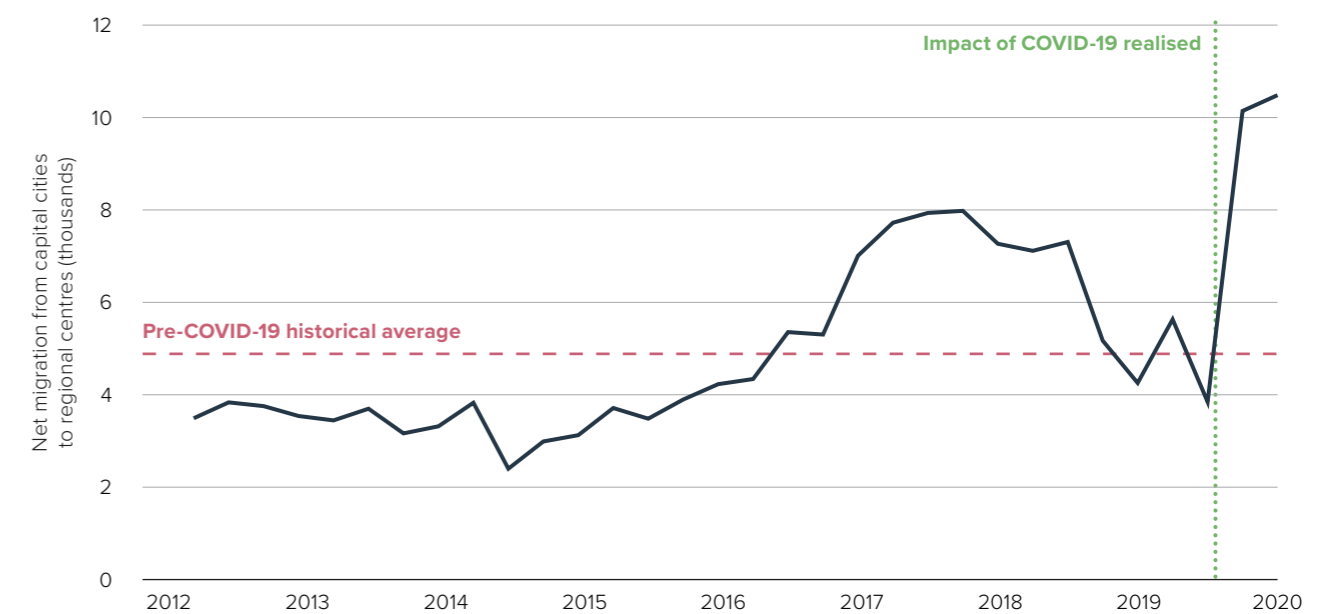
A marked characteristic of 2020–2021 has been the shift for many from working in the office to working from home. This has accelerated a trend that was already underway as a result of technology developments.

With the future likely to include more remote working, the regionalisation that was already taking place before the pandemic will continue and accelerate (see **Figure 1.7**).⁶⁷

Even after the pandemic declines, it is expected that 1 in 10 Australian workers will work from home 2-3 days per week.⁶⁸

This change is expected to support longer, less frequent commutes for up to 1.4 million Australians, increasing the attractiveness of settling in Smaller Cities and Regional Centres (including satellites).

Figure 1.7: More people staying in regional areas, as well as increased departures from capital cities, led to a 200% increase in net migration during COVID-19



Source: L.E.K. Consulting commissioned by Infrastructure Australia (2020)⁶⁹

This trend has significant implications for future infrastructure planning and delivery in both cities and regions.

To plan and develop assets that are fit-for-purpose and sustainable, governments will need an updated evidence base in relation to how people choose to live and work.

It will be essential to have access to leading indicators up-to-date, robust population data, and information about the role infrastructure plays in driving settlement and industry location decisions. The **Industry productivity and innovation chapter** has more detail on the need for additional data to support infrastructure decision-making.

This information will help to determine and prioritise the interventions needed to retain residents in Regional Centres and continue to catalyse growth.

“ The focus of investment in economic and social infrastructure needed to support a population redistribution trend is substantively different to current scenarios. ”

The Australian Government has invested \$13.7 million over four years from 2020-21 in the *Better Data Use to Support Delivery for Regional Australians* program, which includes the development of a Regional Data Hub.⁷⁰ The Regional Data Hub will be a new central source of economic, demographic and socio-economic data for Australia’s regions. It aims to strengthen the evidence base for community and government decision-makers, informing place-based infrastructure planning and addressing the need for coordinated, comprehensive and accessible data on issues affecting regional Australia.

Invest in social infrastructure that builds communities

As discussed in the **Social Infrastructure chapter**, the quality of social infrastructure is integral to community wellbeing, as it builds social cohesion and enhances productivity and quality of life.

For Smaller Cities and Regional Centres, quality, fit-for-purpose and adaptive social infrastructure is central to their ability to attract and retain residents and businesses.

While people's choice of where to live is heavily influenced by employment availability, other liveability factors, such as access to health and education services, as well as arts and recreational activities also feature highly.

The focus of investment in economic and social infrastructure needed to support a population redistribution trend is substantively different to current scenarios.⁷¹

Many regional locations and small cities are the 'hub' in a hub and spoke model of service delivery for their local catchment areas. This presents a risk that legacy infrastructure, such as public hospitals and schools that are ageing or under strain, will not be able to meet the needs of larger populations.

To attract and retain residents, skilled workers and businesses, state and territory and local governments should identify, strategically plan for and prioritise appropriate social infrastructure, then sequence it according to local community need.

In addition, international experience shows that planning and investment in initiatives, such as appropriate housing options and education initiatives, as critical to realising the benefits of growth as developing transport hubs and networks.⁷²

Connect more places with incremental, targeted transport investment

Mass transport connections between Australia's Fast-growing Cities and Smaller Cities and Regional Centres have not changed substantially since railway lines were first established.

While the aviation sector has evolved in line with the global industry, its ground-based infrastructure and alternative rail services have not kept pace. This is particularly noticeable in regional areas, which rely on regional airports for access to markets, services and fly-in-fly-out (FIFO) services.

The reforms proposed in the **Transport chapter** include refocusing regional airport investment on a multi-modal hub and spoke model that connects aviation infrastructure to other land transport modes.

This would be assessed on the basis of delivering day-return or similar access outcomes for regional residents wishing to access essential services in large cities.

Under this scenario, more Australians would be able to travel to their nearest aviation gateway to a Fast-growing City in three hours or less.

Take a new approach to rail infrastructure investment

The National Faster Rail Agency is progressing business cases for various rail corridors, while state and territory transport agencies are leading a transformation of urban transport.

There needs to be an outcome-focused approach to providing access to rail services where decisions use a data-based understanding of movement requirements. The new population movement trends across the country provide a meaningful catalyst for considering these changes.

If the current increase in demand for connections between Smaller Cities and Regional Centres and Fast-growing Cities continues, the business cases for regional connectivity enhancements will substantially improve for some communities.

The Australian Government needs a deeper understanding of existing and future travel patterns, and of the role transport infrastructure investment plays in changing how people and businesses decide where to settle. This could provide a credible justification for investing sooner than previously forecast. For further detail, refer to the **Transport chapter**.

Improve investment business cases by enhancing liveability

To strengthen the business cases for regional connectivity, governments should first look for ways to increase the vibrancy, amenity and local activity levels of Smaller Cities and Regional Centres along proposed transport corridors. Short-term catalytic investment in these places would be the most effective approach.

In addition, there should be new local links (such as extra bus services and cycle paths) to service the anticipated onward journeys of travellers that future transport interchanges will attract.

This should be supported by local accessibility improvements that improve the amenity of Smaller Cities and Regional Centres.

These activities will support the growth of Smaller Cities and Regional Centres as attractive locations for residential settlement and business investment and encourage the development of activity precincts.

By attracting more jobs and businesses to Smaller Cities and Regional Centres, population growth will follow and transport connectivity to these communities will improve.

For places along significant corridors, the Australian Government should adopt a staged investment approach that delivers incremental transport improvements. The increments should be prioritised based on the ability of the investment to enable the place to realise national policy objectives and desired land use outcomes.

Align digital connectivity with a shifting population

Providing high-performing, reliable digital infrastructure is vitally important for Smaller Cities and Regional Centres.

In addition to attracting people from Fast-growing Cities who wish to work remotely, digital connectivity supports residents to remain in the community and have choice in their infrastructure access via digital delivery models.

Digital adoption among regional Australians has increased dramatically recently. NBN Co reports that lifestyle habits underwent a major shift during the COVID-19 pandemic. Record numbers of people used online substitutes for face-to-face access to health services, education, arts and entertainment, and 56% remained socially connected through video calls with family and friends.⁷³

This additional demand for digital infrastructure is forecast to keep growing.⁷⁴ The regionalisation of the workforce following the pandemic is likely to add further pressure to digital infrastructure in Smaller Cities and Regional Centres, which will need to accommodate additional traffic.

Telecommunications and digital infrastructure is a critical part of the regionalisation agenda, and a systemic view of regional telecommunications challenges and opportunities is therefore increasingly urgent.

High-quality digital infrastructure can support step changes in the productivity of dominant regional industries, such as agriculture, resources and tourism. It will also enable regional economies to diversify by attracting data-intensive businesses and high-tech industries that rely on fast and reliable broadband.⁷⁵

NBN Co has acknowledged the benefits of supporting regionalisation by reinforcing new consumer behaviour with technological capability. To stay ahead of future demands for internet speeds, capacity, reliability and latency, it will need to invest in the technology that best suits the needs of specific regional networks.⁷⁶ While fixed wireless and satellite technologies have significantly improved regional telecommunications, technology-led policies are exacerbating the digital divide between urban and regional communities.

For example, some regional customers face data and telecommunications caps and limitations that do not apply to city users.

“Providing high-performing, reliable digital infrastructure is vitally important for Smaller Cities and Regional Centres.”

The Australian Government can improve these essential services by removing limitations on technology preferences for regional areas to support competition and encourage infrastructure-sharing.

A less restrictive environment for communications technology in these areas will also help address the risk of a distortion of regional markets. Some Regional Centres have benefited economically from the early rollout. Others are finding it difficult to grow their economies and attract people and businesses without adequate telecommunications infrastructure.⁷⁷

To find out more about these topics and Infrastructure Australia's proposed reforms, refer to the **Telecommunications and digital chapter**.

1.3 Lifting access in Small Towns, Rural Communities and Remote Areas

Key messages

- Meeting the infrastructure needs of smaller communities is often difficult, and some **Small Towns, Rural Communities and Remote Areas face significant infrastructure deficits**.
- Infrastructure is **more expensive to provide on a per-person basis in low population areas** but these communities are more **reliant on available infrastructure for productivity and wellbeing**.
- Improving infrastructure access can help these communities to better **meet economic challenges, build resilience and improve quality of life**, especially in Aboriginal and Torres Strait Islander communities.
- Infrastructure investments for rural and remote communities should **plan for, and respond to, population change** and be underpinned by a **shared vision for their long-term future**.
- Community Service Obligations (CSOs) play an important role in ensuring regional towns and remote communities receive infrastructure investment and can access the related services at reasonable prices. However, **CSOs must be better designed, targeted, integrated and more transparent**.
- There are **opportunities to share resources, skills and facilities** between communities, and between smaller communities and larger metropolitan centres. This will reduce costs, improve access and lead to better-coordinated infrastructure delivery.

Bridging the infrastructure gap

Each Small Town, Rural Community and Remote Area has distinct strengths and challenges that affect its residents' quality of life. However, there are several commonalities around infrastructure in smaller settlements.

In low-population areas, communities and their businesses rely more on available infrastructure for their productivity and wellbeing than their city counterparts. Yet infrastructure is more expensive to provide on a per-person basis in these areas, leading to lack of choice and higher prices.

Having poor infrastructure services in Small Towns, Rural Communities and Remote Areas is limiting their opportunities for current and future growth and may undermine the long-term viability of some communities. There needs to be a more systematic approach to meeting infrastructure needs across sectors.

The *2019 Audit* reported that infrastructure service quality in remote areas is often poor. It noted that better connection to the rest of the country is vital for individuals and economies, particularly for Aboriginal and Torres Strait Islander communities.⁷⁸

1.3 Recommendation

Support a better quality of life by aligning funding and minimum standards with principles for sustainable infrastructure delivery in Small Towns, Rural Communities and Remote Areas.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory regional service agencies

When this should impact:



Where this should impact:



5-10 1.3.1 Ensure communities in Small Towns, Rural Communities and Remote Areas have access to infrastructure services in line with defined minimum standards.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory regional service agencies

0-5 Based on community size, demographics and location, define minimum standards across economic infrastructure sectors (transport, energy, water, telecommunications and waste).

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory regional service agencies

5-10 Based on community size, demographics and location, define minimum standards across social infrastructure.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory regional service agencies

5-10 Manage potential future population and economic growth by developing staged land use plans that accommodate infrastructure and land use requirements.

Proposed lead: State and territory planning departments

5-10 Identify demand pressures by monitoring and forecasting population and service density for infrastructure services for small towns.

Proposed lead: State and territory demographers

Supported by: State and territory regional service agencies

0-5 Ensure nationally consistent governance arrangements for municipal services in remote areas by including the Anangu Pitjantjatjara Yankunytjatjara (APY) Lands in the South Australian Government's Municipal Services (MUNS) program.

Proposed lead: Office of Local Government South Australia

Supported by: South Australian Department of Premier and Cabinet

5-10 1.3.2 Improve the transparency and effectiveness of Community Service Obligations by redesigning them to include robust criteria, be cost-neutral and reflect community priorities.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory regional service agencies

0-5 To ensure Community Service Obligations are delivering public value, establish an interdepartmental taskforce to review their performance and identify potential improvements.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Improve understanding of costs and benefits of Community Service Obligations through mandatory public reporting on their performance.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory regional service agencies.

5-10 Ensure assets are culturally responsive and will be well-utilised by undertaking service design for Community Service Obligations in partnership with Aboriginal and Torres Strait Islander communities.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Indigenous Australians Agency, state and territory Aboriginal and Torres Strait Islander affairs departments, state and territory regional service agencies

0-5 **1.3.3. Facilitate sharing of infrastructure services and resources between communities and individuals by enabling the sharing economy.**

Proposed lead: Department of Transport, Infrastructure, Regional Development and Communications

Supported by: Geoscience Australia, Digital Transformation Agency, Department of Finance, Services Australia, state and territory government property agencies

0-5 Ensure infrastructure assets in Small Towns, Rural Communities and Remote Areas are understood and used by incorporating them in the Digital Atlas of Australia.

Proposed lead: Geoscience Australia

Supported by: Office of the National Data Commissioner, Digital Transformation Agency

5-10 Support service provision and sharing of Community Service Obligation benefits by integrating their funding arrangements with place-centric asset-sharing platforms tailored to Small Towns, Rural Communities and Remote Areas.

Proposed lead: Department of Finance

Supported by: Services Australia, Digital Transformation Agency

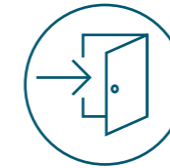
0-5 Provide services efficiently by optimising investment in built assets and social infrastructure through developing integrated infrastructure strategies across governments.

Proposed lead: Department of Finance

Supported by: State and territory government property agencies



Measuring progress



Access

Infrastructure minimum standards reporting

Public reporting on infrastructure availability and quality against minimum standards in all communities with a population under 10,000

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Quality

Localised Community Service Obligations

Communities with minimum standards can participate in Community Service Obligation co-design

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Affordability

Community Service Obligation contestability

Community Service Obligation provision is contestable

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Planning that reflects the diversity of smaller communities

One in 10 Australians live in communities of less than 10,000 people.⁷⁹ Located across Australia, these areas have small populations and often low or declining growth rates.

In 2016, there were:

- 88 small towns with a population of between 5,000 and 10,000 people
- 526 small towns with 1,000 to 5,000 people
- more than 1,000 rural communities with a population of less than 1,000 people.⁸⁰

Small Towns, Rural Communities and Remote Areas can be close to major regional and metropolitan centres, acting as commuter and feeder communities to larger centres and enjoying relatively high levels of infrastructure and services.

Conversely, some remote communities are hundreds of kilometres from the nearest regional centre, with limited access to everyday infrastructure that delivers potable water, reliable telecommunications and choice in transport.

Some Small Towns have a declining population. They face the challenge of maintaining existing

infrastructure assets with a dwindling financial capacity to do so. Others have a static population but need to renew and maintain legacy infrastructure.

Monitor and respond to changing needs

Not all communities with a population of less than 10,000 are in decline or static. Overall, the number of Australians living in small towns increased from 2.2 million people in 2011 to 2.3 million people in 2016.⁸¹

These figures include some rapidly-growing communities that are managing the extra pressures population growth is putting on existing infrastructure. As discussed earlier in this chapter, this challenge has been compounded by accelerated growth in some communities during the COVID-19 pandemic.

Due to their small size, minor population increases or decreases in these communities can have a significant impact on local economies and access to services.

Governments should monitor smaller towns that are experiencing strong population growth. This would include regular infrastructure assessments involving local participation to ensure their infrastructure capacity is not overwhelmed and funding infrastructure that supports continued sustainable population growth.

Governments should also ensure these rapidly growing small towns have appropriate land use plans to respond to the scale of current and anticipated population changes.

State and territory governments can support this by cascading down their regional development plans into appropriate local planning documents that remove barriers to growth and contribute to wider strategic goals for the region.

Prioritise infrastructure needs in smaller communities

Focus on essential services

Across all Australian infrastructure sectors, there are ongoing challenges in delivering services to meet community expectations. This is particularly true in Small Towns, Rural Communities and Remote Areas.

As outlined in the *2019 Audit* and in other chapters, many remote communities have access to limited infrastructure for essential services such as water and transport.

The impact of this is particularly stark in remote Aboriginal and Torres Strait Islander communities.

“Many remote communities have access to limited infrastructure for essential services such as water and transport.”

Different states have different agreements to support the delivery of these essential services. Between 2014-15, the Australian Government reached an agreement with the Queensland, Western Australian, Victorian, Tasmania and Northern Territory governments to transfer the responsibility for energy, water and other municipal and essential services in remote Aboriginal and Torres Strait Islander communities from the Australian government to these jurisdictions.⁸²

South Australia reached a similar agreement with the Australian Government in 2015, receiving additional funding to provide municipal services on Aboriginal lands, but the Anangu Pitjantjatjara Yankunytjatjara (APY) Lands were excluded from the agreement.⁸³ Currently, municipal services for these communities are funded by the Australian Government and delivered by a Northern Territory-based Aboriginal corporation, while essential services such as water and energy are delivered by the South Australian government. To support a nationally consistent approach and ensure services are delivered in an efficient, equitable and community-led manner,

responsibility for municipal service delivery for the APY lands should be transferred from the Australian Government to the South Australian Government. The Australian Government should provide additional funding to the South Australian government to expand the geographic reach of the Municipal Services (MUNS program).

Good-quality water

Some communities in remote areas do not have access to reliable and safe water services that meet Australian Drinking Water Guidelines (ADWGs),⁸⁴ which specify minimum requirements for good-quality drinking water.

There is evidence the outcomes specified in the Guidelines are not regularly achieved, particularly in communities with Aboriginal and Torres Strait Islander populations.⁸⁵ The challenge is most apparent in smaller regional communities, which must manage their existing water assets with limited budgets and often ageing infrastructure.⁸⁶

Providing access to potable water is the responsibility of state, territory and local governments throughout Australia. However, access to water for remote communities has not been consistently managed across jurisdictions.

The **Water chapter** contains more information about this topic and proposes reforms.

Reliable transport networks

Access to transport services is critical to the success and sustainability of smaller communities.

The National Remote and Regional Transport Strategy discussed how poor transport options in regional and remote Australia reduce access to employment, education, health services and economic opportunities.⁸⁷

It identified priorities such as improving all-weather access on roads, better connections to regional centres, and faster and more frequent rail services.⁸⁸

To learn more, refer to the **Transport chapter**.

Access to digital services

Digital connectivity is now regarded as a must-have service to participate in society, and digital exclusion reinforces social and economic disadvantage. Given the changing nature of work and industry, the potential risks in the future from a growing digital divide are likely to become more serious.

The *Australian Digital Inclusion Index* measures digital access, affordability and digital ability and gives each area a score out of 100.



Australia's least digitally included regions are located in regional areas: Eyre (45.0), south east South Australia (48.6), north Victoria (50.8), and Murray and Murrumbidgee (51.0).⁸⁹

This topic is covered in more detail in the **Telecommunications and digital chapter**.

It is clear the essential service needs of people living in Australia's remote communities are not always being met because there is not the infrastructure to support them. This disadvantages these communities and creates an inequitable divide between them and the rest of Australia.

Tackling many of these challenges will take a coordinated effort across all levels of government.

Introduce minimum standards based on agreed principles

There are currently different approaches and standards to providing essential services in Australia. Challenges are addressed separately by each sector and solutions are applied with varying consistency across communities.

A better solution includes defining and adopting minimum standards of access and service delivery to guide infrastructure investment decisions and service benchmarks in these places.

A focus on drinking water, sewage, waste, electricity, all weather transport access and communications services would anchor local place-based approaches to infrastructure planning.

Over time, minimum standards for these essential services could evolve to incorporate the provision of social infrastructure services that are appropriate to the scale of the community, including remoteness and demography. Refer to the **Social infrastructure chapter** for more details on social infrastructure provision.

Collaborate across borders

The standards should be based on a set of nationally defined principles that outline a sustainable approach to infrastructure delivery in remote areas.

These principles would ensure land use and infrastructure decisions are coordinated and planned. They would allow local communities to develop consensus about service delivery, economic activities and the location of critical social infrastructure.

The consultation and collaboration process for developing the principles and standards should be led by a specialised taskforce established by the Department of Infrastructure, Transport, Regional Development and Communications in partnership

with the states and territories. Ideally, reporting against these minimum standards will be coordinated through National Cabinet, on a sub-committee.

Infrastructure services in all communities could then be audited against the standards on a rolling basis and updated every 4-5 years.

This approach would ensure state and territory governments focus on resolving basic infrastructure access and reliability issues faced by smaller communities.

It would also build community confidence that ongoing basic infrastructure needs are being addressed, support improved social outcomes, and encourage future growth and economic opportunities.

Improve services and opportunities for First Nations peoples

Many Small Towns, Rural Communities and Remote Areas include a significant population of Aboriginal and Torres Strait Islander peoples.

Failing to improve essential services in remote communities reinforces existing inequality and disadvantage, while infrastructure can play an important role in facilitating access. For example, food security for remote Aboriginal and Torres Strait Islander communities could be improved through upgrading road infrastructure to these communities.⁹⁰

The place-based approach of the *2019 Audit* highlighted how the challenges faced by Aboriginal and Torres Strait Islander peoples were impacted by where they live, which can present unique circumstances, particularly in remote homelands, including islands.

“Failing to improve essential services in remote communities reinforces existing inequality and disadvantage, while infrastructure can play an important role in facilitating access.”

In particular, it highlighted problems associated with overcrowding in remote areas due to a lack of fit-for-purpose dwellings and supply shortfalls.⁹¹

As described in the **Social infrastructure chapter**, inadequate housing exacerbates poor health, education and wellbeing outcomes for Aboriginal and Torres Strait Islander peoples, which are already below those of other Australians.

There should be governance mechanisms to support these communities in assessing their needs and participating in the delivery and

economic benefits of infrastructure investment, including culturally responsive services. These approaches will increase ownership of outcomes.

It is important the identified needs and subsequent business cases for infrastructure investment in these communities support local and national objectives for improving quality of life.

Deliver local jobs

Aboriginal and Torres Strait Islander communities in Remote Areas have comparatively low labour force participation and employment rates,⁹² which governments have tried to improve through a range of employment and community development programs.

A recent example is the Community Development Program (CDP), the Australian Government's remote employment and community development service. A new Remote Jobs Program will replace the Community Development Program in 2023 and be piloted in some locations in 2021.

The viability of these programs is highly dependent on participants having their basic needs for housing, transport, electricity and water met. This underscores the importance of minimum standards being implemented in parallel and reflects the enabling role infrastructure plays in social and economic participation.

Redesigning the CDP in consultation with Aboriginal and Torres Strait Islander communities and enterprises, and tailoring it to local priorities, including the infrastructure maintenance needs in each location, with cost shared between levels of government and asset owners will deliver meaningful and lasting outcomes.

The new Remote Jobs program should also apply findings from established programs that have improved opportunities for economic participation and employment and other social benefits. They include the National Indigenous Australians Agency's Indigenous Ranger Programs and other private-sector and community-led programs that are creating remote employment opportunities.⁹³

There should be a particular focus on providing access to networks and capital so more Aboriginal and Torres Strait Islander peoples can run their own small businesses. In remote locations, entrepreneurial activity may be a more accessible opportunity than other forms of employment.

Digital connectivity is needed to support access to these opportunities. Aboriginal and Torres Strait Islander arts organisations have reported that, during the COVID-19 pandemic, there has been a strong demand for visual arts, but not always the digital infrastructure to support e-commerce to capitalise on it.



Ensure CSOs deliver the promised benefits

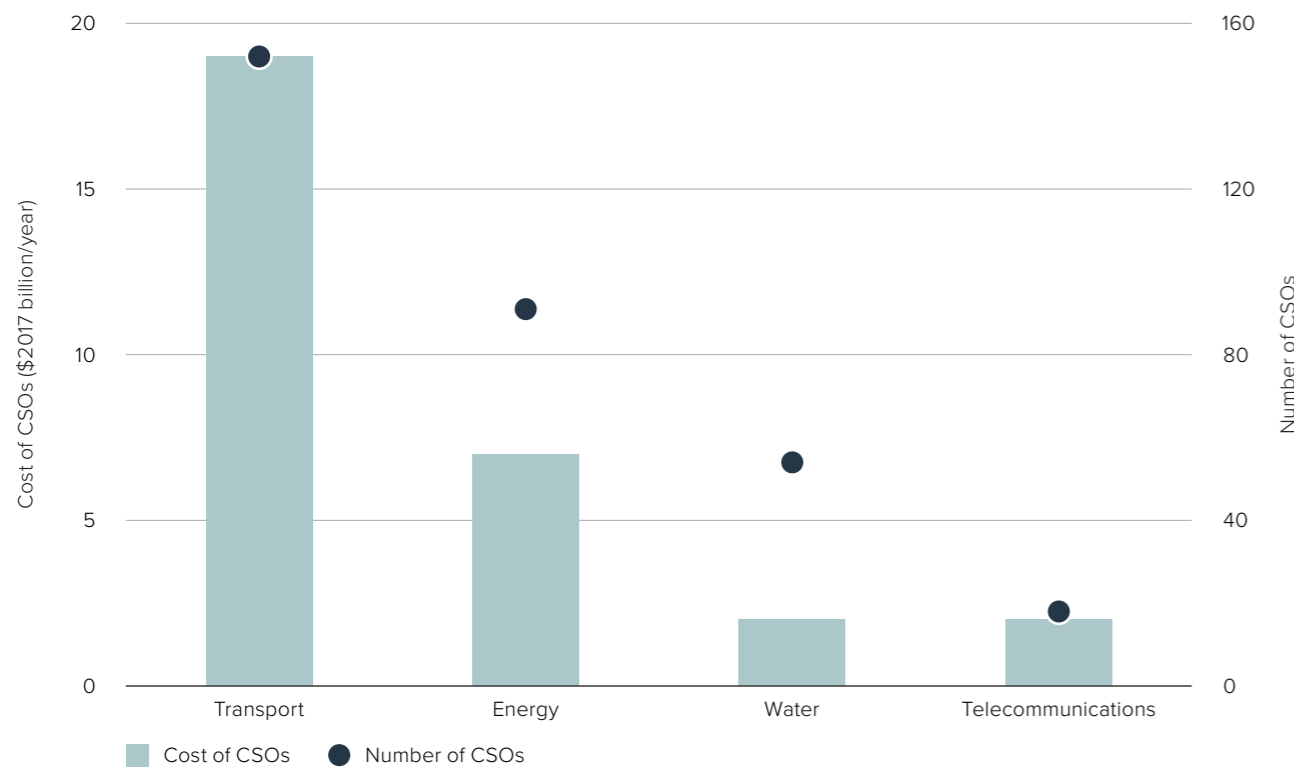
Subsidies are vital for some areas of infrastructure service delivery in Australia, and for all infrastructure sectors in Small Towns, Rural Communities and Remote Areas. They allow the provision of infrastructure that supports quality of life and addresses social disadvantage.

Subsidies are often provided through Community Service Obligations (CSOs) nationally, which target services that are provided for a social purpose and would otherwise be economically unviable.

Research conducted for Infrastructure Australia by the Centre for International Economics identified 315 infrastructure CSOs, 39% of which are not transparent (see **Figure 1.8**).⁹⁴

In the *2016 Plan*, Infrastructure Australia recommended that 'infrastructure community service obligations should be well-defined, transparently disclosed to the community, paid for by taxpayers rather than other users and, wherever possible, exposed to a competitive process to ensure services are routinely delivered at the right level, for an efficient price.'⁹⁵

Figure 1.8: Despite being worth billions of dollars, CSOs are not always transparent



Source: Centre for International Economics (2018)⁹⁶

The Australian Government supported the recommendation.⁹⁷ However, there has been mixed progress on disclosing CSOs and redesigning them where appropriate. While telecommunications CSO transparency has improved, the true cost of providing other infrastructure is opaque.

A lack of consistent review processes for funding arrangements results in taxpayers being unsure they are efficient and deliver value for money. This can reduce community support for CSOs and the benefits they deliver.

Australian governments can improve the design of CSOs to better achieve the policy outcomes they seek. CSO design should consider delivery efficiency, encourage contestability, and take into account the impact of technology changes on infrastructure and service delivery.

Making the nature, costs and objectives of CSOs more transparent would ensure the costs and benefits are understood by governments, communities and other stakeholders. This would empower all stakeholders to engage in evidence-based discussion and decision-making on services that best meet their local needs.

Enhance infrastructure outcomes through sharing

Costs

Uncoordinated delivery of social and economic infrastructure in smaller communities can lead to duplication, increase costs and undermine service outcomes.

In some cases, the delivery of standalone infrastructure may not be economically justified. However, sharing costs across programs of work can make it economically viable to provide a greater range of services or improve the quality.

Skills, resources and facilities

There are opportunities to share resources, skills and facilities between communities, and between disparate smaller communities to reduce costs, improve access and better coordinate infrastructure delivery.

This approach should include upfront coordinated planning that targets shared service and mixed-use facilities.

It should also support better sequencing of investment across government agencies, and levels of government, so different service types can be delivered together to reduce overall cost.



Data

As described in the **Industry productivity and innovation chapter**, data-sharing and transparency about future investment pipelines at a local level would encourage more collaboration between infrastructure providers.

The Australian Government's 2015 Regional Telecommunications Independent Review Committee noted that investment in regional infrastructure presents an opportunity to piggy-back major works to provide communications more cheaply, such as during roadbuilding or laying a pipeline.⁹⁸

“Uncoordinated delivery of social and economic infrastructure in smaller communities can lead to duplication, increase costs and undermine service outcomes.”

However, the Productivity Commission has raised concerns that the lack of existing publicly accessible information about existing telecommunications infrastructure has limited the scope for infrastructure sharing and led to duplication and higher costs.⁹⁹

This is also the case with other infrastructure, particularly where projects involve multiple infrastructure sectors.

More consistent and comprehensive public information about asset locations would improve infrastructure investment and facilitate integrated planning and coordination.¹⁰⁰

Asset sharing presents opportunities

Governments need to consider the ability of Small Towns, Rural Communities and Remote Areas to adapt to digital and shared models of the burgeoning platform economy (social and economic activity that is assisted by online platforms). This could present opportunities to identify private assets for new community use.¹⁰¹

While adoption of digital models is now widespread in many large urban centres, these services are less functional in remote communities. The consolidated provision of asset-sharing platforms for these communities could reduce the need for duplicate assets and the associated costs. Under this model, community members, visitors and other users would use online booking platforms to access community assets, such as community centres, or plant and equipment.

There is an opportunity for these assets to be captured as part of the Australian Government's forthcoming Digital Atlas of Australia's geography, which will bring together government data on people, economy, employment, infrastructure, health and the environment.

CSO policies should be structured to incorporate the cost of funding these sharing platforms.

Government responsibilities

Place-based approaches to infrastructure are heavily driven by local governments, which deliver a range of traditional and innovative infrastructure projects beyond roads and waste management.

While they have infrastructure delivery abilities, local governments across Australia are constrained by resources, budget and individual council capabilities.¹⁰² This is particularly true for local governments in small local government areas or population bases.

Shared services models could deliver better outcomes to these communities, reduce investment by infrastructure providers and lead to more affordable costs for government. Yet their adoption so far has been limited and uncoordinated.

A more collaborative approach between all levels of government is critical to ensure long-term place-based infrastructure outcomes are delivered for communities in these locations, despite varying funding, regulatory, legislative and policy challenges.¹⁰³

Integrated place-based strategies developed by Australian, state and territory government agencies for infrastructure delivery, particularly in regional communities, could identify opportunities for shared and coordinated infrastructure delivery.

Governments must also seek to build skills and capacity in delivering shared services. They could leverage existing partnerships and networks that can implement shared service delivery models, such as council groups, or partner with not-for-profit and community groups that could provide multiple forms of social infrastructure. For more reforms relating to this topic, refer to the **Social infrastructure chapter** of this Plan.



1.4 Unlocking opportunity in Northern Australia and Developing Regions

Key messages

- Targeted reform and investment to develop Northern Australia can boost **national economic growth**, industry productivity and energy security and reinforce **national security**.
- Infrastructure investment in Northern Australia presents **specific challenges**, including extreme climate, diverse environments and economies and low population density.
- There needs to be better **data to inform decision-making**, including on population, the environment, natural resources and infrastructure requirements.
- Economic growth will require access to a highly **skilled labour force** and engagement of **local workers**, including Aboriginal and Torres Strait Islander peoples.
- Aboriginal and Torres Strait Islander communities' participation** is essential for northern economic development. Infrastructure investment is needed in these communities to improve their economic participation and wellbeing.
- Infrastructure needs to be designed, delivered and scaled to **meet the requirements of diverse settlements** that range from small cities to remote communities.
- Enhancing connectivity and liveability** is necessary so Northern Australia can attract and retain skilled workers and their families and provide adequate services to remote communities.

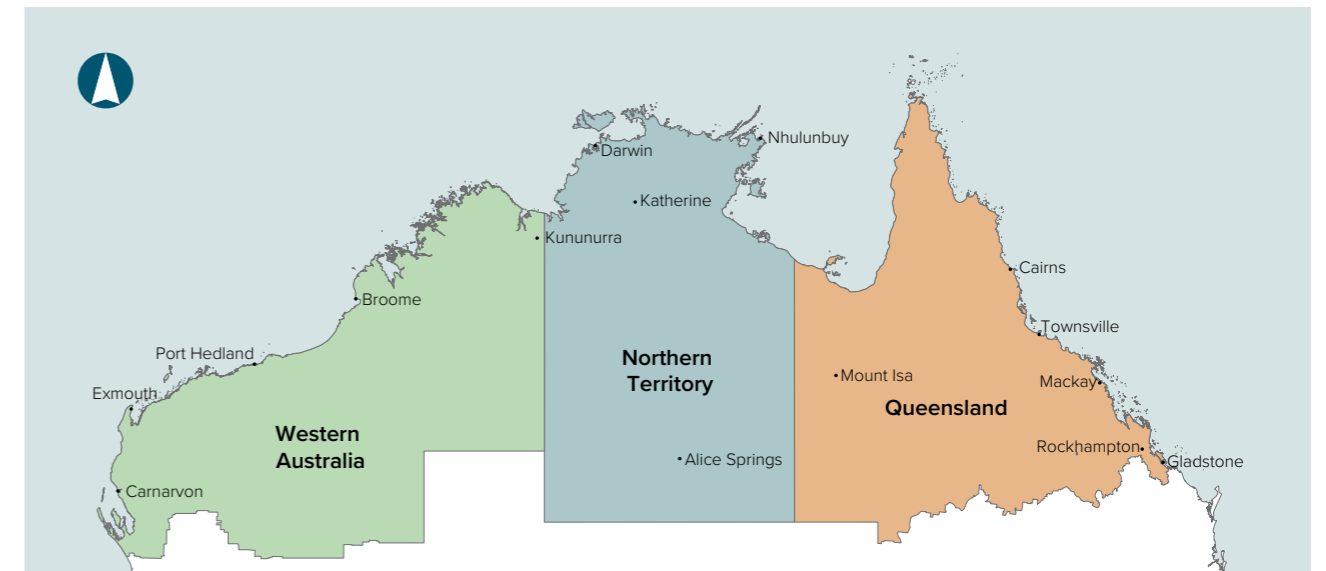


An economic powerhouse with great potential

This reform incorporates Northern Australia, which covers the Northern Territory and the northern parts of Queensland and Western Australia (see **Figure 1.9**), and developing regions with limited established infrastructure yet strong growth prospects where industry composition is changing.

Northern Australia encompasses 53% of Australia's land mass but is home to only 5.2% of the population (1.3 million people).¹⁰⁴ Settlements are widely spread and range from coastal cities with populations of more than 100,000 to dispersed remote communities of 100 people.

Figure 1.9: The geographic position of Northern Australia is key to its potential contribution



Note: These boundaries are as per the definition of Northern Australia in the *Northern Australia Infrastructure Facility Act 2016 (Cth)*.

The area is already a major contributor to the Australian economy. It generates about 8% of Australia's GDP and its per capita Gross Regional Product is 50% higher than for Australia as a whole.¹⁰⁵

It is the major energy production hub for Australia and the largest producer of this country's three leading exports — metallic minerals, coal and liquefied natural gas (LNG).¹⁰⁶ In 2019-20, agricultural production in Northern Australia was over \$9 billion — 15% of Australia's total.¹⁰⁷

With strategic infrastructure investment, the region has the natural resources and geographic position to make an even larger contribution to the Australian economy.

This would enable it to realise potential across current and emerging industry sectors, attract and retain skilled workers and deliver sustainable benefits to its communities.

Energy and resources for today and tomorrow

Northern Australia's significant resource base and highly efficient production systems underpin its economic fundamentals.

There is a unique mix of world-class energy resources. The extensive petroleum resources,¹⁰⁸ (conventional and unconventional natural gas and liquids) and renewable resources are vital to Australia's energy security.

The region's vast land area and high-quality solar resources makes it a preferred location for large-scale renewable energy projects and, in the future, green hydrogen.¹⁰⁹

These will be key as Australia and its overseas export partners transition to lower-cost, lower-emission futures.

Northern Australia is also poised to become a major supplier of critical minerals such as lithium and silicon, which are inputs into much-needed new energy products, such as electric vehicles, solar panels and wind turbines.¹¹⁰ These minerals will be vital to global energy transition, digitalisation and leading-edge technologies.¹¹¹

The **Energy chapter** describes how that sector is transforming and the associated reforms.

A growing role in the national economy

As Australia responds to shifting economic, population and technological trends over coming years, the important role of Northern Australia is expected to grow.¹¹²

The sectors that will drive and enable this growth include:

- renewable energy for export and use by energy-intensive, manufacturing
- offshore and onshore gas for LNG and gas-based manufacturing
- minerals development and processing
- agribusiness
- carbon offsets, capture and storage
- tourism.¹¹³

In addition, the region is well-positioned to host industries that are aligned with Southeast Asian markets.

This includes a diversity of emerging industries such as renewable energy, manufacturing, marine servicing, space launch services and aeronautical research and development (R&D).¹¹⁴

Strong defence and security capabilities

The strategic geographic position of Northern Australia, which faces the Indo-Pacific region, makes it key to national defence, security and disaster response.¹¹⁵

There are multiple dimensions to the contemporary concept of security. They include:

- defending the nation
- resilience and response to natural and human-induced disasters
- biosecurity and border integrity
- security of food, fuel and infrastructure
- efficient and resilient supply chains
- strategic cooperation with neighbours in defence, resilience and economic development.¹¹⁶

Northern Australia is well-placed to deliver on all these fronts. It is already a focus of investment in defence infrastructure and multi-user infrastructure used by national security operations and defence forces from other nations.

Several Northern Australian cities are also hubs for disaster response for both their region and nearby Indo-Pacific countries.

Improving infrastructure will attract greater investment

While Northern Australia offers many advantages to businesses, they often face more challenges than businesses in the rest of Australia due to the region's size and remoteness.

The most serious problems and their solutions relate to access to and quality of infrastructure, which impact the related services.

“ Much of the infrastructure in Northern Australia is inadequate for current needs, let alone growth. ”

There are long and sometimes fragile supply chains, higher workforce, energy and transport costs, and inadequate telecommunications and digital connectivity. These translate into higher overall costs that flow to customers.

To attract more commercial investment, the region needs higher quality, more resilient infrastructure to help reduce costs, minimise supply chain disruptions and help businesses reach their potential.

The required infrastructure is diverse, including: gas pipelines, electricity generation and transmission, water supply, all-weather roads, enhanced rail, sea and air transport and reliable telecommunications.

Realising a step-change in the region's economic contribution requires investment. Much of the infrastructure in Northern Australia is inadequate for current needs, let alone growth.

Planning for new infrastructure should take into account the needs of people, business and industry, as well as defence and security operations.

The role of Our North, Our Future 2021-26

Infrastructure planning should complement and support the recently refreshed plan for northern development, *Our North, Our Future 2021–26*, which focuses on supporting national recovery efforts from the COVID-19 pandemic and driving job creation and industry growth.¹¹⁷

Infrastructure Australia's Northern Australia reforms aim to complement the objectives of the *Our North, Our Future* agenda, recognising the value of a resilient northern economy for locals and Australia's national prosperity.

Many of our recommendations reflect the Australian Government's focus on identifying and investing in growth areas, industry development and digital connectivity.

1.4 Recommendation

Ensure Northern Australia and Developing Regions fulfil their economic role, attract and retain skilled workers and enable participation of Aboriginal and Torres Strait Islander people through greater collaboration between governments on infrastructure needs across the region.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

When this should impact:



Where this should impact:



0-5

1.4.1 Improve investor certainty by collecting and publishing better data on the region's characteristics and infrastructure.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Foreign Affairs and Trade, state and territory infrastructure departments, state and territory economic development departments

0-5

Support informed decision-making, identify gaps and determine priorities for data collection and research through the creation of a cross-jurisdictional agency collaboration group to lead an audit of data availability and adequacy.

Proposed lead: Office of Northern Australia
Supported by: Infrastructure Australia, Bureau of Infrastructure and Transport Research Economics, Bureau of Communications, Arts and Regional Research, Australian Bureau of Agricultural and Resource Economics, ATAP Steering Committee Secretariat, CSIRO: Commonwealth Scientific and Industrial Research Organisation, Department of Agriculture, Water and the Environment, National Indigenous Australians Agency, state and territory planning departments, state and territory infrastructure agencies, state and territory regional development agencies

0-5

Reduce investor uncertainty and improve decision-making by identifying, creating and publishing place and network-centric data, including assessing natural resource endowments.

Proposed lead: Cross-jurisdictional collaboration group led by Office of Northern Australia
Supported by: Department of Foreign Affairs and Trade, Australian Bureau of Agricultural and Resource Economics, Department of Agriculture, Water and Environment, CSIRO: Commonwealth Scientific and Industrial Research Organisation, Geoscience Australia, state and territory infrastructure departments, state and territory planning departments, state and territory economic development departments, state and territory resources departments

0-5

Better meet the current and future needs of users by undertaking a new Northern Australia Infrastructure Audit.

Proposed lead: Infrastructure Australia

0-5

1.4.2 Support industry development by developing place and network-based infrastructure strategies linked to incumbent and emerging growth industries.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Office of Northern Australia and state and territory infrastructure departments

0-5

Identify potential growth industries and growth patterns in key industries through a renewal of the Northern Australia Agenda.

Proposed lead: Office of Northern Australia
Supported by: State and territory economic development departments

- 0-5** Meet the requirements of growth industries by undertaking place-based assessment of digital adequacy, accessibility and affordability.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Telecommunications network operators - fixed and mobile, state and territory digital economy departments

- 0-5** Identify opportunities for shared infrastructure and reduced costs by undertaking joint assessment of enabling infrastructure requirements for major industry developments.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Office of Northern Australia, state and territory infrastructure departments

- 0-5** Reduce business costs by improving supply chain efficiency and reliability through the inclusion of end-to-end key supply chain strategies that connect productive regions with domestic markets and export gateways in the National Freight Strategy.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Foreign Affairs and Trade, Cooperative Research Centre for Northern Australia, state and territory transport departments

- 0-5** Support the infrastructure pipeline delivery for Northern Australia and grow key industries such as major resources, energy and agribusiness by developing a skills formation and attraction plan assessing skills requirements, skills training capability and liveability factors.

Proposed lead: Department of Education, Skills and Employment

Supported by: Infrastructure Australia

- 5-10** Attract and retain a skilled workforce by supporting liveability through investment in social infrastructure and connectivity.

Proposed lead: Office of Northern Australia

Supported by: State and territory infrastructure departments, Department of Infrastructure, Transport, Regional Development and Communications

- 5-10** Facilitate local workforce participation by identifying opportunities for developing innovation or specialisation precincts alongside major infrastructure.

Proposed lead: Department of Education, Skills and Employment

Supported by: State and territory industry departments, state and territory education and training departments

- 5-10** **1.4.3 Support participation of Aboriginal and Torres Strait Islander enterprises and individuals in infrastructure planning and delivery by developing joint programs for agencies leading the planning, delivery and operation of infrastructure.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Indigenous Australians Agency, Office of Northern Australia, state and territory Aboriginal and Torres Strait Islander affairs agencies, state and territory infrastructure departments

- 0-5** Ensure infrastructure delivers improved social and economic outcomes for communities by aligning major infrastructure investment with the objectives of the Northern Australia Indigenous Development Accord and Closing the Gap targets.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Indigenous Australians Agency

- 5-10** Support Aboriginal and Torres Strait Islander participation in the Northern Australia economy, including infrastructure delivery, by assessing and prioritising investment in enabling digital and transport connectivity in partnership with local First Nations communities.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Indigenous Australians Agency, Northern Australia Infrastructure Facility, Office of Northern Australia, state and territory infrastructure departments

- 0-5** Build the capability of Aboriginal and Torres Strait Islander entrepreneurs and traditional owners to participate in the economic development process through financial and technical support to map the commercial potential of their land and water assets, and develop feasibility studies and commercial partnerships with project proponents.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Indigenous Australians Agency

- 0-5** Improve the consistency and effectiveness of Aboriginal and Torres Strait Islander procurement policies by standardising monitoring and performance reporting across jurisdictions.

Proposed lead: Department of Prime Minister and Cabinet

Supported by: National Indigenous Australians Agency, Northern Australia Infrastructure Facility, state and territory finance departments, state and territory Aboriginal and Torres Strait Islander affairs agencies

- 10-15** Sustain local community employment in infrastructure delivery and other projects by developing an essential skills training academy building infrastructure delivery skills and knowledge.

Proposed lead: Department of Education, Skills and Employment

Supported by: Department of Infrastructure, Transport, Regional Development and Communications, National Indigenous Australians Agency, state and territory infrastructure departments



Measuring progress



Governance

Northern Australia Infrastructure Audit

Current register of public and private infrastructure assets in Northern Australia

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Economic

Aboriginal and Torres Strait Islander employment

Percentage of Aboriginal and Torres Strait Islander people aged 25-64 who are employed (Closing the Gap Target 8)¹¹⁸

Target: 62%

Timeframe: 0-5 **5-10** 10-15 15+



Social

Northern Australia population growth

Northern Australia population annual growth rate

Target: 1.5%
(Pre-COVID-19 national average)

Timeframe: 0-5 5-10 **10-15** 15+



Developing infrastructure that responds to distinct characteristics

Understand Northern Australia's needs

Current industries in Northern Australia have high growth potential, and emerging sectors show promise for development. However, the patterns and speed of growth for each sector are uncertain, and the priorities and timing for the infrastructure needed to support this industry development are unclear.

Inter-government strategic scenario planning and options assessment is needed to align strategic planning and investment. This will involve assessing the potential development patterns for each industry sector, their infrastructure priorities, and opportunities for sharing infrastructure capability between sectors and to support regional development.

Following this process will enable the adaptive management of place- and network-based infrastructure strategies as industry development locations, timing and pathways emerge.

Collect and analyse more data

There are knowledge gaps about the environment, natural resources and demographics of Northern Australia that have implications for assessing its infrastructure needs, planning and delivery.

The lack of data deters effective actions, such as land use and infrastructure planning, investment attraction, service delivery and environmental assessments.

Among the data-gathering requirements are:

- **strategic assessments** to gather environmental baseline data, assess the potential cumulative impact of development at a regional scale, devise management measures and determine infrastructure needs
- ongoing **underground water assessments** to determine sustainable yields and water supply options for development
- consistent **hazard mapping** for cyclones, storm surges, floods and bushfires to underpin infrastructure design, emergency responses and disaster management plans
- **corridor planning** to assess optimal routes and configurations for infrastructure, conduct assessments and secure tenure, with the goal of facilitating efficient land use and rapid infrastructure delivery in the future
- **demographic, labour force, education and skills mapping** to better understand current population

dynamics and skills availability, and to provide baselines for effective workforce planning, development and engagement measurements

- **assessments** of the adequacy of current infrastructure and associated services, and of future requirements under various development and growth scenarios.

The *2019 Audit* identified several infrastructure challenges and opportunities in Northern Australia. Being able to access and generate relevant data, including new third party data, would better inform decision making and lead to a focused, place-based assessment of the region's infrastructure needs.

Undertaken as part of a refreshed Northern Australia agenda, a new *Northern Australia Infrastructure Audit* would assess data adequacy, identify gaps, reflect current and new priorities and determine and prioritise future needs.

Build a skilled workforce by improving liveability and connectivity

Northern Australia's development is constrained by lack of access to a skilled workforce made of people who are committed to seizing long-term opportunities in the region. This deters local business activity and can result in leakage of many of the benefits of major projects through long-distance supply and fly-in-fly-out workforces. The region needs to bolster its skilled workforce to enable industry development, service delivery and infrastructure provision.

Most local government areas in the region experience consistent negative internal migration, with more people leaving for other Australian locations than arrive from them. While there are many long-term committed residents in the Northern Territory, around 1 in 12 people who live there depart each year, although in 2020 this trend began to improve.¹¹⁹

To support the ambitious objectives laid out in the *Our North, Our Future* agenda, there needs to be a highly capable, and much larger workforce.

To meet this need, it will be necessary to overcome the challenges of widely dispersed communities, high churn rates and static or falling populations in many locations.

Investment in infrastructure that enhances connectivity and improves the liveability of Northern Australia's cities, towns and communities will help to resolve this problem by attracting and retaining skilled workers and their families through all life stages.

Invest in social infrastructure

Employment is the primary reason people move to Northern Australia from interstate and overseas, but their reasons for leaving are more complex.¹²⁰

While employment and career opportunities remain important, lifestyle, urban amenity, climate, service availability and quality, partner employment and living costs also influence decision-making.

Research has highlighted the importance of social infrastructure and services in retaining people in Northern Australia throughout different life stages.¹²¹

Families with children place a high value on the quality of health, education and family support services, while late career workers and retirees tend to focus more on urban amenity, community connectedness and passive recreation opportunities.

Whatever their stage of life, Northern Australia residents are concerned about living and travel costs and being able to connect with family and friends elsewhere.

Investments that improve social wellbeing, cultural development and recreation opportunities, and underpin the development of cohesive communities, are priorities in Northern Australia.^{122 123}

As a result, governments have invested in theatres, art galleries, sports stadiums and community sports facilities in its major centres.

Access to high-quality services and infrastructure, such as education and training, health and affordable housing has also been identified as key to attraction and retention in regional areas.

Kick-start growth with high-quality connectivity

Wherever people live, transport, digital infrastructure assets and services are key to conducting business, delivering essential services and enhancing liveability.

Much of Northern Australia is poorly served by physical connectivity and digital. There is sparse mobile telephone coverage outside cities and towns and low capacity on many digital networks. Transport services are patchy, expensive and often difficult to access.

“ Much of Northern Australia is poorly served by physical and digital connectivity. ”

The **Transport chapter** and **Telecommunications and digital chapter** propose reforms that will address these deficits.

Support more reliable supply chains

Northern Australian businesses rely on interstate and intrastate trade in goods and services.¹²⁴ These businesses, and their customers and suppliers around Australia, need efficient and resilient supply chains to keep supply costs low, maintain reliable connectivity and support competitiveness.

Instead, there are inadequate road networks, sparse air and rail routes and inefficient intermodal transfer points. This increases input and production costs and slows the transport of supplies and products in and out of the region.

Many issues revolve around the region's remoteness, which make it reliant on interstate suppliers, distributors and customers.

Supply chains relying on transport between the rest of Australia and Northern Australia are vulnerable to many risks, such as:

- disruption by extreme weather
- road and rail incidents
- interruptions to international trade and their impact on domestic supply via southern ports
- disruptions to processing and warehousing in southern capitals highlighted during the pandemic.

Supply chains within Northern Australia are susceptible to disruption too. High-intensity weather events periodically close roads and railways.

In addition, many of the region's road networks are under-developed and regional roads remain unsealed. This makes them impassable for heavy vehicles in the wet season and they can be completely closed when low-level stream crossings flood.

As a result of all these factors, supply chain operators for minerals, commodities and agriculture (which typically rely on multiple operators) often struggle to meet regional needs and are forced to impose additional costs on their customers.

Unreliable supply chains not only increase costs for businesses, households and government agencies in Northern Australia, they compromise liveability, delivery of essential services and national security. Building more efficient and resilient supply chains to, from and within Northern Australia should be a government priority.

For a detailed discussion of this subject, see the **Transport chapter**.

Localise the benefits of infrastructure delivery and industry growth

Project development and infrastructure construction can provide a short-term stimulus for local economies but may also result in economic and social disruption. In some cases, major projects are not strongly connected to local economies, which can lack the business and workforce capacity and social infrastructure to derive strong and sustained value.

Also, local businesses and workforces can find it difficult to engage with major project teams, who are often not locally established. If communities are linked with project leaders, this can deliver local and regional economic benefits, including employment opportunities.

The next wave of development in Northern Australia will require skilled workforces to plan, deliver and operate infrastructure. Local capacity in the public and private sectors needs to be enhanced by attracting and retaining leaders in the technically complex fields of planning, procurement, financing, construction and operations.

There must be deliberate steps to develop these skills in Northern Australia. Enlisting and developing

workers in the communities that will house infrastructure projects is an important factor for delivering local benefits. Increasing their capacity should incorporate a proportionate transition of the workforce to operation and maintenance roles.

“ The next wave of development in Northern Australia will require skilled workforces to plan, deliver and operate infrastructure. ”

Developing a trained local workforce can reduce asset maintenance costs and increase operational resilience by not having to rely on transport infrastructure and services to support access from workers from outside regions. Providing education and training services to develop the local workforce as well as the physical and digital technology that supports them is therefore important to Northern Australia's economic development. Place-based digital plans require consideration of both infrastructure as well as digital literacy and use cases.

For more detail on improved workforce planning, see the **Industry productivity and innovation chapter**.



Make First Nations peoples central to economic development

Participation of Aboriginal and Torres Strait Islander peoples is fundamental to sustainable Northern Australia development.

“Participation of Aboriginal and Torres Strait Islander peoples is fundamental to sustainable Northern Australia development.”

The region is home to 170,000 Aboriginal and Torres Strait Islander peoples. This represents 13% of the total Northern Australian population,¹²⁵ and 26% of the total Aboriginal and Torres Strait Islander peoples in Australia (compared to a 2% representation within the average Australian community).¹²⁶

In the Northern Territory, the figure is 30% of the population and in the Kimberley region of Western Australia it is 49%.¹²⁷ There are many small communities on Aboriginal and Torres Strait Islander land — 72 in the Northern Territory alone.¹²⁸

Support the outcomes set by the 2020 Accord

Governments with Northern Australia interests have committed to ensuring Aboriginal and Torres Strait Islander communities are central to the Northern Australia agenda. They see full participation as being at the heart of increasing productivity, encouraging investment and realising the full potential of the North.

In January 2020, the governments of Western Australia, Northern Territory and Queensland, along with the Australian Government, adopted the *Northern Australia Indigenous Development Accord* ‘to drive a coordinated approach to economic activity, innovation and business opportunities.’ The Accord was developed by the Indigenous Reference Group of the Ministerial Forum on Northern Development. It articulates six outcomes:

- Creating jobs, fostering labour participation, entrepreneurship and business acumen for Indigenous Australians.
- Establishing knowledge management systems and producing research and development to support Indigenous commercial end-users.
- Attracting infrastructure to support Indigenous economic development.
- Facilitating access to capital and domestic and international markets for Indigenous businesses.

- Activating the economic value of land, water, sea, and cultural resource rights.
- Creating institutional arrangements that work to activate, accelerate and optimise Indigenous economic development across northern Australia.

Address infrastructure shortfalls

Achieving the desired outcomes of the *Northern Australia Indigenous Development Accord* within an acceptable timeframe will be challenging. They all require effective planning and delivery and improved service levels by every infrastructure sector, in particular:

Roads: Unreliable road access restricts the access of Aboriginal and Torres Strait Islander communities to services and outside markets, reinforcing disadvantage.

Telecommunications: While services to remote parts of Northern Australia have improved substantially over the past decade, poor reliability and service quality in key locations still impede businesses and service providers. The situation is becoming more acute as First Nations businesses embrace e-commerce and cloud-based services, and as health and education services are increasingly delivered remotely.

Transport: While governments across Northern Australia are working to improve physical connectivity for remote communities, the task remains large and expensive, as described in the **Transport chapter**.

Signed in 2019, the *Barkly Regional Deal* between the Australian and Northern Territory Governments is a step forward. It includes infrastructure investment to improve living conditions in Tennant Creek and surrounding communities.

However, at current rates of infrastructure investment across Northern Australia, it will be many years before major improvements result in better social and economic outcomes for a majority of remote Aboriginal and Torres Strait Islander communities.

Current infrastructure funding and financing instruments do not reflect the needs and circumstances of these communities, and local Aboriginal and Torres Strait Islander communities and organisations may not have the capacity to participate in land use and infrastructure planning.

In addition, unique governance arrangements related to tenure, such as native title and statutory land regimes, require different approaches to infrastructure planning and development. The Australian

Government is currently investigating options for enabling greater economic activity by Aboriginal and Torres Strait Islander communities on native title land through leasehold arrangements.

Use infrastructure to stimulate local economic opportunities

Combined with enhanced infrastructure, industry growth and development would offer pathways for greater engagement in the economy by Aboriginal and Torres Strait Islander peoples in Northern Australia.

The resilience and international competitiveness of the region’s economy relies on their involvement because of land rights and interests, and the large local labour force they represent. There are untapped opportunities for these communities to be entrepreneurs or proponents across different elements of the value chain in sectors such as agriculture, tourism, forestry and mining and resources.

Enabling Aboriginal and Torres Strait Islander peoples to benefit from economic growth will require investment in infrastructure to improve basic services, such as telecommunications, energy and water. It will also depend on these communities being more involved in infrastructure planning and delivery, which will deliver employment opportunities.

Build on existing government strategies

To help mature project concepts and build an infrastructure pipeline, Northern Australia governments should de-risk investment by developing data sources that inform planning and feasibility studies in relation to potential land uses.

Governments should also design infrastructure planning, funding, procurement and maintenance frameworks to maximise opportunities for the participation of First Nations peoples and enterprises.

These should include consistent procurement policies that encourage the flow of benefits to Aboriginal and Torres Strait Islander communities and allow sufficient time for their enterprises and workers to develop new skills and capabilities.

The Australian Government has introduced an *Indigenous Employment and Supplier-use Infrastructure Framework*¹²⁹ to increase Aboriginal and Torres Strait Islander employment and supplier use in the delivery of land transport infrastructure projects that are federally funded or co-funded.

The Framework applies to projects receiving \$7.5 million or more in Australian Government contributions under the current *National Partnership Agreement on Land Transport Infrastructure Projects*.¹³⁰ In some circumstances, it can apply to projects below \$7.5 million if they have strong potential to support Aboriginal and Torres Strait Islander community participation.



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2

Sustainability and resilience



What you will read in this chapter

- **Reform 2.1: Infrastructure planning for an uncertain future** – The importance of a consistent all-hazards, systems approach to resilience planning; quantifying the costs, impacts and benefits of resilience investment; and embedding resilience into infrastructure assessment and decision-making.
- **Reform 2.2: Technology-led sustainability** – Embedding sustainability into infrastructure assessment and decisions; using the quadruple bottom line to understand sustainable outcomes; and reducing emissions through government leadership, job creation and market development.
- **Reform 2.3: Transparency and collaboration build trust in decisions** – Efficiently involving communities in infrastructure decisions; harnessing data to address community needs over the entire asset lifecycle; increasing transparency; and protecting land corridors for the highest-value use.

Key messages

- The events of 2019 and 2020 highlighted that **Australia is vulnerable to natural and non-natural hazards** such as bushfires, floods, drought, extreme heat, cyber threats and pandemics.
- In a time of rapid change, uncertainty and risk, **there must be new practices to ensure infrastructure plays its role** in protecting lives, enabling business continuity and preserving biodiversity while lowering greenhouse gas emissions and delivering service access, affordability and quality of life to all Australians.
- A **nationally consistent, systemic approach to resilience planning** would consider the interrelationship between shocks, stresses and future trends while identifying infrastructure interconnections and vulnerabilities.
- To be successful, planning needs to **quantify the costs of disasters and benefits of resilience investment**.
- Government and private sector organisations are **advancing efforts to embed resilience across a range of hazards**.
- **Integrating sustainability and resilience into planning and decision-making** will allow Australia to meet present needs without compromising the ability of future generations to meet theirs.
- **Infrastructure assets and services are emissions-intensive**, so it is critical their development supports governments in meeting emissions reduction commitments.
- If **long-term emissions targets inform current projects**, the assets will be in the best interests of users, investors and taxpayers, remain viable in the future, and will not displace more sustainable and efficient infrastructure investment.
- Private and public investment can be mobilised to create zero-carbon assets, with government leadership setting the trajectory through **targets, policy, regulation and reporting**.
- Decision-making should be **inclusive and transparent** and enable long-term planning for future infrastructure assets, including weighting intergenerational benefits and trade-offs.
- If decision makers **collaborate inclusively with stakeholders, incorporate the quadruple bottom line, make evidence-based decisions, increase process and data transparency and reserve corridors for future assets**, they will deliver value for money investments while building trust and strong relationships with communities.

Introduction to sustainability and resilience

To protect Australia, the infrastructure sector must change

During 2019–2020, Australia faced the COVID-19 pandemic, a record-breaking bushfire season, extensive flooding and drought, geopolitical risks and cyber-attacks on critical infrastructure networks. These events showed just how critical infrastructure is for maintaining community safety, biodiversity and a functional economy.

Australia's governments, communities and businesses are recovering from these compounding crises. They are trying to return to normality, reduce the impact of hazard events and rebuild the economy. This creates an opportunity to take stock of lessons learned and make communities more resilient and sustainable.

The compounding impacts of disasters that have impacted Australia over the last two years is a warning sign for the uncertainty and risk that lays ahead.

As shocks and stresses become more interrelated, they are likely to grow more severe.¹ Stresses increase vulnerability to shocks and amplify their impact. If they are left unchecked, they can trigger shock events.

This country has experienced profound disruption in the past, with the impact flowing through to the economy (see **Figure 2.1**). However, the scale, pace, interconnectedness and uncertainty of shocks and stresses today are more systemic and threatening.

The International Panel on Climate Change (IPCC) estimates global warming is likely to be 1.5 degrees higher than pre-industrial era levels between 2030 and 2052 if present emissions rates continue.² If this were to occur, Australia would experience increasingly damaging East Coast Lows, more frequent and intense heatwaves, increases to peak wind speed and more extreme rainfall.³

Communities, businesses and decision-makers in government cannot continue to make decisions by default. Protecting Australians and preserving their way of life will involve transforming infrastructure planning, delivery and management.

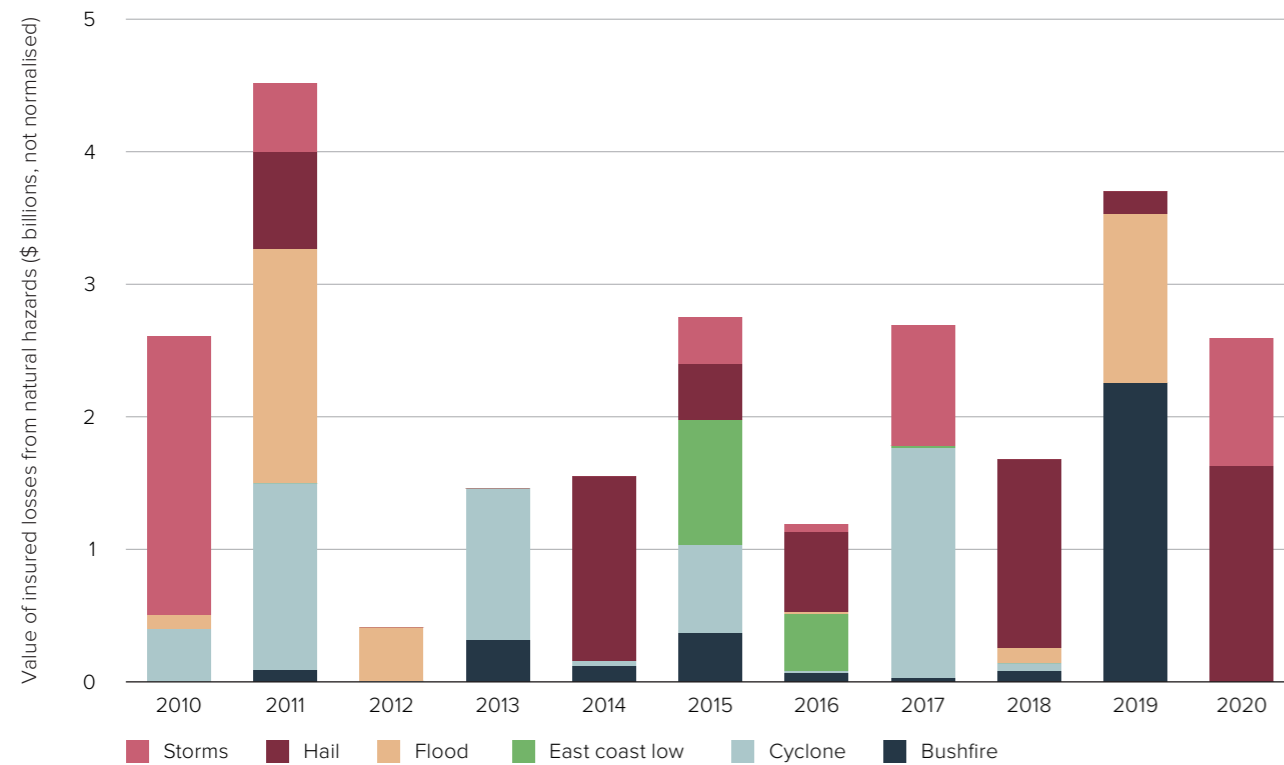
Resilient communities have the ability to resist, absorb, accommodate, recover, transform and thrive in response to the effects of shocks and stresses in a timely, efficient manner to enable positive sustainable economic, social, environmental and governance outcomes.

Sustainable infrastructure is planned, designed, procured, constructed and operated to optimise economic, environmental, social and governance outcomes over the life of the asset. This is done in a way that ensures it supports the needs of society today without compromising the needs of future generations.

Sustainability focuses on better outcomes to improve and protect economic, governance, social and natural environments. It differs from resilience, which focuses on the ability to mitigate and adapt to future uncertainty so sustainable outcomes can be achieved.⁴

Shocks: Disaster events with an immediate damaging impact, such as cyber-attacks, extreme storms or flooding.

Stresses: Chronic long-term or cyclical trends that undermine systems over time, such as rising inequity, ageing infrastructure or rising sea levels.

Figure 2.1: Previous shocks have had significant economic consequences

Source: Royal Commission into National Natural Disaster Arrangements (2020)⁵

Systemic change and trust are needed

The infrastructure sector has a critical mitigation and adaptation role to play when preparing for future extreme events. Assets and networks must be able to resist, absorb, accommodate, recover, transform and thrive in response to shocks and stresses. Communities and decision makers need to understand the trade-offs of living in disaster-prone areas.

A new approach to infrastructure investment and operation will enable fundamental change. It will allow Australia to pivot from being reactive to being proactive, from a focus on individual assets to considering the whole system, and from individual to shared responsibility.

This is the foundation for creating resilient communities. In addition, it will allow Australia to meet present needs without compromising the ability of future generations to meet theirs.⁶

The infrastructure sector needs transformation and systemic change at all levels of government, all sectors and in all communities. The changes range from how communities are engaged to how resilience and sustainability are considered in investment

decisions. Changes will not only ensure assets are more resilient and sustainable, but that the network, sector, place, precinct, city and region are too.

Part of the solution is long-term decision-making processes that are inclusive, transparent and integrated. These will provide a clear, consistent approach to managing and valuing resilience and sustainability. At the same time, they will make the most of opportunities for government leadership, productivity and market development.

The ability to deliver change is highest when communities trust government and institutions. Substantial changes to how governments and the private sector act in periods of complexity and uncertainty will only be accepted and effective when citizens trust decision makers to act on their behalf and with their best interests at heart. To gain this trust, government decisions need to be inclusive and transparent, and reflect community needs and preferences.

Resilience and sustainability are so essential to this country's future that the *2021 Australian Infrastructure Plan* uses them as a lens to inform every proposed sector and cross-sector infrastructure reform.

Reforms relating to sustainability and resilience are discussed in every chapter of the Plan. For example, the **Energy** and **Waste** chapters contain reforms around moving to net zero (carbon neutral) emissions and promoting the circular economy.

Infrastructure planning has improved since 2016

Planning processes have evolved since the *2016 Australian Infrastructure Plan*.⁷ Communities are engaged more frequently in developing state infrastructure strategies.⁸

Also, multiple jurisdictions are undertaking long-term corridor protection by strategically acquiring and reserving land for potential infrastructure projects.⁹ As well as supporting future development, this strategy reduces expenditure by acquiring tomorrow's land at today's prices. These practices should be expanded and become mainstream in every jurisdiction.

There is room for further improvement

Embedding resilience and sustainability should be automatic

Since 2016, the infrastructure sector has made progress in considering resilience in a systemic sense, but there are still obstacles. There needs to be more effort to better implement sustainability and resilience in infrastructure design, operation and maintenance.

Some of these factors are already considered in formal decision-making and investment frameworks and guidelines. However, a lack of clear guidance, expertise, consistency and data means this does not translate into practical application. Part of the problem is limited guidelines and tools for providing consistency or incorporating risk-reduction measures into project design and investment decisions.

Decision-makers need incentives to look beyond short-term value (which can transfer systemic risk from one part of the system to another) and recognise the long-term value of sustainability and resilience. This issue is a focus in this chapter and changes to the *Infrastructure Australia Assessment Framework* arising from a recent review.¹⁰

Sustainability and emissions reduction considerations are not strong enough

While emissions have decreased in some sectors, there needs to be more action if Australia is to meet its Paris Climate Agreement obligations.¹¹ For example, Australia's passenger vehicle emissions and efficiency standards are not keeping up with global best practice.

Infrastructure assets and services are emissions intensive.¹² There needs to be more recognition of

the important role infrastructure and services will play in helping governments meet their emissions reduction targets.

“ There needs to be more effort to better implement sustainability and resilience in infrastructure design, operation and maintenance. ”

Comprehensively tackling light vehicle emissions, introducing electric vehicles at the right scale and time and changing social infrastructure procurement standards are three cost-effective examples of what could be done. Embedding the quadruple bottom line (economic, environmental, social and governance outcomes) into decision-making will help to identify broader sustainability and emissions reductions investment and reform in the best long-term interests of users and taxpayers.

The decision-making process needs to be clearer

Infrastructure Australia's *Infrastructure Decision-making Principles* maintain there should be more effort to make decisions around Community Service Obligation (CSO) mechanisms clearer when planning infrastructure.¹³ Being more open and building community trust includes developing more inclusive engagement practices and consistently releasing transparent information about decisions across the entire infrastructure lifecycle.

The four major sustainability and resilience opportunities

The *2019 Australian Infrastructure Audit* outlined four major sustainability and resilience challenges and opportunities for the infrastructure sector.¹⁴

Improve governance and decision-making:

Infrastructure users are rarely at the centre of decision-making, despite growing community demand for transparency and effective engagement. Governments need to build community trust by harnessing the knowledge of local communities and incorporating what they learn into infrastructure investment decisions.

Progress resilience strategies: Australia's assets and networks, places and communities lack comprehensive resilience strategies. This is despite the change, disruption, interdependencies and social, economic and environmental challenges that this country faces now. These are all combining to create risk, complexity and opportunity for infrastructure planning, delivery and operation. To protect Australia against an uncertain future, resilience must be embedded into assets, networks and places.

Be a global leader in sustainable infrastructure:

Australia is well-positioned to lead the world in investing in and developing approaches to infrastructure that enhance sustainability. This work will benefit current and future generations. It will also protect and increase Australia's international reputation as a sound, reliable, well-governed and low-risk environment for sustainable investment. To maintain this enviable position, the Australian Government needs to manage current and emerging risks.

Reduce carbon emissions: The *2019 Audit* suggested governments should prioritise addressing risks around the emissions intensity of infrastructure and services, and frame progress on emissions reduction. Doing this would improve Australia's sustainability, sequence emissions reductions and ensure progress against international commitments.

As the *2019 Audit* identified, the Australian Government will need to actively ensure Australia aligns its policy objectives with its commitment to the UN Sustainable Development Goals (SDGs). Australia has signed on to the 2030 Agenda for Sustainable Development, which commits this nation to working towards 17 SDGs.¹⁵ They include good health and wellbeing, responsible consumption and production, and climate action.

The COVID-19 pandemic led to fundamental change

The COVID-19 pandemic has reinforced the importance of understanding and strengthening critical connections and interdependencies between networks and assets, places and communities, and the economy. For example, many health and education services were able to move online because of government investment in digital technology and the National Broadband Network (NBN).

There was nationwide take-up of new technologies such as collaboration tools and cybersecurity, making it possible to move rapidly from physical to virtual service provision. This enabled business continuity and the ongoing functionality of the Australian economy. Many people were able to keep their jobs so they could continue earning and spending.

Going forward, harnessing a collaborative, flexible and adaptive approach to infrastructure will handle uncertainty, enhance community resilience, improve equitable access to opportunities and give communities the best chance to thrive.

Other trends that emerged during the pandemic, such as increased decentralisation of the energy supply and a revaluing of parks and other

community assets, should also be amplified and extended as Australia recovers. Supportive policy reforms will help to make the Australian economy more resilient and sustainable by providing opportunities for new industries and the jobs of the future.

How we developed the Plan for Sustainability and Resilience**Extensive stakeholder input**

The **Sustainability and resilience chapter** was developed through extensive research, analysis, collaboration and engagement. This was supported by Infrastructure Australia publications and work we undertook in partnership with Infrastructure NSW during 2020–2021, including:

- *A Pathway to Infrastructure Resilience: Opportunities for systemic change and Guidance for asset owners and operators in the short term*¹⁶
- *Sustainability Principles: Infrastructure Australia's approach to sustainability*¹⁷
- A review of the *Infrastructure Australia Assessment Framework*, which provides guidance on incorporating sustainability and resilience into infrastructure projects.¹⁸

The *2021 Plan* also takes into account feedback made through the *2019 Audit* stakeholder workshops and submissions process, and the stakeholder workshops Infrastructure Australia ran in collaboration with Infrastructure NSW. These covered the sector-specific and cross-sectoral impacts of shocks and stresses on infrastructure. The workshops were attended by more than 550 stakeholders from industry, community organisations, academia and all levels of government.

Infrastructure Australia, in collaboration with state and territory infrastructure bodies, also ran a workshop to better understand how climate risk factors affect infrastructure planning and decision-making. 40 people representing 19 organisations from the Australian Government, state and territory governments, academia and industry participated.

Acknowledgements

Infrastructure Australia is aware of the vast amount of work being undertaken in relation to sustainability and resilience. Australian governments and organisations have developed legislation, policy, recommendations and research that are relevant to the reforms highlighted in this chapter. Government and private sector organisations are also advancing efforts to embed resilience across all types of risk.

The following initiatives and work have been valuable inputs to the reforms proposed in this chapter:

- Australian Institute for Disaster Resilience: *Disaster Risk Handbook*¹⁹
- CSIRO report on *Climate and Disaster Resilience*²⁰
- Australian Business Roundtable for Disaster Resilience and Safer Communities: *Resilience Valuation Initiative*²¹
- The United Nations Office for Disaster Risk Reduction: *The Sendai Framework for Disaster Risk Reduction 2015-2030*²²

- National Resilience Taskforce and Department of Home Affairs: *National Disaster Risk Reduction Framework*²³
- NSW Treasury and Infrastructure NSW: *Guidelines for Resilience in Infrastructure Planning: Natural Hazards*.²⁴

In particular, the reforms are informed by the findings of *The Royal Commission into National Natural Disaster Arrangements Report*.²⁵



2.1 Infrastructure planning for an uncertain future

Key messages

- A **nationally consistent, all-hazards, systemic approach to understanding and quantifying risk** will ensure Australia's assets, networks, systems, communities and places are resilient.
- Risk and resilience assessments should consider the **multi-dimensional nature of challenges**, including a comprehensive approach to hazards, threats and future trends.
- **Identifying and communicating interconnections and interdependencies** before, during and after shocks or stresses is critical to managing systemic vulnerability.
- Effective decision-making needs **diverse and inclusive collaboration and data** that supports credible hazard, disaster and climate scenario forecasting.
- Quantifying the potential impact of disasters and the benefits of strengthening associated systems will **build the economic case for investing in resilience**.
- **Methodologies must be embedded** in early infrastructure planning, decision-making, maintenance and operations.
- **Frameworks and feedback mechanisms are required to gauge compliance and the success** of sustainability and resilience policy and investment.

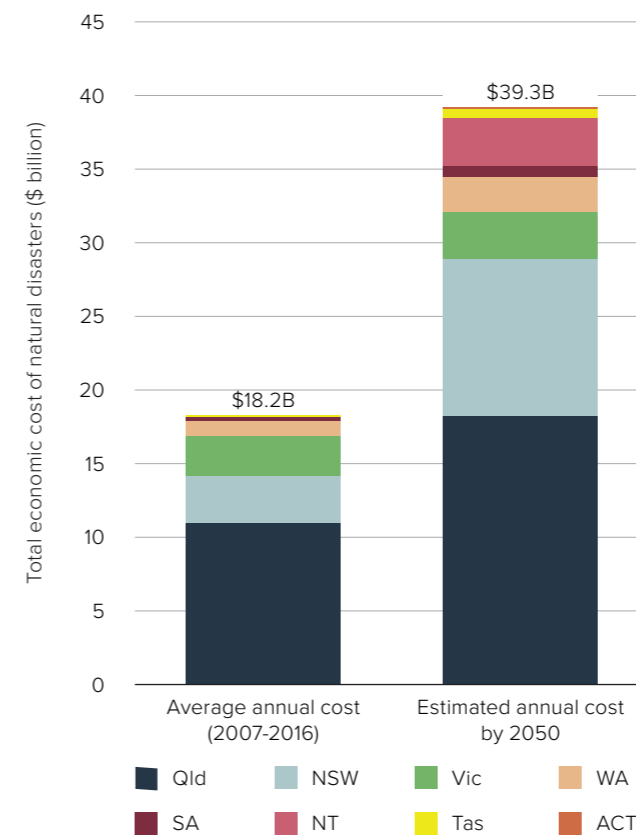


Building resilient communities through systemic, collaborative planning

The 2019 *Audit* found trends impacting infrastructure planning were creating growing uncertainty. Since then, bushfires, drought, storms, floods, coastal erosion, cyberattacks and the COVID-19 pandemic have highlighted the interconnected nature of Australia's infrastructure, environment, people and places. They have also shown the importance of building infrastructure resilience to safeguard communities, ecosystems and the economy.

While Australia has experienced profound disruption before, the scale, pace and interconnected nature of change is unprecedented today and predicted to grow.²⁶ As **Figure 2.2** shows, the related economic costs will increase accordingly.

Figure 2.2: The economic cost of disasters will more than double by 2050



Source: Australian Business Roundtable (2017)²⁷

As uncertainty increases and systems become more complex and interdependent, infrastructure assets and networks are becoming more vulnerable. In response, a systemic consideration of resilience has emerged as an approach that focuses on the capacity of a system to maintain or recover functionality in the event of disruption or disturbance.

It considers the contribution the asset makes to the resilience of the whole system rather than the resilience of the individual asset.

The first step in a systems approach to resilience is to develop a consistent, nationwide understanding of the risks Australia faces, including:

- community needs and preferences
- the value of resilience
- the ways infrastructure assets interact
- the systems they influence
- the roles and responsibilities for managing risks.

The singular, siloed perspective that is common today will largely have to shift to a collaborative approach that strengthens the resilience of assets and networks, systems, places and communities across Australia. This will demand coordination and collaboration across multiple government levels and sectors. No single sector or organisation can do this work alone.

Taking a systemic approach also means sharing responsibility and accountability across all participating organisations. To build a model of shared responsibility, infrastructure owners and operators must work with land use planners, emergency services, businesses, academics, technical experts and communities within, and across, state borders.

The model must align collaborative action with organisational responsibilities. In particular, it should set out clear responsibilities for governance and for coordinating place-based network and asset planning and decision-making.

An all-hazards approach will also be required. This assumes the functions and activities used to manage one event are likely to apply to a range of events, whether they are caused by natural or human activity. Event types include natural disasters, acts of terrorism, financial market crashes, failure of critical infrastructure (power, water and digital) and ecosystem collapse.

Collecting and analysing critical disaster and climate data, along with information on the exposure of people and assets, will help to develop a clear understanding of the full costs borne by communities when disasters strike. This will help to value resilience consistently through the infrastructure lifecycle. By quantifying the risks, costs, benefits and performance of resilient assets and consistently valuing resilience, there will be a stronger economic case for effective investment and more informed decision-making.

2.1 Recommendation

Build community resilience to all hazards by considering systemic risks, interdependencies and vulnerabilities in infrastructure planning and decision-making.

Proposed sponsor: National Recovery and Resilience Agency

Supported by: Department of Home Affairs, state and territory resilience agencies, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies, state and territory environment departments and asset owners and operators

When this should impact:

0-5

5-10

10-15

15+

Where this should impact:



- 0-5** **2.1.1 Create an environment for consistent action by establishing clear cross-sector policy priorities to inform resilience planning, policy prioritisation and reform decisions.**

Proposed lead: National Recovery and Resilience Agency

- 0-5** Improve strategic oversight and coordination of resilience outcomes across sectors and jurisdictions by establishing nationally consistent scenarios and common policy priorities.

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Prime Minister and Cabinet, Australian Treasury, Department of Home Affairs, Department of Agriculture, Water and the Environment, state and territory resilience agencies, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies and state and territory environment departments

- 0-5** **2.1.2 Improve community resilience and coordinated action through a consistent, nationwide, systemic approach to risk identification.**

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Home Affairs and Australian Climate Service

- 0-5** Facilitate collaboration across sectors, layers of government, asset owners and operators, businesses and communities by creating formal governance arrangements, resourcing and a convening authority in line with the *National Disaster Risk Reduction Framework*.

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Home Affairs, state and territory resilience agencies, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies, regional development bodies and state and territory environment departments

- 0-5** Enable timely information exchange and build accountability by expanding participants to the Trusted Information Sharing Network, sharing information and best practice and developing connections and ongoing relationships.

Proposed lead: Department of Home Affairs

Supported by: National Recovery and Resilience Agency, asset owners and operators, industry representative groups, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies and state and territory environment departments

- 0-5** Inform decisions on risk reduction options and approaches, and enable data driven decision-making by standardising and sharing data about disasters, hazards and asset and network interdependency.

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Home Affairs, Australian Climate Service, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies and state and territory environment departments

- 0-5** Improve place-based and network-based systemic risk assessment and decision-making by producing local hazard maps for asset owners and operators and communities.

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Home Affairs, Australian Climate Service, Department of Agriculture, Water and the Environment, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies, state and territory environment departments and asset owners and operators

- 0-5** Inform decisions to increase the resilience of a place, network or asset across Australia by identifying cascading systemic failures, interdependencies and interconnections and local vulnerability of all sectors' assets and networks.

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Home Affairs, Australian Climate Service, Department of Agriculture, Water and the Environment, local governments, state and territory departments of local government, asset owners and operators, and communities

- 10-15** Better predict and mitigate major hazards and risks with a national risk and disaster probability model for all hazards.

Proposed lead: National Recovery and Resilience Agency

Supported by: Department of Home Affairs, Australian Climate Service, state and territory planning departments, state and territory infrastructure departments, local governments,

state and territory emergency management agencies and state and territory environment departments

- 0-5** Ensure a systemic approach to resilience is established and considered by place-based resilience bodies, such as Resilience Sydney.

Proposed lead: Local governments

Supported by: State and territory departments of local government and National Recovery and Resilience Agency

- 0-5** **2.1.3 Facilitate joint action by establishing a common, long-term understanding of the potential impacts of climate change, both nationally and locally, that informs land use and infrastructure planning and decision-making.**

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: Australian Climate Service, National Recovery and Resilience Agency and state and territory environment departments

- 0-5** Enable consistent planning, shared responsibility and joint action by establishing long-term (2035, 2050 and 2100) Australian national climate scenarios. These should be based on possible climate futures that align with different Representative Concentration Pathways, and projections and forecasts for economic activity, energy use and land use patterns.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: CSIRO: Commonwealth Scientific and Industrial Research Organisation, Bureau of Meteorology and Australian Climate Service

- 0-5** Establish a national understanding of climate adaptation risk assessment by publishing and communicating the scenarios. Target communities with differing levels of scientific and technical expertise, from technical roles to decision-makers and the broad community. Ensure the tools and data are accessible and increase understanding.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: CSIRO: Commonwealth Scientific and Industrial Research Organisation, Bureau of Meteorology and Australian Climate Service

- 0-5** Support cross-sector coordination and shared responsibility by undertaking and publishing an annual assessment of the consideration and effectiveness of climate risk and resilience in infrastructure planning and decision-making.
Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies and industry representative groups
- 0-5** Embed climate risk considerations into land use and infrastructure planning and decision-making by developing a training program, tools and guidance materials.
Proposed lead: Infrastructure Australia
Supported by: National Recovery and Resilience Agency, state and territory planning departments, state and territory infrastructure departments, local governments, state and territory emergency management agencies, state and territory environment departments, state and territory infrastructure bodies and asset owners and operators
- 0-5** Ensure existing and future asset planning considers climate risk by conducting climate adaptation risk assessments, developing strategic planning and policy decisions, and designing and approving future assets using climate scenarios, tools and guidance.
Proposed lead: Infrastructure Australia
Supported by: National Recovery and Resilience Agency, state and territory infrastructure bodies, industry representative groups, asset owners and operators, infrastructure investment assurance and assessment agencies and state and territory treasuries
- 10-15** Ensure climate risk is incorporated into infrastructure projects and services by mandating the consideration of climate risk in project assessment.
Proposed lead: Infrastructure investment assurance and assessment agencies
Supported by: State and territory treasuries, state and territory infrastructure bodies and industry representative groups
- 0-5** **2.1.4 Ensure infrastructure decisions consider resilience through clear and harmonised guidance on how projects can address risks and value resilience.**
Proposed lead: State and territory infrastructure bodies
Supported by: Infrastructure investment assurance and assessment agencies, state and territory treasuries, industry representative groups, Coalition for Climate Resilient Investment and National Recovery and Resilience Agency
- 0-5** Ensure infrastructure assessment frameworks, and associated tools and guidance, including the *Australian Transport Assessment and Planning Guidelines*, consider risks and resilience by incorporating future scenarios and hazard information.
Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: Infrastructure Australia, state and territory infrastructure bodies, infrastructure investment assurance and assessment agencies, state and territory treasuries and ATAP Steering Committee Secretariat
- 0-5** Support land use and strategic planners, infrastructure and emergency planners and local governments to develop state and territory, regional and local plans by enhancing infrastructure assessment frameworks and associated climate and disaster risk tools and guidance.
Proposed lead: State and territory planning departments
Supported by: Australian Climate Service, National Recovery and Resilience Agency, Infrastructure Australia and state and territory infrastructure bodies
- 0-5** Value resilience in infrastructure investment by developing a training program and guidance materials on how to value resilience in decision-making through the infrastructure lifecycle.
Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies, industry representative groups and Coalition for Climate Resilient Investment

Measuring progress



Social

Natural disaster impact on people

Number of directly affected persons attributed to disasters (UN Sustainable Development Goal 13.11)²⁸

Target: 17.8
(per 100,000 population, 3-year average)

Timeframe: 0-5 5-10 10-15 15+



Governance

Consideration of climate risk

Percentage of proponents applying climate guidance and tools under Infrastructure Australia Assessment Framework

Target: 100%

Timeframe: 0-5 5-10 10-15 15+



Economic

Average annual cost of disasters

Stabilise the cost of disaster in real terms at 2019 levels²⁹

Target: (2019) \$18.2Bn

Timeframe: 0-5 5-10 10-15 15+



Ensuring national consistency and collaboration

Australia's infrastructure plays an essential role in making Australian communities resilient. Resilient communities can resist, absorb, accommodate, recover, transform and thrive in response to the effects of shocks and stresses in a timely, efficient manner to enable sustainable economic, social, environmental and governance outcomes.

“With growing uncertainty and change lying ahead, long-term investments such as infrastructure must accommodate changing circumstances.”

The 2019 *Audit* identified significant challenges that are preventing these outcomes. It concluded Australia needs comprehensive resilience strategies and reform that reduce the personal, social and financial costs of shocks and stresses by improving the resilience of assets and services.³⁰

With growing uncertainty and change lying ahead, long-term investments such as infrastructure must accommodate changing circumstances. Australia will spend over \$1 trillion on infrastructure before 2050.³¹ The challenge of responding to changing risks is particularly significant for long-lived assets with large capital costs, such as airports, dams and rail.

A nationally consistent approach to resilience based on a clear and concise articulation of policy priorities is required so reforms and investment can be prioritised.

Use scenario planning to plan for uncertainty

To complement the expression of national priorities, there should be a nationally consistent suite of scenarios to test how investments and reforms will perform. This would build on the work of the Australian Government's Centre for Population, including the *Population Statement*, the *Intergenerational Report* and CSIRO's *Australian National Outlook*.³²

National scenarios would provide regions and places with consistent principles and processes for developing localised scenarios. This would enable decision-makers to reflect on their objectives and understand and plan for a well-adapted and resilient future.

Scenario planning brings together high-quality data with scenarios that consider an agreed set of plausible futures. It is critical if infrastructure asset and network planning and decision-making is to support community resilience. Scenario planning is useful for stakeholders as it investigates and reviews interconnected and increasingly uncertain variables that enable them to plan for enhanced resilience.

A broad range of factors should be considered when building the scenarios, including (but not limited to):

- economic performance
- energy use
- population, settlement and land use patterns
- demographics
- technological trends
- geopolitical risks.³³

They should also consider climate change projections across standard Representative Concentration Pathways (greenhouse gas concentration trajectories used for climate modelling).³⁴ Scenarios should be regularly reviewed and updated to incorporate best international practice and the latest scientific modelling.

Adopt a systemic approach to managing risk

Australia's risk management approaches must adapt to meet the multifaceted challenges of hazard, exposure and vulnerability.³⁵ Doing this successfully requires a systems approach that emphasises collaboration, shared responsibility and accountability.

Systemic thinking shifts the focus from the resilience of a physical infrastructure asset to the contribution that asset makes to the resilience of the broader network, provision of critical services, supply chains and cross-sectoral systems. It allows interdependencies and vulnerabilities to be considered holistically, within the context of increasing shocks and stresses. This will strengthen the resilience of the asset, network, sector, place, precinct, city and region.

Taking a systemic approach not only changes the emphasis from asset to system, it moves responsibility from individual to shared responsibility. For example, protecting an asset or network requires collaboration across sectors, communities and local governments so disaster risk management is integrated into asset design and disaster risk management plans.

The steps towards transformational systemic change are described in the Infrastructure Australia and Infrastructure NSW paper *A Pathway to Infrastructure Resilience: Opportunities for systemic change*.³⁶ The pathway described would:

- **Set and monitor strategic resilience outcomes:** Governance that adopts a systemic view of risk and establishes the accountability and resources necessary to achieve system-wide resilience.
- **Adopt place-based approaches:** Planning tools and data to consider multiple place-based issues simultaneously and address resilience and community needs.
- **Manage uncertainty through scenario planning:** A common set of future scenarios to streamline planning and support cross-sector coordination and shared responsibility.
- **Ensure land use planning and development decisions support resilience:** Planning systems that value and set resilience as policy objectives, incorporate new and emerging data, capture local opportunities and assess strengths and weaknesses.

- **Improve infrastructure investment decision-making:** Agreed mechanisms and guidance for quantifying the projected economic, social, environmental and governance implications of the impacts associated with managing uncertainty or resilience.
- **Value green and blue infrastructure and biodiversity:** Improving the understanding, valuation and governance of green and blue infrastructure. Encouraging the use of green and blue infrastructure to address service needs, such as drainage, stormwater and erosion mitigation, as well as complementary quadruple-bottom-line benefits, such as space, habitat and recreational infrastructure.
- **Improve data needed for informed planning, action and decision-making:** Coordinating, sharing and standardising critical disaster and climate data, including data and information on shocks and stresses, the exposure of people and assets and the vulnerability of people.
- **Collect and share information on asset and network vulnerability:** Creating a shared understanding of potential impacts to interconnected systems and increasing asset and network owners' understanding of their decisions on interconnected systems.
- **Build trust through more inclusive decision-making:** Including communities and informing them about the risk, uncertainty and trade-offs related to infrastructure services and their livelihoods, and allowing people's active participation in determining possible outcomes.
- **Embed traditional ecological knowledge in decision-making:** Opportunities to systematically draw on traditional ecological knowledge to manage land and natural resources, and mitigate-risk.³⁷

“Australia's risk management approaches must adapt to meet the multifaceted challenges of hazard exposure and vulnerability.”

The recommendations in this chapter are just a starting point for embedding a systemic approach to managing risk. There will also need to be ongoing, broader changes aligned with the identified opportunities.



Consider resilience through a place-based lens

In a complex and interconnected environment, spatially constraining analysis to a defined place can support effective decision-making and allow a systemic consideration of risk.

Place-based planning is cross-sectoral and involves community collaboration so it can consider the ways society, the economy and environment come together to shape a distinct physical location.

Focusing on the interconnections between infrastructure assets and networks in a specific place and analysing the associated risks can support more effective decision-making and allow these risks to be systemically considered.

Having a better understanding of interdependencies between infrastructure networks will highlight cascading impacts from infrastructure outages. For instance, the cross-sectoral effects of electricity service disruption. This understanding allows more effective responses that make communities more resilient to shock or stresses.

Place-based planning is an important component of effective risk planning. It allows a finite physical network to be assessed against the risks posed by a range of hazards and scenarios. The result is that the most pressing shocks, stresses, systemic interdependencies and vulnerabilities are clearly identified for each location.

Collaborate to strengthen place-based resilience planning

Traditionally, decisions about land use, infrastructure planning, environmental conservation and emergency planning are often made in disconnected policy silos. By contrast, a cross-sectoral, place-based approach supports collaboration and coordination. This approach considers the impact of decisions of one sector on others, and thus supports more robust decisions.

Collaboration means all levels of government, along with stakeholders and communities, can consider multiple issues and their cross-sectoral effects simultaneously. This allows a systemic, cross-sectoral response to shocks and stresses rather than each sector addressing risk in isolation. A broader understanding of issues also allows place-based planners to consider and balance economic, social, environmental and governance outcomes.

Collaboration and coordination practices should be embedded into planning and infrastructure decisions. This will help build stakeholders' ability to develop

and maintain long-term adaptation strategies, where infrastructure networks and assets and the community are aligned and work together.

If local governments are limited by scale or resourcing, they should reduce duplication and optimise resources by jointly creating, resourcing and authorising place-based entities to convene stakeholders and plan for resilience.

Some Australian cities already have place-based, resilience-focused organisations. One example is Resilient Sydney, which is part of a global program that is building the capacity of cities to survive and thrive in the face of chronic stresses and acute shocks. These and similar initiatives can play an important role in making communities resilient.

“ Collaboration and coordination practices should be embedded into planning and infrastructure decisions. ”

Harness the power of diversity and inclusion

Australia's infrastructure systems are complex and many risks are systemic. Effective strategic planning, land use and investment decisions are therefore essential to mitigate damage to property, livelihoods and people during disasters.

Resilience planning should incorporate the views of local communities, technical specialists and organisations that can play a valuable role in strengthening resilience.

Incorporating diverse perspectives is essential to deliver robust, innovative decisions, by including governments, organisations and communities that understand local complexity.³⁸ The people who live with the consequences of disasters should be involved in resilience planning and understand the trade-offs for living and working in an area.

Communities have expert knowledge of how their local areas function — before, during and after shock events. By encouraging diverse input, decision-makers would be able to build on this information to create resilient communities that have stronger responses to a shock or stress.

It is important for planning to involve consultation with people who experience disproportionate impacts from shocks and stresses and are more vulnerable to the impacts. They include people with disability and chronic health conditions, Aboriginal and Torres Strait Islander peoples, and regional and remote communities.

Inclusive and participatory decision-making takes coordination and resourcing, so it is important to include local government. With a place-based remit and an established convening role within communities, local governments are well-placed to manage long-term community relationships and build local knowledge about needs, risks and opportunities.

The decision-making process should also involve Aboriginal and Torres Strait Islander people with expertise in managing the Australian environment.³⁹

Support decisions with the best available data

Access to good quality data is the foundation of a national system of shared responsibility for infrastructure risks. Robust decisions need to be based on critical and trusted data about the frequency and severity of shocks and stresses, the exposure of people and assets, and disasters, hazards and climate change. Currently, hazard and risk data is mostly fragmented, uncoordinated and unstandardised across states and territories. It is held by many organisations across multiple formats and applications. This limits the effective coordination of response, recovery and place-based and network-level planning. It also constrains systemic resilience.

“ Access to good quality data is the foundation of a national system of shared responsibility for infrastructure risks. ”

It is imperative to create a national hazards information system to develop, hold and share credible, trusted hazard and risk information that supports evidence-based risk assessments. It will take time to standardise data. A harmonised approach should initially be implemented to gather comparable and compatible types, sources and levels of data.⁴⁰

A national hazards information system should provide:

- data on hazards and the community, including exposure, inequality, vulnerability and other factors contributing to shocks and stresses
- climate projections that underpin climate risk data
- data that is user-focused, accessible and can be used for a range of applications
- data that is high-quality, timely, trustworthy, consistently available and at the right level of granularity⁴¹

- functionality that allows users to interpret data without being a technical specialist or climate change expert
- data collection and reporting systems that are standardised across sectors and jurisdictions for consistency and interoperability
- appropriate protections around confidentiality, privacy and security.⁴²

A shared understanding of what risk and hazard information is required, rather than the data itself, can help to establish ownership. This is particularly true where there is personal or privately held data, which cannot be accessed or shared by governments.

In situations of systemic risk, complexity and uncertainty, a complete dataset to inform a decision will often not be available. If data is absent or ambiguous, decision-makers need robust tools to enable them to act, such as national scenarios and common policy priorities. The necessary reforms to support resilience decision-making are described in detail in *A Pathway to Infrastructure Resilience: Opportunities for systemic change*.⁴³

Apply consistent national scenarios

The amount of government funding available is finite, so it has to be targeted. To help with the decision-making process, local governments should align to national goals and common scenarios, identify local impacts and consider current and future risks in their area (see Table 2.1). This would enable resilience priorities to be compared with other communities.

The process would include assessing existing assets, networks and systems performance and conducting gap analysis. This will identify the most pressing systemic vulnerabilities and risks for each local government area, and allow their comparison.

To make this approach effective, collecting performance data for infrastructure assets across Australia would need to be routine and standardised. Network and asset-level performance data is a critical input into both place- and network-based resilience assessments, and into systemic thinking.

Another valuable input into scenarios is refined estimates of hazard frequencies and damages. A national risk and disaster probability model for all hazards should be created to ensure they are more accurately predicted and mitigated.

Assessing national risks at a local level

A 2019 report by climate risk analysts XDI, *Climate Change Risk to Australia's Built Environment – A Second Pass National Assessment*, examined Australia's climate risk between 2020 and 2100 by analysing five hazards:⁴⁴

- bushfire
- riverine flooding
- coast inundation
- subsidence
- wind.

This granular data set considered more than 15 million Australian addresses in 544 Local Government Areas and ranked Local Government Areas for current and future risk vulnerability (see **Table 2.1**). The analysis is helping to develop a better understanding of localised resilience and vulnerability so interventions can be more targeted. The first edition of this project was funded by the Australian Government.⁴⁵

Table 2.1: Access to comparative national data helps to build a compelling local business case

Top 10 Local Government Areas at risk. All hazards – 2020				
Rank	TTIPS	VAR%	HRP#	HRP%
1	Gold Coast, Qld	Greater Shepparton, Vic	Gold Coast, Qld	Greater Shepparton, Vic
2	Brisbane, Qld	Wangaratta, Vic	Brisbane, Qld	Wangaratta, Vic
3	Sunshine Coast, Qld	Mid Murray, SA	Greater Shepparton, Vic	Murray, WA
4	Greater Shepparton, Vic	Murray, WA	Sunshine Coast, Qld	Maranoa, Qld
5	Central Coast, NSW	Gold Coast, Qld	Fraser Coast, Qld	Mid Murray, SA
6	Fraser Coast, Qld	Fraser Coast, Qld	Wangaratta, Vic	Federation, SA
7	Moreton Bay, Qld	Tweed, NSW	Mandurah, WA	Horsham, Vic
8	Wangaratta, Vic	Maranoa, Qld	Bundaberg, Qld	Mandurah, WA
9	Tweed, NSW	Noosa, Qld	Tweed, NSW	Fraser Coast, Qld
10	Mackay, Qld	Douglas, Qld	Moreton Bay, Qld	Hinchinbrook, Qld

Top 10 Local Government Areas at risk. All hazards – 2100				
Rank	TTIPS	VAR%	HRP#	HRP%
1	Gold Coast, Qld	Greater Shepparton, Vic	Gold Coast, Qld	Greater Shepparton, Vic
2	Brisbane, Qld	Wangaratta, Vic	Brisbane, Qld	Murray, WA
3	Sunshine Coast, Qld	Mid Murray, SA	Sunshine Coast, Qld	Adelaide Hills, SA
4	Greater Shepparton, Vic	Murray, WA	Central Coast, NSW	Wangaratta, Vic
5	Central Coast, NSW	Gold Coast, Qld	Newcastle, NSW	Mundaring, WA
6	Moreton Bay, Qld	Tweed, NSW	Greater Shepparton, Vic	Mid Murray, SA
7	Fraser Coast, Qld	Fraser Coast, Qld	Fraser Coast, Qld	Maranoa, Qld
8	Tweed, NSW	Mandurah, WA	Moreton Bay, Qld	Noosa, Qld
9	Mackay, Qld	Douglas, Qld	Mandurah, WA	Narrabri, NSW
10	Mandurah, WA	Noosa, Qld	Tweed, NSW	Western Downs, Qld

TTIPS: The Total Technical Insurance Premium is the annual average loss per address (or group of addresses) for all hazard impacts in a Local Government Area.

VAR%: Percentage of Value at Risk is the technical insurance premium expressed as a percentage of a single asset's replacement cost, specified for a 1-year period with no discounting of the technical insurance premium or the asset replacement cost.

HRP#: Number of High Risk Properties. An asset is classed as becoming High Risk if its VAR% for a given year exceeds 1%.

HRP%: Percentage of High Risk Properties.

Source: XDI (2019)⁴⁶

Value resilience in investment decisions

Investing in resilient design can minimise losses of service and reduce whole-of-life costs for infrastructure owners, users and taxpayers. It also ensures assets contribute to the systemic resilience of their locations and the communities they serve.⁴⁷

To minimise costs and increase value, the value placed on resilience through the infrastructure lifecycle must be consistent. A national approach to quantifying the risks, costs, benefits and performance of resilient assets would embed the economic case into the business case for investment, along with commercial whole-of-life cost considerations.

Harmonising national and jurisdictional business case and project assurance guidance would provide a consistent understanding of how projects support community resilience.⁴⁸ This would clarify the best-value opportunities for interventions that enable adaptation or mitigation.

To support evidence-based decisions, data and common scenarios should be used to quantify the costs for the interventions needed to build community resilience. The benefits should be evaluated from a broad, systemic and whole-of-life perspective, and include those that flow to communities over time as places and systems become more resilient.

It is equally important to consistently quantify the full costs of disasters borne by communities beyond loss of life, injury and damage to infrastructure and property.

These include the impact of service disruptions on small to medium enterprises, community trauma and declining wellbeing, and damage to, or loss of, features of cultural value and natural ecosystems.⁴⁹ This will assist in analysing the value of resilience investment.

The intent is to realise a nationally consistent process for valuing resilience. The new approach should include:

- a methodology for undertaking place-based resilience assessments within business case development over infrastructure's long-term lifecycles of 50 to 100 years
- an information campaign for all decision-makers that includes practical guidance and training materials so resilience can be consistently considered across Australia
- high-quality data and resilience scenarios for testing interventions⁵⁰
- alignment with national and jurisdictional business case and project assurance guidelines, including the *Australian Transport Assessment and Planning Guidelines*.⁵¹

Embedding these aspects will produce a standardised, Australia-wide process for valuing resilience that analyses the full value of resilience investment.



Using green and blue infrastructure to address extreme heat

The role of green and blue infrastructure in supporting liveability, including cooling urban spaces, requires clear and consistent acknowledgement. Green and blue infrastructure includes natural, managed and constructed green spaces, waterways, wetlands, lakes and marine environments.

It plays a vital role in supporting liveability by having a positive impact on health, productivity, culture, ecosystem services and property values. Importantly, it also cools urban spaces, a role that must be considered in land use planning and infrastructure plans.

Cooling makes Australia more liveable as it mitigates extreme heat, a complex stress that can trigger shocks. Extreme heat kills more Australians than any other natural stressors.⁵² An estimated 2% (36,000) of total deaths were associated with heat between 2006 and 2017.⁵³

The impact of heat on Australian cities is expected to continue growing due to our changing climate, the urban ‘heat island’ effect (where an urban area is warmer than the surrounding environment) and changing settlement patterns.

Responsibility for addressing extreme heat in urban design and designing, delivering and maintaining green and blue infrastructure sits across state and territory governments, local governments and the property industry. Collaboration will be necessary to ensure a nationally consistent approach and realise the liveability and health benefits.

What should governments do?

Green and blue infrastructure should be categorised as an asset class and an agreed methodology developed to quantify the benefits it delivers. The methodology should also consider costs, including ongoing maintenance costs to enable resourcing.

Addressing extreme heat and promoting and protecting green and blue infrastructure must be embedded as objectives for strategic planning. These should also be codified in regulations, building and design codes and standards.

Green and blue infrastructure should be prioritised as a risk mitigation and adaptation intervention, with targets for reducing extreme heat in urban areas by increasing or maintaining green and blue infrastructure.

There also needs to be a consistent approach to developing high-quality data:

- Data on the **quantity, quality and spatial distribution of green and blue infrastructure** should be analysed to identify the baseline performance of places during heatwaves. This can help develop priorities, enable monitoring and progress evaluation.
- Performance data should **identify the people and places most exposed to extreme heat**, including the health status, demographic structure and vulnerability of local populations. This will create a map of where heat and community vulnerability intersect.

For more information about measuring the economic impact of green and blue infrastructure, see the **Social infrastructure chapter**.





2.2 Technology-led sustainability

Key messages

- Infrastructure is sustainable when it is planned, designed, procured, constructed and operated to **optimise economic, environmental, social and governance outcomes over the life of the asset**.
- By **integrating sustainability into planning and decision-making**, Australia will meet present needs without compromising the future.
- Infrastructure assets, networks, services and communities will be **critical in meeting government and industry commitments to sustainability**, including reducing emissions.
- Australian governments have a common aspiration to net zero emissions but **there are varied commitments and targets**.
- As infrastructure can operate for 40–100 years, **investments made today must consider a net zero future**, including investing in technology that enables it.
- Governments must leverage a **comprehensive understanding of each sector's emissions profile** to coordinate action, identify opportunities and plot short- and long-term emissions reduction pathways.
- Certainty, confidence and adequacy of policy settings helps investors to manage risk. Prioritising long-term sustainability outcomes can **attract investment in new and emerging low-emissions technology and industries, assist post-pandemic recovery and create jobs**.
- **Policy reforms need to acknowledge they do not occur independently of the infrastructure that is in place and investment in the future**, so they increase value for money outcomes and contribute to emissions reduction while maintaining a strong economy and high quality of life and affordability for all Australians.

Ensuring infrastructure contributes to sustainable outcomes

The Australian Government's commitment to reach net zero and its *Technology Investment Roadmap* is aligned to the challenges and opportunities identified in the *2019 Audit*.⁵⁴ One area that still needs action is the *2019 Audit*'s finding that Australia could lead the world in developing and applying approaches to infrastructure that enhance sustainability.⁵⁵

Taking a leadership position would provide many benefits for this country. It would attract investment; develop new industries; enhance the resilience of infrastructure outcomes; provide a competitive advantage for infrastructure sector exports; and present new export opportunities for manufacturing, primary industries and service businesses.

The concept of sustainable infrastructure is embedded in this Plan, which considers sustainability outcomes throughout, including: managing waste through a circular economy; increasing water security; energy efficiency and renewable generation uptake; and securing broad economic and social outcomes through a range of social infrastructure projects and services. These outcomes and the associated activities and reforms are detailed in the relevant chapters: **Water, Waste, Energy and Social infrastructure**.

Additionally, to help prioritise the reforms within the *2021 Plan*, Infrastructure Australia has applied a quadruple-bottom-line view of sustainability outcomes (economic, social, environmental and governance) when assessing the trade-offs of the reforms. This is provided in the **Reform Priority List**.

The need for broad and specific reforms

The sustainability reform outlined in this chapter focuses on embedding the quadruple bottom line as a goal for all infrastructure policy and investment. The sector-specific and wider reforms highlight the value of balancing sustainability.

The emissions reduction reforms are presented in that context, reconciling value for money infrastructure assessments with considerations of the 40-to-100-year operating lives of infrastructure assets and the timelines demanded by commitments to a net zero future.

In many cases, as well as environmental benefits, shifting to lower-emissions infrastructure will also lead to economic, social and governance benefits. These include supporting existing and emerging low-emissions technologies to create new jobs and industries, diversifying Australian agriculture and land management industries, and providing increased access to comparable governance information.

We have mainly focused on infrastructure assets with strong Australian Government involvement and high potential to support emissions reduction targets, such as transport. However, we also encourage state and territory governments and local councils to improve the sustainability of social infrastructure.

Sustainable infrastructure

The assets, networks and systems that connect and provide access to services for communities today without compromising the ability of future generations to meet their needs.

Sustainable infrastructure is planned, designed, procured, constructed and operated to optimise economic, environmental, social and governance outcomes over the life of the asset.

A sustainable approach to infrastructure is outlined in *Sustainability Principles: Infrastructure Australia's approach to sustainability*.⁵⁶

Meeting emissions reduction commitments

Australia's international commitments to reduce emissions are evident in a number of emissions reduction policies across levels of government.

The Australian Government has committed to a technology-led approach to reduce emissions, focusing on investments in new and emerging low-emissions technologies that drive economic growth.⁵⁷ Prime Minister Scott Morrison has signalled an intention to achieve net zero 'as soon as possible, and preferably by 2050'.⁵⁸ Australia is also a party to the *Paris Agreement*

(United Nations Framework Convention on Climate Change), which mandates the reduction of greenhouse gas emissions by 26% to 28% by 2030 compared to 2005 levels.⁵⁹

States, territories and many local councils have adopted ambitious commitments to a net zero future. They have done this through progressive policies and whole-of-economy or sectoral targets to either reduce emissions or reach net zero emissions by 2050 or earlier.⁶⁰

In many cases, government commitments follow private sector leadership. Investors are moving rapidly to capitalise on opportunities associated with the transition to a low-carbon future and limit their exposure to climate and carbon risk.

Collectively, these trends present opportunities for governments to:

- attract additional competitively priced investment in assets that are designed and operated to reduce emissions
- deliver sustainability outcomes for the community
- lead through policy settings that provide certainty and confidence for business.

Governments have the power to pull many levers to accelerate change, particularly in Australia's most emissions-intensive infrastructure sectors. They can do this through infrastructure assessment frameworks, performance and procurement targets, reporting, and changes to standards and regulations.

Individually and collectively, these changes have the potential to catalyse sustainable investment in the best interests of current and future users and taxpayers.



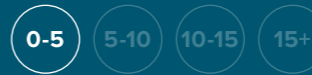
2.2 Recommendation

Meet Australia's present and future needs by establishing the quadruple bottom line as a goal for all infrastructure policy and investment.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory environment departments

When this should impact:



Where this should impact:



0-5 2.2.1 Achieve consistency and shared ownership through embedding the quadruple-bottom-line into infrastructure decision-making frameworks.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Infrastructure investment assurance and assessment agencies, state and territory treasuries and state and territory infrastructure bodies

Proposed lead: State and territory treasuries
Supported by: Infrastructure investment assurance and assessment agencies and state and territory infrastructure bodies

0-5 Ensure consistent understanding by adopting the quadruple-bottom-line definition of sustainability.

Proposed lead: State and territory environment departments

Supported by: State and territory infrastructure delivery agencies, state and territory infrastructure bodies and state and territory treasuries

0-5 Facilitate national and cross-sectoral consistency by using quadruple-bottom-line guidelines to develop complementary, sector-specific sustainability principles and frameworks.

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies, infrastructure investment assurance and assessment agencies, state and territory treasuries and industry representative groups

0-5 Meet Australia's commitments to net zero through long-term sector-specific plans that set interim emissions reduction targets and strategies that prioritise infrastructure investments and services.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory environment departments, industry representative groups

0-5 Support common approaches to assessment, cross-sector collaboration, shared responsibility and best practice, and develop connections and networks, by forming a cross-jurisdictional sustainability group.

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies, infrastructure investment assurance and assessment agencies, state and territory treasuries and industry representative groups

0-5 Ensure consistent application of the quadruple-bottom-line at the strategic proposal development phase by embedding sustainability guidelines in investment frameworks and guidance materials. These should include considering sustainability when identifying problems, developing options and undertaking economic analysis.

0-5 2.2.2 Deliver cost-effective emissions reduction and broad sustainability benefits consistent with the quadruple-bottom-line by prioritising energy efficiency in the built environment and social infrastructure.

Proposed lead: State and territory social housing providers
Supported by: Community housing providers, state and territory education departments and state and territory housing departments

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- 0-5** Identify potential to embed quadruple-bottom-line outcomes in social infrastructure assets by auditing existing social infrastructure assets and using Green Building Council of Australia's Green Star rating system, Infrastructure Sustainability Council of Australia IS Rating Scheme and NABERS tools.

Proposed lead: State and territory infrastructure departments
- 0-5** Ensure quadruple-bottom-line outcomes by introducing procurement standards. These should mandate sustainable performance, including energy efficiency measures and the electrification of appliances, for government-owned social infrastructure.

Proposed lead: State and territory infrastructure departments
- 0-5** Ensure quadruple-bottom-line outcomes by accelerating performance upgrades to social infrastructure, including schools, hospitals and public and community housing stock. Prioritise the increased installation of solar PV, storage and smart meters in social housing.

Proposed lead: State and territory housing departments, state and territory health infrastructure agencies, state and territory education departments
- 0-5** Improve energy efficiency and reduce emissions from new social infrastructure by increasing performance standards and updating the National Construction Code in line with the *Trajectory for Low Energy Buildings*.

Proposed lead: Building Ministers Meeting
Supported by: State and territory housing departments, Australian Building Codes Board, state and territory health infrastructure agencies, state and territory education departments, and state and territory government property agencies
- 0-5** Support ongoing monitoring and improvements in social housing by creating and implementing a work program for updating energy performance standards that streamlines approval processes and conducts regular reviews.

Proposed lead: State and territory energy departments
- 0-5** Ensure the built environment's emissions reduction pathway is understood and coordinated by establishing collaborative sectoral leadership groups, similar to the Better Buildings Partnership or the Materials and Embodied Carbon Leaders' Alliance.

Proposed lead: State and territory environment departments
Supported by: State and territory energy departments and state and territory transport departments
- 0-5** **2.2.3 Deliver cost-effective emissions reduction and broad sustainability benefits consistent with the quadruple bottom line by managing zero emissions vehicle uptake and vehicle standards.**

Proposed lead: Department of Industry, Science, Energy and Resources
- 0-5** Ensure the uptake of electric vehicles at the right scale and time to optimise quadruple-bottom-line benefits by delivering a national electric vehicle strategy through the expansion of the Future Fuels Strategy.

Proposed lead: Department of Industry, Science, Energy and Resources
- 0-5** Facilitate cost-effective emissions reductions by aligning vehicle emission standards with global best practice and requiring manufacturers to reduce emissions over vehicle portfolios.

Proposed lead: Department of Industry, Science, Energy and Resources
- 0-5** Ensure national consistency and coordination by aligning state and territory strategies and actions to the national strategy, including targets and timelines for transitioning all government fleet vehicles to electric vehicles whenever they are fit-for-purpose.

Proposed lead: State and territory finance departments
Supported by: Australia, state and territory government fleet managers, and state and territory transport departments

Measuring progress



Environment

Greenhouse gas emissions

Infrastructure sector emissions – net zero by 2050⁶¹

Target: Net zero

Timeframe: 0-5 5-10 10-15 15+



Governance

Quadruple-bottom-line

Percentage of projects submitted to Infrastructure Australia that are expressed and measured against the quadruple bottom line of economic, environmental, social and governance outcomes

Target: 100%

Timeframe: 0-5 5-10 10-15 15+



Environment

National climate adaptation scenarios

Percentage of Australian, state and territory government infrastructure strategies adopting common climate scenarios

Target: 100%

Timeframe: 0-5 5-10 10-15 15+



Applying common sustainability principles

Sustainability means many things to many people. Without agreeing on common principles, it is difficult to prioritise actions, value outcomes or plan and partner for shared goals. Although sustainability is commonly referenced across all forms of infrastructure, the desired outcomes are often narrow, unaligned or short-sighted.

Decision makers typically focus on one issue, such as reducing emissions or waste, without considering complementary benefits or costs. As a result, cost-effective sustainable practices that are in the best interests of users and taxpayers are often overlooked. Ignoring these outcomes is a missed opportunity. It risks increased costs and a lower quality of life for future generations.

Always consider the quadruple-bottom-line

Infrastructure Australia’s recommended sustainability principles are based on a quadruple-bottom-line definition that covers social, economic, environmental

and governance components (see **Table 2.2**).⁶² For each sustainability principle, specific factors will help to achieve sustainable outcomes.

These principles help industry, governments and communities to better understand their roles, responsibilities and aims, and the opportunities for embedding sustainability into projects and services.

“Every principle must be considered and balanced when making decisions to ensure the best long-term outcomes and trade-offs.”

Regardless of the complexity of the challenges facing these groups, every principle must be considered and balanced when making decisions to ensure the best long-term outcomes and trade-offs. Balancing them helps communities to be functional and fair while not adversely impacting future generations and the planet. This applies to every infrastructure issue, from dredging ports to constructing energy generation facilities.

Table 2.2: Quadruple-bottom-line sustainability principles leads to better outcomes

Component of sustainability	Principle
Social	Infrastructure and policies should improve quality of life, access and wellbeing to create an inclusive and fair society.
Economic	Infrastructure and policies should grow productivity, the Australian economy and allow equitable access to economic and growth opportunities, while efficiently using financial resources.
Environmental	Infrastructure and policies should protect environmental outcomes by reducing pollution, balancing resource consumption, conserving natural ecosystems and resources, and supporting climate mitigation and adaptation.
Governance	Infrastructure and policies should build trust in governance and institutions through transparent, accountable and inclusive decision-making.

Source: Infrastructure Australia (2021)⁶³

Unlock the potential of infrastructure to reduce emissions

As a party to the *Paris Agreement*, the Australian Government has committed to reducing greenhouse gas emissions by 26% to 28% by 2030 compared to 2005 levels.⁶⁴ Prime Minister Scott Morrison has signalled an intention to achieve net zero ‘as soon as possible, and preferably by 2050’.⁶⁵ The *Climate Solutions Package*, *Australia’s National Hydrogen Strategy*, *Future Fuels Strategy* (due for release in late 2021), *Technology Investment Roadmap* and *Low Emissions Technology Statement* have all been developed to support this national commitment.⁶⁶ These policies outline the Australian Government’s intention to support, develop and use new and emerging low-emissions technologies to reduce emissions, develop new industries and increase productivity.

All state and territory governments have committed to achieving net zero emissions by 2050.⁶⁷ States, territories and local councils are responsible for infrastructure design, delivery and operations. Emissions reduction can be achieved during each of these stages. The private sector also needs to act, as state and territory emissions targets cover all emissions produced within the state, not just by assets that are overseen by the government.

Nationally and across jurisdictions, emissions reduction targets are informing innovation and reform in relation to infrastructure. As the infrastructure sector influences about 70% of Australia’s emissions, it must be a leading enabler and adopter of low-emissions technology.⁶⁸ It should play a stronger role in meeting Australia’s emissions commitments and targets across all levels of government. This is particularly true in the most emissions-intensive infrastructure industries, such as transport and energy, which are prioritised in this Plan.

Let investor appetite inform government policy

The global transition to a low-carbon economy, which aligns with *Paris Agreement* outcomes, is estimated to require developed countries to invest \$2.6 trillion each year for the next decade.⁶⁹ Much of this transitional capital can be funded or financed by the private sector.

Australian and international investors have a strong appetite for low-emissions-intensity assets. This capital is available to support and accelerate a low-emissions COVID-19 pandemic economic recovery.⁷⁰ Private sector appetite stems from the long-term financial security of investing with sustainability in mind.

There are also concerns about climate change’s potential to cause structural shocks to capital markets that would spread across economic systems and potentially damage companies’ social licence to operate.⁷¹ Worldwide, there are currently an estimated \$17.5 trillion of assets at risk of becoming stranded (stranded assets are those that used to have value but no longer do).⁷²

In this environment, the private sector is increasingly demanding visibility of low-carbon production and supply chain sustainability for their purchases. Many investors are reducing their exposure to commodities, assets and services that contribute to the impact of climate change.⁷³

In a globally competitive investment market, maintaining private sector confidence and minimising risk is critical to support investment.⁷⁴ For example, to encourage more investment and a durable market, California has set a maximum level of greenhouse gas emissions per unit for several building materials.⁷⁵

To help with decision-making, investors also expect higher levels of transparency and reporting on the risks and opportunities associated with climate change so they can reduce their risk exposure.

“As the infrastructure sector influences about 70% of Australia’s emissions, it must be a leading enabler and adopter of low-emissions technology.”

To continue attracting private sector investment for their projects, governments at all levels must respond to these demands by increasing their focus on:

- delivering sustainability through planning and procurement
- enabling sustainability by adopting new technologies
- supporting investment in new and emerging low-emissions technologies
- adopting higher standards of evidence of, and reporting on, sustainability in operations and outcomes.

Governments can drive change through effective plans, policies and incentives, and set rules that minimise the burden on developers while optimising quadruple-bottom-line outcomes for the way assets and networks are designed, built and operated.

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Governments should also set standards and targets for the assets they own, including procurement targets for sustainable materials and technologies.⁷⁶ Strengthening these settings will provide infrastructure owners and operators, investors and suppliers with certainty regarding the supply, maintenance and warranty of these materials.

Acting to reassure investors will benefit users and taxpayers. A stable, transparent and properly regulated environment will attract cheaper capital. This will lead to lower costs for users and taxpayers.

Use audits and ratings tools to calculate and enhance performance

To identify priorities for improving and investing in sustainable infrastructure, an understanding of baseline asset performance is critical. States and territories should audit health assets, schools and education infrastructure, and social housing to understand data gaps and establish need.

Publicly reporting the audit results would create a database for inter- and cross-jurisdictional comparison, attract investment and support best practice. These rating tools are effective ways to target investment, benchmark sustainability performance, set priorities and enable transparent reporting across a range of assets:

- **NABERS** measures the environmental performance of Australian buildings and tenancies, including energy efficiency, water usage and waste management as well as the environmental quality of a building and its impact on the environment.⁷⁷
- The **Infrastructure Sustainability Council of Australia IS Rating Scheme** evaluates sustainability across the planning, design, construction and operational phases of infrastructure programs, projects, networks and assets.⁷⁸
- **Green Building Council of Australia's Green Star** is a holistic rating system for evaluating sustainability across the design, construction and operational phases of buildings and social infrastructure fit-outs and precincts.⁷⁹
- **GRESB's Global ESG Benchmark for Real Assets** scores and benchmarks environmental, social and corporate governance (ESG) performance data, providing business intelligence and engagement tools to investors and managers.⁸⁰

All these tools can also provide the data required to qualify for certified financing instruments that will attract investment.⁸¹

Develop a comprehensive emissions reduction strategy

The Australian Government is developing a *Long-term Emissions Reduction Strategy*, which it will take to the 26th United Nations Framework Convention on Climate Change Summit in Glasgow in 2021.⁸²

To create this strategy, governments need an emissions profile for each sector so they can precisely coordinate value-for-money, effective cross-sectoral emissions reduction plans. This will enable them to meet targets by identifying the most effective sector and cross-sector actions to support emissions reductions. Governments already have access to this data. For example, the *National Inventory* provides greenhouse gas emission estimates by economic sector, and the *State and Territory Greenhouse Gas Inventories* provide an overview of each state and territory's annual greenhouse gas emission estimates.⁸³

Whether it is mandated or a target, the trajectory of emissions reduction is an important consideration when planning for infrastructure as part of a transition away from energy- or carbon-intensive infrastructure assets. While there are forward-looking plans to capitalise on low-emissions technology, there needs to be further work on planning for the withdrawal of large carbon-intensive assets to conform with government aims.

By doing so, Australia can capitalise on the opportunities presented by new and emerging technologies.

Government emissions-reduction strategies should identify near-term opportunities. They should also plan for staged investment in sectors that require either more time or further research and development before transitioning to a low-emissions future.

As **Table 2.3** shows, the contributions that past, present and estimated emissions make to Australia's overall total vary considerably by sector. The electricity sector and transport sector account for 51% of Australia's total emissions.⁸⁴ Since 2016, emissions in electricity have fallen as large amounts of renewable generation have entered the market.⁸⁵ This trend is expected to continue, as discussed in the **Energy chapter** of this Plan.

Transport emissions have grown faster than any other sector, increasing by 60% since 1990.⁸⁶ Light vehicles now make up 41% of all transport emissions.⁸⁷ This is predominantly due to Australians' reliance on private vehicles, which has grown since the COVID-19 pandemic.⁸⁸ The transport sector should therefore be prioritised for emissions abatement.

Sector emissions summaries, alongside other emissions profiles, are useful tools for governments and private sector decision-makers when monitoring and planning long-term, phased-in emissions reductions.



Table 2.3: Sectors' emissions contributions vary so they need tailored reduction strategies

Sector	National Greenhouse Gas Inventory		Projection
	2005 (Mt CO ₂ -e)	2020 (Mt CO ₂ -e)	2030 (Mt CO ₂ -e)
Electricity	197	170 ↓	111 ↓
Stationary energy	82	102 ↑	103 ↑
Transport	82	90 ↑	100 ↑
Fugitives	41	51 ↑	54 ↑
Industrial processes and product use	31	30 ↓	30 –
Agriculture	86	72 ↓	75 ↑
Waste	16	13 ↓	11 ↓
Land use, land use change and forestry	95	-19 ↓	-5 ↑
Total	630	510 ↓	478 ↓

NotesMt CO₂-e: Million tonnes of carbon dioxide equivalent

2005: Actual emissions for year to June 2005, as of September 2020 inventory (released 2021)

2020: Actual emissions for year to September 2020, as of September 2020 inventory (released 2021)

2030: Projected emissions for 2030, as of December 2020 projections (released 2020)

Totals may not add up due to rounding.

Source: Department of Industry, Science, Energy and Resources (2020, 2021)⁸⁹**Use emissions data to improve decision-making**

Harnessing our understanding of how the sources and scale of emissions are impacted by activities throughout supply chains and across sectors enables effective decision-making. It can help to:

- accurately identify the benefits of fuel choice, such as diesel or electrification
- identify embodied energy in materials, such as concrete or steel
- support local product sources to reduce supply chain resource consumption and energy intensity.

Understanding where emissions are generated in each sector, supply chain and asset help to coordinate action. It means businesses better understand their emissions profiles, highlighting immediate opportunities to improve productivity and efficiency across supply chains.

For governments, emissions data is the foundation for sequenced emissions reductions.⁹⁰ Using this information to develop strategies for reducing sectoral emissions will help them plan more precisely and meet their incremental emissions reduction targets.

Support long-term targets

Many assets built or retrofitted today will be used for decades to come.⁹¹ Investment decisions therefore require a thorough understanding of their operational life, benefits and costs. It is critical their planning and delivery aligns with a trajectory that will achieve long-term net zero emissions targets. Without a clear, widely supported target, any infrastructure asset investment with a 40–100 year operating life must consider net zero compliance.

This is particularly critical for infrastructure owned or overseen by state and territory governments, such as land transport, ports, energy, water, waste and social infrastructure, where targets to reach net zero by 2050 are ubiquitously in place.

To meet the Australian Government's net zero ambition, any future infrastructure investment in an infrastructure sector it oversees must plan for net zero. This includes telecommunications, aviation, national surface transport and some social infrastructure.

Most federal assets are long-term, with operating windows extending into the second half of the century. This includes those that are currently under consideration, such as irrigation dams, pumped hydroelectricity and faster rail.

Plan for the future for every sector

All governments should support infrastructure planning for reduced emissions through long-term, sector-specific plans. These will deliver sector-specific interim targets and strategies and acknowledge opportunities for emissions reduction across different sectors and supply chains.

These plans should draw on industry experience, make best practice for emissions reduction mainstream, support new and emerging low-emissions technologies, and incentivise innovation through research and development.

If they fail to do this, Australia could be left with the costs of stranded emissions-intensive infrastructure. This will hamper global competitiveness and increase emissions while burdening users and taxpayers with avoidable costs.

“Without a clear, widely supported target, any infrastructure asset investment with a 40–100 year operating life must consider net zero compliance.”

Governments should plan for, invest in and apply sustainable infrastructure solutions throughout the entire infrastructure lifecycle. The most transformative, lowest-cost sustainability benefits can be captured in the early phases of project inception, scoping and strategic planning.



Embed sustainability in infrastructure assessment

Embedding sustainability in infrastructure assessment will help to drive more sustainable and cost-effective projects. In particular, sustainability should be considered during problem identification, options development and base and project cases for cost–benefit analysis and material impacts.

For assets that are procured, funded and built by the Australian Government, states and territories and local councils, there need to be nationally consistent sustainability guidelines. This will ensure investments maximise opportunities to deliver sustainability outcomes and reduce emissions.

Sustainability requirements in infrastructure assessment vary across jurisdictions. Infrastructure NSW are leaders in this area, with extensive guidelines on how to incorporate sustainability into infrastructure planning and business cases. While increasing in their maturity, the remaining jurisdictions do not have comprehensive requirements and rely on the *Infrastructure Australia Assessment Framework* for guidance on sustainability and climate adaptation.⁹²

Further collaboration and harmonisation between jurisdictions would provide consistent infrastructure planning and decision-making, including adaptation and mitigation.

Deliver new sustainability standards

Codes and standards are critical for lifting asset sustainability performance. Mandated performance standards reduce asset emissions and costs, while making building temperature more comfortable for their occupants.

“Emissions targets and minimum performance standards should both be applied for new and existing infrastructure assets.”

Procurement targets and standards are effective ways to build new industries or markets, and incentivise businesses to develop new materials.⁹³ Emissions targets and minimum performance standards should both be applied for new and existing infrastructure assets.

Two key sectors that governments can immediately influence are social infrastructure and transport.

Improving social infrastructure assets

State and territory governments should lead the acceleration of targets and performance upgrades for social infrastructure such as schools, hospitals, justice assets and social housing. Similarly, the Australian Government should consider opportunities that are available through its social infrastructure investments, across building portfolios, and by supporting initiatives to improve the sustainability of universities and national cultural institutions.

Value for money emissions reductions can be achieved by ensuring new social infrastructure is energy-efficient and reduces emissions. To achieve this, the Building Ministers Forum should update the National Construction Code in line with the Council of Australian Governments' (COAG) *Trajectory for Low Energy Buildings*.⁹⁴ The *Trajectory* recommends incremental changes until buildings are 'zero energy (and carbon) ready'.

Improvements in energy standards for new buildings could deliver 19–25% energy savings in new residential buildings by 2030 and reduce energy bills by up to \$29 billion between now and 2050.⁹⁵

State and territory housing departments should also ensure new social housing has a 6.5 or 7 star NatHERS (Nationwide House Energy Rating Scheme) rating, depending on the climate. The *Trajectory* found this rating provides the minimum thermal performance necessary to deliver comfort and resilience. Residents could then meet their remaining energy needs in a way that reduces energy costs and peak demand use.⁹⁶ This will in turn reduce the need for energy costs to be supplemented through the welfare system.

At the same time as these reforms, efficiency improvements that target commercial buildings should be expanded to include government-owned residential buildings and social housing.⁹⁷ Installing solar PV, energy storage options (such as batteries) and smart meters should be prioritised for social housing so tenants have greater control over their energy use, with retrofits prioritising the poorest performing social housing.

Further reforms that give energy consumers clear and consistent incentives to take up energy efficient assets are outlined in the **Energy chapter** and the **Social infrastructure chapter** of the *2021 Plan*.

Making vehicles more efficient

Car manufacturers provide more efficient, lower operating cost vehicles to countries with higher fuel efficiency standards. As a result, Australians have more expensive and carbon-intensive alternatives than other Organisation of Economic Co-operation and Development (OECD) countries. To reverse this situation, the Australian Government must enact vehicle emissions standards and introduce a new carbon dioxide standard.⁹⁸

In addition, current fuel efficiency standards should be revised. These standards are a low-cost, low-impact option to reduce emissions. They are also an important enabler for the uptake of electric vehicles and will signal a durable Australian electric vehicle market to investors and consumers.

New standards, regulation and integrated planning will also help to ensure electric vehicles overcome barriers to adoption. For example, planning provisions for charging infrastructure could be improved. This would involve changing the National Construction Code to ensure new buildings contain charging stations and enhancing signage, safety and vehicle-to-grid integration.⁹⁹

Use procurement targets to stimulate markets

Setting procurement targets for sustainable and net zero emissions materials in construction would be an effective method for governments to reduce emissions and ensure broad sustainability outcomes. The potential for emissions reductions are large. Producing steel and cement generates 15% of all global carbon dioxide emissions.¹⁰⁰

At sufficient scale, government procurement decisions can encourage investment to meet the upfront costs of switching to the production of low-emission, recycled and remanufactured materials. Procurement targets give manufacturers and importers certainty around their market and potential return on investment.

When setting procurement targets for materials, it is critical to consider cost-competitiveness with existing production.¹⁰¹ Procurement targets should not introduce uncertainty. To ensure this, governments need to work with industry and monitor global research, learning and trends.

Electrifying a portion of government fleets would kick-start the Australian electric vehicle market. By demonstrating demand, manufacturers are likely to provide a wider range of electric vehicles to suit a

variety of consumer needs. Government procurement and fleet replenishment would also create an attractive secondary electric vehicle market for a broad range of consumers.¹⁰² Where appropriate (such as for standard passenger vehicles), fleets should target 100% zero emission vehicles within five years. For each fossil-fuel powered vehicle bought by a government agency, the purchaser should have to justify why a zero emission vehicle was not a better option.

Ensure electric vehicles are a rising tide not a tidal wave

Encouraging zero emissions vehicle uptake is in the best interests of users and taxpayers. However, it has broad implications for the structure and operation of the energy market as greater uptake will increase electricity demand and place pressure on local distribution infrastructure.

No single agency, government or sector can drive the systemic transformation Australia needs to introduce zero emission vehicles.¹⁰³ There needs to be a concerted Australia-wide effort. The Department of Industry, Science, Energy and Resources should expand the Future Fuels Strategy into a comprehensive, coordinated national strategy for zero emission vehicles, that considers state and territory commitments. This would incorporate energy and transport responses across governments to manage the deployment of zero emission vehicles at the right scale and time. Currently, the Future Fuels Strategy aims to enable consumer choice, stimulate industry development and reduce emissions in the road transport sector.¹⁰⁴

Having a forward-looking national plan for zero emissions vehicles (both electric and hydrogen) will reduce uncertainty for consumers, industry and manufacturers by providing a clear statement of support. While all zero emissions vehicles should be supported, electric vehicles are likely to offer the most immediate and cost-effective alternative for most private vehicle owners to the internal combustion engine. The plan should make introducing these vehicles at the right scale and time a priority.

Electricity networks will play an important cross-sectoral role during the transition, including developing enabling infrastructure and grid integration technologies. Government agencies, energy market operators and road agencies will need to collaborate with each other and with vehicle and charging manufacturers. For more information, see the **Energy chapter** and the **Transport chapter**.



2.3 Transparency and collaboration build trust in decisions

Key messages

- In an environment of rapid change, uncertainty and risk, it is critical to embed new practices to **ensure infrastructure delivers affordable, quality, accessible and cost-effective services**.
- Inclusive decision-making **harnesses government, academic, industry, business and community knowledge about places** and the **infrastructure and services people need to support quality of life and productivity**.
- Collective knowledge **supports value-for-money investments in infrastructure** that build community trust.
- Digital technology provides an opportunity to **develop a deeper understanding of community needs and aspirations** and a strong evidence base for decision-making, project design and delivery.
- Increasing transparency around how infrastructure decisions are made will inform communities, build trust and allow feedback at a time, and in a way, that can be most useful.
- Long-term, coordinated planning processes that connect sectors, governments, businesses and communities will **ensure infrastructure delivers against a clear vision that benefits all Australians**.

Creating trust and value through good governance

People's willingness to support one another, quickly adapt to changing circumstances and follow the advice of experts, institutions and leaders has helped Australia to respond well to the COVID-19 pandemic and recover from other recent disasters.

Community trust was essential for this positive response. It will also dictate the effectiveness of new approaches to sustainability and resilience proposed in this chapter. Similarly, the success of the *2021 Plan's* reforms, such as the introduction of time-of-use energy tariffs (see the **Energy chapter**) or road user pricing (see the **Transport chapter**) rely heavily on community trust.

Good governance builds strong relationships between people and institutions. It allows citizens to trust decision-makers to act on their behalf and with their best interests at heart.¹⁰⁵

In infrastructure decision-making, good governance is strengthened by inclusive engagement practices, the use of community data for evidence-based decision-making, greater transparency, and coordinated long-term planning. To deliver on these objectives, governments at all levels need to change their cultures and build capacity.

Inclusive engagement grants equal opportunities to all members of the community. It involves providing easy-to-understand information and consulting with a wide range of people using processes that are easy to participate in. As well as building trust in

institutions, it helps to create infrastructure that is fit for its purpose, has strong community approval and provides value for money.

To support effective decision-making, there needs to be robust and timely data about the needs, preferences and aspirations of communities for their local areas. This will support fact-driven decisions that ensure projects more effectively meet community needs. Stakeholders also need enough time to consider, comment on and meaningfully assess decisions.

If project proponents are clear and transparent about how and why they are developing infrastructure projects, communities will trust their decisions and accountabilities will be clearly established. It is essential to provide easy access to up-front, publicly available information on how infrastructure is being paid for and the costs and responsibilities for keeping it running. This can be achieved by publishing transparent information about the development of an infrastructure project, how it will address all stakeholders' strategic objectives, and releasing post completion reviews.

Long-term strategic planning also results in better community outcomes and builds community trust. By integrating land use and infrastructure decisions, governments can identify future infrastructure needs, set aside land for developing assets, and ensure regulation enables complementary uses for land in the surrounding areas. This will ensure infrastructure is developed at the least cost while minimising disruption to surrounding land use and local environments.

2.3 Recommendation

Build community trust in infrastructure decision-making and institutions by ensuring infrastructure decisions are transparent, and reflect place-based community needs and preferences.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Infrastructure investment assurance and assessment agencies, state and territory treasuries and state and territory infrastructure bodies

When this should impact:



Where this should impact:



0-5 2.3.1 Improve community sustainability and build trust by embedding the quadruple bottom line in government decision-making and assessment.

Proposed lead: State and territory planning departments

Supported by: State and territory infrastructure bodies

0-5 Facilitate participatory community engagement and build trust by clarifying consistent engagement and reporting requirements, resourcing plans and measurement mechanisms.

Proposed lead: State and territory planning departments

0-5 Ensure consideration of the quadruple bottom line by adding engagement standards across assurance process stages.

Proposed lead: Infrastructure investment assurance and assessment agencies

Supported by: State and territory treasuries and state and territory infrastructure bodies

0-5 Increase transparency and maintain social licence by reporting on activities as part of Environmental, Social and Governance and Corporate Social Responsibility reporting processes using existing standards and measures.

Proposed lead: State and territory treasuries

0-5 Improve the business case for community engagement by conducting research on the benefits of effective engagement.

Proposed lead: State and territory planning departments

0-5 Understand the effectiveness of engagement activities in meeting quadruple-bottom-line outcomes, including equity and accessibility, by producing public reports on the impact of community feedback on decisions.

Proposed lead: State and territory planning departments

0-5 2.3.2 Make more transparent and consistent decisions throughout infrastructure projects and services by responding to, and understanding, place-based community needs and preferences at state and territory, regional and local government levels.

Proposed lead: State and territory planning departments

0-5 Align decision-making with community needs and preferences by incorporating decision-makers, communities, infrastructure owners and operators into early strategic planning stages. Collect information by conducting audits, assessing place-based community data and publicly releasing findings.

Proposed lead: State and territory planning departments

Supported by: Local governments and state and territory infrastructure bodies

0-5 Facilitate transparent place-based decisions by creating a framework to support the collection and public release of reliable, meaningful and comparable data across agencies and local governments.

Proposed lead: State and territory planning departments

Supported by: Local governments and state and territory infrastructure bodies

0-5 2.3.3 Build community trust by providing transparent, timely and clear information about infrastructure decision-making and post completion assessments.

Proposed lead: State and territory planning departments

Supported by: Infrastructure investment assurance and assessment agencies, state and territory treasuries and state and territory infrastructure bodies

0-5 Increase transparency by committing to, developing and releasing post completion reviews. Establish delivery dates for staged reviews when the project begins. Include information on whether the economic case in the project's business case was realised, lessons learnt, and whether the project was on time and within budget.

Proposed lead: State and territory planning departments

0-5 Improve transparency and community trust and understanding by publicly releasing key information supporting infrastructure decisions, subject to privacy and data sovereignty considerations.

Proposed lead: The Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory infrastructure departments

0-5 Encourage national consistency and cross-sector coordination by developing a national report highlighting best practice, including case studies based on publicly released data.

Proposed lead: Infrastructure Australia

Supported by: State and territory infrastructure bodies, infrastructure investment assurance and assessment agencies, state and territory treasuries and industry representative groups

0-5 2.3.4 Improve community certainty and confidence and meet long-term community needs by sequencing infrastructure delivery.

Proposed lead: State and territory planning departments

0-5 Ensure the acquisition and management of corridors in the long-term interests of users and taxpayers by identifying high-value corridors, conducting corridor feasibility studies and establishing joint funding and governance arrangements.

Proposed lead: State and territory planning departments

0-5 Allow infrastructure co-location, precinct development and agency cost-sharing by centrally managing land acquisition and management.

Proposed lead: State and territory government property agencies

0-5 Meet infrastructure costs while maintaining community support by developing transparent, hypothecated levies on adjacent land and infrastructure service catchments, such as the Western Australian Government's Metropolitan Region Improvement Tax.

Proposed lead: State and territory treasuries

Measuring progress



Governance

Lessons learned

Percentage of nationally significant infrastructure projects that have undertaken a post completion review

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Governance

Trust in infrastructure industry

Percentage of Australians with trust in the infrastructure sector¹⁰⁶

Target: Top 5 nations

Timeframe: 0-5 5-10 **10-15** 15+



Governance

Participation in regulation design

Australia's ranking among OECD nations for stakeholder engagement when developing regulations¹⁰⁷

Target: Australia to top 5 OECD nations

Timeframe: 0-5 5-10 **10-15** 15+



Engendering trust by engaging communities effectively

The 2019 *Audit* highlights the need for meaningful and effective engagement so communities can help to shape infrastructure decisions.¹⁰⁸ Involving local people in decision-making is a core component of good governance.¹⁰⁹ It increases trust in institutions and delivers infrastructure that meets community needs, ensuring projects deliver value.¹¹⁰

“ Involving local people in decision-making is a core component of good governance. ”

To be most successful, engagement needs to be part of early decision-making. Firstly, by land use departments when they are developing strategic plans that determine the overarching needs of the community and the infrastructure required to support them. Secondly, by network operators and asset owners in the early design of individual projects.¹¹¹

This approach will ensure community needs and expectations are the starting point for planning and design efforts, and that project outcomes are anchored on planning decisions.

Prioritise inclusive, equitable and accessible approaches

Engagement processes should make it easy for people to be involved, value fairness and equity, and encourage people from diverse backgrounds, experiences and perspectives to participate.¹¹²

As well as consulting direct users of new infrastructure, the views of the whole community must be considered, with the process accounting for the changing nature of these cohorts. Participants should reflect the make-up of the whole community, not just now but over the future life of the infrastructure asset.

Groups that are isolated or historically excluded could require bespoke approaches so they can participate. This will ensure infrastructure meets all its objectives and addresses the needs of the broader population.

To be meaningful, engagement policies, frameworks and toolkits should be:

- adopted by strategic infrastructure planning agencies and project proponents
- transparent to when and how organisations will engage and mobilise resources, which will build legitimacy and ensure their accountability to communities and users

- move away from traditional town hall meetings and calls for submissions towards using user-centred design that prioritises accessibility (of language, activities, facilitators and engagement spaces)
- tailored to the type of decisions required, which will depend on the size of the project, the complexity of the problem it solves, the solutions identified and how much the community can influence outcomes¹¹³
- aware and sensitive to stakeholder and community engagement fatigue
- transparent around where Aboriginal and Torres Strait Islander peoples, and vulnerable and disadvantaged individuals, can have influence and access
- designed to genuinely reflect a cross-section of community views over time, including before the project was announced.

Increase accountability by encouraging quality feedback

Communities provide low-quality feedback when the timing, context and likely action following an engagement process for an infrastructure project or service are opaque.

To encourage people to provide quality feedback, planning and project delivery agencies must be clear about a range of factors, including:

- project maturity
- aspects of the project open to review
- types of information required to inform decision-making
- triggers or thresholds for change
- the range of ways communities can provide feedback.

When feedback is received, the agencies must show they are responding by, for example, producing public reports. These should outline how feedback helped to shape decisions and the reasons for those decisions, and evaluate how effective engagement activities have been at meeting equity and accessibility objectives.

It is also important to prioritise measuring and quantifying the value of good engagement. This will support mainstream acceptance of transparent, inclusive approaches and increase demand for effective practices, both in the community and from other governments.¹¹⁴

Collect and share data to understand community requirements

Community data has the potential to contextualise the needs of a place, identify how service provision differs, and shine a light on community views. It can substantially enhance planning and decision-making, ensuring infrastructure better meets community needs at all stages, from planning and design to delivery and operation.

“Detailed community data must become as much of an input into early project design as technical studies and feasibility considerations.”

To develop targeted, place-focused infrastructure projects, planners need access to longitudinal data about a community's needs, preferences and aspirations for their local areas.¹¹⁵ Detailed community data must become as much of an input into early project design as technical studies and feasibility considerations.

By drawing on data that identifies needs, proponents will be able to articulate the benefits of their projects during community engagement processes, including why one option has been chosen over another. Ultimately, communities will become more trusting of the proponents, the engagement process and the outcomes, which will be tailored to a place's needs.¹¹⁶

The 2020 Victorian *Local Government Community Satisfaction Survey*, provides a vital interface between councils, decision-makers and communities.¹¹⁷ The survey offers a glimpse of the potential for data to contextualise a place's needs. This data assists decision-makers to build a compelling case for change by aligning investment and services to community preferences.

Community data is currently collected by a range of agencies across different levels of government. State and territory government departments engage periodically with communities when creating strategic plans and projects. Local governments undertake community engagement every five years to develop strategic plans.¹¹⁸ Governments conduct studies every year to understand the cross-agency implications of infrastructure decisions for places and cascading impacts on other sectors. Each study establishes a baseline for community demographics, preferences and infrastructure needs, and often sentiment too.

While some of these government and academic studies are publicly released, not all government research is accessible. Releasing the information would contribute towards building trust with local communities.

Improve data collection processes and frameworks

Governments have access to data that highlights community sentiment and needs beyond that available to industry. Increasingly, they are acknowledging this data holds value. As well as being more willing to publicly release it, they have introduced policies to support reactive data requests.

To strengthen this approach and support infrastructure planning and decisions, the role of government as a data custodian must evolve into a deliberate position of data discovery and cleansing then sharing. For example, land use planning agencies should collaborate with infrastructure departments to audit and assess the range of available data then release it to relevant organisations. This will ensure the data is available to project proponents from the early strategic planning stages onwards.

The next step would be to make data collection, analysis and presentation more consistent. This would produce reliable, meaningful and comparable data that could be aggregated to provide a uniform perspective, leading to improved decision-making and greater equity.

To provide a consistent view, there needs to be a framework to support data collection across agencies and levels of local government. A standardised set of strategic questions could then be applied by multiple data collection agencies across local government areas to enable an understanding of regional and local needs.

Project proponents and infrastructure policy organisations would collaborate to assess data needs then develop questions that elicit useful information using user-centred design. Collected information should be presented in a user-friendly format for a range of capabilities, and developed around specific infrastructure provider and user use-cases.

An important aspect of these data collection projects would be considering privacy and data sovereignty issues to protect individual and community interests.

Make decisions more transparent to build trust

To allow informed deliberation about whether decisions are equitable and sustainable, it is critical to be transparent and consistent with cost estimation and reporting.¹¹⁹

As the 2019 *Audit* identified, transparent, accessible information should be provided consistently across the project lifecycle. This way, communities will better understand why and how projects are developed, funded and financed, and how the infrastructure will perform over time.¹²⁰ Projects should be benchmarked against similar assets, including evaluating whether strategic objectives are being achieved.

Communicate regularly at all stages

The links, or lack of them, between long-term infrastructure strategies and project funding and delivery decisions should be more clearly established and communicated to affected communities throughout a project.

“Transparent, accessible information should be provided consistently across the project lifecycle.”

Information about whole-of-life costs, including when the asset is operational, should form part of project decision-making and public engagement. This might include aligning the project with national population forecasts and articulating the asset's relationship with other planned projects.

Openly sharing planning materials and business cases would lead to more rigorous decision-making, resulting in infrastructure projects that more effectively meet community needs.¹²¹

It would also mediate the tendency for governments to announce fixed costs and timelines for large, risky projects without adequate community consultation and planning.¹²² This practice exposes the government and taxpayers to risk, including:

- limiting commercial flexibility
- influencing competitive processes to prioritise a dollar goal, not a scope outcome
- locking in scope and budget ahead of detailed planning
- increasing the risk that scope changes will be misrepresented as cost overruns.

Keep the information flow going

The need for more transparency is often associated with the early stages of a project. For example, when assessing community needs (challenges and opportunities), forming long-term strategic plans, undertaking project-specific planning and making project investment decisions.

However, true transparency means decision-makers should continue releasing project information at milestones throughout the asset's lifecycle. This includes continually reinforcing which strategic problem a project is trying to solve, how different options have been considered, and how the project is responding to community needs and preferences.¹²³

Once the project is completed, sharing evaluation information will help stakeholders to understand whether a project has delivered the intended benefits and enable informed community engagement on the scope of future projects and investments.¹²⁴

It will make communities confident that governance and decision-making processes are delivering high-quality outcomes at the least cost, and that decisions are being informed by continuous learning.

Aim for best practice

To improve infrastructure planning outcomes across the country, more transparent approaches should be adopted by all levels of government in Australia. To meet best practice standards, they should be enhanced to include greater consideration of risks, data protocols, funding and financing.

Infrastructure NSW's *Timely Advice on Infrastructure Projects* guidelines provide a benchmark for all governments planning to release infrastructure project information.¹²⁵ To support more widespread adoption of transparent approaches, governments should report regularly on how they have applied them so other jurisdictions can learn from their experiences.

Act now to meet future needs

Coordinated long-term planning involves assessing the future infrastructure needs of a place and protecting or acquiring land to accommodate assets as they are delivered. Protecting strategic infrastructure corridors reduces the cost of infrastructure delivery, makes communities confident about access to services, and minimises disruption to residents and the natural environment. For example, acquiring land before housing development occurs protects governments against land value increases and avoids expensive tunnelling and remediation costs.¹²⁶

“Purchasing land for corridor protection is a relatively low-risk exercise for governments as acquiring land in the short-term does not preclude changing course in the future.”

According to Infrastructure Australia's publication *Corridor protection: Planning and investing for the long term*, protecting and acquiring corridors could significantly reduce total project costs.¹²⁷ Protecting and acquiring land now for seven major projects was shown to save up to \$10.8 billion.¹²⁸

Coordinating governments and agencies is important when identifying where zoning and land acquisition are necessary to reserve space. This might be for large, disruptive infrastructure assets, such as linear infrastructure (roads, powerlines, railway tracks) or projects in fragile ecosystems such as coastal zones.

The use of land reservation for a single site that might support vertical infrastructure (offices, apartment buildings, car parks) is also of growing importance, especially in Fast-growing Cities such as Sydney and Melbourne.

Coordinate corridor reservations

Purchasing land for corridor protection is a relatively low-risk exercise for governments as acquiring land in the short-term does not preclude changing course in the future. Corridors can always be sold if they choose not to deliver an asset, usually for more than the purchase price.¹²⁹

However, land acquisition does carry significant upfront costs. To manage them, there should be centralised government acquisition and management, so infrastructure co-location, precinct development and agency costs can be shared.

While corridor or asset reservation should be overseen by the respective agency, all the lands should be centrally managed before their use to ensure land is not held unnecessarily and remains available for the highest-value use.

The benefits of corridor acquisition are widely understood within the local community.¹³⁰ Governments should therefore develop funding mechanisms to support acquisition and development, such as levies on adjacent land and infrastructure service catchments. One proven example is the Western Australian Government's Metropolitan Region Improvement Tax, which has made a significant contribution to meeting and minimising infrastructure costs while maintaining community support.¹³¹

To ensure the land is not developed for other long-term purposes such as housing, and to facilitate complementary land uses, protection for strategic corridors and sites will need to be embedded in land use plans.¹³² Corridor protection should not be reserved exclusively for transport infrastructure. It is also applicable to strategic blue and green infrastructure corridors to support future growth areas, such as Western Sydney.

When selecting short-term land uses for strategic lands, it is important to avoid sterilising the corridor by selecting a more attractive use than its long-term alternative. By actively managing reserved land, governments can identify whether the temporary use is entrenched, sterilising its long-term role. If this happens, an alternative corridor will need to be protected.

For instance, after more than 70 years of reservation, the F6 Freeway corridor in New South Wales will be retained for use as green infrastructure and the planned motorway will be directed into tunnels. The change in strategy recognises changing needs in that community,



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3

Industry productivity and innovation



What you will read in this chapter

- **Reform 3.1: Improving planning, portfolios and pipelines** – A series of reforms that will transform how governments sequence, plan, engage and communicate with industry so it becomes more efficient and effective.
- **Reform 3.2: Enhancing project outcomes** – Proven best practice approaches that, when applied early, drive superior project outcomes.
- **Reform 3.3: Digital by default** – Why the sector must adopt innovative digital technologies, tools and processes and why innovation needs industry-government partnership.
- **Reform 3.4: Next generation infrastructure investment** – Australia needs a new operating environment for the infrastructure sector where all tiers of government work together to drive meaningful and structural change that will future-proof assets and services.

Key messages

- The future of Australia's infrastructure hinges on being **affordable, meeting current and future needs and maintaining access to high-functioning industry** that creates, operates and maintains it.
- Improvements to industry productivity are needed to **deliver greater value for money and reduce the risk of cost escalation** for governments as we deliver an ambitious investment pipeline.
- More effective and efficient decision-making **requires more meaningful and early industry engagement**.
- Best practice portfolio and pipeline management by governments will **unlock new productivity dividends** helping ensure **project scheduling responds more effectively** to local industry capacity.
- The sector is at the beginning of a journey to acknowledge and **support better mental health** and a more **diverse and inclusive workforce**.
- Rather than focus on just shovel-ready announcements, governments should first **ensure every project is investment-worthy**.
- Sufficient **time and resources at the front end of projects**, together with improvements to market engagement processes, will enhance project outcomes.
- A digital by default approach will **create better, more cost-effective and productive infrastructure for all**.
- **All levels of government should be model clients** and champions for industry health and productivity.
- To realise these benefits, the decisive first step **begins with each level of government taking action and working together with industry**.

Introduction to industry

Australia's future relies on a sustainable infrastructure industry

The infrastructure sector is a complex patchwork of stakeholders that includes individuals, private businesses, industry associations and governments. These groups range in size, from a single user to a very small business and all the way up to large multinational organisations.

“To successfully deliver the ambitious pipeline of planned infrastructure projects, the model of ‘short-termism’ must change.”

Governments at all levels play a critical role as an infrastructure regulator, owner and user. They also represent a major stakeholder group —community members. It is the wider community that pays for, is a customer of, and often a neighbour to, public infrastructure.

The sector's success relies on regularly engaging with this diverse set of stakeholders to deliver some of Australia's largest and most complex undertakings.

While there is a clear and shared objective for industry, governments and the public to work together to deliver sustainable infrastructure, short-term attitudes and behaviours can often stand in the way.

To successfully deliver the ambitious pipeline of planned infrastructure projects, the model of ‘short-termism’ must change.

Instead of concentrating on an individual project or contract, there should be a clear, system-wide, future-focused view built around a long-term vision for Australian infrastructure.

Through this approach, Australia can benefit from cost-effective, quality, functional, safe and sustainable infrastructure that meets stakeholder's needs, for tomorrow and decades to come.

The pandemic recovery is the opportunity to improve

The *2019 Australian Infrastructure Audit* identified that, across economic and social infrastructure, the sector accounts for close to 20% of Gross Domestic Product (GDP).¹

This emphasises the importance of infrastructure, and underscores the criticality of the sector that delivers and operates it. With record investment underway to support the recovery from the COVID-19 pandemic, the infrastructure sector is primed to play an even greater economic role.

To maximise the benefits for all stakeholders, there needs to be a collaborative effort to tackle legacy processes, behaviours and attitudes across the sector. Doing this successfully will lead to positive infrastructure performance, deliver better value to taxpayers and users, and ultimately make infrastructure an attractive sector to work and do business in. Long-term, this will have a major impact on the sector's productivity and growth.

Infrastructure Australia's recommendations and reforms address some of the sector's major challenges and will transform the sector through:

- balanced commercial arrangements
- more appropriate apportionment of risk between industry and government
- modern and sustainable cultural behaviours
- consistent uptake of best practices including effective due diligence and digitisation.

Implementing these reforms will lift productivity, embed best practice and support innovation. This will maintain the sustainability, affordability and value of infrastructure to the benefit of end users, the sector and governments.

If all tiers of government and industry work together to deliver the right infrastructure, Australia can remain prosperous and productive now and well into the future.

Despite progress since 2016 more reform is needed

Since the *2016 Australian Infrastructure Plan*, governance and oversight in the Australian infrastructure industry has improved.²

Increasing transparency has been an important step and has helped to provide the insights that shaped the *2021 Plan*.

The creation and evolution of infrastructure bodies in all states and territories has provided a framework for strengthening collaboration. The benefits were highlighted during the COVID-19 pandemic, with infrastructure bodies in all jurisdictions supporting Infrastructure Australia's *Ten Principles of an Infrastructure-led Recovery*.³

While there has been broad progress against the key reforms identified and promoted in the *2016 Plan*, there are still some high priority areas to address that will drive reform.⁴ They include skills planning, collecting data throughout the project lifecycle, embedding positive behaviours and innovation, and optimising the use of existing infrastructure rather than promoting costly new builds.

As regulators, purchasers and benefactors of public works infrastructure, governments can be catalysts for positive change within the sector. This role complements, rather than replaces, the actions required of other change agents, including industry, academia and the supply chain. It is critical that they also play their part in implementing the recommendations in the *2021 Plan* to transform the sector, either directly or through representative bodies and associations.

There is an opportunity to be world-class

The *2019 Audit* underscored the criticality of a high-functioning Australian infrastructure industry.

Six key themes included:

- challenging the current approach to planning, funding and delivering infrastructure projects
- substantially improving transparent reporting around planned projects
- enhancing the engagement model with industry and the infrastructure supply chain
- reducing project risk through better due diligence
- growing capability and capacity while addressing cultural issues
- doing more with less, as the sector's resources have become constrained.

These themes have been amplified by the contemporary challenges of the COVID-19 pandemic and economic recovery. These have accelerated the need for a longer-term and reformative vision for Australia's infrastructure.

Infrastructure and construction are complementary

The 'infrastructure sector' is often confused with the 'construction sector'. While different, they are complementary and interdependent.

The **infrastructure sector** accounts for one fifth of Australia's GDP. It includes many actors, including multi-national organisations, peak bodies, governments, the public service and individuals.⁵ These groups perform a range of duties throughout each asset's life, such as early planning, design and engineering, professional services for reviews and assurances, construction, commissioning and operations and maintenance.

The **construction sector** is a dominant component of the infrastructure sector, along with other industries such as commercial, residential and industrial (for example, mining, oil and gas and pharmaceuticals). This sector represents around 7.2% of Australia's GDP and engages around 10% of the working population.⁶ Construction costs make up a relatively small component of all outgoing costs incurred over the life of some infrastructure.

How we developed the *Plan for Industry Productivity and Innovation*

Led by collaboration

The *2021 Plan* represents a year-long process of analysis, stakeholder engagement, and identifying and prioritising solutions. Infrastructure Australia welcomed input from a wide range of stakeholders then tested our findings with industry and government.

Hundreds of stakeholder submissions were bolstered by workshops, engagement sessions and interviews with over 1,000 individuals. Their feedback has informed the reforms in the *2021 Plan* and provided Infrastructure Australia with best practice approaches to meeting the sector's challenges.

Future policy development

The analysis and reforms in the *2021 Plan* are underpinned by future papers from Infrastructure Australia that present a new model for policy-making. They will provide policy-makers with a more detailed understanding of reform opportunities and insights to increase productivity and support broader sector transformation. This includes *Deliverability: A Roadmap for Industry Productivity and Innovation*, which puts increasing collaboration at the core of reform.

Acknowledgements

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We would also like to acknowledge the contribution of public sector agencies from governments of all levels, particularly state and territory infrastructure bodies.



3.1 Improving planning, portfolios and pipelines

Key messages

- Investment in Australia's public infrastructure is **volatile and increasingly targeted towards megaprojects**. Both these trends are challenging as they impact the affordability, deliverability and productivity of infrastructure.
- Governments can reverse declining productivity by reducing investment volatility** to create an efficient, cost-effective, sustainable and attractive market.
- By **adopting portfolio planning and management best practices to create a more stable infrastructure sector**, governments will ensure industry can better respond to government's needs by providing the materials, skills and capacity to deliver tomorrow's infrastructure.
- Having a stable pipeline will allow the transformation of industry productivity through the adoption of production and manufacturing approaches to **reduce cost volatility, lower overall prices and create a more sustainable industry**.
- The infrastructure industry is global. If Australia is to remain an attractive and competitive market for investment, there needs to be a **desirable market** environment built on **certainty, partnership and transparency**.
- Through reform, it is possible **Australia will have access to more domestic and international resources** to create, operate and maintain infrastructure into the future.
- Commitments to effect cultural change should seek to **deliver better mental health and wellbeing outcomes** alongside **greater workforce diversity and inclusion** across the sector.

Using a system-based approach to unlock productivity

The infrastructure industry is facing a number of systemic challenges. The major issues include: low productivity; high market volatility (driven by difficult-to-predict and rapid changes in investment); a high contractor failure rate; and a reduced ability to source materials, plant or equipment.

These are compounded by escalating input costs, cultural issues, and cost and schedule overruns.

These are not project issues. They are symptoms of systemic portfolio-wide challenges that present themselves on individual projects.⁷ While they are diverse, the majority can be allayed by having a more stable, predictable and dependable infrastructure pipeline and portfolio of works.⁸

To achieve this, a cultural shift is needed in government approaches so infrastructure is seen as a system instead of hundreds of individual and siloed projects and contracts.

Governments must approach infrastructure delivery as an interconnected system. The infrastructure pipeline of work must be managed actively to optimise a portfolio of projects drawing on the same workforce, organisations and resources.⁹

Governments can mature the current project-to-project or contract-to-contract approach through better sequencing of works, which will strengthen market confidence and increase the desirability of the sector.

The impacts of the COVID-19 pandemic present a unique opportunity to do this. As highlighted in the **Place chapter** of the *2021 Plan*, population growth has paused in major cities. At the same time, there is a push for wider economic recovery through infrastructure, with increasing calls to improve the speed of projects to market.

Following the impacts of the pandemic, and the withdrawal of stimulus investment, the availability of public funding for infrastructure is likely to be lower. It will therefore be critical to embrace reform in order to enhance productivity. Increasing the sector's productivity will be critical to ensure we can continue to see the necessary levels of new and refreshed infrastructure to support economic growth and quality of life.

“ Following the impacts of the pandemic, and the withdrawal of stimulus investment, the availability of public funding for infrastructure is likely to be lower. It will therefore be critical to embrace reform in order to enhance productivity. ”

Moving to a better coordinated program of activity may require a degree of administration, however will deliver a more productive and cost-efficient infrastructure sector overall.¹⁰

Adopt earlier, evidence-based decision-making

Changing to a system-based approach means government clients will need to critically understand the inputs and constraints that inform infrastructure deliverability, such as materials, skills, plant and equipment.

This critical understanding is required on multiple levels: policy, portfolio planning and on individual projects. Earlier is better, as it allows governments and industry to react with sufficient time.

Adopting a systems-based approach to planning infrastructure will require process change, with a minimal investment in skills and systems delivering

large rewards. Such approaches have been successfully implemented and achieved by other sectors, including automotive and manufacturing.¹¹

Through a systems-based mindset, these sectors have already captured benefits associated with 'industrialisation' – the move to systematized production and manufacturing, including a greater use of modern methods of construction, bulk purchasing arrangements, and more integrated supply-chain involvement.

Infrastructure, including construction, needs to shift towards industrialisation to reverse the stagnating productivity trend of the past three decades. This will lead to a more efficient workforce and higher productivity, delivering better quality infrastructure with reduced waste at lower cost.

Make infrastructure a sector of choice

Government departments and agencies, and industry employers all have a role to play in changing industry culture and developing workforce capability and capacity. Government procurement and project management teams should be at the forefront of driving industry transformation. They can use government influence and buying power to positively address the cultural challenges and behaviours that dominate the infrastructure sector.

Private organisations need to accelerate cultural reform by becoming model employers and improving relationships with the education sector and their future workforce. This could involve identifying, attracting and developing skills that are in short supply, managing workloads to avoid burnout and doing more to attract a diverse workforce.

Addressing capability, capacity and cultural challenges will help ensure a more equitable, productive and sustainable sector.



3.1 Recommendation

Improve industry productivity and value for money by having a coordinated project pipeline with a mature approach to procurement and risk management.

Proposed sponsor: State and territory treasuries

Supported by: State and territory infrastructure delivery agencies

When this should impact:



Where this should impact:



0-5 **3.1.1 Improve industry capacity and capability by prioritising procurement and portfolio management and increasing pipeline transparency, certainty and confidence.**

Proposed lead: State and territory treasuries

Supported by: State and territory infrastructure delivery agencies

0-5 Ensure active management of project procurement within the pipeline and help industry to actively manage its capacity and risk exposure by strengthening portfolio management capabilities within the public service.

Proposed lead: State and territory treasuries

Supported by: State and territory infrastructure delivery agencies, state and territory public service commissions

0-5 Develop a jurisdiction-wide, cross-sectoral infrastructure project pipeline that actively tracks progress of projects throughout their lifecycle while considering critical inputs, constraints and risks that influence their deliverability.

Proposed lead: State and territory infrastructure bodies and state and territory treasuries

Supported by: State and territory infrastructure delivery agencies, and asset owners and operators

0-5 Provide annual jurisdiction-wide pipeline briefings that provide industry with a clear macro-level view of expected procurements and act as a forum to provide feedback on pipeline risk.

Proposed lead: State and territory infrastructure bodies and state and territory treasuries

Supported by: State and territory delivery agencies and industry representative groups

0-5 Ensure future infrastructure investment and project delivery commitments are regularly reviewed and considered against the jurisdiction-wide, cross-sectoral infrastructure project pipeline and industry capacity forecasts.

Proposed lead: State and territory infrastructure delivery agencies

Supported by: Infrastructure Australia, state and territory treasuries, Department of Infrastructure, Transport, Regional Development and Communications and industry representative groups

5-10 **3.1.2 Create a step change in infrastructure productivity by industrialising the sector.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory treasuries and Business Council of Australia

5-10 Develop and implement infrastructure productivity roadmaps supported by adopting modern methods of construction, including design reuse, standardised design elements, earlier supply chain involvement, digitalisation, modularisation, prefabrication, offsite construction, frame agreements and bulk procurement.

Proposed lead: State and territory infrastructure bodies, state and territory treasuries

Supported by: State and territory infrastructure delivery agencies and industry representative groups, such as prefabAUS.

0-5 Create a positive change culture by ensuring public sector project professionals are empowered and the organisation leadership is incentivised to be innovative and adopt best practices.

Proposed lead: State and territory public service commissions and the Australian Public Service Commission

Supported by: State and territory infrastructure delivery agencies

10-15 Create, embed and pursue sector-wide efficiencies by developing and implementing project processes, templates and assurance activities that prioritise industrialisation.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory infrastructure delivery agencies and industry representative groups, such as prefabAUS

0-5 **3.1.3 Ensure the industry is a sector of choice for employees and can meet current and future workforce demands by introducing cultural reform that embraces diversity and inclusion.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory treasuries

5-10 In partnership with industry, deliver a workforce attraction and retention strategy that navigates current workforce challenges and sets out tangible and achievable solutions that create a sector of choice for current and future talent.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Skills Commission and industry representative groups

5-10 Foster a new model of collaboration between governments and industry by developing and implementing an infrastructure industry culture commitment and industry policy aimed at improving project delivery.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory infrastructure bodies, state and territory infrastructure delivery agencies, industry representative groups, inclusive of National Association of Women in Construction and Australian Constructors Association

0-5 Embed the infrastructure sector culture commitment through existing social procurement frameworks and pre-qualification schemes.

Proposed lead: State and territory treasuries

Supported by: industry representative groups, inclusive of Social Procurement Australasia and Social Traders

0-5 Improve the productivity and attractiveness of the sector by adopting and promoting a five-day working week, working hour limits, and job-sharing practices across the public and private sectors.

Proposed lead: State and territory infrastructure delivery agencies

Supported by: Industry representative groups

Measuring progress



Governance

Transparent project pipeline

Percentage of jurisdictions that have consolidated 10-year pipelines for projects and concessions over \$20 million

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Economic

Modern methods of construction

Percentage of projects that have incorporated modular construction methods

Target: Over 80%

Timeframe: 0-5 5-10 **10-15** 15+



Social

Gender equality

Female participation in construction on par with female total workforce participation rate¹²

Target: (2019) 47%

Timeframe: 0-5 5-10 **10-15** 15+



Enabling a high-functioning industry through a stable project pipeline

Over the years, governments have worked to develop a range of public-facing infrastructure pipelines and programs. While good progress has been made, more can be done. The infrastructure industry is the same as other sectors — it thrives on greater visibility and transparency.

“ To be efficient, the infrastructure sector needs access to a single, dependable, predictable pipeline of projects so government and industry can understand future demand and plan with certainty. ”

The industry-led Australia New Zealand Infrastructure Pipeline (ANZIP) collects relevant information to provide the definitive reference point for future projects across both countries.¹³ However, as it is based on publicly available information, it is limited by what governments release.

Similarly, Infrastructure Australia's *Infrastructure Priority List* is limited by its focus on nationally significant projects and initiatives in the planning (pre-funding and pre-delivery) stages.¹⁴ It therefore only provides insights into a limited segment that depends on the market's overall efficiency.

To be efficient, the infrastructure sector needs access to a single, dependable, predictable pipeline of projects so government and industry can understand future demand and plan with certainty.

The benefits of such a pipeline would be amplified if it harboured critical information from jurisdictions. For example, basic scope descriptions, potential commercial models and indicative timing for key phases. The pipeline could be further bolstered if expanded to include sale and lease opportunities for currently operating infrastructure.

Together, these enhancements could increase industry visibility of upcoming assets and lead to greater coordination.

In this way, governments would improve scheduling, resourcing and training, which could then make project delivery cheaper and less risky.

Infrastructure users, taxpayers and governments would all benefit.¹⁵ There would also be far-reaching impacts for industry and skills development, knowledge-sharing and national productivity.

Turn pipelines into strategic planning tools

The transparency of the infrastructure project pipeline has improved since the *2016 Plan*. However, the associated benefits of improved project scheduling and workforce development will only be strengthened further if information within the pipeline becomes more detailed and available.

A genuine, high-quality pipeline represents a transparent, dependable and comprehensive perspective of future work across sectors. It should be feasible for industry to deliver and consider the entire work program.

Governments can elicit considerable internal benefits by considering critical inputs and internal and external constraints then using them as an input to 'smooth', 'sequence', or 'phase' future works. This approach is considered good practice portfolio management as it ensures supply can meet demand in both elevated and reduced periods of activity.

Furthermore, a stable infrastructure pipeline underpins broader economic policy. A good example is how infrastructure is currently being used in Australia and around the world as an economic recovery mechanism from the COVID-19 pandemic.

Ensuring project scheduling responds more effectively to local industry capacity:

- enables the public and private sectors to direct people, equipment and related resources to where they can deliver optimal value
- delivers an expanded project pipeline with less risk of cost escalation and delays
- leads to fewer materials shortages¹⁶
- minimises low-productivity practices such as triple shifts
- avoids hyper-escalation of input prices (when goods, services and labour shortages force ever-higher costs), the cost of which is ultimately borne by the taxpayer.¹⁷

This shift should be a priority. Australia has already been facing an ongoing skills and materials shortage in the infrastructure sector and this situation is likely to get worse. More and more, countries that have traditionally provided Australia with skilled professionals are competing for these individuals as they too ramp up their infrastructure spending. The United States alone has proposed a USD 2 trillion infrastructure strategy.¹⁸

Further increases in demand will likely result in further negative impacts in the form of cost escalation and delays. Portfolio management can ease pressure on a sector that is critical to Australia's economic recovery.

While funding decisions should remain at the discretion of governments, it is in everyone's best interests to understand market capacity

and sequence work accordingly. This will assist in avoiding delays, reduced build quality, or excessive prices rises for scarce resources.

A new national focus on market capacity and deliverability

In March 2020 the Council of Australian Governments (now National Cabinet) requested Infrastructure Australia report on the capacity of the market to deliver the forward infrastructure pipeline.

This work includes a detailed study on infrastructure risk, skills supply and materials supply chains.

The report will be a local and international first, providing Australian governments with detailed insights to understand how we will deliver the infrastructure of tomorrow.

Unlock the benefits of industrialisation

Government and industry alike directly benefit from stable project pipelines, and effective use of portfolio management is the key to creating stability. With this stability and better coordinated buying

power, governments can start to transition towards the industrialisation of the sector.¹⁹ This transition is long overdue and could result in productivity benefits of up to 60%.²⁰

Industrialisation will transform the infrastructure sector

The current approach to infrastructure requires each infrastructure asset to be uniquely designed, built, and operated. However, like the shift from hand built automobiles to mass production led by Henry Ford and others, there is an opportunity to standardise components and approaches in infrastructure.

This move to 'industrialisation' seeks to reverse the trend towards bespoke designs and move to a more consistent approach characterised by higher productivity. Infrastructure industrialisation involves the systematic adoption of highly efficient infrastructure production methods that emphasise the use of offsite manufacturing and automated component assembly processes.²¹

This differs from the current approach that favours bespoke designs, components, and parts installed for a single purpose. Learning from other sectors that have successfully traversed towards industrialisation, such as automotive and commercial aerospace, the infrastructure sector can move towards an environment with major productivity gains.²² The change will require systematic changes in design approaches, purchase arrangements, technology adoption, and commercial arrangements.

Through industrialisation, projects move from being regarded individually to being considered together as a 'system'. Governments can capture benefits from innovative concepts and approaches in planning, design, and delivery.

The opportunities include design reuse, standardised design elements, supply chain integration, 'lean' manufacturing and 'Six Sigma' techniques, modularisation, prefabrication, offsite construction, frame agreements, bulk procurement and digitisation.²³

These can all be deployed to increase productivity, reduce waste and create higher-quality infrastructure for less.

For more information on opportunities for digitisation in the sector, see **Reform 3.3** in this chapter.

Under industrialisation, small-scale improvements in production practices that are applied on a single project can be shared and expanded to similar projects in the same state, between states or even across the country.

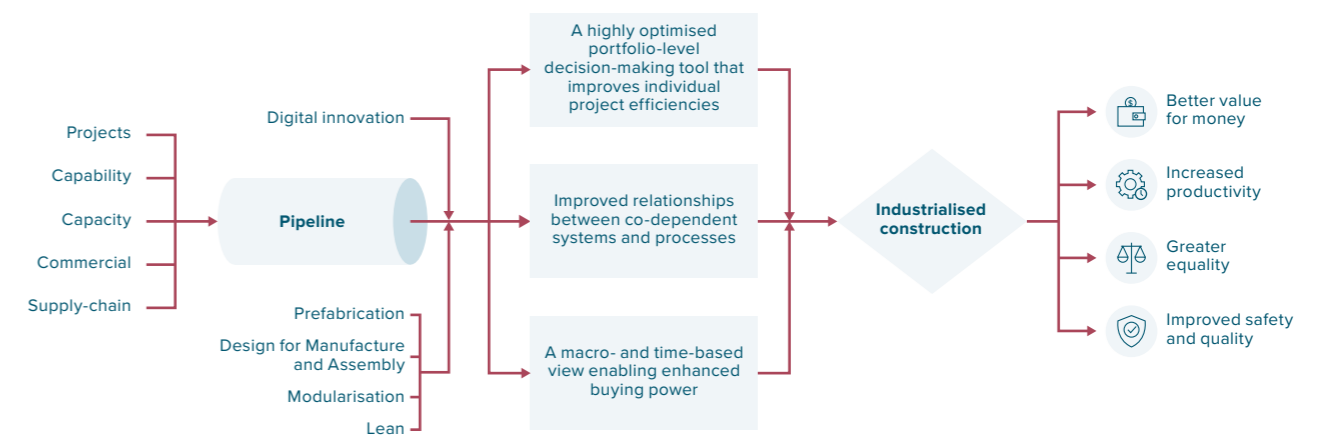
This creates a multiplier effect, generating a positive impact on budgets and timelines for all projects (see **Figure 3.1**).

It is important to highlight that industrialising the infrastructure sector can help accelerate other necessary pursuits, notably decarbonisation, sustainability and resilience. For example, industrialisation can increase the uptake of building products with a lower environmental impact (such as high-strength concrete or eco-friendly cement binders) by using collective buying power and combining it with continuous improvement in materials management.²⁴

Reaching the sector's full industrialisation potential for cost reduction and efficiency relies on the widespread adoption of modern approaches to infrastructure.

Together, governments and industry need to move away from bespoke design and construction processes. Governments should develop orchestrated infrastructure programs instead of individual projects and favour approaches and commercial models that maximise the use of modern methods of design and construction using standardised components.²⁵

Figure 3.1: Taking a portfolio approach will improve infrastructure outcomes



Source: Adapted from Oltmann, J (2008)²⁶

Need for government leadership

If Australia is to enjoy the full benefits of industrialisation, there will need to be government leadership.

This starts with the development and implementation of a roadmap towards industrialising the infrastructure sector. The roadmap would capture where governments can utilise innovative approaches to infrastructure planning and delivery, including:

- using bulk procurement arrangements across and between projects
- reusing project designs or using generative design
- increasing design standardisation and common parts between projects
- using modern methods of construction such as manufactured assembly and offsite construction
- use of digital by default technologies, processes and systems.

A whole of government response would lead change:

Treasuries and delivery agencies would have to respond by changing their procurement practices.

Skills commissioners, education departments and agencies responsible for public sector skills would use industrialisation to plan for tomorrow's skills needs in the private and public sector.

Agencies responsible for land use planning and natural resource extraction would use it as a baseline for long-term permits and approvals (such as quarry materials).

As part of roadmap development, governments should seek out, and build on, progressive initiatives being implemented now. Key examples include the Victorian School Building Authority, Health Infrastructure New South Wales and the Transport for NSW digital engineering framework.²⁷

For more information about digital technologies, processes and systems that can make the transition towards industrialisation more seamless, see **Reform 3.3** in this chapter.

Invest in, attract and develop high-quality people

Infrastructure is more than concrete, steel and glass. People are pivotal to successful project delivery and efficient infrastructure operations. Future skills needs are exacerbated by current shortages. Over the past decade, engineers, architects, construction managers and surveyors have all been in high demand, as have trades such as welders, bricklayers, plumbers and electricians.²⁸

With increased activity and more complex projects lying ahead, the 'people' element of infrastructure should be prioritised.

An important part of this challenge is finding and developing the next generation of leaders. Governments need to act decisively to attract, develop and retain existing and potential project leaders in the public service and across the industry.²⁹

Developing skills beyond leadership in the broader workforce also needs attention. The prevailing approach to developing individuals is to rely on them to incrementally learn from on-the-job project work. A new approach is needed to develop the capabilities organisations and the wider industry need for tomorrow.³⁰ For example, it will be difficult to find leadership and skills in digital and modern methods of construction if these opportunities are relatively rare within public infrastructure projects.

A broader, more diverse workforce will encourage new leadership, but the Australian construction sector remains highly male dominated.³¹ In 2020, women made up less than 13% of the total construction sector

workforce, with over three quarters of this proportion engaged in clerical or administrative roles.

What is required is meaningful long-term partnerships with the education sector, students and sector employers — including governments — that are informed by the future pipeline of projects. It is critical these relationships seek to attract a diverse and inclusive workforce, and target the skills required for tomorrow's infrastructure.

The Australian Government and the National Skills Commission should help develop these skills through a national workforce attraction and retention strategy. Together, they could uncover gaps in workforce capabilities, skills and training requirements when measured against current and future needs, and act to address them. This activity should be informed by a future skills assessment that aligns with a national vision for Australia's future infrastructure, as discussed in **Reform 3.4** of this chapter.

The strategy should cover the entire infrastructure sector, including industry and relevant government departments and agencies. It should also include engaging with educational institutions to develop tailored programs, and providing financial support for education.

Training and development can take years, and the skills required for Australia's infrastructure workforce are likely to change. To ensure the infrastructure sector has the right people to deliver a national infrastructure vision, it must consider and develop the right skills today.

Build a positive culture through collaboration and policy

Industry and governments have jointly acknowledged the need to improve the culture of the infrastructure sector. Significant reform is already underway:

- The New South Wales and Victorian governments have established a roadmap to improve culture and practices with the construction industry through the Construction Industry Leadership Forum and the Construction Industry Culture Taskforce.
- Infrastructure NSW's 10-point commitment provides a roadmap to support the adoption of reform.³²
- The *Australian Building and Construction Industry Blueprint for Better Mental Health and Suicide Prevention* and Consult Australia's *Champions of Change* initiatives also demonstrate the industry's commitment to reform and willingness to lead.³³
- In the United Kingdom, the Construction Leadership Council presents a model for leadership and collaboration that could be adapted for the Australian context while building on existing industry and government initiatives.³⁴

While the ambition is shared, cultural change is inherently hard to define and difficult to shift. It is also particularly challenging to create change from a central department or agency as culture is localised. Despite the challenge of change, the economic and societal benefits in creating a positive culture across the industry are clear.

A positive culture is one that values inclusion, ensures people feel comfortable enough to raise concerns, and promotes a thriving and productive environment where employees feel empowered to perform at a high level.³⁵

“ The economic and societal benefits in creating a positive culture across the industry are clear. ”

The construction industry was flagged as high-risk in the recent Respect@Work national inquiry.³⁶ Shifting to a positive culture is overdue, and will create new norms. The industry should promote the widespread adoption of practices that will create positive working environments, making the sector more attractive for future employees at all levels.

A positive culture can help prevent instances of harassment and disrespectful behaviour. These and other benefits will translate into a better performing, more productive industry. In addition, evidence shows a more positive workplace culture increases workplace diversity, creating higher-functioning and more accessible infrastructure.³⁷

It also ensures governments have a bigger pool of resources that can deliver and operate infrastructure, reducing their exposure to delays and escalation.

One way governments can influence the sector is by using their buying power to drive positive cultural change.

Governments can begin by working with industry on a commitment to improve the sector's culture, such as pay equity, mental health, diversity in the workforce, working patterns, career progression, career breaks and mentoring.

Public sector leaders can become champions of change to drive behaviours, policies, and processes. A good example of leadership is the New South Wales Health Infrastructure partnership with Roberts Pizzarotti and the University of New South Wales on the Project 5 'Weekend for every worker' initiative at Concord Hospital in Sydney.³⁸

Once established, subsequent public investments should follow the new standard. Governments could leverage existing arrangements, such as prequalification processes and/or social procurement frameworks to accelerate the transition.

Increasing the focus on mental health

The construction sector is in the top three unsafe sectors in Australia.³⁹ Having this reputation is an obstacle to attracting and retaining good workers.

What is probably less well known is that the average worker in the Australian construction workforce is six times more likely to commit suicide than be the subject of a workplace fatality.⁴⁰ Approximately 20% of these suicides are directly related to work in the sector.⁴¹

In Victoria, research has highlighted that mental health challenges for the local construction industry exceed those of the average population by 40% for depression, 38% for anxiety and 37% for stress.⁴² It is likely the nationwide statistics for the industry are similar.

Change must begin with both governments and industry investing more in mental health programs. As well as delivering social and moral benefits, this investment makes economic sense, with a proven positive return on investment of \$2.30 for every dollar invested.⁴³





3.2 Enhancing project outcomes

Key messages

- The **earliest stage of each project is the optimal point** to ensure the best solution is identified and the right infrastructure is built.
- Thorough and robust **due diligence processes are effective tools** for minimising or **removing risks**. They should occur before major commercial contracts are awarded and are the key to successful infrastructure delivery.
- **Australia's governments** have an important role to play in advocating for and driving best practice in due diligence through **Front-End Engineering and Design (FEED)** and a 'go slow to go fast' mentality.
- Governments should collaboratively **partner with industry to mitigate risks** when defining and delivering infrastructure.
- **Consistently using standard form contracts** that support more collaborative behaviours and allocate risk to those able to manage it are immediate opportunities for reform.
- **Governments should seek out and address other industry pinch points**, such as payment certainty, access to insurance, contract complexity and market deliverability.
- Governments should see infrastructure design and delivery as both **a long-term endeavour and one of continuous improvement**. Areas of opportunity include embracing focused innovation, increasing transparency and improving long-term estimating.

Getting infrastructure right from the start

Infrastructure is a long-term investment that delivers assets that normally operate for over 50 years. Therefore, planning, design and construction should deliver assets that serve the community for many decades.

The whole project planning and delivery team must understand the current and future environment in which the asset is being delivered, and the likely impact of challenges, opportunities and risks. This understanding must extend beyond usage to include environmental and climatic factors.

The greatest opportunities to ensure the best solution is identified, and the right infrastructure is built, happen at the earliest stages of the project during problem identification, project origination and design.

Improving how projects are conceived, planned, designed and assured in these early stages has long been regarded the most effective mechanism owners have to consistently deliver superior project outcomes. Australian public infrastructure often misses the opportunity to improve project outcomes.⁴⁴

The desired outcomes are most easily influenced during the first stage, project origination. This is when the due diligence that informs a more detailed understanding of scope, cost and timeframes can remove challenges that might otherwise appear in later stages.⁴⁵

Investing time and resources in due diligence in the early stages is therefore essential. If prioritised by all levels of government, it can enhance project outcomes and improve the operating environment for all stakeholders.

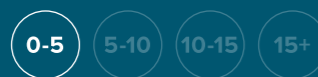
Due diligence also reduces project risks by making them less likely to incur a financial loss, miss delivery deadlines or fail to deliver the right operational outcomes.⁴⁶ Conducting due diligence in the early stages of a project ensures stakeholders have sufficient time to ensure risks can be avoided and/or mitigated throughout a project's life. The practice of due diligence prioritises risk avoidance and mitigation as compared to risk transfer – particularly for parties that require greater assistance to manage those risks.

3.2a Recommendation

Improve value for money and reduce risk by consistently adopting appropriate best-practice front-end due diligence for projects.

Proposed sponsors: State and territory infrastructure delivery agencies

When this should impact:



Where this should impact:



0-5 3.2a.1 Reduce risk, improve competition, lower bid costs and improve project outcomes by consistently applying due diligence activities to the front-end of all infrastructure projects.

Proposed lead: State and territory infrastructure delivery agencies

Supported by: Industry representative groups

0-5 Uplift quality of infrastructure decision-making through the development and delivery of training for key decision-makers on due diligence and de-risk, construction innovation, timing of project announcements, commercial and legal, and project governance.

Proposed lead: State and territory infrastructure bodies and Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory public service commissions and industry representative groups

0-5 Increase maturity and reporting of project planning and design through public-facing annual reports of de-identified Australian Government funded projects.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Office of the National Data Commissioner

0-5 Improve value for money and reduce risk by prioritising resources and time to develop business cases, create reference designs and undertake comprehensive due diligence processes.

Proposed lead: State and territory treasuries

Supported by: Industry representative groups

0-5 Ensure a strategic view of risk is appropriately translated to project procurement by developing and applying mature risk allocation processes that comprehensively assess and validate risk and uncertainty and fairly apportion them to the parties best-placed to manage them.

Proposed lead: State and territory infrastructure delivery agencies

Supported by: Industry representative groups

0-5 3.2a.2 Improve infrastructure value for money by applying whole-of-life cost, scheduling and risk management best practices, processes and systems.

Proposed lead: State and territory treasuries

5-10 Improve consistency, efficiency and transparency of project decision-making by developing and promoting nationally consistent project information structures.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Australian Cost Engineering Society, Australian Institute of Quantity Surveyors, NATSPEC, NBS and BuildingSMART

0-5 Ensure a consistent focus on value for money by developing in-house capabilities, in areas such as cost management systems and processes, scheduling, risk management, estimating and project controls.

Proposed lead: State and territory infrastructure bodies

Supported by: Industry representative groups, inclusive of Australian Cost Engineering Society and Australian Risk Engineering Society

0-5 Enhance the quality of decision-making by developing a nationally consistent whole-of-life infrastructure cost and schedule benchmarking tool and mandate its use on all nationally significant projects.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Infrastructure Australia, industry representative groups, inclusive of Australian Cost Engineering Society, Asset Management Council of Australia and Australian Institute of Quantity Surveyors

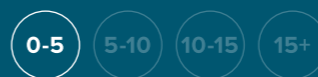
3.2b Recommendation

Reduce uncertainty for industry and improve value for money by improving engagement with industry and the supply chain.

Proposed sponsor: State and territory treasuries

Supported by: State and territory infrastructure delivery agencies

When this should impact:



Where this should impact:



0-5 3.2b.1 Reduce risk and improve value for money by using common and best practice commercial arrangements, standard contract forms and delivery approaches to infrastructure.

Proposed lead: State and territory treasuries

Supported by: State and territory infrastructure delivery agencies and industry representative groups, such as Institution of Civil Engineers

0-5 Unlock market equality and lower risk by utilising more collaborative commercial models that facilitate value for money and smaller engagements directly with contractors and consultants.

Proposed lead: State and territory treasuries

Supported by: State and territory delivery agencies and industry representative groups, such as Consult Australia, Australian Contractors Association and Australian Owned Contractors

0-5 Apply appropriate consistency and improve certainty in procurement by developing a procurement decision-making tool to more effectively understand and allocate scope in line with project fundamentals.

Proposed lead: Department of Finance

Supported by: State and territory treasuries, Australasian Procurement and Construction Council and Infrastructure Australia

0-5 Improve consistency, certainty and value for money by developing and implementing a new nationally consistent contract suite to support a spectrum of procurement models.

Proposed lead: Department of Finance

Supported by: State and territory treasuries, industry representative groups, inclusive of Institution of Civil Engineers and Society of Construction Law Australia

0-5 Maintain a viable, competitive industry and supply chain by ensuring insurance is available for consultants, contractors and sub-contractors involved in major projects. This may include brokering insurance on behalf of industry on a pro rata basis and changing existing policies on retention or insurance limits.

Proposed lead: State and territory insurance policy-holders and their insurers

Supported by: State and territory insurance agencies and industry representative groups, including Insurance Council of Australia, Enginsure and Consult Australia

0-5 Increase competition in the industry by developing guidelines and training programs on market engagement best practices that are accessible to all project practitioners. Cover topics such as multi-stage bidding, fair risk appropriation processes, bidding requirements at each gate, receiving industry feedback, using nationally consistent contract forms and the supporting procurement decision-making tool.

Proposed lead: Australasian Procurement and Construction Council

Supported by: Industry, state and territory treasuries, and state and territory infrastructure delivery agencies

0-5 Maintain the financial health of the supply chain by reviewing payment certainty and payment security legislation in light of current practice. Focus on compliance with requirements and consider whether the scope of these frameworks sufficiently addresses poor practices.

Proposed lead: State and territory treasuries

Supported by: Industry representative groups



5-10 **3.2b.2 Create a culture of genuine innovation by clarifying the desired project outcome innovation criteria in bid requirements, including outcomes, value for money, risk and embedding successful innovation in future projects.**

Proposed lead: State and territory infrastructure delivery agencies

Supported by: Australasian Procurement and Construction Council

5-10 Normalise risk appetite and use of innovation by aligning innovation criteria in bid assessment with project and organisational needs, including tangible measurable outcomes that are owned by a project leader.

Proposed lead: State and territory delivery agencies

Supported by: Australasian Procurement and Construction Council

0-5 Reduce risk and lower the likelihood of variations by conducting constructability, operability and maintainability reviews on projects. Repeat reviews at multiple stages of each project's lifecycle, particularly in the early stages before awarding main works contracts.

Proposed lead: State and territory infrastructure delivery agencies

Supported by: Industry representative groups, including Facility Management Association of Australia, Asset Management Council of Australia and Australian Constructors Association

Measuring progress



Governance

Standard contracts

Percentage of projects or programs over \$250 million (2021 \$) that use a nationally standard contract suite, with the integrity maintained

Target: Over 80%

Timeframe: 0-5 5-10 **10-15** 15+



Quality

Valuing innovation

Percentage of projects or programs greater than \$250 million (2021 \$) specify project scope to be prioritised for innovation

Target: Over 80%

Timeframe: 0-5 5-10 **10-15** 15+



Quality

Early provider engagement

Percentage early contractor and operator engagement for projects over \$250 million (2021 \$)

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Governance

Security of payment

Percentage compliance with security of payment legislation

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+

Spending time to reduce risks early in each project

The success of infrastructure projects reflects the care and deliberation taken through the conception, planning, and early design stages. Effective due diligence requires time, effort and resources in the front-end of projects.

By taking this approach, Australia's governments can ensure infrastructure investments are ready for delivery before they are considered or announced as shovel-ready.

Successful project delivery relies on critical front-end steps, such as comprehensive consideration of project objectives and reducing risks and uncertainties to inform clear project objectives.

The objective is to support the successful delivery of the most appropriate solution for a diverse range of end users. This means understanding and managing risks before procurement and delivery.⁴⁷

Reducing risks on projects in the early stages should be seen by governments as an obligation rather than an option or the responsibility of industry delivery partners in later stages.

Go slow to go fast

Due diligence processes can increase government success by committing to a 'go slow to go fast' approach, as illustrated in **Figure 3.2**.

Due diligence can help avoid early announcements or releasing early design solutions and delivery models that reflect an incomplete understanding of benefits. Premature announcements are directly linked to poorer project performance and undermine good project behaviours.⁴⁸

If due diligence is done thoroughly, at the right time and is properly supported, it will result in a clearly defined project with lower costs, faster delivery timeframes and reduced risk overall.⁴⁹ It can also help reduce the variability of cost, and schedules between projects.⁵⁰

Research shows that successful projects are supported by clear problem definition, scope and design, and improved transparency in risk identification and management. If these are evident when the project is commercially awarded, it will deliver better outcomes. These benefits are well-documented in multiple Auditor-General reports on infrastructure project outcomes conducted across Australia.⁵¹

Broader research shows projects employing these practices will be 24% more predictable with costs, 30% more likely to generate greater customer satisfaction, and more likely to be delivered within faster and more predictable timelines.⁵²

Figure 3.2: A project that 'goes slow to go fast' is more likely to succeed



Learn and apply good practice from other capital-intensive industries

Australia's governments can learn from other countries and capital-intensive industries that apply best practice due diligence through front-end engineering and design (FEED) processes.⁵³

Changes in scope, incorrect and incomplete designs, unforeseen conditions and weak interface management are a major cause of variations, claims and disputes for Australian infrastructure projects.

Application of FEED can counter these challenges and improve outcomes by enhancing project definition, costings and scheduling. This makes projects less risky, encourages lower bids and results in fewer variations during delivery.⁵⁴ Everyone benefits, including the taxpayers that ultimately wear the cost of poor project conception and delivery, and the associated risk and uncertainty.⁵⁵

Pivotal FEED activities may be conducted in current business case development, reference design creation or assurance processes. The critical difference between these current processes and FEED is that FEED applies a comprehensive

and systematic bottom-up approach that focuses on knowledge gaps and their direct influence on outcomes.

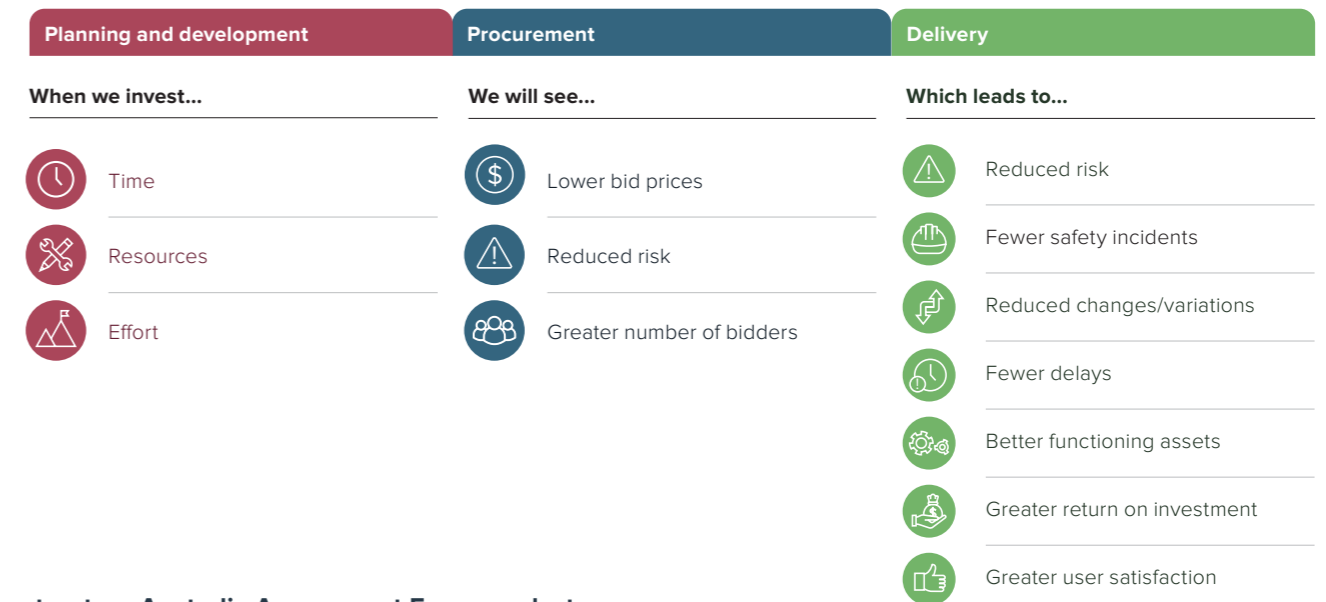
It is an exercise in understanding more rather than progressing with the minimum required to satisfy assurance activities.⁵⁶

Realising the benefits of FEED requires systems, capability and commitment early in project planning and development (see **Figure 3.3**). Leadership and support across governments is required to ensure the benefits are protected against early project or delivery announcements, premature budget estimates or design solutions without appropriate scoping.

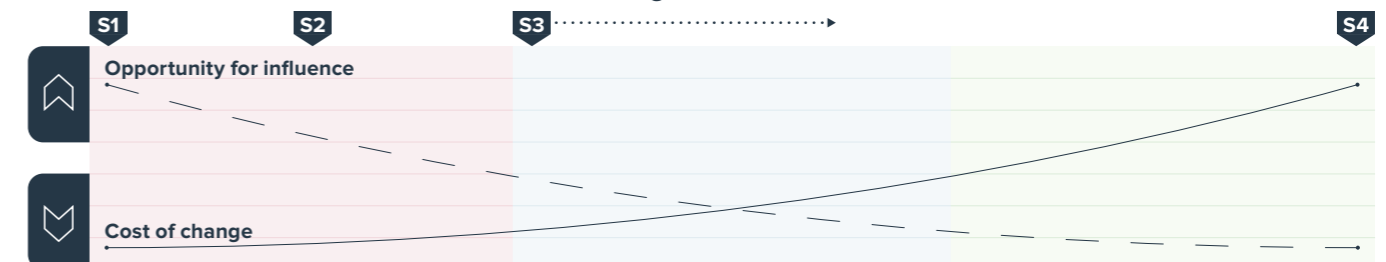
The *2021 Plan* recommends best practice due diligence through FEED processes be incorporated into existing processes.⁵⁷

Implementing FEED will ensure the wider community, including diverse users, will benefit from better-planned, fit-for-purpose infrastructure. For more information on community access to infrastructure, see the **Transport chapter**.

Figure 3.3: Effective due diligence through FEED delivers better project outcomes



Infrastructure Australia Assessment Framework stages



Source: Adapted from Office of Projects Victoria (2019)⁵⁸

Improve decision-making through whole-of-life considerations

There is often a large emphasis on project delivery costs (capital costs) when making investment decisions about an infrastructure asset. Yet capital costs often only account for between 1% to 20% of the total spend over an infrastructure asset's life.⁵⁹

Governments can improve infrastructure decision-making if they better understand operational costs over the full life of the asset.

Incorporating this understanding can also address unintended trade-offs that arise in pursuit of lower capital costs. The largest, often unintended, consequences come from making decisions about equipment, design or functions that cost less in the short-term, but more over a longer period due to factors such as higher operational or maintenance costs, or increased services support, among others.

There are other trade-offs too. For example, selecting the lowest-cost bid can result in unforeseen reductions in quality, on reliability and safety. Making this decision, intended or otherwise, can result in sub-optimal infrastructure assets that may be in place for decades.

Whole-of-life considerations will ensure governments are better placed to consider the detrimental effects on future users and taxpayers if a lowest-cost bid changes the quality of the asset.⁶⁰ A new, nationally consistent best practice approach for governments assets and validation of ongoing operational costs is needed to improve decision-making.

This approach will empower project teams to assess project scope, project options and tender bids on a whole-of-life basis. This will enable them to consider if higher upfront costs will yield lower operating costs that provide a better overall return.

“ Governments can improve infrastructure decision-making if they better understand operational costs over the full life of the asset. ”

Conversations about whole-of-life best practice approaches are inseparable from calls to increase the use of common information structures, systems and processes across the project and asset lifecycle. Examples include work breakdown structures, cost breakdown structures, asset classification schemas and maintaining critical project meta-data (such as risk). This information, once structured and consistently followed, is valuable to a range of stakeholders.

For example, given the magnitude of current and planned investment forecast in the transport

infrastructure sector, it is critical that asset planning is informed by quality whole-of-life data. For more information about the need for nationally consistent modelling tools in the transport sector, refer to the **Transport chapter**.

Decisions must support global competitiveness and consistency

Australia's governments can create a more attractive infrastructure market and drive the cultural changes by reforming procurement practices. A focus must be maintaining global competitiveness to ensure the sector remains attractive to foreign organisations and investment.

Despite wholesale changes in international practices, commercial arrangements in Australia's infrastructure sector have remained relatively unchanged over recent decades. Many other countries are increasingly acknowledging the role of infrastructure delivery, focusing more on market stability, and driving towards a more collaborative operating environment.⁶¹

This disconnect is particularly problematic for firms operating in the global infrastructure delivery market.

Organisations participating in the sector, both domestic and international, are increasingly likely to look for opportunities elsewhere if local infrastructure projects and contracts are comparatively risky, or offer lower and less predictable margins than other countries.⁶²

Governments can ensure Australia's infrastructure sector is a more attractive and productive environment through commercial reforms that attract international investment. These should address industry pinch points and be developed collaboratively, with a commitment to shared objectives.

Governments and taxpayers will also benefit from commercial reform. It will enhance individual project outcomes and increase Australia's capacity to deliver more infrastructure in the future through a sustainable and thriving industry.

Transform governments into model clients that collaborate with industry

Governments can deliver better project outcomes through procurement that recognises long-term collaboration as an inseparable component of a sustainable industry. Poor risk management and contracting practices such as assumption of adversarial relationships between government and industry foreshadow project failure and undermine collaboration.

Governments as model clients can build stronger, more trusting relationships with the infrastructure industry.



Address the need for contract reform

Procurement contracts and processes present a major opportunity for reform to address industry-wide grievances.

Frequently, governments use contracts that are labelled 'standard', however are actually bespoke. Contract uniqueness can lead to interpretation issues and contract management failures.⁶³ The situation is often compounded by requests for industry to respond to tenders within unreasonably short timeframes. Furthermore, it is rare for costs associated with bids to be directly recoverable.

Current tendering practices have compounding effects from the contractor to the supply chain. In the long-term it erodes industry confidence and may deter bidders.⁶⁴ This reduces competition, so taxpayers pay more for the infrastructure.⁶⁵

Governments can lead change as model clients. For example, bidders should be able to recover some of the bid costs from governments where they are unsuccessful. Alternatively, governments can arrange the tendering and bidding process to reduce the bidding pool sooner or can utilise FEED processes to reduce risk so as to ensure the contracting market avoids unnecessary costs.

Both these approaches will create a more positive environment and mitigate attempts by the contractor to recover costs elsewhere.

Be open and fair about project risk

The current contract approach in public infrastructure is to pursue the maximum transfer risk to the successful bidder. This is perceived to protect the government and taxpayer from these risks. However, many providers are unable to mitigate or minimise these risks, or do it cost-effectively. Despite the belief risk is transferred and therefore managed, poorly allocated risk exposes government to inflated project costs and the risk of project cost and time over-runs, or potential project failure. At its best, this practice is misleading as it erroneously suggests risks are being effectively managed.⁶⁶

The practice of forcing industry to accept risks they cannot reasonably control or bear increases the likelihood of variations and inflated budgets, including excessive contingencies. It increases the risk of default and can drive negative behaviour such as withholding payments to suppliers and sub-contractors, and over-engineering or 'gold plating' project designs to cope with uncertainties. Such negative outcomes compound and erode value for money.

Governments can create positive outcomes by being transparent, highlighting risk and implementing management best practices. Championing the role of 'model client' and reviewing risk models with the successful bidder will increase industry confidence and value for money outcomes.⁶⁷ The resulting project scope will lead to fewer claims and variations and ultimately increase the market's capacity to bid.⁶⁸

Project risk can be reduced through the use of standard form contracts, reviewing onerous clauses in contracts, and moving towards more 'collaborative' arrangements (irrespective of the contracting model used). Even high-risk transfer models, such as 'design and construct', can be more collaborative.

Another key opportunity to reduce risk in infrastructure is to review the Private Public Partnership (PPP) model. PPPs are the primary vehicle to support private investment in public infrastructure. However, recently the use of PPPs has been declining in both in Australia and domestically. The decline is in part due to the industry concerns about risk allocation or complexity. The reduction in the use of the model could have the undesirable impact of reducing opportunities for private investment, thereby reducing overall investment or increasing costs to taxpayers.

In the face of declining use, PPPs in Australia need to be reviewed. This should start with government and industry focussing on the 'partnership' element of PPP. A reinvigorated PPP model that establishes genuine delivery partnerships through greater sharing of risk and reward will increase the accessibility of this model for smaller projects and deliver more projects overall.⁶⁹

The UK is leading the way

The United Kingdom Institute of Civil Engineers has developed the New Engineering and Construction Contracts (NEC). These formal, consistent guides, templates and other supporting documents can be used on a range of infrastructure in the United Kingdom.

The latest iteration, NEC4, was launched in 2017. The NEC is a family of standard contracts, so it promotes a range of options for use in a variety of commercial situations, project types, scenarios and locations.

Beyond project implementation, the system includes supply contracts, frame agreements, professional services arrangements and design, build and operate contracts.

NEC is attracting global support and accolades from practitioners, owners and all parts of the supply chain.

The NEC simplicity, collaborative focus, and effectiveness at sharing risk and reward has seen it adopted internationally, supporting the United Kingdom's access to international markets for exporting services and attracting investment.



Source: NEC Contracts (2017)⁹⁰

Address industry's insurance risk

Australia's infrastructure sector is feeling the effects of globally hardening insurance markets in which premiums are significantly increasing while coverage is reducing.⁷¹ Infrastructure sector insurance premiums have increased more than 20% over the past year, double global norms.⁷²

While some increases are due to bushfires and other extreme events, premiums could be lowered if Australia's governments changed their risk practices. As buyers, beneficiaries and regulators of infrastructure, governments can reduce insurance costs by maturing their conversations with industry around risk. This will involve apportioning risk to the most appropriate party and avoid over-specifying coverage.

Governments can also reduce insurance costs by looking at innovative ways to use their sovereignty and buying power to broker insurance services on behalf of industry. Policies and costs could be novated to consultants, contractors and sub-contractors on a pro rata basis, similar to the approach used by Queensland's Department of Transport and Main Road's principal arranged insurance (PAI) model.⁷³

Without these changes, there are likely to be fewer organisations that can participate in delivering publicly funded projects, considerable rises in bid prices, and reduced insurance coverage.

Improve early market engagement

Industry and government experience shows that earlier market engagement with a focus on risk transparency and collaboration tend to drive healthier and more open conversations. This results in high-performing infrastructure that is better designed and delivered.⁷⁴

Early engagement should involve comprehensive and transparent risk workshops with potential delivery partners. These will help governments to better understand if projects are scoped and packaged in ways that can be successfully delivered by industry.⁷⁵

The prevalence of mega-projects and mega-contracts is escalating.⁷⁶

Governments can reduce the likelihood of market failure and increase competition by packaging the work in line with project fundamentals and market capacity. A range of methods can achieve this, including partitioning, joint venturing, interfacing and/or staggering commencement and delivery.⁷⁷ Staggering can be implemented with quality investment practices such as real options analysis.⁷⁸

Earlier market engagement will also help government project teams to determine the most appropriate delivery method, based on industry's capacity and the project type. This will create best practice guidelines for market engagement during early project phases.

“Earlier market engagement with a focus on risk transparency and collaboration tend to drive healthier and more open conversations.”

The guidelines should cover topics such as multi-stage bidding, industry feedback on design, and government-led implementation of constructability, maintainability and operability reviews. To encourage this new approach, governments should develop commercial and collaboration skills across all infrastructure delivery agencies.

Protect payment certainty and security

Delayed and disputed payments throughout the infrastructure supply chain are significant industry issues.

Governments are model clients when it comes to paying parties where there is a direct contractual relationship. However, issues with payment certainty and security are more prominent down the infrastructure supply chain for businesses that are indirectly contracted.⁷⁹ Over recent decades, there have been attempts to address this with legislation, but the challenge remains unresolved. This situation has contributed to comparatively high rates of insolvency for businesses across the sector.⁸⁰

Given the volume of upcoming work in public infrastructure in response to the COVID-19 pandemic, it is critical this issue is addressed using compliance and enforcement, or by using progressive commercial practices.

For example, government can take a more active role by working directly with sub-prime contractors and consultants working on government infrastructure projects to verify whether payments have been made.⁸¹ If payment issues continue, government should consider interventions such as advanced payment or project bank accounts that pay sub-prime suppliers, contractors and consultants directly.

Be clearer about what innovation means

Innovation is an area where an increased focus on project outcomes by governments will improve both industry relationships and how projects are delivered.

Innovation is often cited as a reason to select a particular contracting model and is included in most infrastructure tenders as an assessment criterion. However, government demands on industry to innovate are undefined and unbounded, so the sector is not progressing as it should.⁸²

Industry innovation should be better supported by governments.

Firstly, infrastructure procuring departments and agencies, and project teams can establish a clear direction for innovation within the organisation. Without this, there can be no meaningful basis for industry and bidder responses. Secondly, innovation will only be passed from project to project if governments ensure previously successful innovations are redeployed and successes are shared.

“Government demands on industry to innovate are undefined and unbounded, so the sector isn't progressing as it should.”

Two key areas for immediate uptake to support innovation are modern methods of construction, as discussed in **Reform 3.1** of this chapter, and using digital tools, systems, and approaches, which is discussed in **Reform 3.3**.



3.3 Digital by default

Key messages

- **Digital and data tools** and practices are key to unlocking substantial **productivity gains and efficiencies** across infrastructure planning, delivery and operations.
- The infrastructure and construction sector has one of the **slowest adoption rates of technology**, innovation and digitally supported ways of working.
- Innovation supported by new technologies and digital transformation **requires collaborative leadership between government and industry**.
- **Government**, as regulators, owners, funders and benefactors of public infrastructure, can play a **lead role** in the transition away from 'digital by exception' towards '**digital by default**'.
- There should be an initial focus on policies, **developing digital skills** to complement core professional competencies, and driving **common standards and approaches**.
- Single-purpose creation and procurement of **information and data** must transition towards an environment where it is **shared, reused, structured, open and valued**.
- With these changes, future infrastructure will be **better designed for end users**, governments will **unlock significant productivity gains**, and infrastructure will **cost less to design, deliver, operate and maintain**.

Unlocking productivity with digital and data innovation

Productivity growth in Australia's infrastructure and construction sector has failed to keep pace with comparable sectors in recent decades.⁸³ Over the past 30 years, the sector has become 25% less productive compared to other Australian sectors such as mining, manufacturing, retail and transport.⁸⁴

The infrastructure sector requires support to meet tomorrow's productivity challenges. This will involve embracing digital innovation and data-based tools or best practice systems and processes.⁸⁵

Embracing digital innovation and the use of data will enable the sector to deliver higher quality infrastructure for the same cost.

It will also ensure it has the capacity to accelerate Australia's post-pandemic economic recovery and provide a new skillset for export to a growing global market.⁸⁶

Embracing digital and data-driven opportunities to create a more productive infrastructure sector is a challenge industry can solve. All levels of government have a lead role as policy-makers, investors, clients and regulators and work together to create change that enables an effective industry response. This will drive the successful implementation of digital and data innovation across the sector.

“ Embracing digital innovation and the use of data will enable the sector to deliver higher quality infrastructure for the same cost. ”

Reforms underpinning a digital by default approach in this chapter align with recommendations in the **Telecommunications and digital chapter** of the *2021 Plan*.

3.3 Recommendation

Increase productivity and embed a culture of innovation in the infrastructure sector by adopting an evidence-based digital by default approach to infrastructure planning, delivery and operations.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

When this should impact:



Where this should impact:



5-10 3.3.1 Increase the productivity of the infrastructure sector by increasing digital adoption in infrastructure planning, delivery and operations.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Smart Cities Council of Australia and New Zealand, Australasian Procurement and Construction Council and Australia New Zealand Spatial Information Council

5-10 Create ownership and vision for digital approaches to infrastructure planning, delivery and operations by establishing a national office for digital by default in infrastructure.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Smart Cities Council of Australia New Zealand and Australian Smart Communities Association

5-10 Increase the adoption of, and create greater national consistency for, digital approaches to infrastructure planning, delivery and operations by developing a national digital infrastructure roadmap.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Smart Cities Council of Australia and New Zealand and Australian Smart Communities Association

0-5 Kick-start digital by default in infrastructure by verifying all federally funded projects adopt innovative approaches across their lifecycle, including Building Information Modelling, digital engineering, embedded sensors and digital asset management. Strengthen nationally consistent guidance, tools and templates to match these objectives.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australasian BIM Advisory Board and industry representative groups, including BuildingSMART Australasia, IoT Alliance Australia and Asset Management Council of Australia

0-5 Improve knowledge-sharing about digital approaches to infrastructure planning, delivery and operations and promote more consistent approaches between jurisdictions by establishing a national digital infrastructure network.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Smart Cities Council of Australia and New Zealand and Australian Smart Communities Association

5-10 3.3.2 Accelerate the adoption of digital approaches to infrastructure planning, delivery and operations by coordinating jurisdictions and achieving national consistency.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Smart Cities Council of Australia and New Zealand and Australian Smart Communities Association

5-10 Increase productivity by implementing the national digital infrastructure roadmap to establish an Intelligent Infrastructure Innovation Scheme across all levels of government.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 3.3.3 Embed a digital by default approach to infrastructure delivery and operations by significantly scaling up related capabilities, resources and activities.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure delivery agencies and industry representative groups, including Smart Cities Council of Australia and New Zealand and Australasian Procurement and Construction Council

5-10 Increase digital adoption in infrastructure and develop jurisdiction-wide digital twins of the built environment by creating or strengthening related capabilities and cross-departmental functions.

Proposed lead: State and territory treasuries
Supported by: State and territory delivery agencies and industry representative groups, including Smart Cities Council of Australia and New Zealand, Australian Smart Communities Association and Australia New Zealand Spatial Information Council

5-10 Embed a digital by default approach by creating and implementing a smart infrastructure policy in each jurisdiction that uses technology and data to drive economic success and social inclusion.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure delivery agencies and industry representative groups, including Smart Cities Council of Australia and New Zealand, Australian Smart Communities Association and Australia New Zealand Spatial Information Council

5-10 Create accountability for quality digital asset management through the asset lifecycle by appointing digital asset champions on all projects, and consider the use of digital estate management contracts. Ensure the owner maintains control of the physical and digital asset.

Proposed lead: State and territory infrastructure delivery agencies
Supported by: Industry representative groups, including BuildingSMART Australasia

0-5 Digitise all major projects by applying contemporary digital engineering practices that leverage proven technologies and processes, such as Building Information Modelling.

Proposed lead: State and territory infrastructure delivery agencies
Supported by: Industry representative groups, including BuildingSMART Australasia



Measuring progress



Quality

Digital twin

Percentage of Australian Government funded projects incorporate a digital twin, using a harmonised approach

Target: 100%

Timeframe: 0-5 5-10 10-15 15+



Governance

National digital infrastructure roadmap

National digital infrastructure roadmap published, with progress reports

Target: Published annually Timeframe: 0-5 5-10 10-15 15+



Governance

Digital asset champions

Percentage of projects over \$50 million (2021 \$) that have digital asset champion roles

Target: 100% Timeframe: 0-5 5-10 10-15 15+



3.3 Digital by default

Focusing more on the 'bits and bytes'

Australia's infrastructure sector has grown substantially over recent decades. Today, the broader industry accounts for nearly 20% of Australia's GDP and directly employs 1.2 million people.⁸⁷

However, the sector's productivity has lagged behind the growth and productivity of other Australian sectors.⁸⁸ To address this poor productivity trend, there is a clear opportunity for government to make digital innovation the core of all infrastructure decision-making.⁸⁹

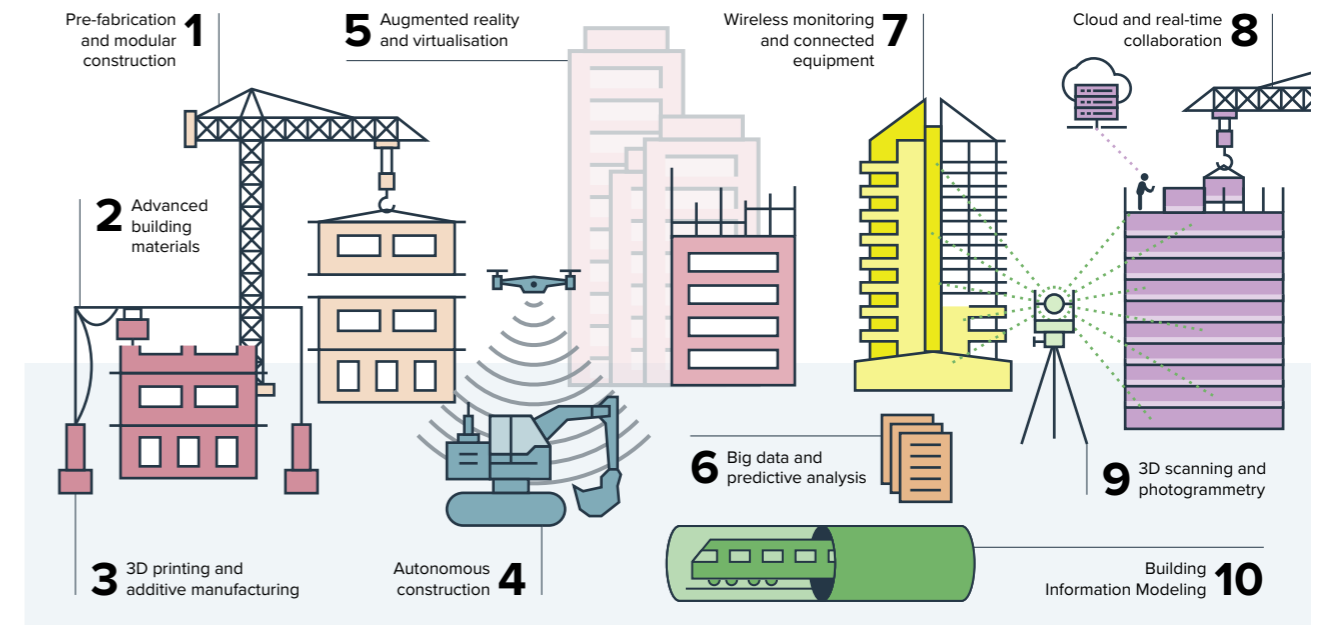
While there has been some progress in adopting digital tools and approaches, it is ad-hoc. Given the scale of the sector, and the magnitude of current and future investment, efforts to embrace digital innovation will unlock substantial productivity gains for the wider community (see **Figure 3.4**).

Implementing best technology practices could result in a productivity improvement up to 15% and more than 5% in cost efficiencies.⁹⁰ If proven digital tools and practices are used now, the sector can realise benefits rapidly.

However, their use requires governments to challenge the current approach to procurement, engagement, and information handover. It will include a progression away from analogue approaches towards the adoption of digital tools and practices as the default for infrastructure projects.

Building Information Modelling (BIM) and digital engineering are two examples of suitably well-established digital tools and approaches. They have been shown to deliver better project outcomes, increase productivity and improve infrastructure performance.⁹¹

Figure 3.4: Embracing digital and data opportunities will unlock productivity and drive value



Source: Adapted from Future of Construction (2018)⁹²

Executive summary

Introduction

1. Place

2. Sustainability

3. Industry

4. Transport

5. Energy

6. Water

7. Telecommunications and digital

8. Social infrastructure

9. Waste

Methodology and results

Next steps

Case Study: Utilities Hub 2.0

A common, and often costly, challenge on infrastructure projects is management of underground utilities. They are difficult to locate and hard to isolate, so they present a critical risk to many projects.⁹³

As a result, utilities can account for approximately 4-8% of a project's budget. To overcome this challenge, the Victorian Government's Level Crossing Removal Project embarked on an important and innovative program, Utilities Hub 2.0, so the team could better understand the ground beneath the level crossings.

Utilities Hub 2.0 combines BIM, Computer Aided Design, Geographic Information System data and technologies with workflows from field technology such as ground-penetrating radar and electromagnetic locators.

The result is a spatially accurate 3D model with metadata that aligns with the relevant Australian Standard for subsurface utility information (AS 5488). The model is available to all project team members and contractors.

They now have access to the most accurate information for project designs and onsite excavations. This means there are fewer asset strikes, reduced costs and delays, and disruptive outages are avoided.

The program has long-term benefits, as the information can be captured, stored and reused for any further work in the area.

Drive routine adoption of technology through government influence

There has been some progress across Australian governments in driving the increased use of digital tools and practices in infrastructure planning, delivery and operations. However, approaches are inconsistent and applied ad-hoc.

“ Governments can drive digital by default outcomes by proactively working with industry to adopt tools and practices that will improve productivity. ”

The current approach relies heavily on the low-risk deployment of technology in pilot form. Under this 'digital by pilot' approach, bespoke initiatives showcase productivity benefits, but the benefits are only partially realised.

There is an opportunity for governments to progress towards a digital by default approach. This should occur by developing policy, guidance and standards that drive consistency and support the training and development of all stakeholders involved in infrastructure. It should be extended to developing or creating in-house expertise and knowledge to support and ensure digital tools and practices are routinely adopted.⁹⁴

Beyond clear policy, guidance and in-house skills development, governments can also make infrastructure more productive by specifying digital requirements, parameters and expectations for each contract and project. Governments can drive digital by default outcomes by proactively working with industry to adopt tools and practices that will improve productivity.

Australia has the potential to create a new era in infrastructure where projects are quicker to deliver and more cost-effective, assets are more fit-for-purpose and highly functional, and the sector's approach is exportable globally.

Harness the power of federation

State and territory governments are predominantly responsible for delivering infrastructure or for implementing digital and innovation, rather than the Australian Government.⁹⁵

States and territories have different levels of maturity when it comes to digital infrastructure and smart cities.

The Australian market is fragmented. There is an opportunity to develop a consistent vision, standard, ways of working and products.

The current inconsistencies have a direct impact on the productivity of the sector, the industry, governments and ultimately the community. This fragmentation can threaten multi-billion-dollar investments that are currently underway. Left unabated, these risks are likely to grow over time. They could entrench resistance and increase the cost of change, while limiting the benefits users receive from infrastructure.

Create change through a centrally-led model

Past federating action led by the Australian Government, such as the National Construction Code and data-sharing during the COVID-19 pandemic, demonstrate the benefits and opportunities that can arise with early and centrally driven leadership.

The Australian Government can help to create a new era of productive infrastructure delivery by applying a federating role to enable sector innovation.

A centrally led model has been key to unlocking productivity benefits in other countries, notably the United Kingdom.⁹⁶

The most effective approach in the Australian context would be to establish a national office for digital by default in infrastructure.

The office would be a centre of excellence leveraging the experiences of similar entities, such as Digital Built Britain, Digital Scotland, or the Infrastructure Technology Department of the Scottish Future Trust.^{97 98} It could reside within an existing department, but would benefit from collaboration with other Australian Government departments and agencies.

The office would work with states and territories and their infrastructure delivery agencies, industry, Standards Australia and other critical stakeholders to provide a unifying strategy for embedding digital infrastructure delivery and operations as the default.

Its initial task would be developing a clear roadmap for national digital infrastructure. This would establish the vision, direction, actors and actions required to create a step change in digital infrastructure planning, delivery and operations.

Drive sector-wide innovation

A concurrent task for the new office would be establishing and managing an intelligent infrastructure innovation scheme to drive innovation across the sector. This would begin with public works infrastructure, where governments have the greatest influence, but would eventually flow into commercial and residential sectors.

The Australian Government should establish the office and lead discussions around cross jurisdictional cooperation. The initial focus of the office should be on the main elements of digital transformation, including:

- vision and governance
- security
- skills and training
- grants and investment
- standards and guidance
- ePlanning
- digital asset management
- projects and procurement
- partnerships and grants
- data and access.

The proposed model creates a framework for driving much-needed national consistency while providing each jurisdiction with a degree of flexibility. The scheme would ultimately generate healthier conversations and unlock latent productivity benefits. Such a scheme would play to government strengths, roles and responsibilities in providing and delivering infrastructure.

Implementing the scheme would support long-term infrastructure planning objectives, particularly for Australia's dense urban environments as they undergo rapid post-pandemic change. For more information on this topic, refer to the **Place-based outcomes for communities chapter** in the *2021 Plan*.

Realise the value of data to start the innovation revolution

When it comes to infrastructure, the term 'innovation' is often associated with approaches that are new, untested or different. However, in many circumstances, innovation should involve thinking more about practices, tools and information that are already available and how they could be more effective and efficient if adapted or reused.

This approach requires governments to embrace data and information capture, structure, sharing and reuse across infrastructure delivery and operations.⁹⁹ This requires a more mature approach in valuing data that is created, procured and (often) disposed of.¹⁰⁰

Other countries are leading the way. For example, Transport for London now shares much of its data publicly, which contributes an estimated £130 million per year to the local economy.¹⁰¹

In Australia, New South Wales has introduced Transport for NSW's Transport Connected Bus Program and a real-time open data program that feeds into customer information apps and other tools.

As these examples show, improving how data is captured, used and shared can unlock diverse economic, governance, social and environmental benefits (see **Figure 3.5**).

Unlocking these benefits is contingent on working across traditional government silos. Cross-departmental agencies, such as Digital Twin Victoria, show it is possible to address this challenge.¹⁰²

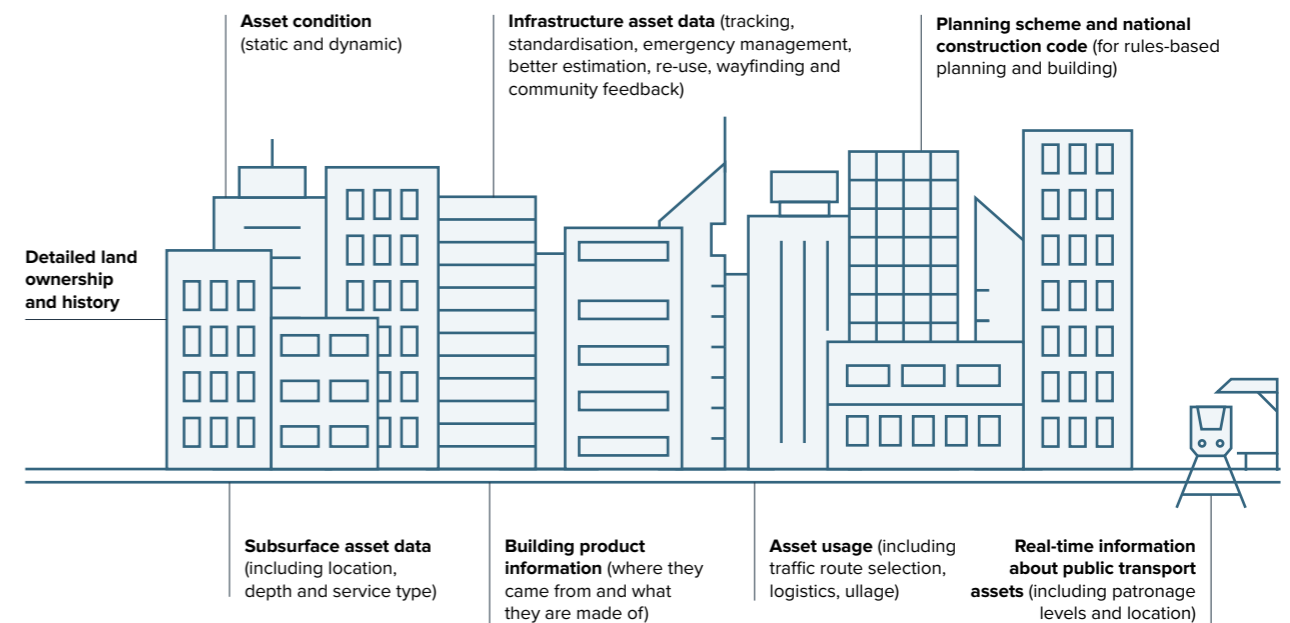
State and territory digital twin owners should be tasked with identifying, collecting, collating or providing data from the infrastructure sector for third party use. Some areas where there could be greater uptake are:

- e-planning
- modernising cadastral systems (land information such as boundaries and subdivision size)
- creating and sharing digital twins
- maintaining accurate and valuable spatial information
- federating data from public and private works
- creating and maintaining relevant standards
- incorporating open data collection and provision as a standard requirement in tenders
- establishing more seamless cross-stakeholder data-sharing, storage and access arrangements.

“Improving how data is captured, used and shared can unlock diverse economic, governance, social and environmental benefits.”

For more information about the value of creating digital twins, see **the next section**.

Figure 3.5: Infrastructure datasets can unlock economic, social and environmental benefits



Build better performing, better-value assets

The goal of infrastructure is to create a high-functioning asset that serves a community need.

Using digital tools and processes during all project phases can help governments achieve this goal. This can improve infrastructure delivery and community usability and engagement.¹⁰³

For example, combining geographic, demographic and future land-use data will help to determine the optimal location and function of a health infrastructure asset.

The benefits of using data to deliver the right project at the right time are clear.¹⁰⁴ However, while there has been a major uplift in the volume of data and information available to decision-makers, it is often unstructured, of mixed quality, siloed, or kept in proprietary formats.

In these circumstances, its value is reduced which may hinder the quality of project decisions.

Governments that address this issue with a sense of urgency will reap a 1–2% productivity increase a year while reducing sector risk.¹⁰⁵

Leverage the full value of data

Community value can also be unlocked by capturing, structuring and sharing data. For example, with patronage, usage and user experience information about existing hospitals, governments can improve the design and function of each subsequent hospital.

At the core of these digital innovations is embedding improved analysis of current and future users. A prime example is the Cross River Rail customer experience centre in Brisbane. As well as being used to familiarise the community with the staged delivery of the project, it is collecting de-identified data about how customers will behave when the system is open.

While digital innovation adds minor costs to a project, it provides significant benefits. These include improved customer simulation, journey mapping and user insights. It is also an ideal mechanism for capturing community member and user feedback, which can increase government social license and ultimately lead to infrastructure that better meets the needs of users.

Three-dimensional digital models of infrastructure are a valuable tool to inform decision making and engagement with the community and other stakeholders. A three-dimensional model can allow large, complex projects to be visualized and understood before they are built, including by members of the public that may be unfamiliar with infrastructure development. This approach allows refinement of scope and design considerations earlier, before the project is physically built. Doing so could, for instance, reduce the cost, frequency and magnitude of government-generated variations later in the project's life and increase community ownership.



Improve government capabilities and knowledge

To embed a digital by default approach across infrastructure projects, governments need to elevate their capability and capacity, particularly on project teams. A good start is to appoint a digital asset champion on all projects above \$50 million.¹⁰⁶ This role would ensure the project is pursuing every opportunity to implement digital by default across the asset's lifecycle and is following relevant approaches and standards such as ISO 19650 (the international standard for managing information over the lifecycle of an asset).

While building this capability in-house, governments may choose to appoint third parties for digital estate management. As an interim step, this would ensure critical information is being captured, shared and used over time, and would increase value for money for every asset.

It is possible to accelerate Australian infrastructure's transformation towards digital by default by looking ahead at sectors that began the transition some time ago. Australia's mining and oil and gas sectors have embraced digitalisation through model-based system engineering, remote operations, embedded sensors, artificial intelligence and robotics.¹⁰⁷

Capture asset data value immediately

Infrastructure projects create large amounts of data, and governments and industry can easily capture the value of their existing and future datasets for reuse or sharing.

Each time this happens, there is a downstream productivity and efficiency benefit for other infrastructure stakeholders and end users:

- engineering designs can be reused on similar projects, saving costs
- the costs of materials and equipment can inform benchmarks that improve value for money
- asset performance data can inform future investments.

To unlock these benefits, governments should encourage delivery departments and agencies to adopt better data management practices. These practices should include the collection, use and storage of structured data sets that allow for use by others in the asset lifecycle and shared with other stakeholders, including the public.

Data management practices in the infrastructure sector should follow the good progress made by governments in open data more broadly.

The transition towards digital by default may be impeded by legal or commercial challenges, such as data sharing, privacy, ownership or security. These challenges can be overcome with quality processes, systems and due diligence.¹⁰⁸ For more information about the importance of due diligence, see **Reform 3.2** in the *2021 Plan*.

Replace engineering with digital engineering

Digital engineering creates richer information that improves decision-making. Its strength stems from all critical infrastructure asset information and data being intelligently linked and attributed to physical and real-world objects. In this environment, any asset can be created twice — first virtually, then physically.

A digital engineering environment creates and supports a raft of benefits for a range of different stakeholders:

- It means components from one project can be reused on the next. This repeatability drives cost-savings, leading to the creation and operation of more infrastructure for less. This is the cornerstone of concepts such as 'design one – build many', which has had considerable success in other capital-intensive sectors such as manufacturing and oil and gas.¹⁰⁹
- It improves confidence in decision-making by creating more intelligently designed infrastructure with fewer risks and increased functionality.
- It enables governments to accurately model how infrastructure will operate into the future when sustainability, climate, resilience and public safety factors are considered. For more information about the role of data and digital approaches in sustainability, see the **Sustainability and resilience chapter**.
- It enables governments to better understand how infrastructure works as a 'system' or within the environment where it is situated.
- It helps to reduce risk for stakeholders across the supply chain. In turn, this will improve delivery confidence, leading to more collaborative and innovative infrastructure.

In 2016, Infrastructure Australia recommended Australia's governments adopt digital engineering by using BIM.¹¹⁰ Although there are some indications of progress, nationally consistent adoption can be accelerated. All governments stand to benefit significantly, as it will provide a pathway for the rapid uptake of digital twins.

Use digital twins to support data-driven decisions

While digital engineering adds value at a project level and between projects, its real value is unlocked when it is integrated at a city- or precinct-level via digital twins.

A digital twin is a conceptual environment where large volumes of data are federated, visualised (usually in three or four dimensions), and used to improve decision-making. Other dimensions such as cost and sustainability can be easily integrated for a more complete picture.

Some Australian governments are beginning to recognise this opportunity, including New South Wales' Spatial Digital Twin, Queensland's SEQ Digital Twin and Victoria with its Fishermans Bend Digital Twin pilot and the establishment of Digital Twin Victoria.¹¹¹ Many of these are supported by CSIRO's Data 61 National Spatial Data Infrastructure National Digital Twin Initiative.¹¹²

While digital twin pilots in these jurisdictions have demonstrated value, there is also an immediate need for a more integrated, cross-jurisdictional collaboration paired with a consistent national approach. This will unlock additional value by driving a new era in long-term planning, policy development, infrastructure development and digital innovation.

While there are many current use cases, more will emerge as digital twin skills and technology develop further.

Governments can work together to accelerate digital twins by creating governance models, processes, technologies, systems and capabilities. These must be designed to drive cross-government collaboration in all aspects of data and digital approaches in the built environment.



3.4 Next generation infrastructure investment

Key messages

- **All levels of governments play an ongoing role** in improving infrastructure project investment decisions and deliverability, supporting sector productivity and ensuring value for money.
- The infrastructure sector needs **a clear and consistent long-term direction**, focused on improvements to productivity, investment and project outcomes over the next 15 years.
- This **vision should be evidence-based**, developed collaboratively by the Australian Government with jurisdictions and industry.
- Before governments identify infrastructure projects as shovel-ready, **proposals should first be developed and assessed as investment-worthy**.
- It is critical to **invest in capabilities** so the Australian Government can understand, execute and oversee more mature commercial and financial arrangements with states, territories and the private sector.
- A **more commercially and financially sustainable infrastructure industry** is vital for Australia's social and economic wellbeing.
- Government and industry can make stronger commitments to increasing sector productivity and competitiveness and **develop a detailed plan to address current challenges**.
- The Australian Government should **continue efforts to become a more proactive investor by building capabilities and processes** that help identify and initiate nationally significant projects, attract investment, upscale gateway reviews and assurances, and develop infrastructure delivery capabilities.

Maximising value for money

There is an increasing focus on the role of infrastructure in Australia's economic recovery from the COVID-19 pandemic.

Governments are looking to infrastructure investment as an effective mechanism for stimulating the economy in the short-term and creating a valuable and productive asset for the community over the long-term.

Realising both these outcomes requires governments to make decisions and establish governance arrangements that prioritise the 'right' infrastructure investments but also have appropriate checks and balances to identify, avoid and challenge other projects as they compete for investment.

Governments can continuously improve how infrastructure investment decisions are made, and how projects can be delivered in a way that reduces risk and increases their return on investment.

This means having the skills, tools and processes to ensure investments and projects represent value for money, stimulate economic and community growth, are predictable and transparent, and can be sustainably delivered by industry. They should also be equitable.¹¹³

All levels of government should consider how infrastructure should be funded and financed into the future through this lens.

The benefits of more effective infrastructure decision-making will improve community outcomes, a healthy and productive industry, attractive markets for supporting local and foreign investment, and reduced economic, social, environmental and political risks.

To support this process, there needs to be a clearer and broader definition of value for money to challenge the current practice of favouring the lowest cost. The definition needs to focus on public value supported by an outcomes-led investment approach.

3.4 Recommendation

Deliver a greater return on investment by ensuring governments act as model clients and custodians of industry health and productivity.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Finance

When this should impact:



Where this should impact:



5-10 **3.4.1 Improve user and community outcomes by aligning investment and reforms with a unified and central vision for future Australian infrastructure.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, inclusive of Australian Constructors Association, Business Council of Australia, Consult Australia and Infrastructure Partnerships Australia

5-10 Increase clarity and confidence for industry, governments and community practice by creating a common national infrastructure vision with a commitment to principles, strategic focus areas, objectives and performance metrics.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 Expand and promote new and existing industry and jurisdictional reforms and best practices by establishing a government and industry collaborative leadership group.

Proposed lead: Infrastructure Australia
Supported by: Department of Infrastructure, Transport, Regional Development and Communications, and industry representative groups, including identified leaders of change

5-10 Provide a consistent view on the maturity of major project decision-making by refreshing and reporting against the Infrastructure Decision-making Principles.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: Infrastructure Australia

0-5 **3.4.2: Optimally allocate and invest in infrastructure with the Australian Government progressing towards a mature and informed investor.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 Strengthen the Australian Government's project delivery capabilities, processes and systems by establishing an office focused on infrastructure project delivery excellence.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Australian Institute of Project Management

0-5 Ensure Australian taxpayer interests are well-represented and drive national consistency in project delivery by appointing experienced senior responsible officers to all major federally funded projects.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Significant Project Investment Delivery Office

5-10 Safeguard community interests and taxpayer funding by ensuring all proposed investments demonstrate an assessment of non-build solutions.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications



Supported by: Infrastructure Australia, state and territory treasuries, infrastructure investment assurance and assessment agencies

5-10 Ensure funding and finance decisions for nationally significant projects reflect best practice by updating the *Commonwealth Procurement Guidelines*, including a clearer and broader definition of value for money.

Proposed lead: Department of Finance
Supported by: Infrastructure and Project Financing Agency

5-10 Provide a pathway for prospective bidders to submit proposals that align with federal infrastructure policy priorities by developing an Australian Government market-led proposals framework that integrates with jurisdictional guidance.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Infrastructure and Project Financing Authority, Infrastructure Australia and industry representative groups, including Infrastructure Partnerships Australia

0-5 Strengthen asset management by ensuring asset registers include condition, use and quality, facilitated by a community of practice between governments, industry and academia promoting excellence in capabilities, processes, audits and systems.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Industry representative groups, including Asset Management Council of Australia

Measuring progress



Governance

National infrastructure industry vision

Australian Government national infrastructure industry vision

Target: Published annually Timeframe: **0-5** 5-10 **10-15** 15+



Quality

Infrastructure project delivery excellence

A permanent Australian government infrastructure project delivery capability

Target: Established Timeframe: **0-5** **5-10** 10-15 15+



Quality

Asset register quality

Percentage of infrastructure asset registers that include condition, use and quality

Target: 100% Timeframe: **0-5** 5-10 **10-15** 15+



Affordability

Whole-of-life value

Percentage of jurisdictions using consistent whole-of-life value for money in their investment frameworks

Target: 100% Timeframe: **0-5** 5-10 **10-15** 15+

Developing a national vision for infrastructure productivity

Current decision-making processes and governance arrangements cause the infrastructure sector to operate in a sporadic, reactive and opaque way.¹¹⁴

All sector participants, including industry, would benefit from a clear and consistent long-term direction for future infrastructure investment and delivery. This would improve industry productivity and infrastructure investments over the next 15 years.

In other countries, providing clarity and agreement by developing and implementing a national infrastructure vision has increased confidence among the public, industry, other tiers of government and domestic and foreign investors.¹¹⁵

Australia would benefit from following these international examples of good practice. It is also important to build on efforts by states and territories to date, such as the *2017 Victorian Infrastructure Plan*.¹¹⁶

The Australian infrastructure vision should be led by the Australian Government and developed collaboratively with jurisdictions and industry. It should be led by the Australian Government and developed collaboratively with jurisdictions and industry.

When the Australian Government takes the lead in creating a national infrastructure vision, its role will be underpinned by its experience in developing visions and directions for other sectors. The National Manufacturing Priorities (established under the Modern Manufacturing Strategy) and the National Science and Research Priorities are just two examples.¹¹⁷

The Australian Government's leadership and vision for infrastructure would complement commitments made

by industry.¹¹⁸ Together, they would create a thriving infrastructure sector through a range of initiatives focused on improving culture, capacity, capability and commercial behaviours.

Establishing a national leadership network supported by representation across industry would be an effective way to build on existing good practice and drive structural change. Infrastructure Australia should lead this initiative and leverage existing good practice.

For more information on the importance of a vision for infrastructure to deliver better outcomes for communities across Australia, see **the Place-based outcomes for communities chapter**.

Ensure projects are investment-worthy

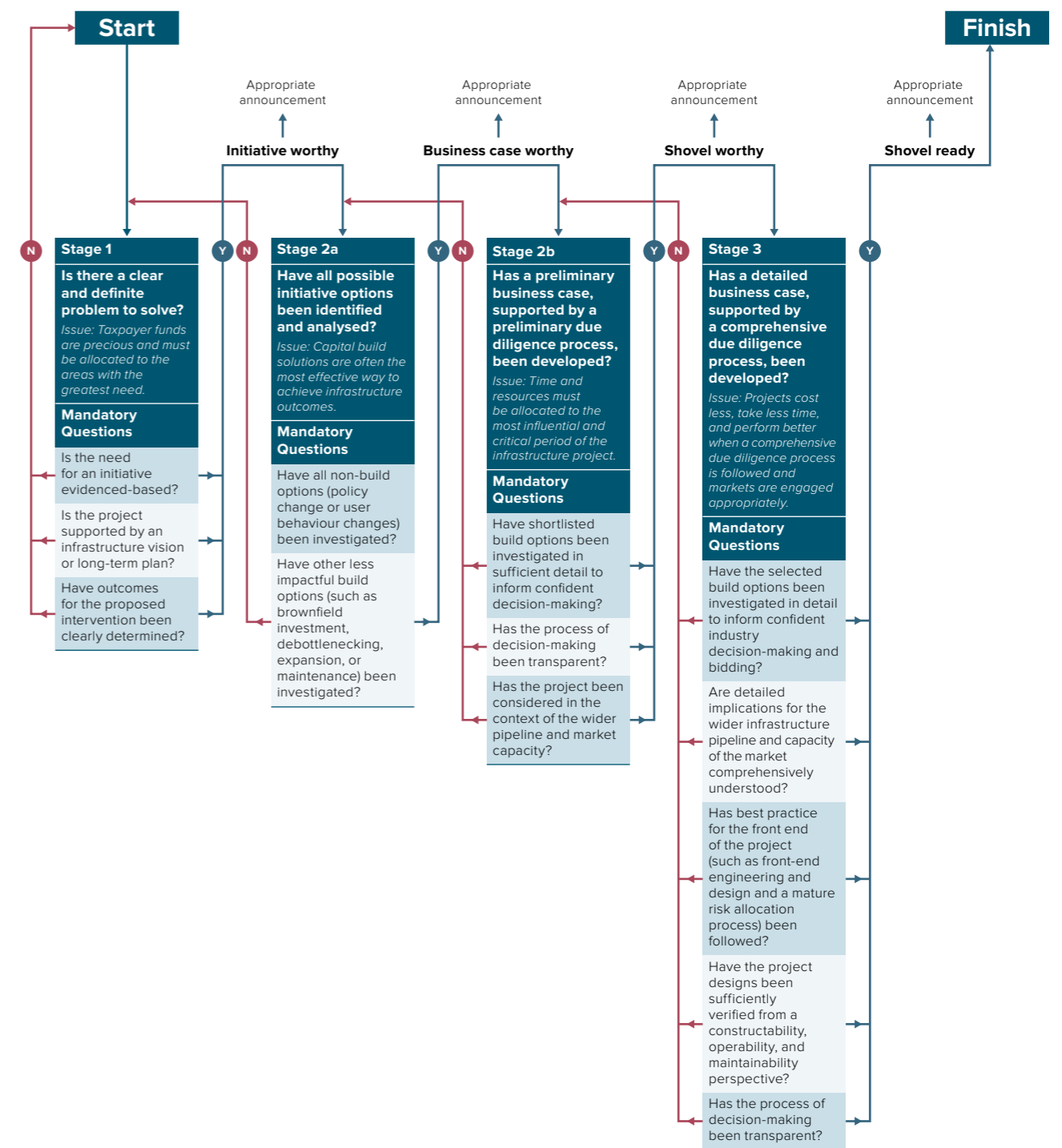
Many stakeholders, including the Productivity Commission, have called for significant improvements to how projects and investments are assessed and developed. They cite the clear link between poor value for money and inadequate project selection.¹¹⁹

To avoid poor performance, infrastructure projects should be assessed as investment-worthy before they are considered shovel-ready, as measured against a long-term view of the desired investment outcomes.

To achieve this, investment decisions should be progressed sequentially and be continuously refined. Each refinement has the potential to unlock significant economic and productivity gains for the proposed projects.¹²⁰

Figure 3.6 highlights the key decision-making steps to ensure a project is investment-worthy before substantial public funds are committed.

Figure 3.6: Sequential decision-making will ensure a project is investment worthy



Solve common problems and maximise value for money

Intelligent investment is characterised by knowing which infrastructure to invest in.

Australia's current and future infrastructure challenges include congestion, equitable access to health, and resiliency in the face of extreme weather events. These and other problems can be solved without spending millions (or even billions) on building or creating new infrastructure facilities or assets.

Instead, governments have a range of non-build solutions that are often more efficient and quicker to realise, and are cost-effective to implement and maintain. For example, they can choose to create or modify policy, set pricing or set incentives and disincentives to change user behaviour.

Softer mechanisms, such as creating awareness campaigns and clear signposting or direction, are other effective tools. For example, in the case of:

Waste: Reduce food organics and garden organics infrastructure construction and operation costs by driving community awareness programs about composting.

Transport: Establish congestion charging arrangements to reduce peak demand and avoid emissions.

Water: Prioritise the use of stormwater for non-consumption uses to avoid downstream network investment and reduce the heat island effect and improve liveability.

Energy: Regulate pricing structures away from a high fixed-charge component towards usage charges, to promote energy efficiency.

“ Intelligent investment is characterised by knowing which infrastructure to invest in. ”

Governments have other inexpensive and intelligent ways to achieve outcomes commonly achieved by investing in new infrastructure. They include better utilising the existing stock of infrastructure, ‘debottlenecking’ it, and/or capturing its underutilised capacity.

For example, in the **transport** sector, governments can make a relatively small investment – relative to the costs of major new capital works – in signalling equipment to run more trains or services simultaneously.

In **social infrastructure**, analysing patient flow may unearth opportunities to convert specific parts of a health facility into multi-use facilities. Such an investment would unlock the latent capacity of the hospital to better respond to patient's needs at a particular time.

A key part of understanding whether the current system, network or asset can generate more output requires a mature approach to asset management. Governments around Australia are beginning to advance their efforts and improve their maturity in asset management.

This progress should be accelerated and enhanced by investments in capability, capacity, systems, process and technology. This will generate social benefits as well as positive economic outcomes.¹²¹

Decisions should be considered over whole-of-life

Decision-making processes and governance arrangements need to ensure the right infrastructure investments are selected.

Quality evidence-based decision-making requires a comprehensive understanding of whole-of-life cost, functionality, performance and condition. All these factors form the basis of quality asset management, in line with international standards (ISO 55000).

Assessment of whole-of-life costs helps to determine if an infrastructure service or asset makes sense over a longer period of time.

Governments should refocus on value and costs across the project and the asset lifecycle by ensuring whole-of-life costs are robustly evaluated in all project business cases.

The Australian Government can require whole-of-life cost assessments to improve asset management. This will require the currency and quality of asset registers to improve.

All public infrastructure owners can drive global best practices by ensuring they routinely capture the condition, use and quality of each asset. Organisations with limited asset management capability and capacity should leverage the community of practices led by industry and academia.

Asset registers and information models should adopt recognised asset information structures, as described in **Reform 3.2** of this chapter.

For more information about asset management, including the establishment of a centre of excellence for the water sector, **see the Water chapter.**

Should this asset be built?

Before infrastructure is deemed shovel-worthy it must be first demonstrated that it is necessary.

All tiers of government, as infrastructure owners and project proponents, should challenge the default position that new assets or further investment is needed in business cases.¹²²

This safeguards finite taxpayer funds for truly required investments, and ensures government is creating an equitable funding environment.

Create an equitable funding and financing environment

The *2019 Audit* found Australians benefit unequally from infrastructure investments and services.¹²³ This lens provides an alternative view for all levels of government to consider how infrastructure should be funded and financed well into the future.

The Australian Government has a range of mechanisms for investing in infrastructure projects, including traditional and conditional grants and commercial and concessional debt, equity and guarantees. Additionally, government should actively review and consider the recycling of capital in established assets, particularly with stable revenue generation, into new assets that meet emerging community needs.

“ Additionally, government should actively review and consider the recycling of capital in established assets, particularly with stable revenue generation, into new assets that meet emerging community needs. ”

Using these different mechanisms effectively can ultimately increase and maximise the value realised from infrastructure investments, particularly in response to growing and sometimes competing community needs.¹²⁴

Government decisions about how best to invest in infrastructure should be informed by a clear understanding of project objectives and risk appetite.

To determine the most appropriate investment mechanism for a project, the Australian Government should develop a strategic infrastructure investment framework to guide decision-making processes. This would complement the existing *Commonwealth Procurement Guidelines* by providing an infrastructure-specific ‘decision tree’ for recommending appropriate and more advanced funding and financing vehicles.¹²⁵

This should be complemented by investing in capability within the Australian Government to understand, execute and oversee more complex commercial and financial agreements with the states and territories and the private sector.

The opportunities and challenges associated with private sector involvement in financing and delivery through the PPP model should also be carefully considered as they continue to evolve. As discussed in **Reform 3.2**, the use of privately funded PPPs is beginning to decline locally and internationally. This trend highlights the importance of careful contract design, a clear understanding of how risk is being managed and shared, and the need for a renewed focus on the partnership aspect of PPP.

Governments should also renew efforts to pursue opportunities that expand the base of investable capital, such as value capture, user pays and asset recycling.

Creating an Australian Government market-led proposals assessment framework that is integrated with existing jurisdictional approaches would provide an additional mechanism for attracting new proposals and investment from the private sector. For example (as discussed in **Reform 3.3**), there are immediate digital asset recycling opportunities for governments to progress.

To increase the likelihood of private sector financing being involved, the review and pursuit of these opportunities needs to be integrated into project decision-making at the earliest stages.

For more information about pricing equality across key areas of Australian infrastructure, see the **Transport, Energy** and **Water chapters.**

Support a healthier, more productive industry

A more commercially and financially sustainable industry is more productive. It is also more likely to invest in developing its workforce, modernise plant and equipment and invest in research and innovation. Ensuring the health of the infrastructure sector is therefore vital to meeting the infrastructure investment task that will be necessary to ensure Australia's social and economic wellbeing.

The *2016 Plan* and *2019 Audit* highlighted that the Australian infrastructure sector needs to improve its performance in the areas of trust, certainty and transparency. This will involve industry and government, as client and supplier, working in partnership, but also the sector as a whole working more transparently with the community. Currently, fewer than two in five Australians trust government, with infrastructure delivery a major interface between the community and government.¹²⁶

“ A more commercially and financially sustainable industry is more productive. It is also more likely to invest in developing its workforce, modernise plant and equipment and invest in research and innovation. ”

Community trust as manifest through infrastructure delivery will be supported by healthy collaborative relationships between government and industry. It is necessary for government to embrace and collaborate with the wider industry, which is made up of groups such as constructors, designers, suppliers, operators and maintenance contractors.¹²⁷

The impacts of the COVID-19 pandemic have seen pressure on the profitability of organisations in the supply chain. With profitability and confidence in the future increasingly marginal for groups further from the prime contractors. It is imperative that the challenges faced by their industry are ultimately shared with governments, which have a lead role to play in addressing them as infrastructure purchasers, clients, owners and operators.

For example, governments should join with industry in making stronger public commitments to achieving a healthier and more productive industry. A publicly released ‘agreement’ between industry and governments, integrated with a detailed plan and commitment from both parties to address longstanding structural challenges, would be a foundation for further action.

Key structural matters to consider would be pipeline certainty, long-term contracting, risk reduction, collaborative models, workplace culture and refreshed definitions and assessments of value for money. The United Kingdom, New Zealand and Scottish governments have taken this approach, leading to positive changes in sector culture.¹²⁸

There should also be further efforts to prioritise industry productivity that complement positive steps made by stakeholders to date. These include Infrastructure NSW’s *10 Point Commitment and Action Plan* and the Australian Constructors Association’s *Commitment to our clients and the construction industry*.¹²⁹

The Australian Government as an ‘active investor’

The Australian Government plays a critical role in how infrastructure projects, assets and services are shaped, defined, financed or funded, approved, delivered and operated. Historically, these responsibilities have been achieved indirectly but the benefits of a more active role are increasingly clear.

As a responsible steward of public funds, the Australian Government should be required to demonstrate value for money outcomes for taxpayers. This is particularly important now, when the sector faces multiple challenges arising from the impact of the pandemic and fast-rising demand for infrastructure services.

Such an environment is driving larger, more complex and more numerous infrastructure projects (particularly larger projects receiving Australian Government contributions). This is increasing project risk. The larger a project is, the higher its risk profile through to delivery.

Economic and social value for taxpayers becomes harder to guarantee when risk in the sector increases. To safeguard economic and social value on behalf of taxpayers, governments should ensure scrutiny, assurance and transparency remain a key part of all infrastructure decision-making.

Leverage the SPIDO to deepen capability

The recent creation of the Significant Project Investment Delivery Office (SPIDO) in the Department of Infrastructure, Transport, Regional Development and Communications reflects the Australian Government’s appetite for becoming a more active investor as well as a responsible steward in infrastructure.

The SPIDO is a dedicated infrastructure project delivery agency staffed by people with expertise in project policy, planning and delivery. The role of SPIDO complements the capability of the Infrastructure and Project Financing Agency, which is focused on both commercial and financial advisory. This new capability represents an important first step and longer-term commitment by the Australian Government to infrastructure delivery.

The full benefits of the SPIDO will take time to realise, given the complexity of the challenges it is responding to and the time it will take to build the associated knowledge, skills and capability, particularly in relation to large-scale projects.¹³⁰

Over time, the work of the SPIDO could support a more substantive and consistent project delivery capability within government. This would include complementary measures such as:

- establishing a body of project experts to support jurisdictions
- creating standardised best practice guidance material
- developing systems and processes to support whole-of-life cost and schedule benchmarking
- proactively identifying, mitigating or managing risk
- increasing returns on investment through specifications based on sustainability, performance and leveraging technology
- deploying in-house specialists and expertise to manage risk and build skills and knowledge across projects nationally
- building a knowledge hub of best practice guidance that supports delivery across projects and sectors.

This new government capability will also be well-positioned to provide transparent advice on shortlists for appointments to the boards of relevant government business enterprises to support infrastructure project delivery. Having a clear view of the balance of skills and experience required to maximise board performance will deliver greater value for money through project delivery and ensure Australian Government interests are well represented.

Strengthen gateway reviews and assurances

The Australian Government should further strengthen its role as an active investor by reinforcing infrastructure gateway review and assurance arrangements. This should happen before there is a deepening of the Australian Government’s role in infrastructure delivery. This would support the Australian Government’s role as an active investor and enhance its ability to assure and understand the business case for investment-worthy projects.

Strengthen the Assessment Framework to support option analysis

The purpose of the Infrastructure Australia *Assessment Framework* is to reduce risk while ensuring infrastructure investment can return the planned economic and social benefits. It does this by using best practice project assurance and evidence-based decision-making, and by applying lessons from similar projects.

The process benefits all stakeholders.

It provides the **Australian Government** with a clearer view of the economic and social viability of project proposals and their deliverability.

It provides **taxpayers** with confidence and helps to build social licence.



It can provide **industry and project proponents** with increased confidence about approaches, assumptions, risks, and benefits.

It can also help ensure lessons from previous projects have been considered and incorporated.

The Australian Government could leverage the *Framework* further by supporting a stronger role for Infrastructure Australia that involves working more closely with state and territory governments to develop project options. This would also ensure greater rigour, transparency and accountability when assessing such proposals outside normal procurement processes.

Enhance gateway reviews

State and territory gateway review processes for infrastructure projects funded by the Australian Government should emulate current best practice, as shown and followed by Infrastructure NSW, and be developed collaboratively with jurisdictions.

The combination of a comprehensive and collaborative Australian Government gateway review process and a greater focus on determining infrastructure deliverability and feasibility is critical for ensuring projects are successfully delivered and best practices are adopted.

Independence is a critical component of review and assurance. Gateway reviews for the Australian Government should be administered independently by an appropriately resourced and qualified organisation. To support this focus, the Australian Government should work with proponents throughout, and on completion of, each federally funded project, to capture lessons, and use the findings to improve future projects. This valuable information would underpin continuous improvement efforts by all stakeholders.

“Independence is a critical component of review and assurance.”



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Transport



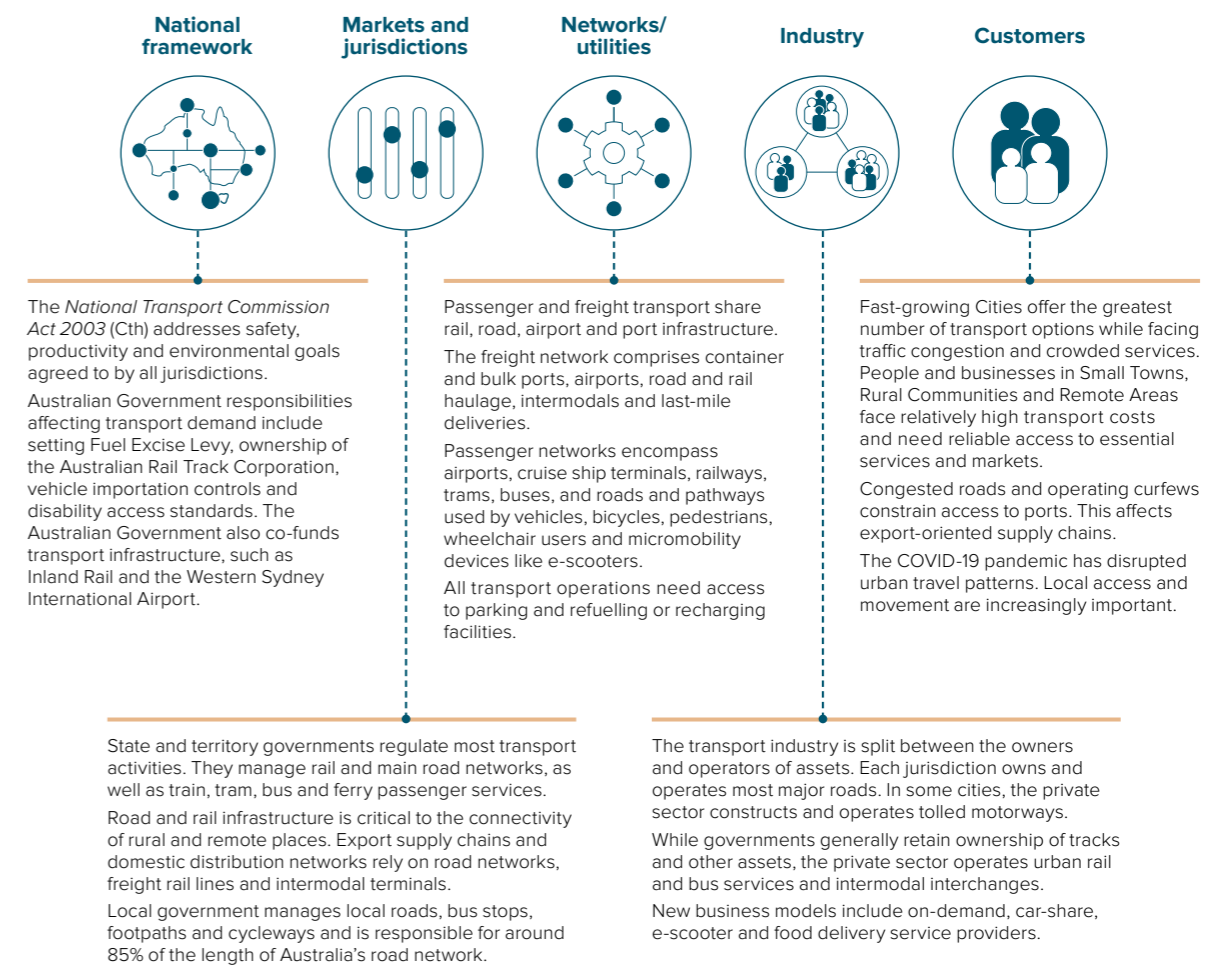
What you will read in this chapter

- **Reform 4.1: Getting the most out of our transport investments** – How existing and new transport infrastructure and services can achieve the best possible movement and place outcomes at a regional, district and local scale.
- **Reform 4.2: Connecting regional and remote Australia** – Creating robust supply chains and user-oriented passenger transport is vital for linking producers to markets and people everywhere to essential services.
- **Reform 4.3: Mobility choice made possible** – Australians in every city and town should have affordable and sustainable door-to-door access to jobs and other everyday requirements.
- **Reform 4.4: A fairer price for every journey** – The part that transparent pricing, charging and funding regimes will play in sustaining the delivery of transport infrastructure services that customers prefer.

Key messages

- **Transport is undergoing generational transformation.** An explosion of new technologies, and fundamental shifts in what users want from services, present Australia with the biggest transport opportunities and challenges since the twentieth century's boom in motor vehicle use.
- **Transport shapes communities.** Australia must build, operate and maintain transport infrastructure that shapes places where Australians want to live, work, play, visit and invest.
- There must be **consistent national movement and place standards** applied under a transparent framework to achieve expected funding outcomes.
- **Transport activities should be aligned** across short-, medium- and long-term horizons, between different levels of government, and across jurisdictional boundaries.
- Working within an overarching vision, **the staged delivery of public transport services, corridors and networks** can establish a culture of sustainable transport use and ensure mobility services keep pace with demand.
- **Strengthening the connectivity of regional, rural and remote communities** is critical to realising their full social and economic potential while maintaining the momentum of regionalisation after the pandemic.
- Targeted improvements will leverage new data and technology to enable **smoother supply chain access to key domestic markets and export gateways**, reducing operator costs.
- **Improving the local accessibility of Smaller Cities and Regional Centres** will support their economic diversification and sustainable population growth, adding weight to the case for progressive regional rail improvements that lead to faster and high-speed rail.
- Regional passenger transport services can do a better job of connecting Small Towns, Rural Communities and Remote Areas to essential services in larger centres if they are **reoriented from a point-to-point to an integrated hub-and-spoke network** and coordinated with digital access.
- **Different transport modes must work together** to enable seamless end-to-end journeys for people and freight in all urban settings.
- With more people walking, cycling or using a micromobility device as part of their daily travel routine, **prioritising and accelerating investment in active travel** will pay health dividends for individuals and create less congested urban communities.
- Demand-responsive services that are fully integrated into the public transport ecosystem will **significantly improve access for people with disability**.
- Providing **demand-responsive public transport and connected pathway networks in the early days of new suburbs** can break the link between greenfield development and car dependence and build critical mass for public transport.
- **Bringing forward new mobility technologies means redesigning cities and towns** to make electric vehicle recharging commonplace and road networks ready for shared, connected and autonomous fleets.
- A **transport pricing and charging system that covers all modes** is needed to ensure transport networks move people and freight safely and efficiently.
- An equitable pricing regime will **visibly dedicate transport revenues to transport outcomes and protect disadvantaged users from an undue cost burden**.
- An equitable regime will **pass on to road users the direct costs of transport infrastructure and services and the external costs of travel choices**, such as emissions, crashes and congestion.
- Public transport users will **pay fares that reflect the travel experience provided by different service types** and encourage a shift away from driving to other modes.
- Under Australian Government leadership, **distance-based road use charging reforms for all vehicles** should build on current heavy vehicle initiatives and other road pricing proposals by individual jurisdictions and be incrementally rolled out nationwide.

Transport sector overview





Introduction to transport

Australia's transport landscape is transforming

Transport is going through rapid and deep changes.

By 2036 how Australians use, share, operate and power transport services – from cars to mass transit and even bicycles – will have undergone the biggest upheaval since the internal combustion engine.

“Transport is going through rapid and deep changes.”

The shared, connected, electric and autonomous transport revolution

Enabled by digital connectivity, the disruption of traditional public transport business models has already driven a fundamental shift in what Australians expect when ordering and paying for mobility.

This disruption has catalysed a move away from private ownership to the sharing of transport assets, from cars to e-bikes.

Now, the transport revolution is extending to the ways in which mobility is powered. This is happening through the growing electrification of the transport fleet and the emergence of other zero-emission vehicle technologies.

Beyond these developments, cars, trucks and mass transit vehicles are continuing to evolve through increasing levels of automation. Ultimately, fully autonomous transport services will operate free of a driver's control.

Door-to-door transport operations

Sharing has turned vehicles, car parking spaces, e-bikes and e-scooters into public assets. For users to access these assets for end-to-end journeys they must be integrated with traditional, scheduled mass transit services.

Streets reinvented

The kerbs and footpaths of city streets will increasingly function as mini depots where users access shared vehicles. As this fleet electrifies, those public locations will need to provide recharging facilities, transforming urban spaces as profoundly as the last century's service stations.

A future-facing transport industry

Realising the opportunity of shared, connected, electric and autonomous transport calls for matching levels of professional innovation. Changing settlement and work patterns, coupled with the rise of automation, will reset many assumptions around travel behaviour.

Overall, Australian transport reforms must maintain the recent momentum of transformation, as well as responding to the legacy impacts of the COVID-19 pandemic. The way Australia plans, delivers, uses and pays for transport over the next 15 years will have to deal with long-term shifts in the sector, the community and the economy.

A clear vision for the future

The *2021 Australian Infrastructure Plan* looks towards a vision of how people and freight will move in 2036. This vision should incorporate five objectives:

Reliable mobility services

Journeys for individuals should be reliable, predictable and affordable, wherever they live and whatever their mobility needs.

Evolving transport technologies will work together to seamlessly connect users as they move through their life's daily needs.

“The way Australia plans, delivers, uses and pays for transport over the next 15 years will have to deal with long-term shifts in the sector, the community and the economy.”

New technologies include micromobility devices (such as e-bicycles and e-scooters) and partly or fully autonomous cars and mass transit, as well as digital connectivity enabling integrated journey planning, real-time information and integrated payment.

The operation of transport networks will be actively measured and managed to deliver governments' objectives. Governments should adopt explicit performance standards for the time it will take users in different places to reach essential destinations, so everyone can plan their day-to-day travel with confidence.

Choice and flexibility

In cities and towns, the transport and land use sectors will work efficiently together to ensure transport services keep pace with growth and change in emerging and established communities.

Active travel and flexible, demand-responsive public transport will be among the first services available in new urban areas.

Every city-dweller who wants and is able to make healthy options, such as walking and cycling, part of a daily routine will do so.

Shared electric vehicles and micromobility devices will recharge — or return power to the grid — in accessible public locations while they wait for their next user.

Connectivity and speed

By 2036, changes to urban transport will be significant, with a host of new transport technology and travel alternatives, such as digital connectivity, impacting the way people and goods move.

The current wave of investment will see mass transit networks extended into outer-urban areas. Through the integration of mass transit with first- and last-mile services, people will be provided with improved end-to-end travel choices.

“By 2036, changes to urban transport will be significant with a host of new transport technology and travel alternatives, such as digital connectivity, impacting the way people and goods move.”

Multimodal journeys will move seamlessly between personal, public and active transport services.

Faster rail services could reach outwards from Fast-growing Cities such as Sydney to Smaller Cities and Regional Centres that are, increasingly, where people are choosing to settle.

Working from or near to home for part of the week will be a preferred lifestyle for many. This will blend well with faster rail travel for going into head office or occasionally enjoying a big city's cultural or social offerings.

Seamless freight networks

Freight represents 5% of the retail costs of doing business in Australia.¹ Freight services will need to rise to the challenge of the Australian Government's *Modern Manufacturing Strategy* and the \$100 billion agriculture sector ambition of *Delivering Ag2030*.^{2,3}

World-class, end-to-end supply chains will support Australian businesses so they can easily connect with domestic and overseas markets.

Major investment in Inland Rail, intermodal terminals and a broader integrated freight network will enable Australian producers to access global markets.

Businesses should work in partnership with government, urban communities and port operators to benefit from seamless links to major export gateways.

Quiet and zero-emission heavy vehicles and micro-freight deliveries will co-exist with sensitive land uses such as housing, without curfews or other constraints.

New planning and pricing models

By 2036, the Australian Government and state and territory governments should collectively plan, prioritise and manage freight and passenger transport infrastructure so it connects seamlessly across jurisdictional borders.

For example, the same train and driver could operate between the Sydney and Melbourne central business districts.

Governments will price road and public transport use based on how far people travel and the impacts their travel choices have on other network users, local communities and the natural environment.

Revenue from transport users should be reinvested in transport services, allowing improvements to transport assets and services.

Funding decisions should align to the movement and place outcomes governments expect from budget allocations for all parts of Australia.

There has been variable progress since 2016

Australia's freight and passenger movement outcomes have advanced significantly in the five years since the *2016 Australian Infrastructure Plan*.

These achievements are the most notable:

- Transport operations are being managed more efficiently and productively using real-time datasets that are available to a range of groups, including passengers and freight operators. Smart device applications that help users to plan journeys and work out supply chain contingency plans are now common.
- In Fast-growing Cities such as Sydney, Melbourne and Brisbane state governments are leading record investment efforts to upgrade, extend and expand high-capacity and high-frequency mass transit networks.

- There has been a sustained trend in jurisdictions opening transport construction, maintenance and operating activities to service providers in a well-regulated commercial market.
- Australian Government and state and territory Transport ministers are progressing heavy vehicle road reforms that will link operator payments to both the impact trucks have on roads and the road improvements this revenue is allocated to deliver.
- Ministers have endorsed and are overseeing implementation of an overarching *National Freight and Supply Chain Strategy*.⁴

These are all recommendations Infrastructure Australia made in the *2016 Plan*.

There has been less progress in addressing these high-priority issues:

- caps, curfews and other constraints on the operation and use of transport infrastructure
- passenger transport service gaps in the outer-urban areas of Sydney, Melbourne, Brisbane and Perth
- first- and last-mile gaps in freight networks
- the need for a light vehicle road user charging regime
- the shortfall between vehicles' environmental performance and global best practice.

Transport services do not match user needs

In the *2019 Audit*, Infrastructure Australia highlighted the challenges facing Australia's efforts to plan, deliver and operate infrastructure.

We also identified some emerging opportunities.

Addressing these major issues has been a priority when developing the *2021 Plan*:

- **There is an opaque, inconsistent approach to funding and maintenance.** It varies according to transport mode and location.
- **Freight network performance varies by location, geography and season.** Australia has world-leading mineral supply chains, while urban and agricultural supply chains face challenges.
- **Regional supply chains are diverse.** While freight infrastructure investments can catalyse regional development, it is difficult for governments to provide sufficient infrastructure to accommodate agriculture's seasonal flows.
- **Efficient supply chain operations are constrained in cities.** This is due to poorly coordinated land use and transport planning,

network congestion and the growth of business-to-customer freight activity (such as delivery vans). This has a particularly severe impact on international supply chains.

- **Domestic supply chains suffer from inefficient or inconsistent regulatory regimes.** There has not been enough digital innovation to support more streamlined practices and improve road safety outcomes.
- **There is a high reliance on private vehicle use for personal mobility.** This adds to the growing cost of road congestion, which cannot be efficiently relieved through the continued expansion of road capacity.
- **Urban travel patterns are becoming more complex with the growth of cities and changes in lifestyles.** This makes it harder for scheduled public transport services to compete with driving.
- **Access to passenger transport services is unequal.** Lower-income households, people with disability, older Australians and those living in rural and remote Australia and outer-urban areas are disadvantaged. The transport sector must work harder to promote social inclusion.
- **Active travel infrastructure needs more funding.** Whether they are urban cycleways or parks and lakeside trails, there needs to be more investment in defined places to walk or cycle if active travel is to rise above levels that remain low by global standards in most areas.
- **Australia is falling behind its global peers in the abatement of transport emissions.** The public sector has not yet fully embraced its role in leading change and enabling the large number of Australian users who want to make the move to take up low- and zero-emission motoring.

COVID-19 accelerated transformation and changed behaviour

When studying the national impacts of the COVID-19 pandemic, Infrastructure Australia identified major trends that apply to all sectors.

For each trend, the key impacts on — and responses from — the transport sector were significant to the development of the *2021 Plan*.

Remote working

During the 2020–2021 lockdowns, 90% of Australian firms used online collaboration tools so people could work from home. This trend continues, although it is not yet clear how long it will sustain beyond the pandemic.

With major transport projects traditionally predicated on five-days-a-week commuter demand, a shift to remote working has significant implications for future transport investments.

Its impact has been felt in regional as well as urban Australia, with 2020 seeing the largest net population growth in regional areas for 20 years.⁵

“ A shift to remote working has significant implications for future transport investments. ”

Regional transport improvements could play a critical role in maintaining this trend and taking the pressure off Fast-growing Cities.

New movement patterns

As work and shopping went online, more people and freight moved locally.

As people escaped home offices through outdoor recreation and avoided public transport, **bicycle sales and use increased**. Retaining and extending pandemic pop-up bike lanes and providing new open space facilities will help to maintain this trend.

Working from home also led to **more people walking in their neighbourhoods**.

For **public transport users**, increased cleaning, physical distancing and seeing real-time occupancy data on apps helped to maintain a base level of trust. While use appears to be generally recovering in line with the return to office-based commuting, it is unclear if or when overall patronage will go back to pre-pandemic levels.⁶

Rideshare providers switched from moving people to moving goods.

Online food orders were delivered by scores of **delivery bike-riders** with varying levels of cycling competence. Crashes, a number of them fatal, focused attention on the safety needs of this growing group of road users.

Faced with empty supermarket shelves (or the prospect of them), **communities accepted the suspension of longstanding constraints** on freight operations in their suburbs. Supply chain operators have challenged governments to maintain these conditions beyond the pandemic.

With car travel, **people changed the time and route of their trips** as they were driving to the shops, or children to school, instead of commuting to an office. **The spread of road congestion across more hours, and into local networks**, continues to challenge all levels of government.

Government leadership is critical for reform

As transport operations are largely the domain of state and territory governments (in partnership with the private sector), adopting and implementing the reforms in the *2021 Plan* will require their leadership.

Many governments are already taking significant steps to adopt and progress transport sector reforms:

- The announcement of road use pricing reforms by the Victorian, South Australian and New South Wales governments is a significant milestone.
- Heavy vehicle road user charging reforms led by the Australian Government are a major step forward.
- South Australia and New South Wales continue to support contestability for their mass transit operations.
- Western Australia is demonstrating leadership in vehicle autonomy and electrification.
- New South Wales, Western Australia, Queensland, Victoria and the Australian Capital Territory are making step changes in urban mobility, moving towards the provision of turn-up-and-go public transport services.
- The Northern Territory and Tasmania are making significant progress in the important areas of road safety and maintenance.

The reforms in the *2021 Plan* build on the platform established by this leadership.

How we developed the Plan for Transport

The transport sector plan has attempted to cover as many aspects of Australia's freight and passenger movement needs as possible.

However, some issues identified in the *2019 Audit* were excluded, including:

Road safety: The *2021 Plan* does not attempt to cover significant policy reform opportunities relating to road safety, although some recommendations would benefit this area.

The Australian Government's Office of Road Safety is currently leading the development of a new *National Road Safety Strategy* for 2021–2030. The strategy will recognise that road safety is not solely a transport problem. Infrastructure Australia will support its development as appropriate.

Cruise ships: The *2019 Audit* pointed towards the lack of cruise ship berths in major cities as a constraint on the visitor economy.

The impact of the COVID-19 pandemic on international travel has made it difficult to develop specific recommendations relating to the cruise ship industry.

This should be revisited when it is clearer how and when Australian tourism will grow.

Acknowledgements

When developing this transport sector plan, Infrastructure Australia engaged collaboratively with organisations and individuals representing multiple sectors, jurisdictions, modes and users.

Our partnership with the National Transport Commission was key to its development.

We also received invaluable assistance from:

- Australian Government and state and territory government departments
- councils across the country
- industry peak bodies
- transport service providers
- port and supply chain operators
- academic experts
- and many others.

Infrastructure Australia thanks the Australian Logistics Council, the National Growth Areas Alliance and Roads Australia for enabling us to engage with stakeholders through online workshops and other activities.



4.1 Getting the most out of our transport investments

Key messages

- Transport infrastructure and operations must be managed under long-term plans.
- A planning horizon of **at least 40 years** for very large transport investments covers more than two generations. This is the time it can take for major population flows to respond to significant changes in access.
- Plans should:
 - align transport investment with an **overarching vision for settlement and activity**, with land use plans referencing national population forecasts and tested against growth scenarios
 - be **based on a nationally consistent movement and place framework**
 - address how the links in a multimodal network hierarchy will **provide specified mobility and access outcomes**
 - **be explicitly linked to budgets** (with at least a 10-year outlook) that integrate capital and operating costs with revenue forecasts to fund identified user outcomes.
- **Delivering major mass transit in increments** will ensure transport investment keeps pace with changing user needs. Delivery stages should include corridor preservation, section-by-section route development and the progressive introduction of public transport enhancements.
- **Combining multiple maintenance projects into programs that industry can deliver quickly and efficiently** will provide more certainty for transport asset maintenance and bring forward associated economic benefits.
- In urban areas, bundled maintenance and minor 'missing link' programs should **focus on addressing first and last mile network gaps for people and freight**. This will shift demand away from car use by improving active travel connections and public transport interchanges.
- To improve their place-based transport development capabilities, **councils should work across local government area boundaries to connect active and public transport movement networks**. These networks should be in place early in the life of land release areas to enable sustainable mode choice and be partly funded by developer contributions and value sharing.

Bringing together assets and services for better user outcomes

Over the past decade, the Australian Government, state and territory and local governments have supported a once-in-a-generation program of investment in transport infrastructure.

To meet future demand growth and provide the transport mode choices users want, government investment and existing assets must work harder and deliver greater value:

- Transport and land use sectors must work in closer partnership to deliver accessible and economically successful places.
- The ways transport infrastructure is planned, funded and developed must be reformed so

visionary, place-changing projects can be completed in stages that connect and combine over years to have a major impact.

- Councils must work more closely across local boundaries to extend the benefits of transport investment to the greatest number of users.

The overall objective of the associated reforms is to strengthen the link between transport spending, movement and land use outcomes in regions, districts and local areas.

This will maximise the value of transport investments by delivering the best possible services to all users.

4.1 Recommendation

Maximise the overall benefits of transport investments by aligning transport programs with place-based objectives.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory planning departments, state and territory transport departments, state and territory infrastructure bodies, local governments

When this should impact:



Where this should impact:



5-10

4.1.1 Maximise the place-shaping impacts of transport investment by linking transport infrastructure funding decisions to published population and land use objectives.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Centre for Population, state and territory planning departments, state and territory transport departments, state and territory demographers

0-5

Enable a consistent approach by all jurisdictions to the development of nationally significant transport infrastructure proposals by specifying the use of:

- an agreed and consistent set of land use and transport modelling tools that meet minimum functional standards
- common inputs, including population scenarios.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Centre for Population

5-10

Prepare place-based visions that identify credible population and land use scenarios. Incorporate measurable objectives for proposed transport projects to contribute to the sustainability of community and user outcomes for a defined area.

Proposed lead: State and territory planning departments

Supported by: State and territory transport departments

5-10

Align investment with place-based objectives by requiring that the proponents of nationally significant transport infrastructure projects reference a published place-based vision for the relevant linear corridor or broader geographic area in their business cases.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10

4.1.2 Ensure the most cost-effective mobility and land use outcomes from transport expenditure by tying transport budgets to the achievement of specified movement and place performance standards.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: ATAP Steering Committee Secretariat, Austroads, state and territory transport departments, local governments

0-5 Enable the achievement of consistent and predictable results from transport expenditure by developing a nationally uniform movement and place framework and associated performance standards for the function of links in a multimodal transport network hierarchy.

- Ensure the movement and place framework aligns with the *National Service Level Standards Framework for Roads*.
- Specify performance standards in the *Australian Transport Assessment and Planning Guidelines*.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: ATAP Steering Committee Secretariat, state and territory transport departments

0-5 Ensure that road authorities select, design, manage and operate road projects in line with their function under a uniform movement and place framework by updating the *Guide to Traffic Management* to incorporate nationally consistent performance standards.

Proposed lead: Austroads

Supported by: State and territory transport departments

5-10 Maximise the benefits of public expenditure by making the allocation of all Australian Government transport program funds to jurisdictions subject to the demonstrated achievement of specified and agreed movement and place outcomes.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 Apply nationally consistent performance standards by aligning the administrative classification of existing roads with their movement and place role.

Proposed lead: State and territory transport departments

Supported by: Local governments

5-10 **4.1.3 Bring forward the benefits of transport investments, in a context of uncertain and changing user needs, by promoting and facilitating the incremental delivery of transport services, corridors and networks as separable stages.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: ATAP Steering Committee, Centre for Population, Infrastructure Australia, state and territory infrastructure bodies, state and territory transport departments

0-5 Ensure the economic analysis of proposed transport investments, and other infrastructure decision-making processes, take account of significant shifts in user preferences and travel behaviours, by updating the *Australian Transport Assessment and Planning Guidelines* to:

- reflect changes to settlement and working patterns catalysed by the COVID-19 pandemic
- consider the impacts of new transport technologies and business models (including Mobility as a Service) on how people travel and freight is transported
- facilitate incremental investment in transport services, corridors and networks.

Proposed lead: ATAP Steering Committee Secretariat

Supported by: Centre for Population, state and territory transport departments, state and territory demographers

0-5 Promote the staged delivery of major transport corridor projects by updating assurance frameworks as required to assess business cases for multi-modal investment programs and monitoring their implementation.

Proposed lead: Infrastructure Australia

Supported by: State and territory infrastructure bodies

5-10 Support incremental and demand-led transport network development, including the staged introduction of different public transport modes to cost-effectively grow the patronage base for these services, by executing new and updated Australian Government funding instruments with state and territory jurisdictions that commit to a multi-year staged funding approach. Take this approach under Federation Funding Agreements and place-based agreements.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments

0-5 **4.1.4 Increase the combined impact of existing transport funding allocations on safety, capacity, accessibility, connectivity and user experience outcomes by coordinating discrete maintenance and upgrade programs for roads, pathways and interchanges.**

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 To ensure available funding delivers the greatest possible user and local economic activity benefits, identify and address multimodal transport network gaps under partnership programs that integrate periodic maintenance with the completion of minor missing links.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 For urban areas, deliver quick wins for users and relieve pressures on congested roads by prioritising minor 'missing link' projects that upgrade walking and cycling networks and improve the accessibility and amenity of public transport interchanges.

Proposed lead: State and territory transport departments

Supported by: Local governments

5-10 **4.1.5 Maximise the collective benefits from local governments' transport investments by reorienting funding programs towards specified end-to-end journey outcomes.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

0-5 Where required, bring forward the completion of cross-boundary local transport networks that meet users' short journey needs and prioritise funding support under place-based agreements for partnerships of two or more councils working together.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

0-5 Help councils to develop their capabilities in planning, prioritising and procuring local transport infrastructure and services that enable increased public transport and active travel use.

Proposed lead: State and territory transport departments

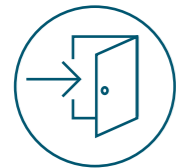
Supported by: Local governments

5-10 Help councils to accelerate the delivery of public transport and active travel infrastructure early in the life of new urban areas by ensuring timely access to developer contributions, value-sharing mechanisms and/or low-cost borrowing facilities.

Proposed lead: State and territory transport departments

Supported by: Local governments

Measuring progress



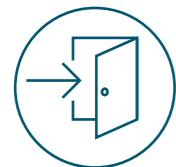
Access

30-minute access

Fast-growing City and Smaller City and Regional Centre households with 30-minute access by public or active transport to employment or a 'basket' of centre-based services that are not available digitally

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Access

Access to public transport

Fast-growing City residents within 400 m of a public transport stop with a service every 30 minutes, or on-demand service, from 7am to 7pm on a normal weekday

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Quality

Land use and transport models

Nationally consistent and deployed set of tools for land use and transport planning

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+

Decisions should support a national vision

To guide investment in transport infrastructure over multiple generations, all planning, funding and delivery agencies need to share a single vision for Australia.⁷

By understanding and working towards this vision, they will make decisions that produce the desired outcomes for population, settlement and land use.

To support the vision, the Australian Government should align transport funding with jurisdictions'

intended land use outcomes. For instance, the Gold Coast Light Rail project has been designed to integrate sensitively with vibrant urban places while providing the capacity to handle significant and growing movement flows (see **Figure 4.1**).

“ All planning, funding and delivery agencies need to share a single vision for Australia. ”

Figure 4.1: Gold Coast Light Rail integrates with the Gold Coast University Hospital campus



Image source: Translink, Queensland Department of Transport and Main Roads (2021)⁸

The Australian Government should also require nationally significant transport infrastructure proposals to refer to these outcomes when they are planned and executed.

If a nationally consistent set of modelling tools and assumptions is applied when forecasting land use and transport outcomes, funding will more equitable.

When there are alternative proposals for transport investment, using consistent inputs will also help to assess them.

It will identify proposals that are incompatible or that might not perform well against goals such as attracting more business investment in an area or lifting local development.

In this situation, governments must defer investment in the proposals that offer poorer performance.

For more information on consistent approaches to project planning across all infrastructure sectors refer to the **Industry productivity and innovation chapter**.

See the **Place-based outcomes for communities chapter** for more information on infrastructure investments that connect our cities, towns and regions.

Match investment to equitable outcomes

Consistent performance standards should guide decisions on funding, planning, building, operating and maintaining transport assets.⁹

As well as being based on mobility outcomes, these standards should address the interaction between transport operations and adjacent land uses (such as shops or housing), and the need to generate economic value over many decades.

Australian Government transport spending should be clearly linked to specified service outcomes for users under a nationally consistent movement and place framework.

“ Australian Government transport spending should be clearly linked to specified service outcomes for users under a nationally consistent movement and place framework. ”

The framework would cover both moving passengers and freight from one place to another and providing access to local places for people and deliveries.

Movement and place outcomes should align with how links between different modes are classified within a transport network hierarchy and across each type of geography, regardless of its state or territory.

Network hierarchy

Classifying the transport links and services that make up a total network based on their function in end-to-end journeys rather than on their mode

Move from ‘megaprojects’ to ‘megaprograms’

Ongoing changes to Australians’ settlement decisions, working routines and travel habits after the COVID-19 pandemic promise challenging and uncertain times for transport decision-makers.¹⁰

In addition to the effects of the pandemic, innovative digital technologies and new ways of sharing vehicles and mobility services are already transforming transport. Transport planners and economists should reset their assumptions about people’s travel behaviour.

Breaking down investment in major new transport corridors into programs of separate projects that will be completed sequentially over many years (‘megaprograms’) is one suitable response to uncertainty.

It will allow passenger volumes for capital-intensive transport solutions to build over time, reducing the risk of over-committing investment to the wrong projects.

Corridor preservation

Setting aside the land where future infrastructure will be built, before surrounding urban development happens

For high-volume passenger movement corridors, this process will involve, in order (see **Figure 4.2**):

1. protecting surface land corridors from inappropriate development
2. identifying centres as the location for future mass transit stations and starting to develop them as busy community hubs

3. connecting these centres with flexible public transport services and developing active travel opportunities, such as walking and cycling networks, across their local catchment areas as early as possible
4. progressively upgrading public transport services, including high-quality bus services, to meet existing demand and encourage travellers to start to shift from car to public transport use. For example, rapid bus services supported the early development of the 20-year-old Rouse Hill town centre, now served by Sydney Metro Northwest (see **Figure 4.3**).
5. delivering high-capacity mass transit on dedicated infrastructure such as busways, light rail and heavy rail.

3. connecting these centres with flexible public transport services and developing active travel opportunities, such as walking and cycling networks, across their local catchment areas as early as possible
4. progressively upgrading public transport services, including high-quality bus services, to meet existing demand and encourage travellers to start to shift from car to public transport use. For example, rapid bus services supported the early development of the 20-year-old Rouse Hill town centre, now served by Sydney Metro Northwest (see **Figure 4.3**).
5. delivering high-capacity mass transit on dedicated infrastructure such as busways, light rail and heavy rail.

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Taking this sequential approach will orient urban planners towards providing users with sustainable transport choices from the outset.

For instance, once demand has been established, they can make capital-intensive investments that are equitable and targeted.

In line with this approach, the Australian Government should seek to enter agreements with jurisdictions delivering staged enhancements to significant transport corridors and networks.

The agreements should be multi-year and have defined funding thresholds.

See the **Sustainability and resilience chapter** for more information on infrastructure planning for an uncertain future. That chapter also addresses coordinated corridor management for all infrastructure types.

For more information on a sequential approach to implementing a pipeline of infrastructure projects, refer to the **Industry productivity and innovation chapter**.

Figure 4.2: Corridors will evolve through progressive investments in different transport modes

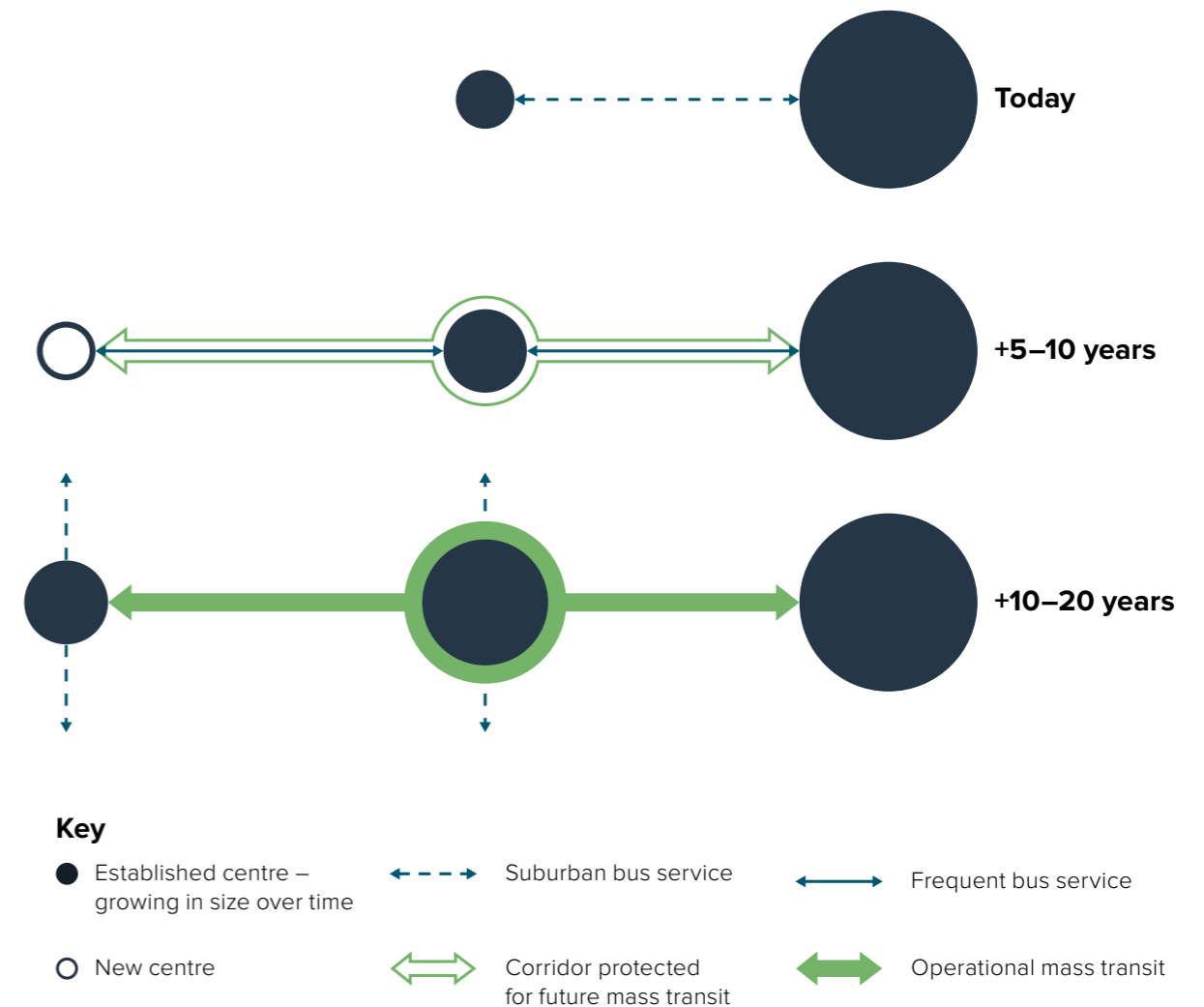


Figure 4.3: Phasing infrastructure projects supports judicious investment and new centre growth



Image source: Infrastructure Australia (2021)

Coordinate investment in maintenance and missing links

Maintenance and small improvement projects that connect transport modes and improve the transport interchange experience for public transport users have several benefits, including:

- helping to change attitudes and increase demand for sustainable transport modes
- shifting demand away from cars, which reduces the growth and impact of congestion
- generating local jobs
- improving assets' resilience to a changing climate
- increasing accessibility for people with disability.¹¹

Governments should structure and coordinate planned maintenance and minor improvements across different transport modal assets at the same time, in collaboration with the transport industry.

This will deliver whole-of-life asset outcomes and better access more quickly and efficiently.

Equip councils to deliver transport that meets local needs

With council-managed roads making up around 85% of the Australian road network,¹² local government

has a bigger role to play in identifying and delivering transport improvements when and where they will make the greatest impact.

The Australian Government, and state and territory governments should ensure councils extract the most possible benefits, and build long-lasting capability, when they receive transport investment funding through stimulus spending and other programs.

To maximise the reach of active travel and other transport networks that cross local government area boundaries, funding programs for jurisdictions with relatively small-sized local government areas should be structured to encourage joint projects between adjacent councils.

Councils also need government support to develop professional capabilities for place-based transport planning and project delivery.¹³

Depending on local needs, this could involve:

- staff secondments
- participation in cross-sector, place-based governance arrangements (for example, City Deal arrangements, which bring councils together with other stakeholders to take coordinated action for an urban area)
- providing training and resources through professional organisations.

Harness development-driven funding to meet user needs

The COVID-19 pandemic has increased the attractiveness of low-density and spacious housing, drawing people away from large centres to outer-urban areas, Smaller Cities and Regional Centres as they become more home-based for work.¹⁴

As a result, local and cross-regional journeys are increasing.

This is likely to put pressure on roads that have not previously experienced city centre traffic jams, and they are at risk of getting more congested.

Even before this trend, traffic congestion was increasing at a faster rate in outer-urban areas than on older road networks around established centres.¹⁵

To address this emerging challenge and reduce car reliance, state and territory governments must invest more in outer-urban public and active transport options.

This should include introducing flexible first- and last-mile services (such as buses) in areas of low-density growth.¹⁶

Funding regimes should be designed and managed to support efforts by councils and others to provide public transport and active travel facilities before people move into new suburbs.

For example, funding sources could include developer contributions and — for areas where significant transport corridor projects are planned — mechanisms for sharing the resulting land value increases and returning this to users in the form of better facilities, which can contribute further to land value (see **Figure 4.4**).

First and last mile

Local transport choices that connect to higher-capacity and faster services (often rail) to get people or freight all the way from and to the start and finish points of end-to-end journeys

Value sharing

Funding transport infrastructure using contributions from the owners of land that increases in value because the new road or railway makes it more accessible

There should be related reforms to facilitate councils' choice in accessing cost-effective finance that provides forward funding to build infrastructure supporting transport choices as soon as people move into greenfield areas. The cost can then be repaid by developers as new suburbs become fully settled.¹⁷

Figure 4.4: Integrating mobility infrastructure into early urban planning makes places more liveable and reduces delivery costs



DevelopmentWA is master planning the METRONET East Redevelopment Scheme around Perth's Bayswater Station, ensuring publicly funded infrastructure supports good place outcomes.

Image source: METRONET (2021)¹⁸



4.2 Connecting regional and remote Australia

Key messages

- Smaller Cities, Regional Centres, Rural Communities and Remote Areas that are better physically and digitally connected (to each other, to Fast-growing Cities and to domestic and overseas markets) **will realise their social and economic potential.**
- There needs to be more use of **new evidence to underpin supply chain action plans for specific commodities** implemented by industry, government and community partnerships.
- Commodity action plans should include **technological innovations, regulatory changes, infrastructure upgrades and place-based agreements for major port precincts.**
- **Increasing the availability and use of freight rail is a high priority for governments,** including optimising access to Inland Rail.
- Ahead of the staged upgrade of existing regional rail services to Fast-growing Cities, Smaller Cities and Regional Centres must become **more connected with, and accessible to, their local catchment areas** through improvements to active travel and demand-responsive services.
- **Upgraded regional rail services will deliver benefits for the outer-urban areas of Fast-growing Cities** as they travel through and connect these places on their way to regions.
- Priorities for investment in faster, fast or high-speed rail should **align with a shared vision for planning Australia's population.**
- The design of faster, fast and high-speed rail networks in different jurisdictions should enable the **interoperability of long-distance train services,** adopting common standards for track and signalling.
- Transport outcomes for people in Small Towns, Rural Communities and Remote Areas should **meet time-based performance standards** for how quickly they can access essential services in Smaller Cities, Regional Centres and Fast-growing Cities.
- To meet these standards governments will need to **manage regional, rural and remote road, rail and aviation services as an integrated and multimodal hub-and-spoke network.**
- The network should be configured to maximise the number of users who can **access essential services and return home on the same day** (or to a comparable standard).

Improve connectivity for regional, rural and remote areas

Smaller Cities and Regional Centres as well as Small Towns, Rural Communities and Remote Areas offer many quality-of-life and economic growth opportunities.

For these places to realise their potential, governments must strengthen supply chains and ensure passenger transport services provide reliable access to jobs and services.

Supply chain

Each link in a supply chain is an action required to get a product or service to its end user. Links move and transform raw materials into finished products, transport them to distribution points, and deliver them to customers.

The reforms proposed in the *2021 Plan* address end-to-end journey outcomes for moving people and freight around regional and remote areas.

The actions Infrastructure Australia proposes will:

- reinforce the supply chains that connect regional and remote Australia to Fast-growing Cities and export gateways
- deliver staged passenger rail improvements that support the growth of Smaller Cities and Regional Centres
- set user-focused performance standards to guide both infrastructure investment and operational coordination across all the passenger transport modes that service Small Towns, Rural Communities and Remote Areas.

4.2 Recommendation

Improve the liveability and economic sustainability of regional, rural and remote areas by developing, maintaining and operating integrated freight and passenger transport networks that meet end-to-end access needs.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

When this should impact:



Where this should impact:



5-10 **4.2.1 Maintain reliable access for supply chains under all conditions by coordinating technological, operational and infrastructure improvements delivered under the National Freight and Supply Chain Strategy.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Industry, Science, Energy and Resources, CSIRO: Commonwealth Scientific and Industrial Research Organisation, National Transport Commission, state and territory transport departments, local governments, airport operators, port operators

0-5 Identify supply chain improvement opportunities across multiple commodities and geographies by developing and applying the TraNSIT model. Drive more responsive supply chain management decision-making by making this evidence accessible to governments, industry and other stakeholders through the National Freight Data Hub.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: CSIRO: Commonwealth Scientific and Industrial Research Organisation, National Transport Commission

5-10 Deliver local safety, environmental and economic benefits for regional, rural and remote communities by identifying and prioritising freight intermodal projects that promote shifting from road to Inland Rail and other freight rail services for targeted commodities.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

5-10 Develop and implement place-based action plans for Fast-growing City port and airport precincts, through government, industry and community partnerships, that align with the National Urban Freight Planning Principles. Improve the efficiency of export- and tourism-oriented corridors by implementing actions that reduce friction between freight operations and dense land uses.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments, airport operators, port operators

5-10 Enable remote area supply chain cost savings by increasing domestic freight operators' access to alternative fuels, including hydrogen produced under initiatives that are currently oriented towards overseas customers and/or non-transport heavy industrial uses such as mining.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Industry, Science, Energy and Resources

10-15 **4.2.2 Support the growth and diversification of Smaller Cities and Regional Centres by investing in their local accessibility and connectivity and progressively upgrading transport connections to Fast-growing Cities.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Faster Rail Agency, Australian Treasury, state and territory transport departments, local governments

0-5 Improve connectivity in and around Smaller Cities and Regional Centres by investing in multimodal transport interchanges integrated with mixed land uses that are adjacent to the train station or (for locations without a train service) the central business district.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 Improve public transport access to the heart of Smaller Cities and Regional Centres from their suburban and rural catchments by supporting the operation of flexible and demand-responsive services.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 Promote active travel for tourism, recreation and local access in and around Smaller Cities, Regional Centres, Small Towns, Rural Communities and Remote Areas by investing in the adaptive reuse of disused railways and integrating these with other linear open space corridors and low-traffic rural roads to provide connected networks.

Proposed lead: State and territory transport departments

Supported by: Local governments

5-10 Strengthen the connection of Smaller Cities and Regional Centres to Fast-growing Cities by progressively upgrading existing regional passenger rail services. Make services more comfortable and reliable, and grow the patronage base for public transport, by investing in customer experience improvements such as new rolling stock and in track projects that maximise the separation of freight and passenger movements.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Faster Rail Agency, state and territory transport departments

5-10 To improve the connectivity and economic performance of outer-urban areas, ensure regional rail service improvements improve accessibility outwards from Fast-growing Cities, and better connect outer-urban areas to their larger regional catchment as well as making established central business districts more accessible to Regional Centres.

Proposed lead: State and territory transport departments

Supported by: National Faster Rail Agency, local governments

10-15 Support regional growth by prioritising faster rail, fast rail and high-speed rail investments based on credible scenarios for population change and using nationally consistent decision-making processes. These should include models and assumptions that are updated to evaluate project benefits and costs across wide geographic areas and over the full life of rail assets.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australian Treasury, National Faster Rail Agency

10-15 Maximise economic, productivity and safety benefits from governments' fast rail, faster rail and high-speed rail investments. Invest in the timely preservation of surface corridors. Ensure the cross-border interoperability of projects is advanced in different locations.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Faster Rail Agency, state and territory transport departments

5-10 **4.2.3 Ensure equitable access to essential services for Small Towns, Rural Communities and Remote Areas by coordinating passenger transport investments and operations.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, airport operators

0-5 Develop and adopt nationally consistent performance standards for Small Towns, Rural Communities and Remote Areas to physically access essential services that cannot be effectively provided online. Articulate standards in terms of the total time taken by people in a rural or remote area to travel to and access the education, health or other services offered by a Smaller City or Regional Centre, and then return home.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 Align spending and service delivery across transport modes with performance standards for Small Town, Rural Community and Remote Area access. Enable the greatest possible proportion of the population of these communities to access centre-based services cost-effectively within a day-return or other reasonable specified timeframe.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments

5-10 Ensure long-distance passenger travel needs are serviced cost-effectively and in line with access performance standards. Do this by integrating regional aviation infrastructure and services programs with land transport services under a multimodal hub-and-spoke network model.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, airport operators

Measuring progress



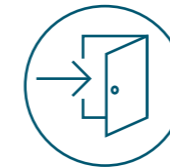
Quality

Faster regional connections

Smaller Cities and Regional Centres have a planned and staged investment program for Fast-growing City connections

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Access

Regional essential service access

One-day return journey for access to essential services

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Governance

Port and airport place-based plan

Major ports and airports have a place-based infrastructure plan and governance framework

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Enabling more efficient and reliable supply chain operations

There are significant opportunities to increase productivity and deliver goods more efficiently with lower-cost supply chains. The COVID-19 pandemic has shown that where there is a shared will supported by community understanding, governments and industry can make changes, such as abolishing curfews, to supply chain procedures quickly (see **Figure 4.5**).¹⁹

To ensure this responsiveness continues in the future, there will need to be commodity-specific supply chain improvement action plans. These should be prepared collaboratively by government, industry and community stakeholders.

The commodity action plans should include targeted modifications to regulations, low-cost tactical changes to operational practices, and local asset improvements.

Preparing them will involve having access to consolidated data and decision-making tools.

These should include the 'Transport Network Strategic Investment Tool' (TraNSIT) model developed by CSIRO: Commonwealth Scientific and Industrial Research Organisation. TraNSIT is a strategic investment and network operating tool that supports road and rail freight decisions.

Ideally, all stakeholders will be able to activate supply chain action plans quickly in response to changes in trade relationships or network operating conditions.

This will keep critical supply chains active despite unexpected external disruptions.²⁰

Transport model

A computer program that supports decision-making by analysing alternative scenarios for passenger and freight travel needs, and different infrastructure investments and transport services that meet these needs

Figure 4.5: Operational changes should continue where possible so supply chain efficiencies can be preserved



Empty supermarket shelves shifted community attitudes during COVID-19.

Invest strategically in freight transport infrastructure

To support business and economic growth and meet sustainability targets, Australia's freight transport industry needs to:

- be given easier access to export gateways
- leverage technological innovation
- take advantage of the connectivity benefits of Inland Rail for certain commodities.

Target public funding

By increasing investment in intermodal facilities and supporting the ongoing maintenance of existing rail assets, the Australian Government will promote the shift of targeted commodities from road to rail freight.

This will reduce congestion and emissions and improve liveability in the cities and towns currently impacted by road freight operations.

A major investment priority is ensuring easy connections to Inland Rail that extend the reach and benefits of this project.

Another is addressing missing links in the freight rail lines that take double-stacked containers to sea ports for export.^{21 22}

Adopt new technologies

New technologies will also play a role. With fuel a significant cost, road and rail transport operators should have access to alternative fuels, such as hydrogen produced under initiatives that target non-transport export customers and heavy industries such as mining.²³

This will help to reduce Remote Area supply chain operating costs and contribute to emissions reduction.

See the **Place-based outcomes for communities chapter** for information on the importance of more effective and reliable supply chains to the economic development of Remote Areas.

The **Energy chapter** addresses the broader policy framework that will support the development of new energy technologies.

Work with affected communities

There is often friction between critical supply chains and dense urban communities, which have different priorities for local amenity and need access to congested roads and rail lines.

To tackle this challenge, there must be place-based agreements for all major export gateways that schedule infrastructure and network management initiatives. These plans should be prepared in partnership with the local community.

Such agreements could promote the uptake of quiet and zero-emission trucks and freight locomotives that use hydrogen, electric or hybrid power sources, and allow modified access conditions for these. For example, low-noise electric trucks could be exempted from night-time curfews, meaning they can operate when congestion is lower.

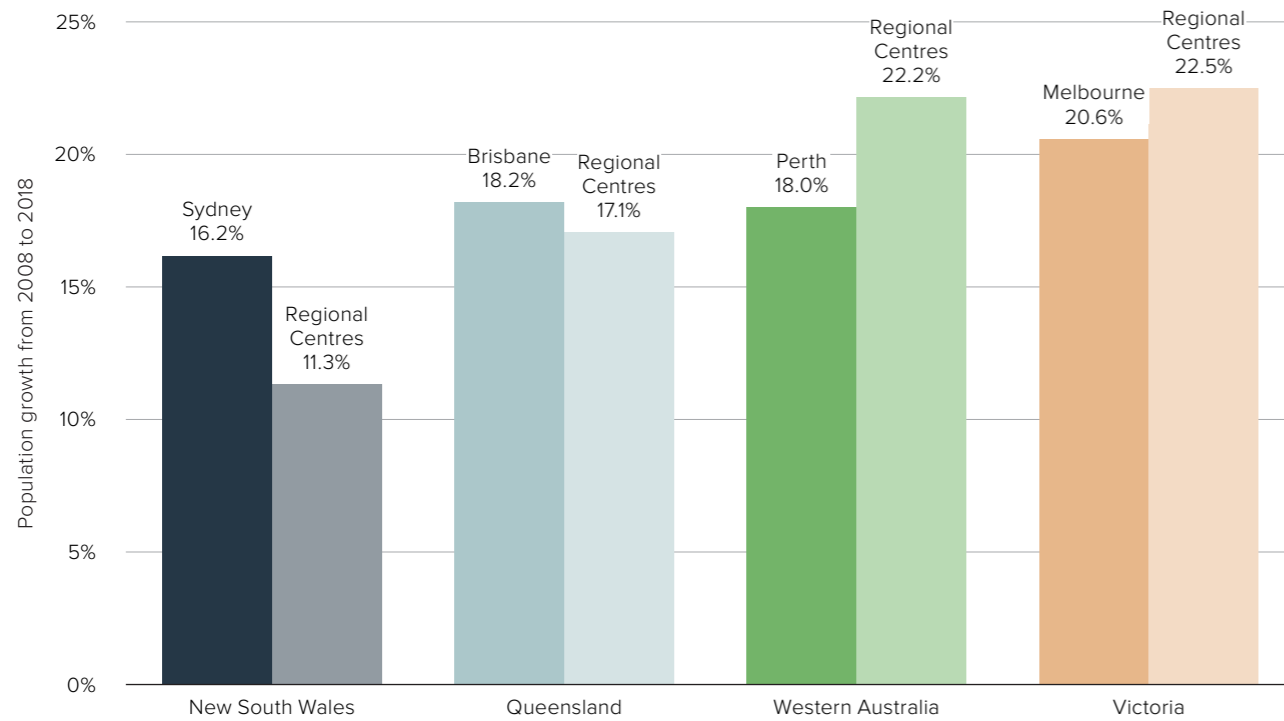
Promote regional growth

The COVID-19 pandemic has led to more people thinking about resettling outside Australia's Fast-growing Cities. This may add momentum to pre-pandemic growth rates (see **Figure 4.6**).

Further government investment in Smaller Cities and Regional Centres as locations that support new economic activities and lifestyles will capitalise on this interest.

Providing better local public transport and active travel choices will make these destinations more accessible to local people and those from nearby Rural Communities. It will also strengthen their viability as regional passenger rail nodes.

Figure 4.6: Regionalisation can be accelerated with better connectivity



Comparative population growth in Fast-growing Cities versus Regional Centres within 300 km of a capital city, 2008–2018

Note: Regional Centres are selected Significant Urban Areas (as defined by the Australian Bureau of Statistics) within 300 km of each state capital. The population growth percentages for Regional Centres are an average of the population growth percentages for each centre. Source: Infrastructure Australia analysis of Australian Bureau of Statistics data (2019)²⁴

Improve connectivity around regional centres

Improving the overall public transport customer experience will meet the needs of users who want to blend regional resettlement with occasional travel to Sydney, Melbourne or another city.²⁵

To achieve these outcomes, along with continued investment in maintaining safe local road networks there should be more public transport and active travel choices for regional communities. These will connect to improved regional services for a more reliable end-to-end journey to a Fast-growing City.

Just like people in larger cities, regional users will then be able to travel without relying on driving for all journeys.

For more information on the connectivity of Smaller Cities and Regional Centres to Fast-growing Cities refer to the **Place-based outcomes for communities chapter**. This includes information on the important role for the Australian Government in facilitating connectivity across state or territory borders, such as between Adelaide and Melbourne.

Provide demand-led services

Using business models that can adapt or introduce services quickly in response to changes in demand, public transport should connect Smaller Cities and Regional Centres to Small Towns and Rural Communities across a broad area.

Integrate interchanges

Identifying, upgrading and developing multimodal interchanges is the first step to establishing these hubs as a focus for local travel, and for connections to regional rail services to reach a city.

Interchanges should be integrated and community-focused so they provide residents with residential, retail, recreational and tourism facilities as well as multiple transport options.

Multimodal

Journeys that use more than one mode. For example, a passenger journey made by riding a bike to catch a train, or a freight journey by truck from producer to warehouse followed by van delivery to the customer’s front door.

Improve track and rolling stock quality

Rail track operators should prioritise the separation of passenger and freight movements to improve the speed and reliability of regional rail services.

Rolling stock improvements to existing regional rail services, such as more comfortable and spacious seats and on-board wi-fi, will increase ride quality. They may also reduce noise levels for people living close to rail tracks.

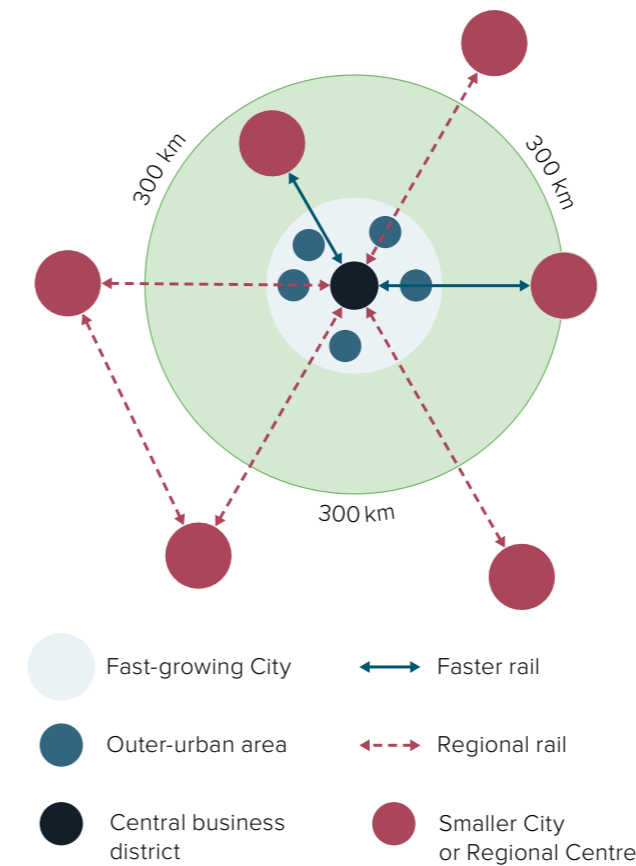
The outer-urban areas of Fast-growing Cities that improved rail services pass through would benefit too. Communities with limited transport options would be able to connect outwards to regions as well as inwards to a central business district.²⁶

Make faster long-distance rail travel a priority

Faster, fast and high-speed rail

These are different long-distance passenger rail products. Faster rail services are operated by existing or new rolling stock and run on upgraded existing tracks, at a speed between 160 and 200 km/hr. Fast rail services require new rolling stock operating on a mixture of new and upgraded track sections, at a speed between 200 and 250 km/hr. High-speed rail uses completely new, dedicated corridors that enable services to operate faster than 250 km/hr.

Figure 4.7: Strengthened regional rail connects existing and emerging centres across a metropolitan area



Smaller Cities and Regional Centres grow with strong connections to established and emerging centres in a Fast-growing City. Within 300 km, faster rail delivers 90-minute journeys.

“ Government investment in faster rail, fast rail and high-speed rail services will play a key role in improving the connectivity and accelerating the settlement of regional areas. ”

Governments must prioritise faster rail, fast rail and high-speed rail investments based on a shared vision for population change in Australia. The Australian Government should advance the prioritisation of cross-border projects connecting cities in different states and territories.

Government investment in faster rail, fast rail and high-speed rail services will play a key role in improving the connectivity and accelerating the settlement of regional areas.

Within 300 km of Sydney, Melbourne and other capital cities, faster rail could deliver 90-minute journeys (see **Figure 4.7**). Investments should be targeted at connections to Smaller Cities and Regional Centres within this radius.

Delivering exceptionally large transport projects like this requires developing and using decision-making processes that account for investment benefits that accrue over a wide geographic area and have a 50-year-plus timeframe.²⁷

The Australian Government should also lead a process to confirm the long-term interoperability requirements for fast rail, faster rail and high-speed rail lines that cross state and territory borders. This will mean jurisdictions adopting common technical standards for tracks, operator training and communication and signalling systems.

Then governments can leverage the widest possible productivity and safety benefits from their investments.²⁸

Preserving surface corridors for high-speed rail construction in the future is another way to increase these projects' value. This strategy will reduce the ultimate delivery costs and enable future stations to be integrated with new land uses.

For more information on corridor management, refer to the **Sustainability and resilience chapter**.

See the **Place-based outcomes for communities chapter** for more information on supporting the accessibility, growth and diversity of Smaller Cities and Regional Centres.

Give more people same-day access to essential services

The Australian Government should review the resources it invests in rural and remote area passenger transport services (including domestic aviation) to align with time-based access performance standards.

The investment focus should be on improving people's access to face-to-face services that cannot be delivered online through better digital infrastructure. For information about the need to accelerate a transition to digital delivery, see the **Social Infrastructure chapter**.

Scheduled point-to-point service

A public passenger transport service, with a set timetable, that links a pair of airports, train or coach stations, or bus stops

Hub-and-spoke network

Coordinates the timetabled operation of different public transport modal services so users can complete journeys by transferring between services at multimodal interchanges

Where digital services are not possible, access standards are needed to guide priorities for governments' transport infrastructure investment and maintenance programs (including regional airport infrastructure and services) as well as public passenger transport operators.

They should specify the level of access people in Small Towns, Rural Communities and Remote Areas should have to essential services in Smaller Cities and Regional Centres.

For example, someone with same-day access to these services will be confident they can travel from their Remote Area home to a centre using public transport; spend long enough there to attend a specialist medical appointment; then return home using public transport on the same day.

Developing the standards will involve reorienting point-to-point passenger transport services into a hub-and-spoke model (see **Figure 4.8**).

Under this model, timetables are integrated across modes and operators and flexible and on-demand services are used more.

Demand-responsive or on-demand services

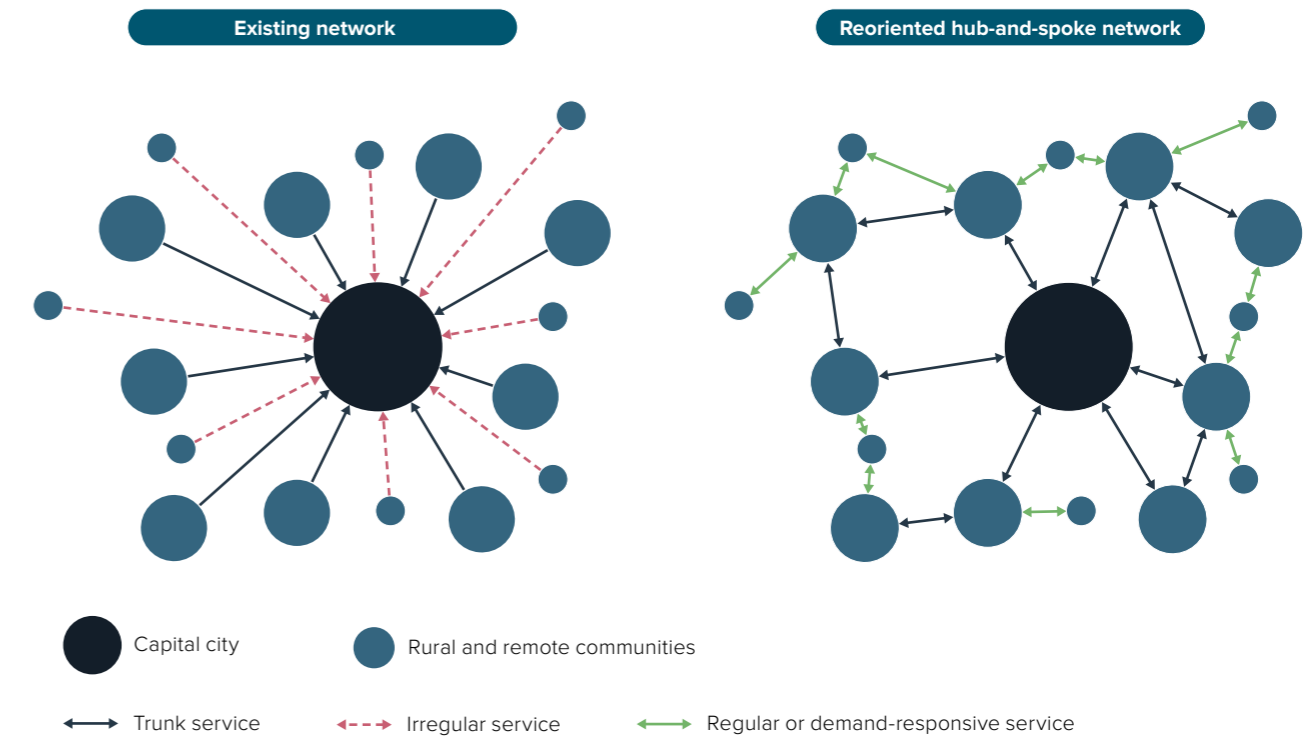
Public transport services that operate when and where users need them rather than to a fixed route or timetable. Services may be wholly on-demand, such as taxis or rideshare services provided by drivers using regular cars. Services can also follow a base route or timetable while having the flexibility to respond to local changes in user demand. For example, a demand-responsive minibus service can divert from a core route to pick up or drop off a user at their front door.

All these reforms will considerably improve the end-to-end journey experience for people in rural and remote areas.²⁹

See the **Place-based outcomes for communities chapter** for more information on minimum standards for these areas' access to infrastructure services.

For more information on a strategic approach to improving digital access for regional, rural and remote areas, see the **Telecommunications and digital chapter**.

Figure 4.8: Reoriented passenger transport services provide better end-to-end journeys for rural and remote communities





4.3 Mobility choice made possible

Key messages

- Transport services must take advantage of technological innovations to **deliver door-to-door mobility for all users in all urban settings**, so people can choose a mode other than driving.
- Prioritising the completion of local active and public transport networks in and around new centres during their development leads to **more sustainable transport patterns**.
- Using frequent bus services to connect centres on planned future rail corridors **builds up patronage, supports staged investment and strengthens the long-term role of mass transit**.
- The total network of mass transit and first and last mile services **must be inclusive and welcoming for diverse user groups** that have not previously been at the centre of transport provision. There should be:
 - **consistent reporting** for transport accessibility outcomes to focus attention on the needs of people with disability and an ageing demographic
 - **updates** to accessible public transport standards and support programs that embrace demand-responsive services
 - **requirements for operators** to actively invite feedback from people with disability and act on it.
- Reduced traffic speeds, lower-cost infrastructure designs and road user education will help to meet the **growing demand for enjoyable, safe and easy walking, cycling and micromobility travel**.
- Customer-oriented Mobility as a Service packages should combine demand-responsive services with traditional public transport and new micromobility products. This will involve **physical changes to transport assets and new contracting models** that integrate scheduled and flexible services.
- **Australia's national vehicle fleet** is transforming, presenting opportunities to rethink the supporting infrastructure.
- Building charging stations, including two-way facilities, into residential developments and public destinations will be critical to **normalising electric vehicle use**.
- As vehicle connectivity and autonomy continue to grow, **digital technology will need to be embedded in roads and traffic management systems**. All new roads should be designed with this in mind.

Taking advantage of the new transport economy

Even before the COVID-19 pandemic, the pace of change in the Australian transport sector was rapidly transforming mobility.

Digital connectivity, smartphone applications and new power sources are fundamentally transforming how people own or share, access, fuel and use transport services.

“ Learning from the experience of 2020 is helping Australia to set positive future directions for passenger transport. ”

The pandemic led to additional and unprecedented travel behaviour changes. For example, users temporarily abandoned city centre public transport services and turned to walking, biking and e-bikes or e-scooters for local access and exercise.³⁰

Learning from the experience of 2020 is helping Australia to set positive future directions for passenger transport that build on the broader momentum of change for the urban mobility sector:

- The isolating effects of lockdowns have reinforced how digitally connected transport services must better meet the needs of people with disability.

- The growth of walking and cycling in local neighbourhoods has highlighted the possibility of active travel for many types of journey, including microfreight deliveries.
- As the use of traditional public transport continues to recover, demand-responsive products (such as Bridj, Keoride, Ola, Shebah and Uber) are able to fill gaps, adapting quickly to changing needs and adding to the resilience of transport networks.

Combining these activities with actions to increase the role of shared, connected, electric and autonomous services in Australia’s mobility mix will result in fairer, safer and more sustainable passenger transport outcomes for all users.

Microfreight

Delivery options that use regular or power-assisted bikes and other small vehicles to carry freight to end users. Microfreight deliveries may connect freight depots on the edge of central business districts to customers in the city core, reducing the need for larger vans and trucks to operate on congested streets.



4.3 Recommendation

Free people from relying on driving for door-to-door mobility by ensuring urban transport services are managed as an integrated, inclusive, user-responsive and smart transport system.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

When this should impact:



Where this should impact:



5-10 4.3.1 Relieve congestion growth at the start of the urban development lifecycle by making active and public transport first and last mile networks the first transport projects completed in the local catchment of emerging and new centres.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

0-5 Pre-empt local congestion growth by identifying and delivering active and public transport networks around urban centres at the same time that they are designated as future mass transit station locations.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 Maximise the accessibility of new mass transit services by active travel and local public transport and reduce reliance on the provision of commuter car parking by requiring mass transit corridor proposals to incorporate a first- and last-mile service delivery plan that addresses:

- active travel modes
- bus priority access
- demand-responsive services
- Mobility as a Service subscription models
- multimodal interchanges connecting first- and last-mile choices to mass transit services.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, local governments

5-10 Promote the emergence of sustainable travel patterns in new communities by facilitating the operation of bus services that offer an attractive and reliable alternative to the purchase of multiple cars by a single household.

Proposed lead: State and territory transport departments

Supported by: Local governments

5-10 Enable the use of innovative funding mechanisms such as developer contributions to meet some of the operating costs of frequent scheduled or demand-responsive services during the first three to five years of people settling in greenfield urban areas.

Proposed lead: State and territory planning departments

Supported by: State and territory transport departments, local governments

5-10 Improve the attractiveness of public transport compared to car use in new release areas by ensuring the design and construction sequencing of road networks enable direct, frequent and efficient bus routes and services between separate subdivisions.

Proposed lead: Local governments

0-5 **4.3.2 Accelerate the trend towards people using their cars less in established urban areas and grow a sustainable patronage base for public transport use for all passenger journey needs by bringing forward traditional and demand-responsive road-based transport products as alternatives to car use for door-to-door suburban travel.**

Proposed lead: State and territory transport departments

Supported by: National Transport Commission, Austroads, local governments, Mobility as a Service operators

0-5 Meet existing and emerging travel demand during the project development phase for mass transit corridors within urban areas by ensuring frequent bus services are operational on parallel roads or preserved corridors (where these are available) before new mass transit projects are announced.

Proposed lead: State and territory transport departments

0-5 Support the timely deployment of transport products that offer a lower-impact alternative to motor vehicle use for urban passenger and freight transport by ensuring traffic control systems, kerbside parking regimes, multimodal interchanges, commuter car parking, bus stops and access pathways are designed to integrate with and support demand-responsive bus, minibus, rideshare, micromobility device sharing and/or microfreight operations, as required.

Proposed lead: State and territory planning departments, state and territory transport departments

Supported by: Local governments

5-10 Enable all jurisdictions to support efficient Mobility as a Service operations that provide users with seamless journey outcomes by developing and implementing a coordinated national position that addresses common definitions, data standards and system specifications.

Proposed lead: National Transport Commission
Supported by: Austroads, state and territory transport departments, Mobility as a Service operators

5-10 To optimise door-to-door outcomes for users in lower-demand markets, ensure contracting models enable the integration of traditional and demand-responsive services under area-based public transport operating contracts.

Proposed lead: State and territory transport departments

5-10 **4.3.3 Ensure all people in Australia enjoy equivalent accessibility outcomes by investing in transport infrastructure and services in line with the Disability Discrimination Act 1992 (Cth),³¹ Disability Standards for Accessible Public Transport 2002³² and broad objectives for universal access to services.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Attorney-General's Department, Department of Social Services, National Disability Insurance Agency, state and territory transport departments, local governments, transport service operators

0-5 Ensure reformed *Disability Standards for Accessible Public Transport 2002* include minimum required feedback mechanisms for people with disability to hold transport service providers accountable for accessibility outcomes throughout the operating life of transport assets.

Proposed lead: Attorney-General's Department
Supported by: Department of Infrastructure, Transport, Regional Development and Communications, Department of Social Services

0-5 Increase the transparency of jurisdictional actions to address the travel needs of people with disability by reporting accessibility outcomes annually using nationally consistent and user-oriented measures. Provide information on changes in door-to-door accessibility outcomes as experienced by different groups of users over the reporting period and specify user-oriented improvements for the coming two years.

Proposed lead: Attorney-General's Department
Supported by: Department of Infrastructure, Transport, Regional Development and Communications, state and territory transport departments, local governments, transport service operators

0-5 Develop and specify nationally consistent performance requirements for accrediting demand-responsive service providers as accessible. In the reformed *Disability Standards for Accessible Public Transport 2002*, include new performance requirements for 12-seater minibuses that are not currently covered by these standards, ensuring vehicles and associated customer interfaces meet the needs of people with disability.

Proposed lead: Attorney-General's Department
Supported by: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Ensure all jurisdictions' mobility service support programs collectively provide efficient coverage for people with disability by ensuring mobility service providers' alignment with a national accreditation framework and empowering program participants to purchase services from accredited rideshare operators through a single point of access.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Social Services, National Disability Insurance Agency, state and territory transport departments

0-5 Invest in the capacity of operators to provide demand-responsive and rideshare services to improve access for people with disability in Small Towns, Rural Communities and Remote Areas where there is not the collective density of demand to support commercial operations.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments

0-5 Address the needs of older Australians, women, children and people who speak or read a language other than English by developing nationally consistent performance requirements for transport services that meet diverse user needs for safe, convenient and easy-to-navigate travel. Only invest in transport proposals that include a plan to meet these requirements.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments

5-10 Reduce dependence on car use for a growing population of pet-owners by developing and implementing performance requirements for public transport networks to meet the mobility needs of people travelling with companion animals, in addition to assistance animals.

Proposed lead: State and territory transport departments

0-5 **4.3.4 Enable every person who wants to walk, ride a bike or use a micromobility device for a local journey or last-mile freight delivery to do so safely by completing continuous separated active travel networks.**

Proposed lead: State and territory transport departments

Supported by: Office of Road Safety, Austroads, National Transport Commission, local governments

0-5 Ensure active travel education for road users of all abilities and ages has an elevated profile in the updated *National Road Safety Strategy*. Address the needs of people walking, bike-riding and using micromobility devices, including e-bikes and e-scooters.

Proposed lead: Office of Road Safety
Supported by: State and territory transport departments

0-5 Develop, implement and support councils' adoption of standardised designs for separated facilities that use temporary barriers or other quickly installed features. These will widen the choice of simplified, user-friendly, safe, lower-cost and cost-effective infrastructure solutions and accelerate the completion of gap-free networks.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 Support councils' installation and management of small local freight depots on the edge of central business districts. These will enable the use of low-impact microfreight modes for last-mile deliveries in congested areas.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 Ensure technical resources support the prioritisation of investments that enable increased travel on foot, by bicycle or wheelchair, or using a micromobility device. Update the *Guide to Road Design* to include lower-cost and cost-effective active travel facilities and promote access to best practice data collection and modelling for active travel projects through updated *Australian Transport Assessment and Planning Guidelines*.

Proposed lead: Austroads

Supported by: State and territory transport departments

0-5 Optimise access for pedestrians, bike-riders, microfreight operators and people using a wheelchair or micromobility device by facilitating the revision of the *Australian Road Rules* to remove regulatory anomalies or obstacles to these outcomes in all jurisdictions:

- the use of lower-cost and cost-effective active travel infrastructure designs
- footpath access for micromobility devices.

Proposed lead: National Transport Commission

Supported by: State and territory transport departments

0-5 Provide an improved and safer active travel experience ahead of the completion of active travel infrastructure improvements by reducing the speed limit on roads that are identified as links in cycling and micromobility networks, where the existing speed limit is greater than 40 km/h.

Proposed lead: Local governments

Supported by: State and territory transport departments

5-10 **4.3.5 Ensure all road users can experience the benefits of world's best practice transport technologies by establishing a single national market for electric, connected and autonomous vehicles.**

Proposed lead: National Transport Commission

Supported by: Department of Infrastructure, Transport, Regional Development and Communications, Department of Industry, Science, Energy and Resources, Department of Home Affairs, Australian Building Codes Board, Austroads, state and territory transport departments, local governments

0-5 Enable the longer-term rollout of fleets of electric vehicles that can both return power to, and draw it from, the grid by ensuring the National Construction Code formalises requirements and specifications for providing and operating next-generation two-way charging facilities and associated signage in multi-residential, commercial, industrial and public buildings, including bus depots.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: Australian Building Codes Board, Austroads

5-10 Facilitate the use of both privately owned and shared fleets of light electric vehicles and micromobility devices by ensuring standard and/or two-way charging facilities are installed at kerbside locations, and in public parking areas by the developers of off-street destinations such as shopping centres and long-term car parks.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 To bring down purchase costs for bus and truck operators and speed up the rollout of new fleets, develop Australian Design Rules and common cross-jurisdictional technical specifications for zero-emission heavy vehicles that assist Australian manufacturers and importers in achieving economies of scale.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Transport Commission

5-10 Ensure that fast-charging facilities for buses (and other zero-emission heavy vehicles) funded under the Future Fuels Strategy are subject to compliance with new cross-jurisdictional technical specifications.

Proposed lead: Australian Renewable Energy Agency

5-10 Facilitate the uptake of new transport technologies by developing nationally uniform standards for the design and operation of road and digital assets used by Level 4 and 5 connected and autonomous vehicles. For all new road and major maintenance projects, immediately adopt and implement standards that offer 'no-regrets' benefits for existing and Level 3 vehicle operations, including line marking and digital speed zone standards.

Proposed lead: National Transport Commission

Supported by: Austroads, state and territory transport departments

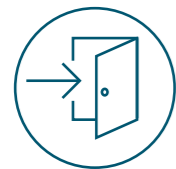
5-10 Ensure the data-sharing framework and associated digital infrastructure for gathering and using connected and autonomous vehicle-generated data are designed to support the separate administration of a national distance-based road user charging regime. Also ensure they align with privacy and cyber security requirements.

Proposed lead: National Transport Commission

Supported by: Department of Home Affairs, state and territory transport departments



Measuring progress



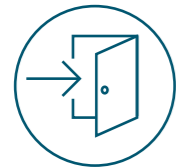
First- and last-mile access

Interchanges integrate high-quality design features, including access to first- and last-mile transport services

Access

Target: 100%

Timeframe: 0-5 5-10 10-15 15+



Accessibility

Public transport accessible to all

Access

Target: 100%

Timeframe: 0-5 5-10 10-15 15+



ZEV market share

Percentage of Australian vehicle fleet that is zero-emission

Affordability

Target: More than 50%

Timeframe: 0-5 5-10 10-15 15+



Establish a sustainable transport culture from day one

Fixed travel habits are hard to change, so early investment in direct active travel and public transport connections to the nearest local centre will shape sustainable future transport patterns in urban growth areas.

People are more likely to choose public transport when services are frequent or on-demand and follow a fast, direct route.³³

In addition, appropriately designing and phasing the construction of road networks in new release areas can make public transport more attractive than car use.

If connecting local road links and bus priority facilities are built early on, operators can avoid circuitous routes and reach more users in multiple greenfield subdivisions with fewer, faster services. This reduces their operating costs and makes it possible to move to a more frequent timetable.

New funding sources (including developer contributions) can also help by temporarily bridging some of the gap between fare revenues and the operating costs for these services.

Invest in centre-to-centre networks

In established urban areas, there is the opportunity to shift more journeys from driving to public transport

or active travel by supporting the evolution of centres from community activity locations to mass transit hubs.

This will involve:

- prioritising early improvements to active and public transport networks around and between local suburban centres, as well as to central business districts
- bringing forward the operation of frequent bus services on express priority lanes to shadow the route of future mass transit lines.

Both actions will deliver a payoff over many years (see **Figure 4.9**).

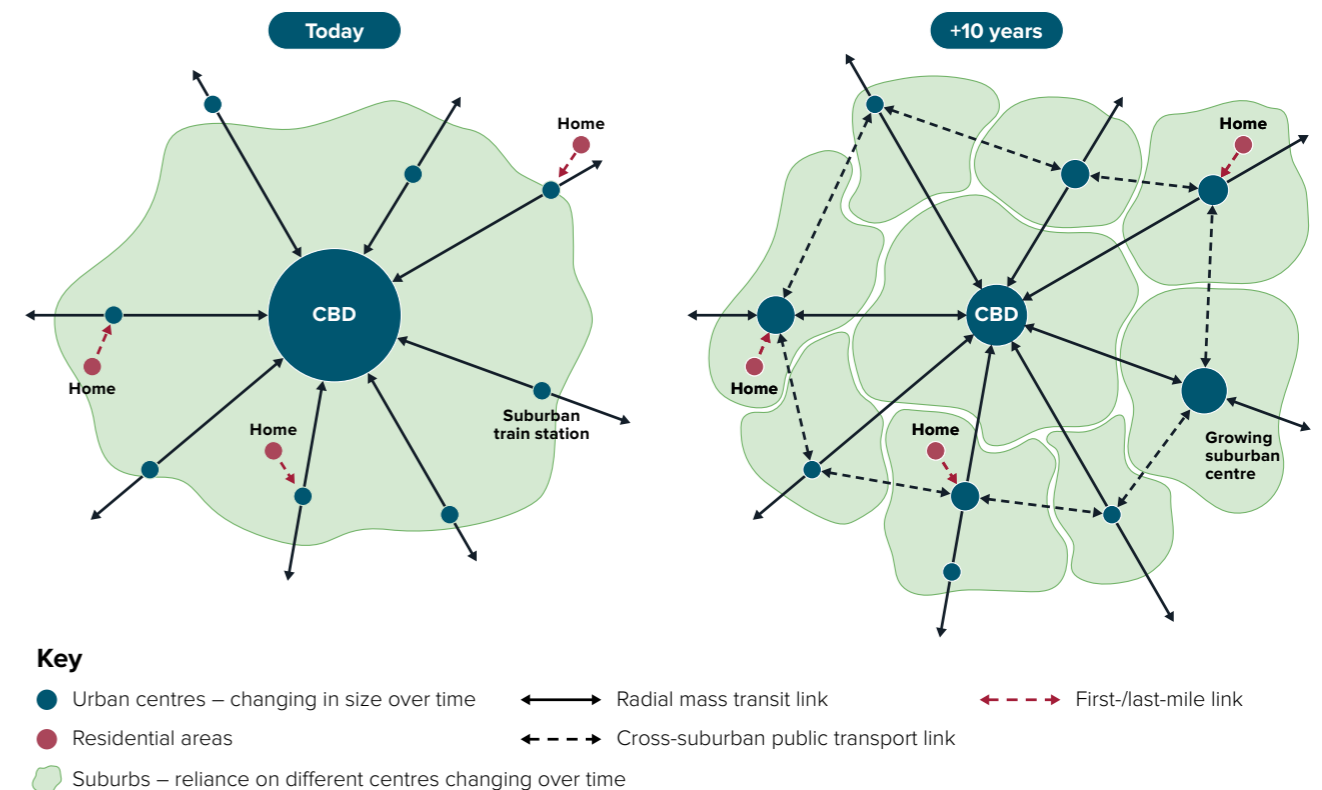
In the short term, users will benefit from being able to access their daily transport needs easily, quickly and affordably.

Over the longer term, as the city evolves, more accessible and connected local centres will support diverse activities that generate growing demand for travelling between them.

By acting with foresight, governments will ultimately strengthen the justification for, and performance of, new mass transit links that provide middle and outer-urban areas with similar transport access levels to those of established inner suburbs.³⁴

For more information on delivering better access in outer-urban areas, refer to the **Place-based outcomes for communities chapter**.

Figure 4.9: Improving direct links between suburban centres serves more travel needs



Plan adaptive assets and services that meet changing needs

Adaptive assets support flexible, responsive transport services that link to many destinations.

When area-based contracts for public transport operators are updated, they should integrate demand-responsive products such as minibuses that divert from a fixed route to pick up or drop off people close to home.

Mobility as a Service (MaaS)

Mobility as a Service subscription packages bundle up different personal travel products in the same way that a telecommunications package bundles mobile phone, internet and digital content services for a fixed monthly cost. Mobility as a Service subscription packages typically come with an app that provides a user-friendly interface between the customer and the mobility product that best meets their needs at the time of travel. A user can subscribe to a Mobility as a Service package as an alternative to owning a car.

This will make it easier for operators to market services to users through Mobility as a Service subscriptions. These package traditional timetabled public transport with demand-responsive services and other personal mobility products such as for-hire e-bikes and car share (for example, Car Next Door or GoGet).³⁵

Building the adaptive mobility solutions of the future will involve system-wide changes:

- Operators will provide flexible and scheduled services that change over the life of their contract in response to demand.
- The proponents, developers and operators of mass transit networks will integrate long-distance services with first- and last-mile connections to deliver end-to-end journeys.
- Mobility as a Service operators will follow consistent national standards for functions such as data sharing, customer payments and the integration of timetables.
- The detailed design specifications for many urban transport assets will anticipate technological and social changes.
- Innovative traffic control and kerbside parking management systems will support demand-responsive and rideshare services and shared micromobility devices where required.

- Commuter car parking spaces will be configured to allow for the changing use of high-value land near transit stops.
- To minimise the impacts of freight transport in a dense urban setting, small new depots on the edge of central business districts will act as a transfer point between traditional vans and last-mile microfreight deliveries.
- Better coordination of garbage and recycling pick-ups will also reduce the number of trucks on city streets. For more on this topic, see the **Waste chapter**.

Where governments need to roll out high-capacity mass transit services quickly to support rapid urban development, new-generation electric guided busways ('trackless trams') can offer advantages. They use a digital guidance system to travel at high speed on dedicated road lanes.

As they do not need rails or overhead wiring, guided busways can be built more quickly than light rail in some situations.

Make transport welcoming for all

Use reporting to drive action on accessibility

Nearly one in five people in Australia is a person with disability, and this proportion is growing.³⁶ To provide equal access, accessible outcomes must be assured over the full life of a transport service, not just when it is new.

There needs to be sustained investment in upgrading public transport assets and services to meet the need for accessible mobility.³⁷

Accessible transport

Infrastructure and services that are designed and operated to provide mobility for all users, including people with disability. Accessible transport outcomes are governed under Australian Government legislation and apply to public transport stops, stations, vehicles and access pathways.

It is critical that people with disability are closely involved when accessible transport outcomes are considered and delivered.

Mandatory reporting would help to make governments more accountable and active in this area.

Governments, councils and operators should report transparently on their accessible transport achievements in a way that allows national comparisons.

The reporting should be from the user's perspective and compare the access outcomes experienced by diverse users, including people with disability, in different situations.

There needs to be sustained investment in upgrading public transport assets and services to meet the need for accessible mobility.³⁸

Also, effective mechanisms for users to provide feedback, and operators to respond and act in real time, must be at the centre of operating practices for public transport.

“ There needs to be sustained investment in upgrading public transport assets and services to meet the need for accessible mobility. ”

Apply access standards to demand-responsive services

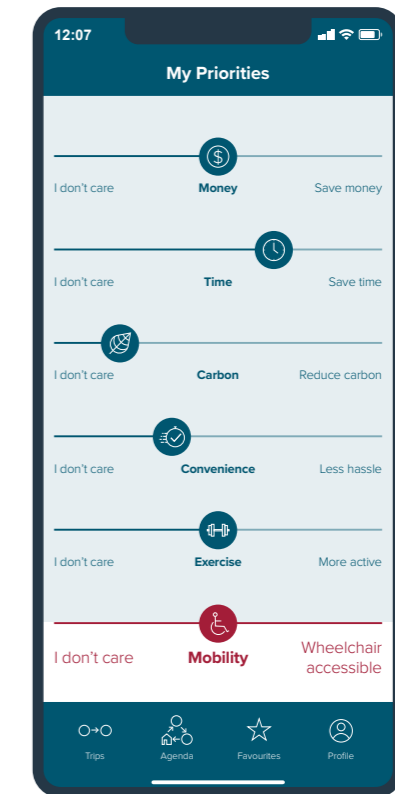
Everyone should be able to access the flexible and demand-responsive travel products that are now an established component of the passenger transport system.

The Australian Government's *Disability Standards for Accessible Public Transport* should be updated to cover these services' performance requirements to a national minimum standard.³⁹

The first focus should be on accrediting services that use minibuses seating up to 12 people, which are not subject to the current standards.

In addition, mobility service support programs should be aligned so participants across Australia can purchase journeys through a single point of access from operators accredited under national standards (see **Figure 4.10**).

Figure 4.10: To support equitable access, travel-planning apps should include accessibility needs



Account for diverse community needs

As well as adapting to changing urban environments, the ways governments plan, design and operate transport must take account of the diversity of Australian communities.

Language: Digital information technologies, and greater use of graphics on signs, offer ways for people who speak or read a language other than English to navigate the transport system more easily.

Lifestyles: Demand-responsive public transport services suit people who might previously have relied on driving for multipurpose journeys that combine school drop-off, commuting and other needs.

Safety: Designing transport interchanges as busy places, so users wait for a service outside a shop or café, results in a safer travel experience for everyone, especially people in vulnerable groups.

Demographic change: The design of transport services should address the needs of people with disability and an ageing population.

Pets: As average household sizes reduce and cities become denser, more urban Australians will rely on pets for companionship. Helping people travelling with pets to be better serviced by public transport is another way to reduce dependence on cars.

Normalise door-to-door thinking

Many Australians want active travel to be a safe and realistic choice for more journeys.

During the pandemic, physical distancing rules prompted more people to walk or cycle more often.

Increased active travel during lockdown provided people with physical and mental health benefits.

The **Social infrastructure chapter** highlights the importance of connected networks of green and blue open space, which can be used for active travel, in giving people access to these benefits into the future.

“ Many Australians want active travel to be a safe and realistic choice for more journeys. ”

The **Water chapter** considers the importance of re-naturalised waterway projects in extending and connecting urban open space and active travel networks.

Looking ahead, nearly one in three people in Australia expect to be cycling or walking more in the future.⁴⁰ This could involve active travel as the sole mode for a journey or combined with another mode, such as public transport.

Micromobility

Covers a range of one-person (or one adult plus children) travel options that combine aspects of traditional bicycle, scooter or wheelchair use with new power options and/or sharing models. Power-assisted e-bikes and e-scooters are examples of micromobility devices that can be either privately owned or shared. In some locations, they are booked and used through smartphone apps.

Accelerating the positive impacts of the pandemic on personal mobility will lead to more Australians choosing walking, scootering, skateboarding and biking, as well as micromobility devices such as e-bikes and e-scooters.⁴¹

To make these choices a normal part of everyday life, there needs to be:

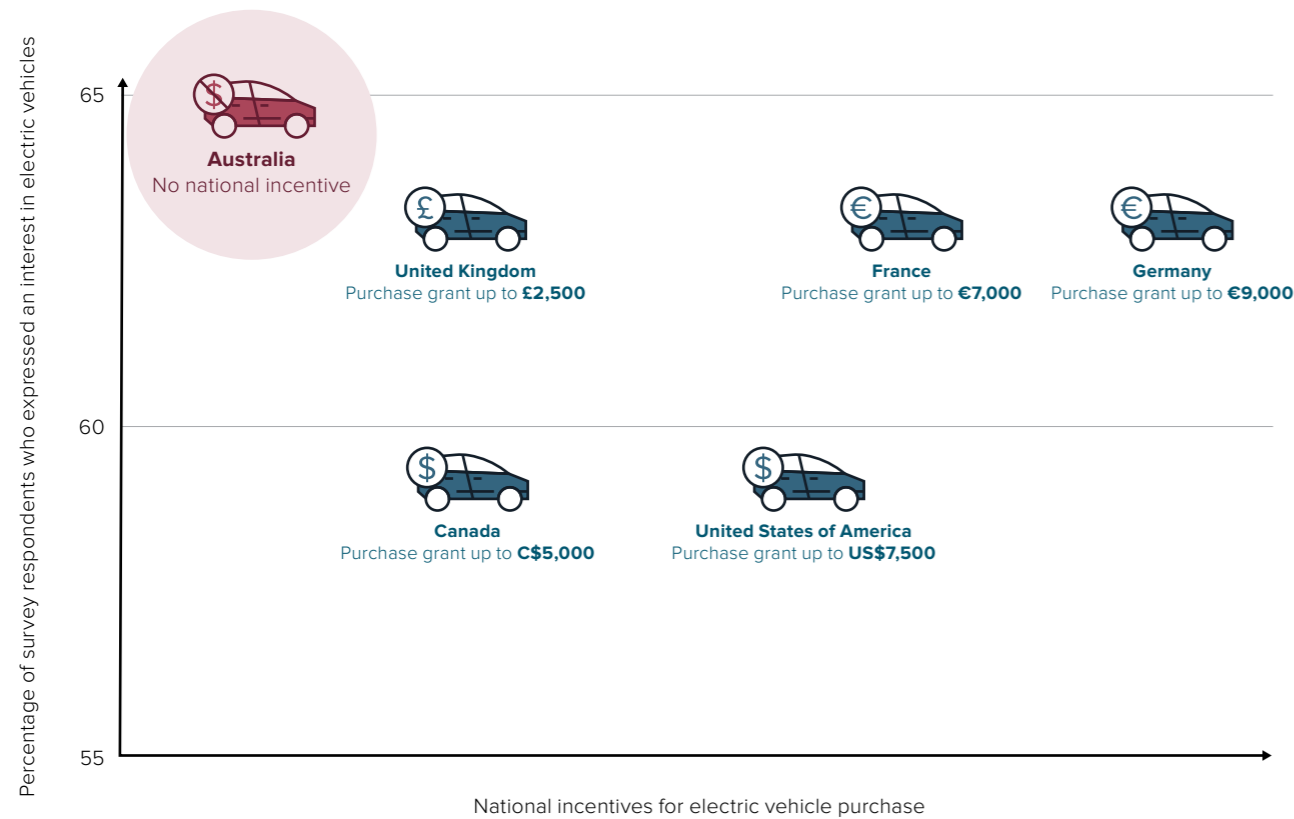
- lifelong road literacy education that starts in childhood
- lower speed limits wherever urban roads provide strategic links in active travel networks but infrastructure improvements are not yet completed
- simplified, lower-cost active travel infrastructure designs that enable safer, physically separated active travel routes to be completed more quickly (see **Figure 4.11**)
- the development of gap-free active travel networks that cross local government area boundaries
- updated and nationally adopted road rules that open up Australia to new micromobility technologies.

Figure 4.11: Pop-up cycleways are a model for the timely, tactical rollout of new facilities



Image source: City of Sydney (2021)

Figure 4.12: Even without financial incentives, Australians want to adopt clean and green motoring



Note: Incentives include electric and plug-in hybrid cars, and do not include state, provincial or other local financial programs, charger installation or old vehicle buy-back initiatives.
 Source: Adapted from L.E.K. Consulting (2020)⁴²

Encourage zero-emission vehicle use

In some countries, electric vehicle purchases are subsidised by the government — \$2,500 in Canada and \$14,000 in Germany, for example (see **Figure 4.12**).

Even without national subsidies, Australians are ready for the transformative impacts of shared, electric, connected and autonomous vehicles on this country’s streets.

Provide the right infrastructure

To capitalise on this readiness, infrastructure that makes it easier for Australians to choose a zero-emission vehicle must be built into the fabric of urban development at different scales.⁴³

Easily accessed charging facilities for shared electric vehicles and micromobility devices should be as widely available and visible as possible, installed as part of public parking areas on city streets and at workplaces, shopping centres and some transport interchanges.

Updated building codes should specify charging requirements for privately owned and commercial

fleets of electric vehicles, in apartment, office, industrial and depot developments.

Two-way charging facilities will be the next generation of infrastructure, enabling electric vehicles to be ‘batteries on wheels’, either drawing power from, or returning power to, the grid at different times of day. Building design standards need to be ready.

Nationally consistent technical standards should be in place for quiet and clean electric and other zero-emission buses, which will replace internal combustion engine vehicles.

Bus depot facilities to house these green vehicles should be built in dense urban areas rather than in distant industrial zones, improving the efficiency and responsiveness of bus services and effectiveness of electricity supply.

Australia’s faster uptake of zero-emission vehicles requires national coordination. This is addressed in the **Sustainability and resilience chapter**.

For information on ensuring the readiness of the grid for the mass use of electric vehicles, refer to the **Energy chapter**.

Apply national standards for connected and autonomous mobility

New transport guidance technologies offer major benefits. Connected and autonomous vehicles may have a reduced risk of collision and take up less road space because of the precision of their operation.

The way users value their time spent travelling may also change. If they do not have to control an connected and autonomous vehicle, people could be free to use their trip for other activities.

The exact timing for the arrival of these technologies is unclear. However the impacts will be increasingly felt during the term of the *2021 Plan*. Adopting nationally uniform standards for designing and operating roads and associated digital infrastructure will enable the faster rollout of autonomous and connected vehicles.

It will also support the emergence of a single Australian market for importing a wide range of zero-emission passenger and freight vehicles.

Where the new standards promise safety and efficiency benefits for vehicles with partially autonomous capability, they should be implemented as soon as possible for all new road and major maintenance projects.

Governments have agreed there will be a national data-sharing framework for gathering and using data generated by connected and autonomous vehicles.

It is essential this system meets *Australian Privacy Principles* and is resistant to cyber security threats. It should also be flexible and scalable so it can ultimately be used to administer a national distance-based charging regime for road users.

For more information on the strategic approach to managing digital assets across all infrastructure sectors, see the **Industry productivity and innovation chapter**.

The **Telecommunications and digital chapter** addresses actions that will increase confidence in the privacy and security of users’ data, including information on personal mobility.



Image source: SEA Electric (2021)



4.4 A fairer price for every journey

Key messages

- **Reforms to how governments plan, manage and invest in transport networks** will bring forward innovative solutions and lead to new infrastructure investment that better matches predicted mobility needs.
- The primary aim of any transport pricing reform should be to support transport operations by **balancing the efficient use of the transport network**.
- For transport infrastructure to efficiently move people and goods throughout its life, there must also be **pricing reform so both passengers and freight users pay a reasonable price**.
- A **reasonable price would capture all travel costs**, starting with the direct costs of building and maintaining assets and operating services.
- What people pay must also **reflect the impact that individual transport choices have on others**, such as emissions, congestion and crashes.
- A successfully reformed transport network pricing regime will **make these considerations clear to all users**. Everyone will understand what they are buying, receive the expected level of service and see their payment going directly towards a known outcome.
- National transport pricing reform should start with **a commitment by governments to dedicate transport revenues to better mobility services**.
- Independent consumer interest bodies should be given the responsibility of **monitoring financial protections for at-risk Australians**.
- Experience with **reforms that are already underway in some jurisdictions should inform nationwide rollout**.
- Participating in the current Heavy Vehicle Road Reform project can **develop agencies' capability to administer broader road user charging and pricing**.
- **A national distance-based road use charge for heavy and light vehicles** must ultimately replace the petroleum fuel excise that will disappear as Australia's vehicle fleet electrifies.
- Charges should reflect the external impacts of road use in different settings, progressively extend across vehicle classes and **be complemented by reductions in fixed vehicle ownership costs**.
- In cities, **supplementary parking and road use pricing** should address time-of-day congestion.
- Reconfigured urban public transport services and fares will provide users with **affordable access to a '30-minute city'** or a comparable standard.
- **Fares should vary by mode and time of day** to reflect the quality of travel experience and promote network efficiency.
- **Rail owners and operators should grow revenues** through value sharing (for example, from increased property values), developing airspace and advertising.
- **Regional rail fares should increase as and when services improve**, with the additional revenue going towards further infrastructure investments, including maintenance.

Delivering equitable mobility outcomes through pricing reforms

Australia's transport network pricing arrangements are not working for users, communities or governments:

- People pay to be mobile through vehicle ownership and operating costs and public transport fares. The outcome they experience varies so markedly that they cannot tell if it is value for money.
- When a person's transport choice affects others by adding to congestion or increasing the risk of injury or death, these factors are not reflected in what they pay.
- Australia's transport payments are not tied to, and do not cover, what it costs governments to provide transport infrastructure and services.⁴⁴ This means the community makes up the difference through the taxation system.

A nationally reformed transport network pricing system would deliver equitable and sustainable mobility outcomes for everyone.

All users would have affordable public transport and active travel choices that provide door-to-door access to jobs and services within an acceptable travel time.

The '30-minute city'

A city where most or all people have convenient and sustainable end-to-end access to jobs and major services within 30 minutes. This level of access depends on both land use arrangements and providing transport services and supporting infrastructure.

In urban areas, this could support the idea of a '30-minute city' or a comparable performance standard.⁴⁵

“Australia's transport network pricing arrangements are not working for users, communities or governments.”

To be successful, the reforms would have to include planners, operators and end users in the conversation. This would build trust in the process and increase acceptance.

The conversation would need to make it clear that there are risks in not acting, vulnerable people will be protected from unfair financial impacts, and transport revenues will be allocated directly to better services.

Any reforms initiated in one jurisdiction could be adapted and introduced into other states and territories.

Ultimately, a consistent set of national distance-based road use charges should replace petroleum fuel excise revenue. This revenue is diminishing because Australia's total vehicle fleet is getting more efficient and will ultimately become zero-emission.

Other reforms that should be considered are supplementary parking and road user pricing that target congestion in Fast-growing Cities, and rebalanced public transport fares that deliver value for money and more efficient network operations.

4.4 Recommendation

Ensure the price paid for mobility supports the efficient movement of people and goods by leading the transition to a nationally coordinated and multimodal transport network pricing regime.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments, state and territory treasuries

When this should impact:



Where this should impact:



0-5 4.4.1 Meet community and stakeholder expectations for transparency and fairness by establishing a nationally consistent governance framework for transport network pricing reforms.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australian Treasury, state and territory transport departments

0-5 Increase confidence in the fairness of the transport network pricing reform process by specifying the minimum level of protection that will be in place during the reform implementation period for users who are at risk of disadvantage for financial or geographic reasons. Reinforce this by nominating the independent agency that will monitor the rollout of user protections in each jurisdiction.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments

0-5 Increase confidence in the user benefits of transport network pricing reforms by developing and seeking National Cabinet endorsement for hypothecation principles. Under these principles, road and public transport revenues will fund integrated and multimodal programs that deliver sustainable mobility outcomes based on projected user needs.

Proposed lead: Australian Treasury

Supported by: Department of Infrastructure, Transport, Regional Development and Communications, state and territory transport departments, state and territory treasuries

0-5 Demonstrate a collaborative approach to the implementation of transport network pricing reforms by developing and seeking National Cabinet endorsement for the principles that jurisdictions will follow when taking the lead in implementing reforms. These will include a commitment to timely information sharing that facilitates the cross-jurisdictional co-delivery of reforms.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments

5-10 4.4.2 Ensure users pay for the true costs of mobility by implementing transport network pricing reforms.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australian Treasury, Department of Home Affairs, National Transport Commission, Australian Competition and Consumer Commission, state and territory transport departments

0-5 Develop state and territory capability to administer an equitable and efficient user-pays charging regime for all vehicle types. Adopt and work towards this objective through the implementation of Heavy Vehicle Road Reform by participating jurisdictions.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: National Transport Commission, state and territory transport departments

0-5 Support the efficient operation of urban transport networks in Fast-growing Cities by developing and implementing policy frameworks that impose an additional price on vehicle parking and use in areas affected by peak period congestion. Ensure revenues support the provision of alternative travel choices.

Proposed lead: State and territory transport departments

Supported by: Local governments

0-5 Develop a national distance-based road user charging regime for all types of vehicles. Ensure the design of the regime addresses risks to privacy and cyber security.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australian Competition and Consumer Commission, Department of Home Affairs, state and territory transport departments

5-10 Maintain at least the level of revenue received from current road user taxes and charges by implementing a national distance-based road user charging regime, with associated changes to the fixed costs of vehicle ownership.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory transport departments

0-5 Review and reconfigure city public transport networks to optimise the number of users who can access centre-based jobs and services within a 30-minute or better performance standard.

Proposed lead: State and territory transport departments

0-5 Review and adjust public transport fares to ensure they reflect the quality of travel experience provided and promote efficient network use. To make fares equitable, reduce the cost of journeys requiring:

- modal transfer, relative to 'single-seat' journeys
- the use of on-road public transport services, relative to rail
- the use of non-peak relative to peak services.

Proposed lead: State and territory transport departments

0-5 Develop and implement strategies to upgrade legacy rail networks in Fast-growing Cities and Smaller Cities by increasing revenues from non-transport activities and development outcomes that benefit from proximity to urban rail services.

Proposed lead: State and territory transport departments

5-10 Increase the per-kilometre cost of using regional rail services between Fast-growing Cities and Smaller Cities or Regional Centres when these services are upgraded. Allocate the additional revenue directly to further service improvements.

Proposed lead: State and territory transport departments

Measuring progress



Quality

Transport hypothecation

Percentage of transport revenues that are hypothecated for better transport outcomes

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Affordability

User-pays regime

A nationally harmonised, equitable and efficient user-pays charging regime across all passenger transport services

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Governance

Distance-based road-user charge

Percentage of vehicles covered by a distance-based road-user charge

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Reforming pricing to complete the transport policy framework

In recent decades, the changing role of the private sector has transformed transport. Businesses today supply road, public transport, maritime and aviation services that were monopoly public sector operations within the lifetime of many Australians.

Governments' role has changed from directly providing transport infrastructure and services to facilitating competition and private investment. They manage these outcomes through a transport policy framework that sets social, environmental, governance and financial parameters for when the private sector supplies infrastructure and services.

The framework also ensures strong protections for users by setting safety standards and subsidising access.

Hypothecation

When governments 'hypothecate' a tax or charge, they reserve the revenue to be spent on a specific program or service. For example, the Government of Western Australia hypothecates revenue from motor vehicle licence fees to a Main Roads Trust Fund that is spent on roads.

However, when it comes to funding transport infrastructure and managing travel demand so people and goods can move efficiently across a multimodal network, Australia's transport policy framework is missing critical elements.

Once it is complete, what people pay for their personal travel and for the goods and services they need will better reflect the true costs of mobility.

These will include the cost of building an asset and of maintaining and operating it so it delivers services throughout its life.

Their payments will also factor in the impact an individual's travel choice has on other people and communities, such as adding to peak congestion, harmful noise and air quality impacts, or increasing the risk of people dying or being injured in vehicle crashes.

As well as setting a reasonable price for different mobility choices, a reformed transport network pricing system will make the cost of these choices clear to users so they can make informed travel choices.

Pricing reform elements need to be in place under a consistent national framework that covers all jurisdictions and modes. A consistent framework will provide certainty and transparency for users while providing some flexibility for states and territories to use pricing to optimise the operation of their network.

The sooner this happens, the more financially sustainable Australia's transport sector will become in the face of coming disruptions.

Protect the vulnerable

Australians need to trust that any transport pricing reform process is equitable and be confident vulnerable users will be protected.

Community service obligation

Governments specify community service obligations (CSOs) that require contracted businesses to provide services that are not commercially profitable. A public transport CSO may specify the maximum wait time between timetabled services or the furthest distance that a user must walk from home to the nearest bus stop.

Transparency builds trust, so the reform process must start with a national conversation on the need for change.⁴⁶

Ahead of reforms, there should be protections for users who are disadvantaged by geography or their financial situation, such as a robust system of community service obligations and fare concessions.

The reformed pricing system should hypothecate transport revenues to specific targeted investments that deliver a better travel experience by integrating multiple modes.⁴⁷

Nationally, and in each state and territory, independent bodies should monitor the impacts the reforms have on users and report on the outcomes of hypothecation.

These agencies might include the New South Wales Independent Pricing and Regulatory Tribunal, and Victoria's or South Australia's Essential Services Commission. These bodies already promote users' interests by overseeing reliable and fair-priced access to important services.

There is more information on the broad question of how to maximise community confidence in a challenging reform process in the **Sustainability and resilience chapter**.

Figure 4.13: Incremental reforms, coordinated across jurisdictions, have more chance of success



Collaborate across the country

Soon, even more funding for road infrastructure will have to come from sources other than the Fuel Excise Levy, which is decreasing. States and territories should work together to deliver pricing reforms incrementally under a nationally coordinated process.

The Victorian, South Australian and New South Wales governments have already announced their intentions to make Australia’s first move towards a distance-based light vehicle road user charging system.

This will initially be for electric and plug-in hybrid road vehicles.

In Sydney and Melbourne, other initiatives are on the agenda to address the impacts of congestion and promote a shift in journey times to less congested periods, when drivers experience fewer delays.

Congestion pricing can take different forms. They could include a levy on the cost of car parking in a centre and paying a fee to drive into a central business district or other congested location at peak times.

Car parking levies are already in place for some Greater Sydney business districts and for central Melbourne. Levies could help to address congestion in other cities while more technologically complex interventions are developed, with revenues going towards improving alternative public transport and active travel choices.

Australia’s transport pricing system is complex, so there should be a staged approach to changing it incrementally across the country that is transparent, fair and user-focused (see **Figure 4.13**).⁴⁸

This approach will build trust and support continuous improvement.

Under a nationally agreed approach coordinated by the Australian Government, states and territories would learn from each other’s reform developments. Reforms from one location could be adapted and transferred to others, as occurs in Sydney and Melbourne.

“Australia’s transport pricing system is complex, so there should be a staged approach to changing it incrementally across the country that is transparent, fair and user-focused.”

As reforms roll out, transport departments should develop the administrative capability to operate new and diverse transport pricing and charging systems. This will build on their experience of participating in the Heavy Vehicle Road Reform project.

Tailor charges to use

A distance-based charge must apply to the use of all vehicles on Australian roads. The goal is that, ultimately, every vehicle owner and user will end up paying a fair price that reflects the impact of their choices.

There should be a single national framework for road user charges that put a price on these impacts, which will vary according to vehicle and journey type:

- Heavy vehicle use increases road maintenance needs because of pavement damage.
- Fossil-fuel and electric-powered vehicles generate varying levels of emissions and other pollutants during their manufacture and operation.
- All cars and trucks, regardless of their power source, can be involved in costly crashes and creating congestion.

By introducing a national distance-based charge in stages, governments will ensure a timely replacement for Fuel Excise Levy revenues. They will also have a source of funds to hypothecate to road maintenance and upgrades, and to alternative mobility choices.

The national charge would be supplemented by congestion pricing collected by state and territory governments. This will discourage travel during peak periods and fund alternative mobility choices.⁴⁹

Prepare users for change

Ahead of the introduction of congestion-oriented pricing, governments should increase the availability of buses and demand-responsive networks and services (for example, by adding more services and bus lanes) and improve walking and cycling access to trains and buses.

This will give people choices that avoid incurring charges, and encourage new behaviours.

In addition, the public transport pricing regime should be reconfigured so fares reflect the quality of the travel experience.

For instance, the relative quality of bus compared to train travel, journeys that involve interchanging between multiple services and non-peak travel should be reflected when setting fares.

This will ensure users get value for money by paying a reasonable amount for the quality of service they receive.

Changing prices will also change travel behaviours, so prices should be designed to promote more efficient use of services. For example, reducing the cost of some services relative to others will spread demand across the network.

Ensure rail services are always priced fairly

In and around Australian cities, people generally pay less than those in other developed nations for the distance they travel by rail.⁵⁰

If existing rail networks and services are to be improved and extended into new markets, funding must come from a range of sources, including (but not limited to) direct user charges.

Fare increases

When longer-distance regional rail services are improved with more frequent, faster or more comfortable services, gradual fare increases are appropriate.

The extra revenue should, however, go towards better public transport choices for regional travellers.

Value sharing

Another potential funding source is cost recovery by governments that own and operate rail services.

When extra services or infrastructure upgrades are introduced, this benefits people living and working near existing stations and can lead to an uplift in property prices.

Through value-sharing mechanisms such as land taxes or special levies on windfall increases in the value of property, governments can channel a share of landowners' gains into further service improvements.

Other options

Airspace developments: Partner with a developer to build apartments and offices in the airspace on top of railway infrastructure (interchanges and stations) to generate sales revenue, leasing income or receive in-kind services such as improving the station.

Commercial and retail activities at interchanges: Develop or retrofit interchanges so they include offices, shops and lifestyle facilities (such as gyms, cinemas and childcare centres) for sale or lease.

Customer-facing advertising: Lease space by rail tracks and inside train carriages to businesses so they can display advertising.



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5

Energy



What you will read in this chapter

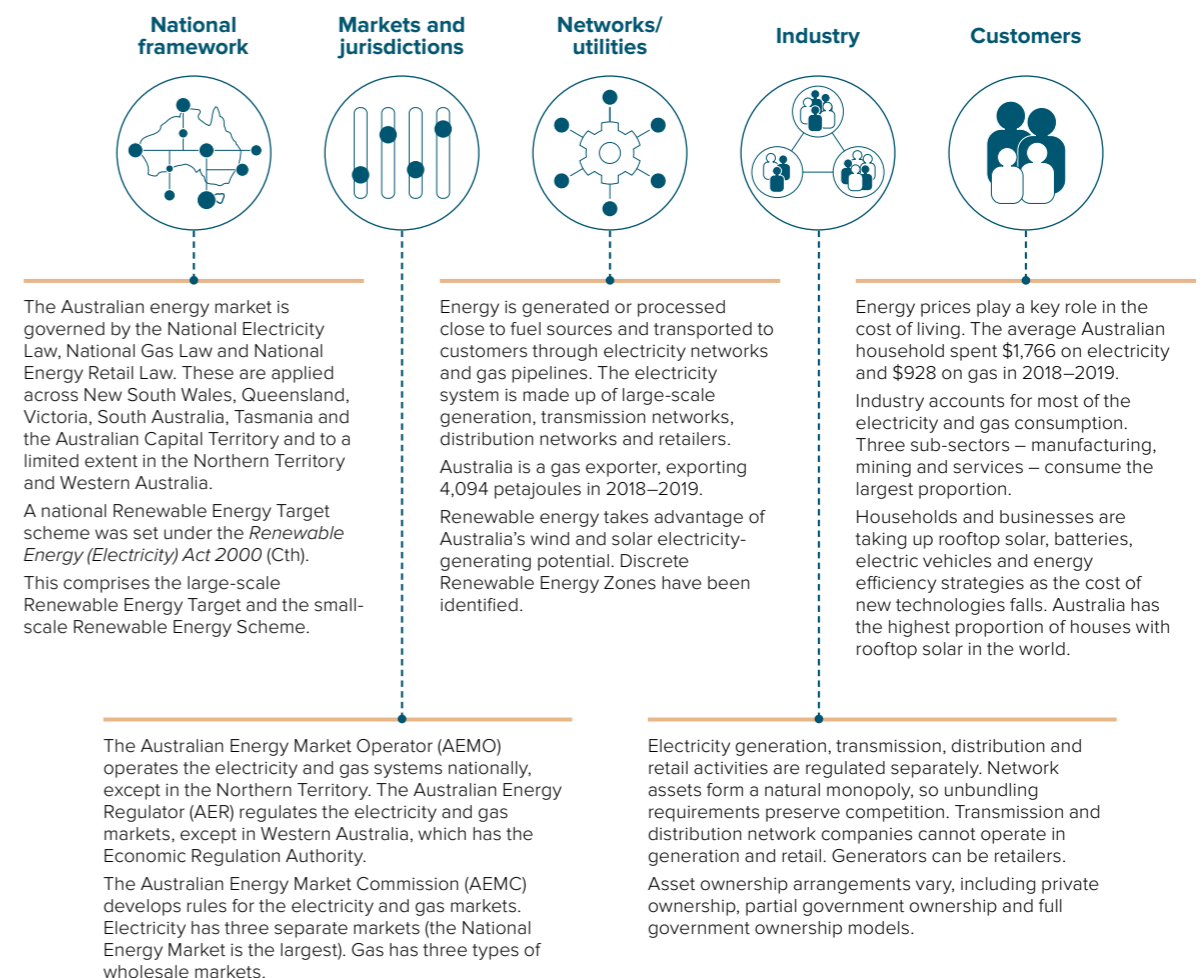
- **Reform 5.1: Putting customers first** – Educating households and businesses to reduce their energy bills by harnessing technologies such as smart meters, rooftop solar, batteries and zero-emission vehicles, and adopting energy efficiency strategies.
- **Reform 5.2: A smart, affordable, reliable grid** – Shaping the future electricity grid so it enables customers to unlock bill savings through smart meters with time-of-use tariffs, encourages electric vehicle uptake and supports cost-effective, timely electricity delivery.
- **Reform 5.3: Powering a cheaper, cleaner future** – Australia needs national leadership to ensure a secure future by positioning this country for the inevitable low-emission energy transition. Global trends and an evolving domestic market will force a shift away from fossil fuel-based energy exports and domestic energy towards low-emission energy sources.

Key messages

- Australia has a big **opportunity to lead the global energy transformation**.
- **The energy sector is fundamentally changing** — from how, where and when energy is generated and how it is transported and stored, to who participates in the market and how users pay for it.
- **Getting energy transformation right is critical to Australia's future**. Energy, particularly electricity, is fundamental to the Australian way of life and underpins the economy.
- **Energy transformation is central to discussions and programs of work** across all levels of government, the energy market bodies, energy regulators and industry bodies. Infrastructure Australia has prioritised **reforms that complement and build on existing work programs** rather than duplicating or creating uncertainty.
- The COVID-19 **pandemic has reinforced the need to focus on customers**, who are driving trends in the electricity sector. Infrastructure Australia has taken a user-centric approach to developing reforms.
- To support the future competitiveness of Australian businesses and Australians' quality of life, there must be an **affordable, clean and customer-centric energy system**.
- Giving customers the **knowledge and tools to unlock bill savings will drive affordability and equality**. It will also **ensure vulnerable customers are no worse off** and receive tailored support to reduce their electricity bills.
- The **future electricity grid must be smart, affordable, and reliable**. It must enable the Australian way of life and support customers who take up new technologies such as solar panels, batteries and electric vehicles.
- With its abundant natural energy resources, **Australia is well placed to enjoy the benefits of low-cost, low-emission energy sources**.
- **National leadership is needed to ensure Australia remains a supplier of choice for energy commodities** by starting to pivot from the current reliance on fossil fuel exports to a wider range of energy sources, particularly those with low emissions profiles, such as green hydrogen.



Energy sector overview



Introduction to energy

The energy sector is transforming

Energy underpins the Australian way of life. It powers homes, helps people and goods to move around and keeps essential social services running. It also contributes significantly to the economy, not least by fuelling every Australian business.

Australia is the third-largest fossil fuel exporter in the world,¹ exporting more than two-thirds of the energy produced here.² But the way Australia — and the world — is powered is going through an unprecedented transformation.

The energy sector is fundamentally changing — from how, where and when it is generated and how it is transported and stored, to who participates in the market and how users pay for it.

Figure 5.1 illustrates how the electricity grid is shifting from a centralised one with small numbers of generators to a decentralised one with more participants who both produce and consume energy.

This transformation is being fuelled by changing technology, changing user behaviours and expectations, and the need to reduce human impact on the planet.

Getting this energy transformation right is critical to Australia's future. Energy assets have a long lifespan — typically 30 to 60 years — so the infrastructure decisions made today will impact Australians for decades to come.

“The energy sector is fundamentally changing — from how, where and when it is generated and how it is transported and stored, to who participates in the market and how users pay for it.”

Many of the challenges, opportunities and reforms are shared across Australia. Therefore, while most of what is recommended in the *2021 Plan* relates to the eastern National Electricity Market (NEM), it also applies to the South West Interconnected System (SWIS) and North West Interconnected System (NWIS) in Western Australia, as well as the many small interconnected systems in the Northern Territory.

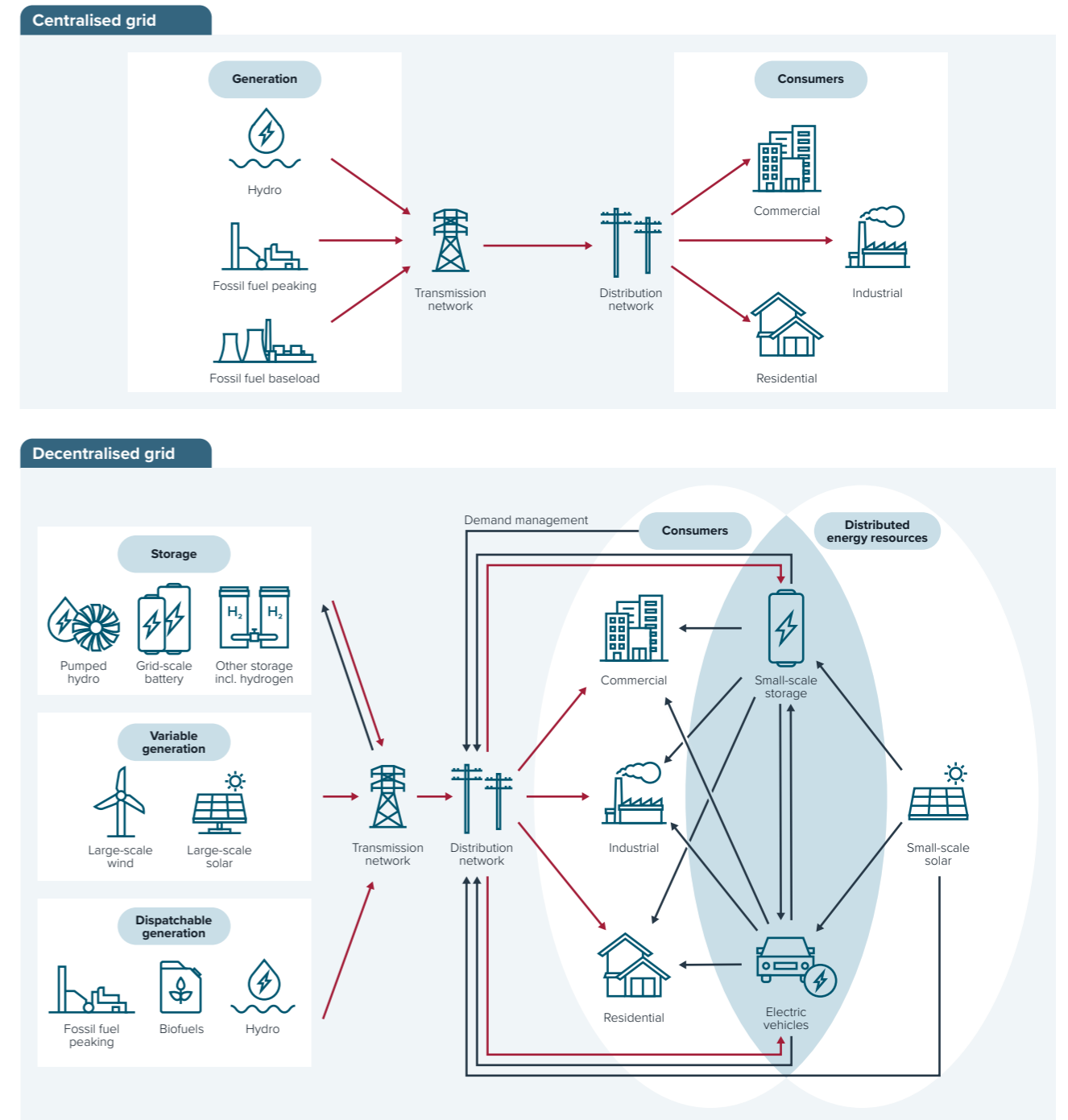


Electricity will become even more fundamental as other areas of the economy, such as transport and industry, start to transition from being fossil-fuelled to renewable electrification.

The energy transformation has been, and will continue to be, a core focus across all levels of government, energy market bodies, energy regulators and industry bodies. The Energy Security Board (ESB) has been tasked by Energy ministers with developing reforms

through the Post-2025 market design project to ensure a fit-for-purpose market design for the NEM. Government energy departments, the Energy National Cabinet Reform Committee, Australian Energy Market Commission (AEMC), Australian Energy Market Operator (AEMO), Australian Energy Regulator (AER) and other industry bodies are working together to support an orderly transition. The *2021 Plan* is part of that ongoing discussion.

Figure 5.1: The electricity system is changing from centralised to decentralised



Source: Adapted from Energy Efficiency Council (2020)³

Energy sector governance – the energy market bodies

- **The Australian Energy Market Commission (the AEMC)** – develops the rules for electricity and gas markets. It makes and amends the National Electricity Rules (NER), National Gas Rules (NGR) and National Energy Retail Rules (NERR), which are the regulatory instruments that govern the national energy markets. While the AEMC cannot propose rule changes, it manages the rule change process, and consults and decides on rule change requests made by others.
- **The Australian Energy Regulator (the AER)** – enforces the rules set by the AEMC. It monitors, investigates and enforces compliance with national energy legislation and rules in Australia's national energy markets. The AER regulates electricity networks and natural gas pipelines by setting the maximum amount of revenue they can earn.
- **The Australian Energy Market Operator (AEMO)** – operates the electricity and gas market. It monitors system performance, forecasts demand and supply, and coordinates emergency arrangements. AEMO is also leading the design of Australia's future energy system through the Integrated System Plan (ISP) that provides an integrated roadmap for the efficient development of the National Electricity Market.
- **The Energy Security Board (the ESB)** – provides whole-of-system oversight for energy security and reliability. It is leading a post-2025 market design process, and was established in 2017 by the COAG Energy Council to make the national electricity market fit for purpose. The ESB consists of an independent chair, independent deputy chair, and the heads of AEMO, AEMC and AER.
- Council of Australian Governments (COAG) Energy Council, now the **Energy National Cabinet Reform Committee** (the Committee) – provides oversight and coordination of energy policy at a national level, as energy policy is the responsibility of states and territories. The Committee consists of Energy and Resources ministers for the Australian Government and states and territories. It has overarching responsibility for electricity and gas markets and provides national leadership on strategic issues.

COVID-19 has reinforced the need for customer focus

The COVID-19 pandemic has shown how customers can drive changes to the electricity sector. Its impact on customer behaviour has accelerated some existing trends and shone a spotlight on current issues.

While the pandemic has had a negligible impact on overall electricity demand, it has driven higher residential electricity consumption that has offset lower business electricity consumption.⁴

It has also underscored these trends:

- There is an increasing need to address energy affordability, with more residential and small to medium enterprise customers facing hardship.
- There is a shift to working from home and settlement in regional Australia, which has accentuated the decentralisation of energy demand.
- There is increased interest in, and uptake of, rooftop solar panels and household batteries as customers take control of their electricity bills and the electricity system decentralises.⁵

Much has been achieved since 2016

The *2016 Australian Infrastructure Plan*⁶ identified the need to continue reforming Australia's energy sector by supporting new disruptive technologies, continuing the market-led rollout of smart meters and having flexible network tariffs.

Produced by Infrastructure Australia, *Prioritising Reform – Progress on the 2016 Australian Infrastructure Plan*⁷ reported that, since 2016, the energy market has been dealing with an influx of technologies, new methods of managing supply and demand, and regulatory uncertainty.

Efforts to address these complex issues have delivered mixed results, and the report identified key issues that have stalled progress, including:

- rising household and business energy bills, which on average have increased at a considerably higher rate than inflation
- the impact of emerging intermittent energy generation such as solar and wind (where output is not readily predictable without any storage capacity) on system stability in some regions of the NEM, SWIS, NWIS and interconnected systems in the Northern Territory
- the impact of reduced gas exports on prices.

Key energy stakeholders hold contrasting views, increasing the difficulty of settling on a robust position.

There has been some progress since the *2016 Plan*. An *Integrated System Plan* has been developed, to be refreshed by AEMO every two years from 2018. The Gas Supply Guarantee was established in 2017 and extended to 31 March 2023. However, more progress is needed on:

- smart meter rollout
- flexible time-of-day tariffs
- standalone power system reforms
- electric vehicle integration
- renewable energy reforms.

The *2021 Australian Infrastructure Plan* has a strong focus on forming a unified national approach that progresses these key areas. Infrastructure Australia has considered some outstanding recommendations from the *2016 Plan*, such as improving resilience, in the cross-cutting themes of the *2021 Plan*.

Meeting challenges and seizing opportunities

To keep businesses competitive and support quality of life, Australia needs an affordable, reliable and customer-centric energy system. This vision complements Australian Government and state and territory government policy priorities.

The entire energy sector is being challenged. Generation technology is changing, customers are becoming producers and feeding energy back into the grid, and households and businesses are starting to participate in the market and manage their own energy outcomes.

However, these challenges are also an opportunity to transition to a high-tech, low-cost, low-emission energy system that supports a sustainable and prosperous future for all Australians.

Tackle affordability issues

Australians believe electricity provides the lowest value for money when compared to gas, water, telecommunications, insurance and banking services.⁸ Electricity is perceived as the least affordable form of infrastructure, with over 60% of consumers rating it as 'costly' or 'very costly'.⁹ The COVID-19 pandemic has added to these energy concerns.

More customers are facing hardship and residential bills are rising as people work from home. It will take

a concerted effort by all levels of government, the energy industry and customers to drive equitable and affordable energy outcomes across Australia.

“To keep businesses competitive and support quality of life, Australia needs an affordable, reliable and customer-centric energy system.”

Their efforts should equip customers with the knowledge and tools to unlock bill savings by harnessing technology. Smart meters, time-of-use tariffs, rooftop solar, batteries, electric vehicles and energy efficiency strategies will all play a part. Throughout this transformation, it is essential to ensure vulnerable customers are no worse off, with tailored support to reduce their electricity bills.

Drive change through a smart grid

The grid is the essential backbone for providing reliable electricity to homes and businesses. The future grid can be smarter and more affordable. It can also enable change in other sectors, such as the uptake of electric vehicles across Australia at scale.

Smart regulations will deliver this future energy system cost-effectively. They will enable the timely connection of renewable generation to the grid and streamline the regulatory tests for electricity network investments so future grid projects can be delivered faster.

Embrace cheaper, cleaner energy technologies

Future Australia will be powered by high-tech, low-cost, low-emission energy sources. The global shift from fossil fuel generation to renewable energy sources is rapidly underway. Australians are leading the way, with the highest adoption of rooftop solar in the world — almost eight times the worldwide average capacity per capita.¹⁰

Thanks to abundant natural energy resources such as solar and wind, all Australians can benefit from this clean energy transition. New and changing approaches to electricity and gas infrastructure can improve reliability, but the shift to intermittent generation sources also presents a transitional challenge that needs to be managed.

The benefits will extend to Small Towns, Rural Communities and Remote Areas. They will be equipped with low-emission, standalone power systems that reduce costs and emissions and improve reliability.

Future-proof Australia's energy exports

Australia's role as an energy exporter of choice is fundamentally shifting. To ensure a secure economic future, this country must seize the opportunity to shift from being a global leader in fossil fuel exports to being a leading exporter of hydrogen and other renewable energy commodities.

To establish these new energy export industries, governments will need to lead and coordinate. Coordinating cross-sectoral infrastructure planning, investing in technology change and establishing regional hubs for producing key products will be critical.

How we developed the Plan for Energy

User-centric policy advice for a busy sector

When developing the recommendations in the *2021 Plan*, Infrastructure Australia's approach was to:

- prioritise benefits to service users and community sustainability
- avoid duplicating existing and ongoing reform work programs, to avoid uncertainty
- complement and build on existing energy transition work programs being undertaken by Australian Government and state and territory energy departments, the ESB, the AEMC, AEMO and the AER.

The *2021 Plan* is a non-build plan of policy reforms that aims to optimise infrastructure for service users and community sustainability. We looked at the sector through the eyes of energy users, considering key issues that are affecting them.

With the growing electrification of transport, industry and household energy, the importance of electricity policy to customers is increasing, so the *2021 Plan* has a strong focus on the electricity supply chain, along with gas and emerging technologies.

Moreover, energy infrastructure is built to serve customer demands. Consumer behaviour and technology directly influence the infrastructure that needs to be built, so enabling more efficient energy consumption will have significant benefits for the whole energy infrastructure sector, not just for users.

Electrification of the economy is part of the unprecedented transformation of this sector. Consequently, electricity will become the predominant energy source in the future. Electrification will enable affordable, reliable and clean energy to power almost every aspect of how Australians live and work.

For broader measures and recommendations around sustainability, see the **Sustainability and resilience chapter**. For more recommendations to enable the electrification of transport services, see the **Transport chapter**.

Acknowledgements

Infrastructure Australia acknowledges the significant work being undertaken by government energy departments, the Energy National Cabinet Reform Committee, the Energy Security Board, the Australian Energy Market Commission, the Australian Energy Market Operator, the Australian Energy Regulator and other industry bodies.

When developing the *2021 Plan*, we engaged with energy market bodies, industry, government and academics to understand their current programs of work and, if appropriate, align our advice to provide a consistent reform narrative to meet challenges and opportunities.

We would particularly like to acknowledge:

- AEMO, which is leading the future vision for the electricity network through the *Integrated System Plan* and is informed by Infrastructure Australia's work analysing the capacity of the Australian infrastructure market
- the ESB, which, with the market bodies, has released an options paper to inform a post-2025 market design
- the AEMO-ARENA (Australian Renewable Energy Agency) Distributed Energy Integration Program (which aims to maximise the value of customers' distributed energy resources for all energy users), in which Infrastructure Australia participated
- our partner the Australian Academy of Technology and Engineering, which ensured the *2021 Plan* was informed by the best expertise.





5.1 Putting customers first

Key messages

- **Business and residential customers can use current technologies** — such as smart meters, rooftop solar, batteries, electric vehicles, energy management systems and energy-efficient buildings, appliances and equipment — **to reduce bills and drive transformation** in the energy sector.
- While uptake of these technologies is increasing, targeted communication and information can support **more customers to invest and realise the benefits of increased energy efficiency and productivity more quickly**.
- **Vulnerable communities will benefit from these investments** through higher minimum standards for rental accommodation and investments in social housing, supporting a higher standard of living and lower bills.
- **Closing the information gap for home owners, investors, buyers and renters** so they better understand domestic energy performance will drive investments and improvements over time.
- Small to medium enterprises, manufacturers and high-energy-intensity businesses can realise new opportunities to upgrade plant and equipment and modernise processes and **enhance business productivity**.
- **A more efficient energy system reduces costs for everyone**. Learning from, and building on, the best programs available and harmonising incentives and information nationally will help Australia move from lagging to leading in energy efficiency.

Supporting customer-led transformation

Businesses and households share a common need for affordable and reliable energy. Emerging technologies are enabling new choices for energy customers to meet these needs with greater flexibility and increasing control over both their demand and supply.

These choices are forcing changes across the industry and could realise efficiency and productivity benefits across the economy.

More than ever, there are tools to help energy customers better understand their electricity use and manage it:

- Smart meters and apps are providing real-time monitoring and helping to change how and when customers choose to use electricity.
- Energy management systems are automating and optimising consumption for best value.
- Rooftop solar systems are reducing electricity consumption from the grid and can help customers participate in the market.
- Batteries are enabling customers to store cheap off-peak or rooftop solar energy for use in peak periods.
- Electric vehicles will soon be able to power homes and export to the grid.
- Increasingly, energy-efficient homes and appliances are reducing bills and, for vulnerable households, supporting a better standard of living.

This customer-led transformation is being replicated in similar sectors, such as telecommunications, water and transport, but customers think energy is providing the worst value for money of these services.¹¹

While many customers have already applied one or more electricity management tools, few have applied them all. Both households and businesses are time-poor, and decisions to invest in energy efficiency and productivity are often not a priority due to a lack of information and understanding of the benefits.

Industry and governments need to do more to close this information gap and increase awareness. This will enable Australians to realise the potential to reduce bills, increase productivity and help vulnerable people to improve their living standards.

Scaling up and harmonising existing best-practice initiatives across states and territories, supporting new investment in energy efficiency, and promoting the opportunities for businesses to improve their energy productivity are no-regrets opportunities.

This will empower customers to unlock savings and create an affordable, efficient and customer-centric energy system for the future.

5.1 Recommendation

Help households and businesses reduce electricity bills by making sure they have the right information and incentives.

Proposed sponsor: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

When this should impact:



Where this should impact:



0-5 5.1.1 Help residential energy customers invest in products and services that reduce their energy bills through education campaigns and tools that help them access the right information when they need it.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

0-5 Reduce household energy bills (and improve residential energy efficiency) through the broader promotion of easily accessible information and education campaigns (leveraging websites like Energy Made Easy and Your Home), and supporting residential customers to:

- invest in the energy efficiency of their homes, renovations and appliances
- understand and manage their energy consumption
- choose their retailer.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: Australian Energy Regulator, state and territory energy departments

0-5 Reduce energy bills and improve health and wellbeing for vulnerable and low-income customers by delivering funding assistance programs to support energy audits and energy productivity upgrades for public and community housing, low-income households and associated rental properties with poor energy performance.

Proposed lead: Department of Industry, Science, Energy and Resources,

Supported by: State and territory energy departments, Energy Consumers Australia, Australian Council of Social Services, Department of Social Services, Services Australia

0-5 5.1.2 Help buyers and renters make informed decisions by mandating energy efficiency disclosure for residential dwellings at time of sale or lease and raising minimum energy efficiency standards for rental properties.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

0-5 Inform home owners, buyers and tenants of the energy performance of their home through the development and application of a national residential energy performance rating scheme for all homes (new and existing) consistent with the *Trajectory for Low Energy Buildings* and *Report for Achieving Low Energy Existing Homes*.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

0-5 Improve the energy efficiency, health and comfort of rental properties by implementing a national minimum energy efficiency standard, including mechanisms for tenants to initiate energy efficiency upgrades of rental properties. This should build on work already underway to set out considerations for development of rental standards through the *Trajectory for Low Energy Buildings* and *Report for Achieving Low Energy Existing Homes*.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

5-10 5.1.3 Give energy customers clear and consistent incentives to take up energy efficiency opportunities by harmonising energy efficiency obligation schemes across jurisdictions.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

5-10 Give energy customers clear and consistent incentives to take up energy efficiency measures by harmonising jurisdictional energy efficiency obligation schemes into a national scheme, or otherwise harmonising schemes, incentives and standards across jurisdictions in line with *National Energy Productivity Plan* goals.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

0-5 Ensure widespread access to energy efficiency schemes throughout states and territories by introducing nationally harmonised schemes where they do not already exist.

Proposed lead: State and territory energy departments

0-5 5.1.4 Help businesses lift energy productivity through targeted information, communications and education alongside direct incentives to invest in energy productivity upgrades.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments

0-5 Improve the energy efficiency and productivity of businesses through targeted communications and education campaigns, and connecting businesses with expert advice to help them identify and implement upgrades to equipment and modernise processes.

- Include programs that specifically target manufacturing, energy-intensive small to medium enterprises and large energy users to assess and report on their opportunities for improving energy efficiency, in the style of the Energy Efficiency Opportunities program and building on the Business Energy Advice Program.

- These tools and touchpoints should help businesses take advantage of opportunities at key points of decision and investment (through major purchases or at tax time) and comply with obligations under harmonised national energy efficiency obligation schemes.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments, industry representative groups

0-5 Give businesses a direct short-term incentive to implement energy efficiency measures and lift energy productivity by extending the instant asset write-off scheme to energy efficiency upgrades of up to \$150,000.

Proposed lead: Australian Treasury

Supported by: Department of Industry, Science, Energy and Resources

Measuring progress



Economic

Energy intensity

Australian energy intensity, expressed as the ratio of primary energy used to Gross Domestic Product¹²

Target: 2.5% reduction Timeframe: 0-5 5-10 10-15 15+



Affordability

Average weekly energy expenditure

Average weekly expenditure on electricity as a percentage of household disposable income, averaged across all households¹³

Target: Less than 3% Timeframe: 0-5 5-10 10-15 15+



Affordability

Energy affordability

Ratio of electricity price index to generic Consumer Price Index. When the ratio is 1, the cost of electricity is changing at the same rate as other goods and services

Target: 1 (parity) Timeframe: 0-5 5-10 10-15 15+



Prioritise energy productivity across the economy

Energy efficiency measures are a ‘set and forget’ investment that pays off through future savings for businesses and households; the increased value of energy-efficient homes and assets; enhanced comfort and liveability; and higher productivity.

They also offer wider community benefits by reducing overall energy demand, which puts downward pressure on wholesale energy prices, and reducing demand peaks, which decreases the need for capital investments in generation and networks that are paid for through customer bills.

The Council of Australian Governments (COAG) *Trajectory for Low Energy Buildings* (the *Trajectory*)¹⁴ is a national plan that sets a trajectory towards buildings that are zero-energy and zero carbon-ready. Implementing the *Trajectory* would:

- reduce overall annual energy demand by an estimated 36 terawatt-hours by 2050. This represents a 15% overall reduction in Australia’s future electricity consumption and a 74% reduction in peak demand growth¹⁵
- reduce network and generation capital expenditure costs by \$7.5 billion and \$4.1 billion respectively¹⁶
- translate into average bill savings of \$559 (23%) for residential customers and \$13,500 (15%) for business customers by 2050.¹⁷

Supporting the realisation of the objectives and broader measures outlined by the *Trajectory* will be critical to realising these benefits for energy efficiency and productivity across the economy for households and businesses.

“The barriers to greater uptake in Australia are not only financial, but behavioural and informational.”

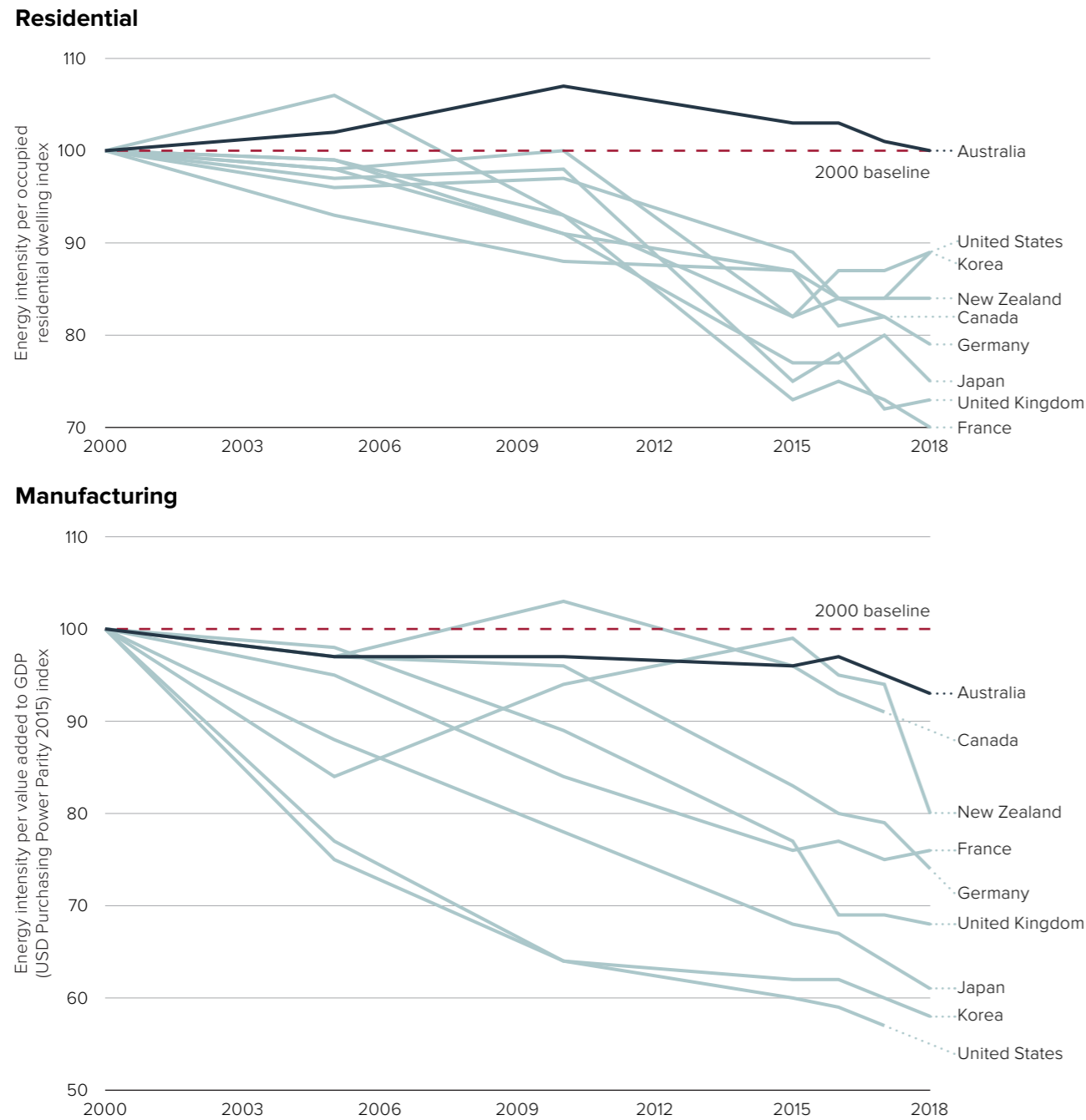
A common proxy indicator for a country’s energy efficiency is the energy intensity of its economy (the amount of energy used to generate a unit of economic output).¹⁸ **Figure 5.2** illustrates Australia’s relatively flat energy intensity index (which tracks changes in energy intensity relative to a base year) for residential and business customers from 2000 to 2018. It reflects the low uptake of energy efficiency measures across Australia.

The graph also demonstrates the untapped potential of energy efficiency measures in Australia compared to such countries as New Zealand and those in the United Kingdom, which have greatly improved energy efficiency in the last 20 years.

The barriers to greater uptake in Australia are not only financial, but behavioural and informational.¹⁹ Supporting customers to make more informed decisions is therefore essential to unlock all the potential savings from energy efficiency.



Figure 5.2: Australia's residential and manufacturing energy intensities have not improved in recent decades compared to peers



Note: Energy intensity refers to the amount of energy used to generate a unit of economic output. Data available for 2000, 2005, 2010, 2015, 2016, 2017 and 2018.

Source: International Energy Agency (2020)²⁰

Invest in residential energy efficiency

The majority of Australia's 9 million homes rate relatively poorly when assessed on their energy performance.²¹ This presents significant opportunities to generate bill savings for residential energy customers, reduce peak demand on the grid and improve comfort and health.

However, households have limited time to address this issue, while opportunities to improve residential energy efficiency are often poorly understood and competing with other household expenses.

Home energy-saving initiatives

Energy productivity in homes can include draught sealing, insulation, ceiling fans, lighting, shading, solar panels, battery storage, more efficient hot water, and reverse-cycle air conditioning.

Increased awareness and accessible information can help consumers navigate opportunities in a changing market and prioritise decisions to invest in energy efficiency through home upgrades, appliance purchases or as part of larger renovations.

The broader promotion of information and education campaigns that support residential energy efficiency will help them to better understand their energy consumption and help inform their choice of retailer. Only 55% of households and 57% of businesses are confident in using the available tools. A similar proportion think information is easily understood.²²

To be effective, a new campaign will need to use a variety of communication methods to reach different groups, including mainstream broadcast media and social media platforms. The campaign should be supported by user-friendly websites, such as Energy Made Easy and Your Home, that help customers understand and compare their opportunities.

It should also support national programs to increase energy efficiency standards, such as the *Greenhouse and Energy Minimum Standards Act* (Cth).

For low-income and vulnerable households, investments in residential energy efficiency have wider benefits. For these consumers, poor energy performance correlates with increased risks for poorer health and wellbeing outcomes. Heatwaves and chronic cold are increasing risks for the elderly and those with pre-existing illnesses. For social housing, low-income households and associated rental properties with poor energy performance, there are substantial opportunities to increase energy productivity and the associated health and social outcomes through funding assistance programs that support energy audits and energy productivity upgrades.

There are approximately 440,000 social housing dwellings in Australia, so the opportunity is significant.²³

For more information on reforms that will provide high-quality social and affordable rental housing, see the **Social infrastructure chapter**.

The **Sustainability and resilience chapter** outlines ratings tools and sustainability approaches to consider for social infrastructure investment and services.

Create an informed market for home buyers and renters

Renters and buyers cannot make informed choices if they do not know how energy efficient a potential home is before they buy or rent it.

Most Australian households support mandatory energy efficiency labelling schemes for residential buildings. There is even stronger support for energy efficiency standards for rental properties.²⁴ However, there is no national framework for reporting household energy efficiency at point of sale or rental.

In 2015, COAG Energy Council agreed a national collaborative approach to residential building ratings and disclosure that would enable home owners, buyers and tenants to understand, compare, value and act on the energy performance of existing and new residential buildings.²⁵

The *Trajectory for Low Energy Buildings* project was approved by COAG in 2019 and sets out a pathway to a national framework for disclosing residential energy efficiency. The *COAG National Energy Productivity Plan* also supports improving residential building energy ratings and disclosure.²⁶

Basing such a system on a single, agreed energy efficiency rating system would help people to understand, compare, value and act on the energy performance of existing and new residential buildings anywhere in Australia.²⁷ This will help overcome barriers such as split incentives between buyers and sellers or landlords and tenants.

As well as improved disclosure of residential energy performance, the *Trajectory* supports minimum energy efficiency rental requirements, noting the benefits of this initiative in resolving the split incentive that exists between landlords and tenants. In line with this approach, Victoria has introduced reforms to its *Residential Tenancies Act* providing for minimum efficiency standards.

For low-income households and associated rental properties, raising these standards will help realise broader quality-of-life benefits. Funding assistance programs to support these upgrades will be important, ensuring the costs of upgrades are not passed on to tenants through increased rents.

The *Trajectory* also notes the opportunity to consider how energy efficiency obligation schemes, financial incentives such as rebates, and Australian Government and state and territory tax incentives could best be coordinated to support these initiatives.

For more information on how standards for homes and buildings can increase energy efficiency (for example, the National Construction Code), see the **Sustainability and resilience chapter**.

Harmonise energy efficiency schemes and incentives

According to where they live, Australians currently receive different incentives and benefits for energy efficiency upgrades. A nationally harmonised energy efficiency scheme would give everyone the same opportunities and could build on the success of existing state schemes such as the Victorian Energy Upgrades program, which is targeting a 7% reduction in demand by 2025.²⁸

A consistent framework of rules and guidelines on eligible energy efficiency measures, products and methodologies across jurisdictions and sectors would help unlock energy efficiency benefits at scale.²⁹

The idea has been proposed before. In 2017, the AEMC recommended creating a National Energy Efficiency Scheme³⁰ to improve energy efficiency program design and administration and reduce costs for delivering energy efficiency upgrades.³¹

The Australian Government estimated that a National Energy Savings Scheme, designed to meet an energy savings target of 5%, could have a net benefit of \$1.5-5.3 billion from 2015 to 2050.³²

States and territories should build on the substantial achievements and learnings of existing programs and harmonise incentives and standards in line with the *National Energy Productivity Plan*.

Increase business and energy productivity

While the Australian Government and state and territory governments have educated Australians on the benefits of energy efficiency in the past, the programs have not been universally available across jurisdictions and have often been short-term and inconsistent.

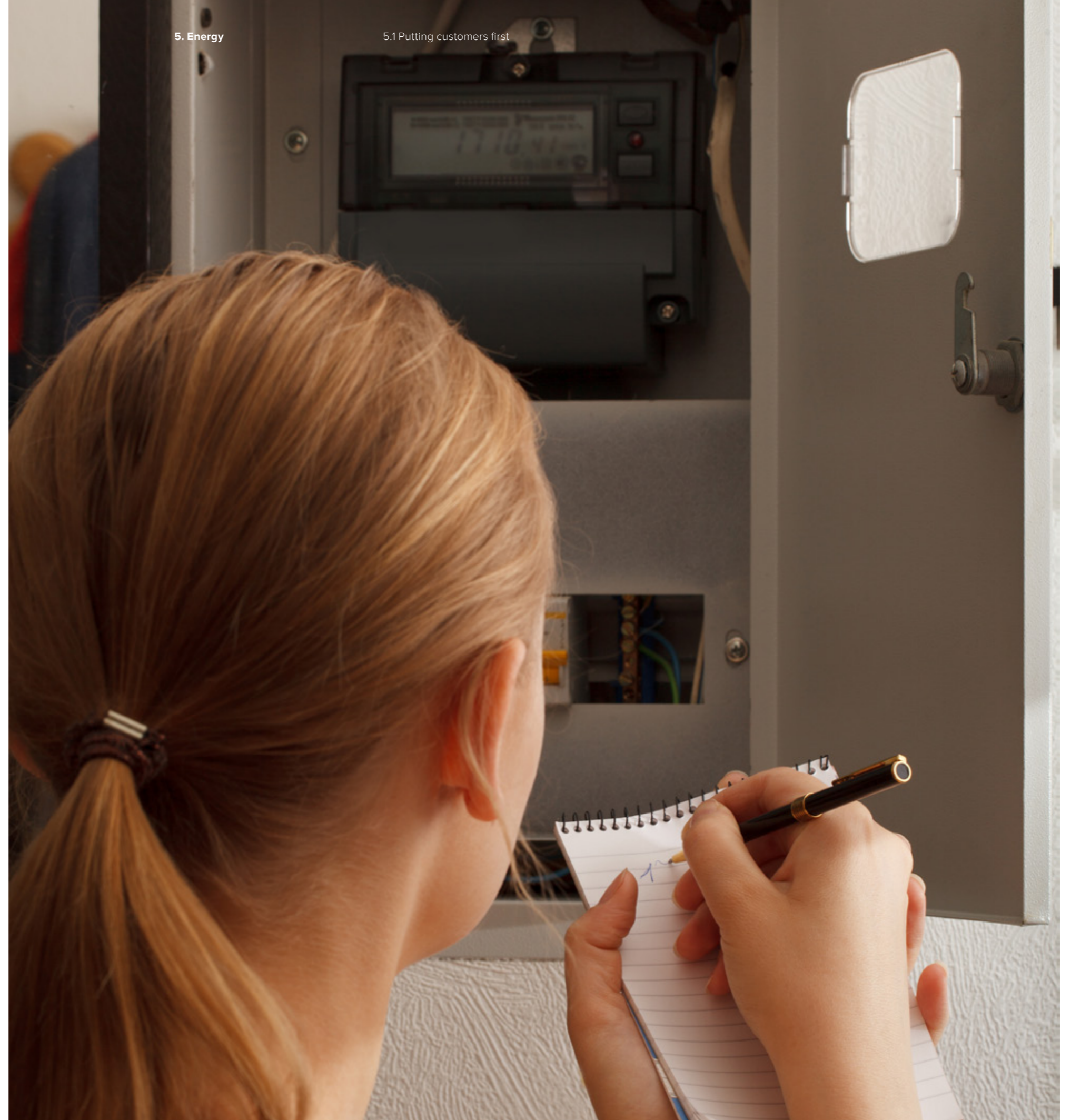
Lack of information is a particular barrier for small to medium enterprises, which are less able to identify energy efficiency measures and may not have the information or expertise to access available government support.³³

Building on initiatives such as the Business Energy Advice Program, businesses should be provided with targeted advice to help identify and implement upgrades to equipment and modernise processes.

Harmonising energy efficiency opportunities across jurisdictions will enhance economies of scale and reduce the compliance burden for businesses with footprints across multiple states. Providing consistent communication will support peer-to-peer learning and help businesses understand their opportunities.

However, the potential savings are often not enough of an incentive to drive the take-up of opportunities.³⁴ Including upfront financial incentives will help businesses to overcome behavioural inertia and any initial cost barriers to implementing energy efficiency measures. Existing incentive programs (for example, the Instant Asset Write-Off Scheme) could be leveraged to target energy efficiency investments.

The incentives would complement the COVID-19 pandemic economic recovery initiatives being offered by the Australian Government and state and territory governments. The incentives would also support and target priority sectors such as energy-intensive manufacturing sectors, food and mineral processing, high-energy-use industries and data centres.





5.2 A smart, affordable, reliable grid

Key messages

- **Energy, particularly electricity, underpins the Australian way of life.** The grid is an essential infrastructure backbone that will only become more vital as more services, such as transport, start to rely on electricity.
- The grid is **transforming from a centralised one-way service to a decentralised two-way system.**
- Getting this transformation right is a **major opportunity to shape a smarter, more affordable and more reliable energy system.** However, it will take national coordination and consumer participation.
- State and territory energy departments and the energy industry **can help improve affordability** by demonstrating the value of smart meters to customers.
- **The industry should incentivise smart meter installation,** accompanied by customer education; user-friendly digital and mobile tools displaying electricity consumption; and a default time-of-use tariff with an opt-out option and exceptions for vulnerable customers.
- **Enabling zero-emission vehicle uptake by customers at scale is complex,** requiring close cross-sector planning and coordination between the electricity and transport industries.
- **Smart regulation will deliver the future grid sooner and more cheaply.**
- Electricity **transmission reforms should be accelerated** so low-emission generation can be connected efficiently to the grid.
- The **regulatory investment test for the electricity network should be streamlined** to reduce project delivery timeframes without compromising the robustness of investment decisions.

Electrification as an enabler

The grid is the essential backbone for delivering electricity from generators to customers and from one part of Australia to another. As more sectors electrify, electricity will become even more essential.

As well as underpinning how Australians live, grid electricity powers many other critical infrastructure services. For example, 88% of telecommunications outages in recent bushfires were due to electricity network outages.³⁵ A resilient electricity grid is therefore critical to making other infrastructure networks resilient.

The way Australians use energy is fundamentally changing — from how, where and when it is generated, to how it is transported and stored, to who participates in the market and how it is paid for.

The legacy system of transmitting energy in one direction from large generators to customers is being displaced by decentralised energy resources. One example is rooftop solar and batteries, which allow consumers to become generators themselves and participate in the market through a two-way flow of electricity.

The grid, which was mostly built to serve the legacy system, needs to facilitate all these changes while delivering affordable and reliable energy to homes and businesses.

“As more sectors electrify, electricity will become even more essential.”

The Australian Government is focused on managing this transformation. The Department of Industry, Science, Energy and Resources, state and territory energy departments, the ESB, AEMO, AEMC, AER and the industry are working on designing the future energy market and readying the system for change.

This reform complements these work programs with customer-centric actions that respond to issues that could affect future users of the grid and identify opportunities to harness this change to make the grid smart, affordable and reliable.

5.2 Recommendation

Transition to a smart, affordable, reliable future grid by implementing regulatory reforms, introducing incentives for customer participation in energy system management and planning cross-sector integration.

Proposed sponsor: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments, Australian Energy Market Commission, Australian Energy Regulator

When this should impact:



Where this should impact:



0-5 5.2.1 Enable customers to manage their energy bills by incentivising smart meter installation, reforming pricing, and empowering them with the right information and tools.

Proposed lead: State and territory energy departments

0-5 Accelerate smart meter uptake and enable customers to access emerging energy management technologies by subsidising smart meters, where not already mandatory or provided for free by the retailer as part of an electricity plan.

Proposed lead: State and territory energy departments

0-5 Empower customers to harness information from the smart meter to reduce their electricity bills by mandating that retailers accompany smart meter installation with the tools customers need to get the most out of them.

- Include free, user-friendly digital and mobile tools that integrate with home energy management systems, give customers transparent real-time access to their energy data, and enable customers to share their data in accordance with the Consumer Data Right for energy.
- Retailers and energy agencies should educate customers on the benefits of smart meters and provide support on how to use energy management tools.

• Retailers and energy agencies should provide free, timely advice on the benefits of an energy management system at the time of installation and whenever customers switch providers.

• Tools and information should be nationally consistent.

Proposed lead: State and territory energy departments

Supported by: Australian Energy Regulator

0-5 Enable customers to actively participate in the energy system and reduce their long-run costs by agreeing a transition towards default time-of-use tariffs for all customers with smart meters.

• State energy departments should mandate that retailers transfer customers with smart meters (including customers who have moved to a premise with a smart meter) to the default time-of-use tariff without any charges, except when the customer opts out or is a vulnerable customer and will be worse off on the time-of-use tariff based on historic consumption patterns.

• Retailers and energy agencies should provide free, timely advice on the long-term benefits for all energy users participating more actively in the system whenever customers switch tariff or providers.

Proposed lead: State and territory energy departments

0-5 5.2.2 Enable the orderly uptake of zero-emission vehicles by undertaking national cross-sector coordination planning.

Proposed lead: Department of Industry, Science, Energy and Resources

0-5 Enable the electrification of transport by forming a long-term national planning working group. This should build on the work by the Distributed Energy Integration Program Electric Vehicle Grid Integration Working Group on improving data access and data standards that help allow for effective national planning.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: Office of Future Transport Technology

0-5 Integrate zero-emission vehicles into the grid safely and cost-effectively by developing an electric vehicle integration strategy.

• This should build on the work by the Distributed Energy Integration Program Electric Vehicle Taskforces, and include the incorporation of demand management, increasing charging infrastructure visibility and ensuring uptake of smart charging and smart metering.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: Distributed Energy Integration Program, Energy Networks Australia, Australian Energy Market Operator, Australian Energy Market Commission

0-5 Enable the better understanding of locational electric vehicle charging patterns and facilitate efficient distribution grid investment by mandating electric vehicle charging infrastructure be added to the Distributed Energy Resource portal.

Proposed lead: Australian Energy Market Commission

Supported by: Australian Energy Market Operator

5-10 Secure electric vehicle adoption across the distribution grid and reduce user and taxpayer costs by providing network businesses with limited flexibility to invest in at-risk distribution grids for locations with high electric vehicle uptake.

Proposed lead: Australian Energy Regulator

10-15 5.2.3 Safeguard the reliability and security of electricity supply by implementing electricity transmission reforms.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: Australian Energy Market Commission

0-5 Enable new renewable energy to connect to the grid by implementing the Energy Security Board Renewable Energy Zones reform framework.

Proposed lead: State and territory energy departments

0-5 Ensure transmission interconnector costs are allocated to the beneficiaries and help new generation connect to the grid more efficiently by implementing transmission access reform.

Proposed lead: Australian Energy Market Commission

Supported by: Energy Security Board

10-15 Fully realise the market opportunity of renewable electricity generation and increase certainty for investors and contractors by implementing the *Integrated System Plan* and reducing the risk and time for grid connections.

Proposed lead: Australian Energy Market Operator

Supported by: Transmission network service providers, state and territory energy departments

0-5 **5.2.4 Reduce electricity network project delivery timeframes by streamlining the Regulatory Investment Test for Transmission (RIT-T) and Regulatory Investment Test for Distribution (RIT-D).**

Proposed lead: Australian Energy Regulator
Supported by: Australian Energy Market Commission

0-5 Reduce project delivery timeframes and regulatory duplication by exempting planned component upgrades and renewals or projects with unviable non-network options that are included in approved five-year regulated revenue determinations from the Regulatory Investment Tests for transmission and distribution.

Proposed lead: Australian Energy Market Commission
Supported by: Australian Energy Regulator

0-5 Focus regulatory scrutiny on higher-value projects by reviewing the cost threshold for the Regulatory Investment Tests for transmission and distribution with a view to increasing the threshold to only capture material investment.

Proposed lead: Australian Energy Regulator



Measuring progress



Access

Smart meter deployment

Percentage of households and business with smart meters

Target: Over 95%

Timeframe: 0-5 5-10 **10-15** 15+



Environmental

Transport electrification enablement

Establish a long-term national planning working group to enable transport electrification

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Quality

RIT-T and RIT-D time to market

Reduce average Regulatory Investment Test for Transmission (RIT-T) and Regulatory Investment Test for Distribution (RIT-D) time to market

Target: 50% reduction

Timeframe: **0-5** 5-10 10-15 15+



Make the grid smarter to unlock affordability

A smart grid can help customers unlock energy bill savings by helping them become more active participants in the energy system. Governments need to facilitate the deployment of smart technology, implement tariffs that incentivise customers to participate in reducing costly demand peaks, and make sure customers have the right information at their fingertips to manage their participation.

Roll out smart meters to enable smarter tools

While other technologies are needed to enable all of the benefits of a smart grid, smart meters are a critical enabler because they give energy users:

- better understanding of the costs associated with their existing electricity consumption patterns
- access to flexible electricity tariffs that have variable prices, depending on time of use
- access to other services, such as energy management and sharing data with third party service providers
- improved ability to integrate, and get the most out of, decentralised energy technologies such as rooftop solar, batteries and electric vehicles.

Smart meters also have wider benefits. They enable electricity distribution network businesses to detect power outages more rapidly and monitor the quality of electricity supply, which will lower the overall cost of operating the power system.³⁶ They can also create data that enables better policy-making and technology development while also protecting customers' privacy.

Despite these benefits, Australia has been slow to adopt smart meters. **Figure 5.3** shows the pattern of smart meter uptake across the National Electricity Market (NEM) over the past five years. If this trend is projected, it would take at least 20 years for every Australian to get a smart meter. There is a significant opportunity to roll out this enabling technology much more broadly across Australia.

As well as smart meters, governments need to give consumers smart tools and lift energy literacy to help them benefit from participating more actively in the energy market.

To realise the benefits of smart meters, customers need to be able to access their consumption information.³⁷ The Organisation for Economic Co-operation and Development (OECD) found that smart meters accompanied by real-time information are the most successful behavioural intervention for helping consumers reduce their energy consumption.³⁸

In Victoria, the rollout of smart meters has been mandated. Yet the Victorian Auditor-General found that tools to access user-friendly information about electricity use are still not widely taken up, even in Victoria, and highlighted that the lack of a comprehensive communication campaign has reduced the value smart meters have created for customers.³⁹

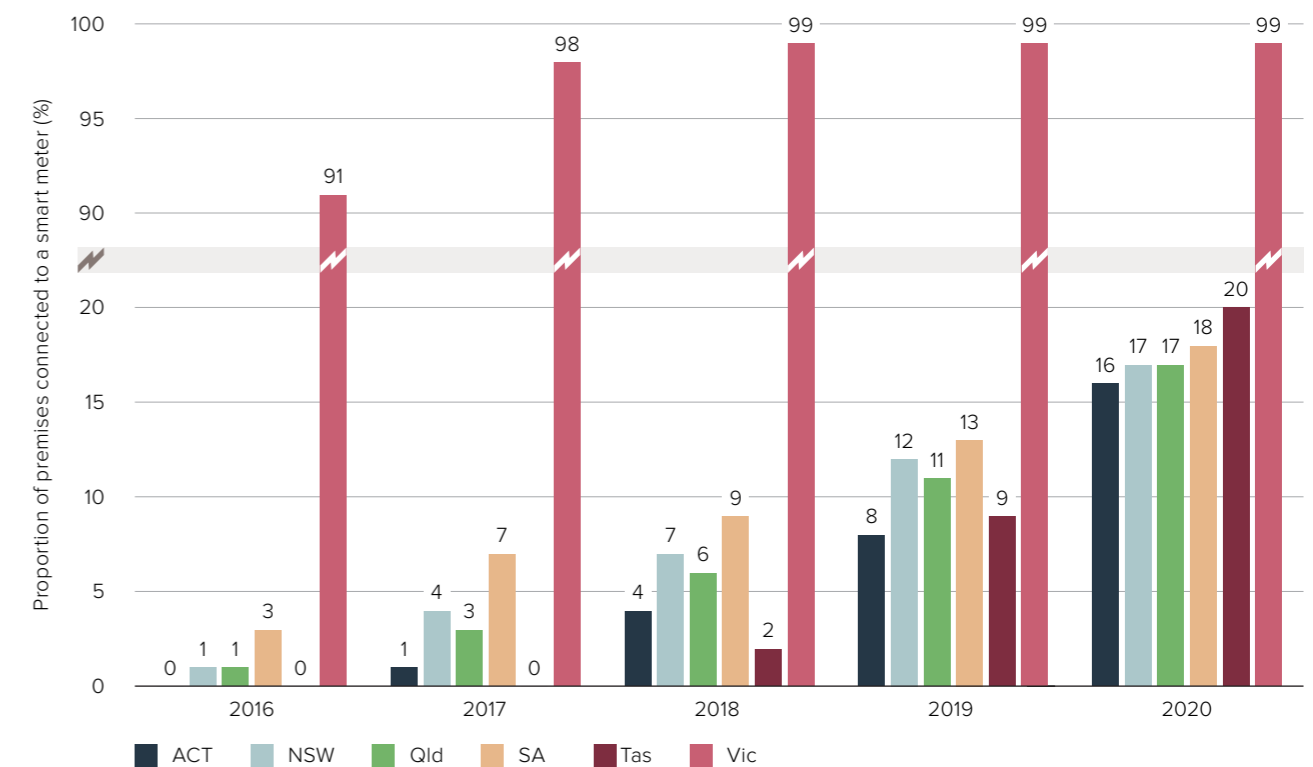
“As well as smart meters, governments need to give consumers smart tools and lift energy literacy to help them benefit from participating more actively in the energy market.”

Without user-friendly mobile digital tools and a comprehensive communications campaign, smart meters will not create value for customers.

Smart meters can also help consumers share their data with third parties to access new business models and facilitate better planning.

As well as making switching services easier, the Consumer Data Right for Energy⁴⁰ being driven by the Australian Treasury will help preserve privacy and give consumers the ability to safely share data with third parties, so they can participate in the market through mechanisms such as virtual power plants that coordinate decentralised assets.

Figure 5.3: A large proportion of customers are not taking advantage of smart meters, except in Victoria where there was a mandatory rollout



Note: Figures are based on AEMO retail transfer statistical data (MSATS). Source: Australian Energy Market Commission (2020)⁴¹

Combine smart meters with smart pricing

Customers can reduce their consumption and their bills by combining a smart meter with a flexible tariff that has time-based variable pricing (time-of-use tariff). While savings for an individual customer are difficult to determine, a national study of tariff reform found that a customer with a relatively flat consumption pattern could save about \$50 a year by switching to a time-of-use tariff, without changing their consumption habits. The same customer could save an extra \$100 a year if they shifted around 20% of their electricity consumption from peak afternoon (2 pm to 8 pm) to other times.⁴²

With smart meters already rolled out in Victoria, distribution companies in that state are starting to move towards default time-of-use tariffing and planning to support energy literacy programs to help customers understand the change.⁴³

Both the NSW Productivity Commission and the Australian Industry Group recommend that smart meters should be accompanied by a time-of-use tariff as a default tariff with an opt-out option.⁴⁴ To encourage uptake, there should be an education campaign that explains how customers can unlock savings through these tariffs.

However, time-of-use tariffs can have an unintended impact on vulnerable customers, who may have a limited ability to shift their consumption away from peaks when electricity becomes more expensive.⁴⁵ Building on the work the social sector has already done in this area, there must be special consideration for these customers to ensure they are not worse off on the time-of-use tariff.

Enable electric transport by planning across sectors

Electric vehicle uptake will soon increase rapidly. The Bureau of Infrastructure, Transport and Regional Economics has forecast that more than 50% of new car sales in Australia will be electric by 2036.⁴⁶ During 2018–2019, new electric vehicle sales increased by 200% (from 2,216 to 6,718).⁴⁷ This upward trend is set to continue — 56% of customers would now consider purchasing an electric vehicle as their next car.⁴⁸

Fleet vehicles are also moving towards electrification. Some state transport authorities are planning to transition to battery electric buses, where the electric motor gets its energy from on-board batteries.

Overcome challenges through collaboration

Enabling electric vehicle uptake at scale is complex. The transport and electricity sectors are converging but are not generally planned together. Electrification could present significant challenges to the grid if hundreds of electric vehicles are charged at the same time in the same place. Handling this kind of network congestion increases the cost of the grid.

Another potential headache for network managers is unpredictable charging behaviour. Given electric vehicles are inherently mobile, it is difficult to predict the timing, location and duration of their demand on the grid.⁴⁹

To enable users to take up electric vehicles in a way that benefits both sectors, energy and transport need to be nationally coordinated and planned together. This requires long-term, committed collaboration between government energy and transport departments, energy market operators, transport operators, vehicle manufacturers and charging station installers across Australia.

Develop cross-sector strategies

Through the Department of Industry, Science, Energy and Resources, the Australian Government should lead cross-sector coordination to harness technological scale and facilitate effective collaboration, in partnership with the Distributed Energy Integrated Program, electricity network businesses and energy market bodies.

Together, these organisations should coordinate strategies to address key issues including:

- smart electricity tariffs to support electric vehicles (see the **Sustainability and resilience chapter**)

- appropriate costs allocation for the grid upgrades required to accommodate electric vehicles
- unifying approaches to modelling electric vehicle demand by transport agencies and infrastructure companies to inform distribution network planning
- capturing and sharing data to improve system modelling and planning, such as through distributed energy resource asset registers
- making vehicle charging behaviour visible to help operate the network
- agreeing charging infrastructure standards with state and territory departments and the Australian Building Codes Board (see the **Transport chapter**)
- establishing cross-jurisdictional technical specifications for zero-emission heavy vehicles (see the **Transport chapter**)
- ensuring transport agencies and the electric vehicle industry understand how electricity network regulation framework and planning timeframes affect the potential uptake of electric vehicles.

Enable networks to invest in electrification

The energy sector's planning and response to electric vehicle uptake is key to reducing distribution grid costs for users and taxpayers. New distribution infrastructure will be needed to support the transition to electric vehicles. Targeted and timely investment will be critical to strike the right balance between enabling electric vehicle uptake and convenient charging while avoiding gold-plating and unnecessary costs for customers.

As more electric vehicles are purchased, network businesses may be forced to make unexpected investments in distribution network infrastructure. Every five years, the AER determines network businesses' forecast revenue requirements. This includes the forecast investment needed to enable an expected number of electric vehicles. However, if the uptake of electric vehicles is greater than expected in an area of the network, the five-year revenue allowance may not provide appropriate investment flexibility to meet customer demand.

The AEMC should consider rule changes that allow network operators more flexibility in investment that enables electrification. Network businesses should minimise costs and disruptions over long-term planning horizons by aligning their plans to future risks and forecasting, in accordance with electric vehicle forecasts over the whole-of-asset lifecycle of networks.

Due to rapid adoption, AEMO does not have complete visibility of distributed energy assets. The Distributed Energy Resources Register, which is providing this coverage for stationary distributed energy resources, should be expanded to include charging of electric vehicles. All charging infrastructure should be included in the register to better understand locational charging patterns and facilitate efficient and targeted distribution grid investment.

Support timely delivery with smarter regulation

With so much going on in this sector, the grid needs to be able to respond quickly to rapid changes in the electricity landscape. It can only do this if the regulatory framework is able to handle change much faster than the current design allows.

Accelerate transmission reforms

The electricity transmission network is not designed to accommodate large amounts of new renewable generators at every location. For example, five solar farms in the West Murray region (Victoria and New South Wales) had their generation output limited to 50% in 2019 because the combined operations were causing grid stability issues that affected the whole region.⁵⁰

Maintaining the attractiveness of the sector for investment will be critical to supporting a cost-effective transition. Investors require greater confidence in the timing and nature of grid connections, to ensure they can invest rationally. The Reserve Bank found that the generation capacity of new large-scale renewable projects that reached

financial close in 2019 fell by around half compared with 2018, partly due to grid connection challenges and network constraints.⁵¹

Renewable Energy Zones (REZs), which aim to unlock scale efficiencies by co-locating renewable generation sites, are ripe for more investment. REZs have rich renewable resources (such as solar and wind) and enough high-voltage 'poles and wires' infrastructure to transmit the power to homes and businesses.⁵² State-based REZ initiatives have already been announced and can accommodate timely investment in renewable energy generation.

The existing generation fleet will need to be replaced as it meets end of life, with significant further replacement needed over the next 20 years. Energy resource types will change from predominantly coal to predominantly wind and solar, which are located in different areas. The role of some existing transmission infrastructure will therefore need to be reconsidered. Beyond this, weather conditions mean wind and solar are intermittent, so larger amounts of generation, storage and interconnection are needed. This further increases the transmission infrastructure requirements.

To enable investment in the transition to a renewable electricity system, Australia needs to action new projects that strengthen the system and enable new generation, and send clearer price signals for transmission access.

Enabling REZs is the first step towards providing efficient transmission investment as they have a high concentration of renewable generation. This work should build on what the market bodies are already doing to review large transmission projects and how new generation connects to the grid.⁵³

Allocate costs to beneficiaries

Interconnectors, which link state-based transmission networks, play a critical role in the bulk transfer of electricity and provide valuable assurance of supply. They can be an efficient transmission investment and support clean energy production when considered against alternative investments.

“To enable investment in the transition to a renewable electricity system, Australia needs to action new transmission projects that strengthen the system and enable new generation.”

A number of new interconnections are expected to be developed across Australia. In the near term, they include an interconnector between South Australia and New South Wales called Project EnergyConnect.



Also an interconnector between New South Wales and Victoria called Victoria to NSW Interconnector West is being considered for development within the *Integrated System Plan*.

Currently, the cost of interconnectors is recovered from customers in the states where they are built and electricity is used. However, the electricity users are not the only beneficiaries. The cost allocation model does not take account of the broader benefits of interconnection, such as increased security and redundancy, and the economic and social benefits of accommodating renewable energy generation development. Interconnectors are significant investments, and the cost should be allocated across all beneficiaries. A working group is underway to look at this issue.

The ESB is considering cost allocation in their post-2025 market design process. This should consider alternate methods, such as proportional, beneficiary-pays cost allocation based on the relative benefits to each state's customers, which are models implemented in New Zealand and the United States. The AEMC must then implement transmission access reform to ensure equitable cost allocation mechanisms are in place.

Address connection issues and enable the new energy system

The AEMC transmission access reform process can also help to address connection issues. Reforming transmission access will send sharper price signals so energy developers plan the location of new generation in ways that use the transmission network more efficiently, both now and into the future.

Actioning the *Integrated System Plan* so the right infrastructure is built at the right time will then be critical to creating certainty and supporting connection of new generation. The *Integrated System Plan* is AEMO's plan for a future electricity system based on detailed modelling and cost-benefit analysis. It identifies an optimal development pathway of both developments and projects which in turn defines where and when new interconnectors and transmission upgrades are required to facilitate new renewable generation.

Timely decision-making is a critical component of providing certainty for investors. AEMO, and others, have an important role to play ensuring efficient decision-making that can support necessary investment in the grid.

Reforming transmission access and actioning the *Integrated System Plan* will help manage grid congestion efficiently as the grid transitions. It is predicted to create considerable savings for customers over the long term.⁵⁴

Reduce electricity project delivery timeframes

The existing electricity regulatory framework requires distribution and transmission network businesses to undertake investment tests for new infrastructure that is part of their regulated asset base, known as the Regulatory Investment Test for Transmission (RIT-T) and the Regulatory Investment Test for Distribution (RIT-D). The aim of these investment tests is to ensure the prudence and efficiency of network investment, including consideration of non-network options, so customers do not pay more than they should for the network.

Existing investment tests, such as the RIT-T, take two years to complete. This timeline presents challenges within an operating environment with increasingly high rates of change. The challenge with the existing process is compounded by the limited control the market bodies have of these changes, which can be behind-the-meter. The cumulative impacts of these changes require a nimble approach from network owners to avoid impacts on the grid.

While the intent of the RIT-T and RIT-D tests is to ensure the robustness of the investment decision is preserved, there is an opportunity to streamline the process to reduce project delivery timeframes and regulatory burden. This can be achieved by:

- reviewing the existing \$6 million cost threshold with a view to increasing it to only capture material investment
- exempting planned component upgrades and renewals or projects with unviable non-network options that are included in network service providers' approved five-year revenue determinations from the RIT-T and RIT-D. For example, projects that involve secondary systems at substations.

To provide the same outcome as the RIT-T and RIT-D (to demonstrate the efficiency and prudence of the investment decisions), network businesses should still develop business cases for material projects that do not require an investment test, so they can be scrutinised through regulatory processes. This streamlining of the RIT-T and RIT-D process may require a rule change.

There may be a further opportunity in the future to review the need for the RIT-T and RIT-D as network businesses embed their business case and investment decision processes, which may deliver the same investment justification outcomes.



5.3 Powering a cheaper, cleaner future

Key messages

- The **global shift from fossil fuels to low-cost, low-emission renewable** energy is rapidly underway and a big opportunity for Australia.
- **Australia still relies on fossil fuels** for domestic electricity production and exports. These jobs and assets could become stranded as the shift accelerates.
- To make the energy transition work for Australia, **renewable energy development needs to be accelerated**.
- This is a **time for decisive national action that secures Australia's future** by harnessing its low-cost, low-emission energy potential.
- The **energy transition is a big opportunity for Australia**. It has world-leading renewable resources, such as solar and wind, that can service both the economy and trading partners.
- Australia can **remain a global energy supplier of choice** by pivoting from fossil fuels to low-emission supply chains.
- Australia's **energy export industries must be redefined through national planning and coordination** that identifies and nurtures a diversified portfolio of low-emission energy industries across energy commodities, services and value-added products.
- The existing **national energy policy and planning framework will need to be enhanced** to increase investor confidence and ensure Australian homes and businesses benefit from affordable and reliable energy.
- **Rural and remote communities should have access** to low-emission standalone power systems, which will reduce their energy costs and improve power reliability.
- **All Australians should share the benefits** of the low-emission energy transition. Fully harnessing this renewable energy potential will enhance Australia's economic sustainability and support global resilience.

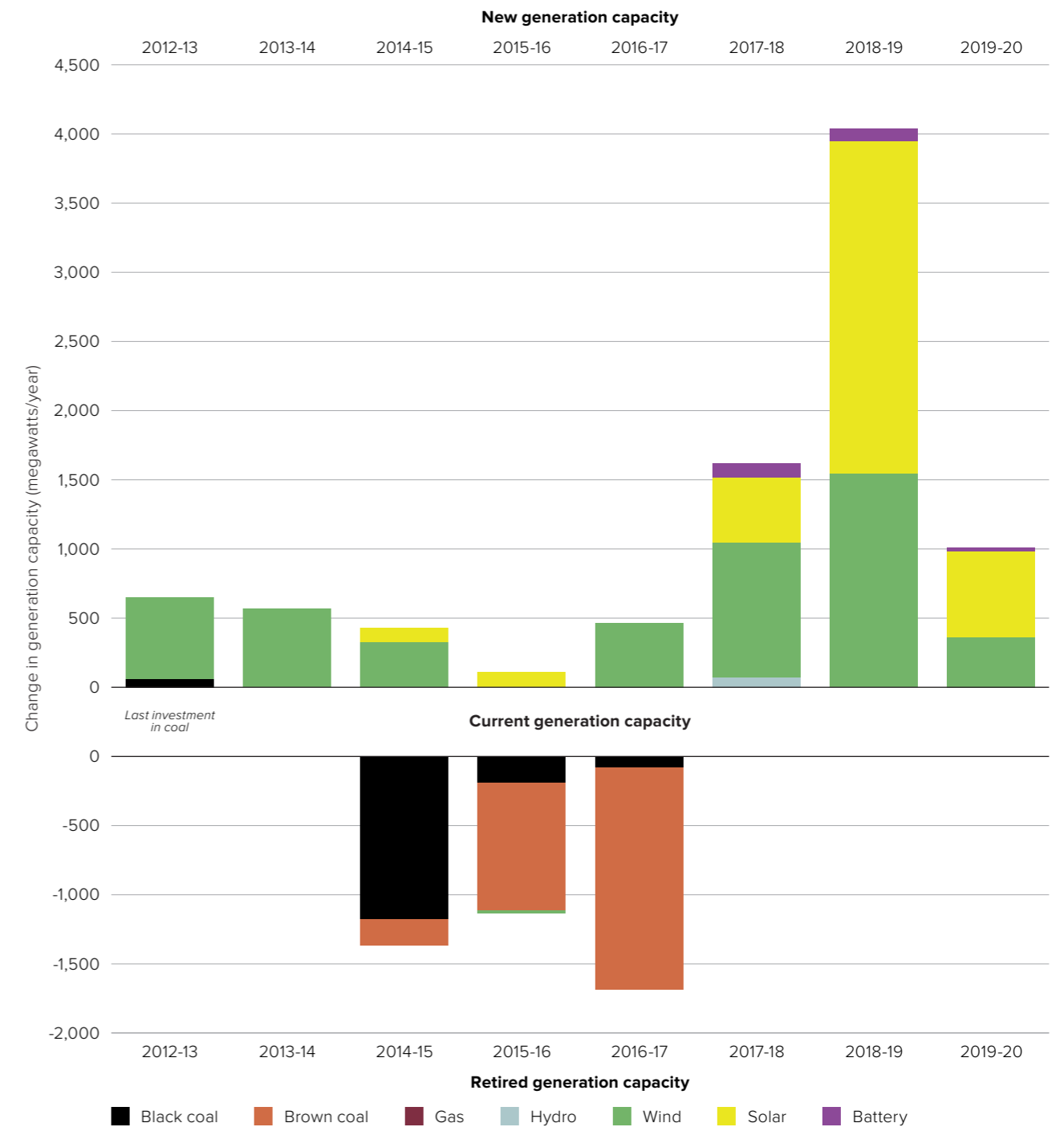


Clean energy is here to stay

The energy transition is moving fastest in generation. Fossil fuels are rapidly being replaced by renewables. **Figure 5.4** shows that retiring coal generation capacity is being replaced by renewable solar and wind generation, and this trend will only accelerate.

Furthermore, coal power station closures are being brought forward. For example, Victoria's Yallourn coal power plant will close in 2028 rather than in 2032 as previously planned.⁵⁵

Figure 5.4: Generation is increasingly shifting from fossil fuels to renewables



Note: Battery storage is treated as generation in the National Electricity Rules. Capacity includes scheduled and semi-scheduled generation, but not non-scheduled or rooftop PV capacity. Data for 2019-20 does not include April, May or June 2020. Source: Australian Energy Regulator (2020)⁵⁶

Australia is well placed to transition its electricity generation mix to renewable energy. It has some of the world's richest clean energy resources, particularly solar and wind. These abundant renewable energy resources can support both affordable and reliable energy here and clean energy export industries such as hydrogen production and energy-intensive manufacturing.

However, currently Australia is heavily reliant on coal and gas for domestic use and export.

Australia is a global superpower energy exporter of coal and gas, exporting more than two-thirds of Australian energy production.⁵⁷ In 2019, renewable energy sources accounted for 24% of Australia's total electricity generation,⁵⁸ but this percentage is rising rapidly as the falling cost of renewables drives a transformative change in the energy generation mix.

All levels of government should be working together to help to shape a low-emission future that benefits all Australians.

In particular, there needs to be strong national leadership and planning to coordinate efforts. This transition is critical to meeting the Australian Government's focus on affordable and reliable energy, as noted by Prime Minister Scott Morrison: 'as we transition to a low-emission economy and we move towards net zero as soon as possible, and preferably by 2050'.⁵⁹

“ All levels of government should be working together to help to shape a low-emission future that benefits all Australians, both now and in the future. ”

The final reform in this chapter builds on work already being undertaken by the Australian Government, as outlined in *Australia's Technology Investment Roadmap*, *First Low Emissions Technology Statement – 2020*⁶⁰ and *Australia's National Hydrogen Strategy*.⁶¹

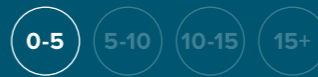


5.3 Recommendation

Transition Australia's exports and domestic energy demand to high-tech, low-cost, low-emission energy sources through a coordinating national strategy.

Proposed sponsor: Department of Industry, Science, Energy and Resources

When this should impact:



Where this should impact:



0-5 **5.3.1. Ensure Australia remains an energy export supplier of choice in decarbonised global supply chains by coordinating national development of low-emission energy sources.**

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments

0-5 Enable collaboration opportunities, shared infrastructure and regulatory consistency across jurisdictions by coordinating a national approach to energy planning.

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments

0-5 Support the development of clean energy export supply chains by identifying key precincts for new low-emission energy export hubs and developing enabling infrastructure plans.

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments

0-5 Grow new export industries and jobs in clean energy commodities and value-added products such as aluminium, green steel, technology and services by developing coordinated clean energy industry strategies.

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments, state and territory industry departments

0-5 Increase investor certainty and enable emerging industries by developing clear, outcome-focused legislation and regulation for emerging low-emission energy technology.

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments

0-5 **5.3.2 Transition Australia to a high-tech, low-cost, low-emission energy system by implementing appropriate regulatory and legislative environments, identifying opportunities to transition assets, and continuing to fund new energy technology development and adoption.**

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments, Australian Energy Market Operator, Australian Renewable Energy Agency

0-5 Increase investor certainty by restating commitment to collaboration through the national governance frameworks that support the National Electricity Market.

Proposed lead: Department of Industry, Science, Energy and Resources
Supported by: State and territory energy departments

- 0-5** Make the electricity market framework fit for purpose for a decentralised, renewable system by implementing a future market design that builds on the post-2025 work by the Energy Security Board and market bodies.

Proposed lead: Australian Energy Market Commission

Supported by: State and territory energy departments, Energy Security Board, Australian Energy Regulator, Australian Energy Market Operator
- 0-5** Maintain electricity market reliability by developing and implementing a trigger-based electricity market review mechanism that is undertaken at key policy trigger points such as announcement of accelerated retirement of thermal electricity generators.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: Australian Energy Market Operator
- 0-5** Get the most out of existing and shared gas infrastructure by enhancing *Integrated System Plan* modelling to co-optimize gas and electricity systems. This will include consideration of the potential for existing gas infrastructure to transition to renewable sources, such as hydrogen or biogas.

Proposed lead: Australian Energy Market Operator
- 0-5** Ensure new sources of gas and hydrogen help provide reliable and affordable energy to Australian homes and businesses by reviewing the application of a nationally consistent policy on potential reservation or prioritisation of new gas sources and hydrogen for domestic consumption.

Proposed lead: Department of Industry, Science, Energy and Resources

Supported by: State and territory energy departments
- 0-5** Give rural and remote communities access to clean, reliable and affordable energy by implementing an appropriate regulatory and legislative environment and funding that supports standalone power systems and micro-grids.

 - State and territory governments should accelerate the amendment of jurisdictional regulation and legislation to enable the implementation of standalone power systems.
 - ARENA should maintain funding for low-emissions standalone power systems and micro-grids.

Proposed lead: State and territory energy departments

Supported by: Australian Renewable Energy Agency

Measuring progress



Economic

National energy planning

Maintain a top-three global energy exporter position

Target: 3rd

Timeframe: 0-5 5-10 **10-15** 15+



Affordability

Energy affordability

Ranking in OECD countries for energy affordability

Target: Top 5

Timeframe: 0-5 5-10 **10-15** 15+



Quality

Standalone power systems

A regulatory and legislative environment exists for standalone power systems and micro-grids in all jurisdictions

Target: In force nationally **Timeframe:** 0-5 5-10 **10-15** 15+



Environmental

Renewable energy generation share

The renewable resources energy share of total final consumption

Target: 90%

Timeframe: 0-5 5-10 10-15 **15+**

Maintain Australia's energy export superpower status

Australia is the world's third-largest fossil fuel exporter,⁶² exporting more than two-thirds of its energy production.⁶³ In 2018–2019, 88% of Australian black coal production and 74% of natural gas production was sent overseas.⁶⁴ These resources and industries have helped make Australia prosperous.

The global transition to low-emission energy sources is an opportunity to redefine Australia's export industries and secure this country's future.

Transforming to a low-emission energy superpower will enhance Australia's economic sustainability and support global resilience.

Some work is underway. Germany and Australia are completing a renewable hydrogen supply chain study to identify how Australia can support Germany in decarbonising its heavy industry.⁶⁵ The International Energy Agency found that, by as soon as 2030, importing Australian hydrogen could be cheaper for Japan than domestic production.⁶⁶ The Australian Government has already committed \$565.8 million to back low-emission international partnerships.⁶⁷

However, the scale and pace of this energy transformation is too important to leave to chance. We need intentional, coordinated planning at all levels of government to harness the opportunities of this energy transformation. Given that lead times can be long and the low-emission energy transition is already rapidly underway around the world, planning must start now.

Coordinate planning across all levels of government

Coordinating the energy transition across Australia is key to meeting the economic stretch goals in the Australian Government's *Technology Investment Roadmap: First Low Emissions Technology Statement — 2020*.⁶⁸

The Australian Government must develop an overarching national planning framework across all energy sources. There should be dedicated working groups for significant policy matters that include other relevant policy stakeholders.

This approach would build on coordination programs like the Distributed Energy Integration Program led by AEMO and ARENA, and the work undertaken in 2019 across the Australian Government and state and territory governments to develop the *National Hydrogen Strategy*.

National coordination will enable consistent planning across jurisdictions through collaboration, knowledge sharing and shared infrastructure.

The Australian Government should also coordinate planning between state and territory governments. With state-based hydrogen strategies in place across South Australia,⁶⁹ Queensland,⁷⁰ Tasmania,⁷¹ Victoria⁷² and Western Australia,⁷³ national coordination has been identified as a key action in the *National Hydrogen Strategy*.⁷⁴

Redefine and diversify energy export industries

For Australia and its trading partners to meet their policy commitments, fossil fuel commodity supply chains will be replaced in future by low-emission energy commodities such as hydrogen and renewable electricity, with existing technologies like gas playing a role in the transition.

These policy commitments depend on a transition to zero-emission supply chains. If industry can make technologies like carbon capture and storage (that reduce the emissions of conventional fuels such as gas) viable at scale, existing commodities may also be able to play a role in supporting this transition with lower undesirable impacts. However, Australia still needs to transition to zero-emission exports to protect its long-term prosperity.

Coal and natural gas were this country's second and third biggest exports in 2019–2020.⁷⁵ Australia should invest in technology and infrastructure that will allow it to remain a supplier of choice in global energy commodity markets.

It should also support developing industries around energy-intensive and value-added products such as green steel and aluminium that will support the jobs and industries of the future. There are further significant opportunities in commodities used in the production of new energy technologies — Australia's combined export earnings from lithium, copper and nickel are forecast to exceed thermal coal export earnings by 2026.⁷⁶

With a long lead time for developing new industries, the Australian Government and state and territory governments should be acting now to identify, plan and nurture these future energy exports. In particular, they need to develop a suitable ecosystem for the new low-emission energy export industry.

This should include identifying key precincts and developing infrastructure plans, similar to the regional hydrogen hubs described in the Australian Government's *Technology Investment Roadmap: First Low Emissions Technology Statement — 2020*⁷⁷ and the *National Hydrogen Infrastructure Assessment* being completed as part of the *National Hydrogen Strategy*.⁷⁸ Setting up dedicated hubs would accelerate these new industries, create jobs through supply chain efficiencies, and foster collaborative innovation.

This national coordination is particularly important given the scaling challenges a developing hydrogen industry will face. The renewable energy industry will need to ramp up to enable a domestic electricity sector transition and provide for electrification of transport and other services, as well as provide electricity for hydrogen production. At the same time, the entire industry will face global competition for resources and materials.

There need to be initiatives now to start building the supply chains needed to deliver a massive increase in Australia's renewable generation capacity, including the relevant skills and services.

Create regulatory certainty for investors

Appropriate regulation and legislation give investors certainty and are particularly important for developing industries. Regulations and laws in their current form are unlikely to be suitable for future low-emission energy industries, and will need to be amended or replaced. One example is the large-scale production and use of hydrogen to transport energy,⁷⁹ which will need its own legal framework.



It can take a long time to develop new or amended regulations and legislation. It is a complex process where multiple stakeholders must be consulted. Governments should follow the COAG *Principles of Best Practice Regulation*, developing the regulations and laws collaboratively so they are fit-for-purpose. They also need to be flexible and innovative so they stay relevant as the new industries evolve.⁸⁰

This work has become critical. The Reserve Bank identified that uncertainty around future national policy direction is constraining investment in renewable energy.⁸¹ The Australian Government and state and territory governments should start the process now so this country is ready for a low-emission energy future.

Ensure all Australians benefit from the transition

Every Australian is entitled to share in the individual and collective benefits of low-emission energy.

Every million dollars spent on renewable energy creates three times more jobs than the same spending on fossil fuels.⁸² If hydrogen becomes a more widespread global technology, an Australian hydrogen industry could create around 7,600 jobs and add approximately \$11 billion a year to Australia's Gross Domestic Product by 2050.⁸³

Strengthen and adapt the national energy framework

To ensure an orderly transition to low-emission energy in Australia, there needs to be certainty around the national energy planning framework while also making it fit for transformative change. This will increase investor confidence, facilitate new models of participation (such as consumer-owned distributed energy resources) and make Australia's energy systems resilient and efficient.

Implement a future electricity market design

State and territory governments should reaffirm the governance framework for the NEM, SWIS and NWIS. Investment decisions are always made with imperfect information, but certainty about the intent and structure of the market gives participants confidence and enables long-term planning that delivers efficient market outcomes. Governments should avoid unilateral policy that departs from this governance framework.

As well as strengthening market governance, the Australian Government and state and territory governments need to implement a future design for the market. Existing rules were designed for a centralised energy system with large thermal

generation, and must evolve to be fit-for-purpose for a decentralised, renewable system where the roles of participants are more flexible.

The Energy Security Board post-2025 future market design program provides a basis for this regulatory transformation, alongside the work programs of the AEMC and other market bodies.

AEMO usually undertakes a comprehensive review of the NEM every two years to produce an *Integrated System Plan*. Announcements of earlier than anticipated closures of power stations or changes in government policy can in part be addressed through careful selection of scenarios or undertaking sensitivity testing and applying decision rules to assess the impacts on the *Integrated System Plan's* optimal development path.

Existing rules for the *Integrated System Plan* require it to be updated where there is a change that could have a material impact on the optimal development path. AEMO may also use its discretion to make out-of-cycle updates to the optimal development path in the *Integrated System Plan* on the basis of new information, but a broader trigger-based review mechanism would ensure timely and proactive management of electricity reliability and security. For more information on emissions trajectories and the phased transition of infrastructure assets, see the **Sustainability and resilience chapter**.

Consider how gas infrastructure can support hydrogen

AEMO reviews gas demand and supply plans once a year through the *Gas Statement of Opportunities*. However, the gas and electricity systems are complementary. The *Integrated System Plan* should consider national planning for gas networks and hydrogen together with the electricity system at scale to co-optimize gas and electricity systems. This should identify opportunities for using existing gas assets to support biogas and the hydrogen economy, as well as consider the *National Gas Infrastructure Plan* that is being developed by the Department of Industry, Science, Energy and Resources.

Ensure new fuel sources meet domestic demand

The Australian Government and state and territory governments should consider a coordinated national approach to gas and hydrogen reservation for domestic use. This would ensure this country's future demands are met and provide equitable, affordable access to future fuels for all Australians.

Sharp increases in gas prices along the Australian east coast recently have shown the importance of ensuring domestic needs are considered. After the east coast gas market was opened to global prices, the price of wholesale gas doubled. It rose from below \$5 per gigajoule in 2009 to over \$10 per gigajoule in 2016. Meanwhile, gas prices declined in Western Australia,⁸⁴ primarily because it had a domestic gas reservation policy.⁸⁵

It is important that, as new fuel supplies become available, national priorities for access to internationally competitive energy are considered at the same time as export potential. However, any national gas reservation scheme will need to operate without affecting state governments' sovereign powers to manage resources.

The scheme would also need to complement existing policies, such as Victoria's prioritisation obligation for onshore gas, which requires any gas produced in Victoria to be prioritised for the domestic market.

Give rural and remote communities their own resilient, affordable energy sources

A standalone power system is an electricity supply arrangement that is not physically connected to an interconnected grid like the national grid. The term is often used to encompass both individual power systems and micro-grids, which supply electricity to multiple customers.⁸⁶

A micro-grid can also be considered as an embedded subset of a broader network that has all the components to be capable of operating independently.⁸⁷ This can increase the resilience of existing networks — for example enabling regional communities to 'island' and operate in isolation from the main grid while maintaining power in bushfires and other emergencies.

Standalone and micro-grid technologies have advanced significantly with the adoption of solar and batteries and are increasingly suitable for Small Towns, Rural Communities and Remote Areas at the edge of the grid. Using them to avoid over-built and unreliable long power lines can reduce cost, improve power reliability and reduce the risk of bushfires started by high-voltage failures.

Being able to choose to supply electricity through a standalone power system instead of the grid can also result in significant savings for electricity distribution

network businesses, which will pass on the savings to customers as lower electricity bills. Supporting the development and expansion of these systems will help to reduce cost for all Australians and increase resilience, particularly for regional communities.

The current trials and planned deployment of these systems generally comprise a hybrid of solar, batteries and backup diesel generators.⁸⁸ ARENA should maintain funding for these trials and expand it to emerging technology, including low-emission energy trials.

Change regulations and laws

The AEMC has recommended changes to the national regulatory framework that will enable distribution network businesses to increase efficiency by using standalone power systems, either directly or through a third party.

However, implementing this regulatory change is subject to states and territories opting in after changing the relevant jurisdictional regulations and legislation. This will include:

- changing the National Energy Retail Law (NERL) application in New South Wales, South Australia and Tasmania through regulations or laws that stop NERL being applied to the sale of electricity to customers who are connected to the national grid
- reviewing jurisdictional regulations applied to equipment and performance standards, network reliability protection, electricity supply safety and the ability to access land required for supplying electricity.⁸⁹

State and territory governments should accelerate these jurisdictional regulation and legislation changes to enable the deployment of standalone power systems.

Combined with trial funding for low-emission standalone power systems, the changes will enable rural and remote communities throughout Australia to benefit from the energy transition.

For more information about how the low-emission transition will benefit regional and rural Australians, see the **Transport chapter**. It provides recommendations to ensure export and heavy industry-oriented hydrogen generation projects are developed with the capacity to serve transport users.

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6

Water



What you will read in this chapter

- **Reform 6.1: Securing our water future** – What Australia needs to do to be certain water resources will meet the nation’s needs into the future.
- **Reform 6.2: Valuing water to create liveable communities** – Reforms that will deliver resilience, liveability and health benefits to the community and improve access to high-quality water services for all Australians.

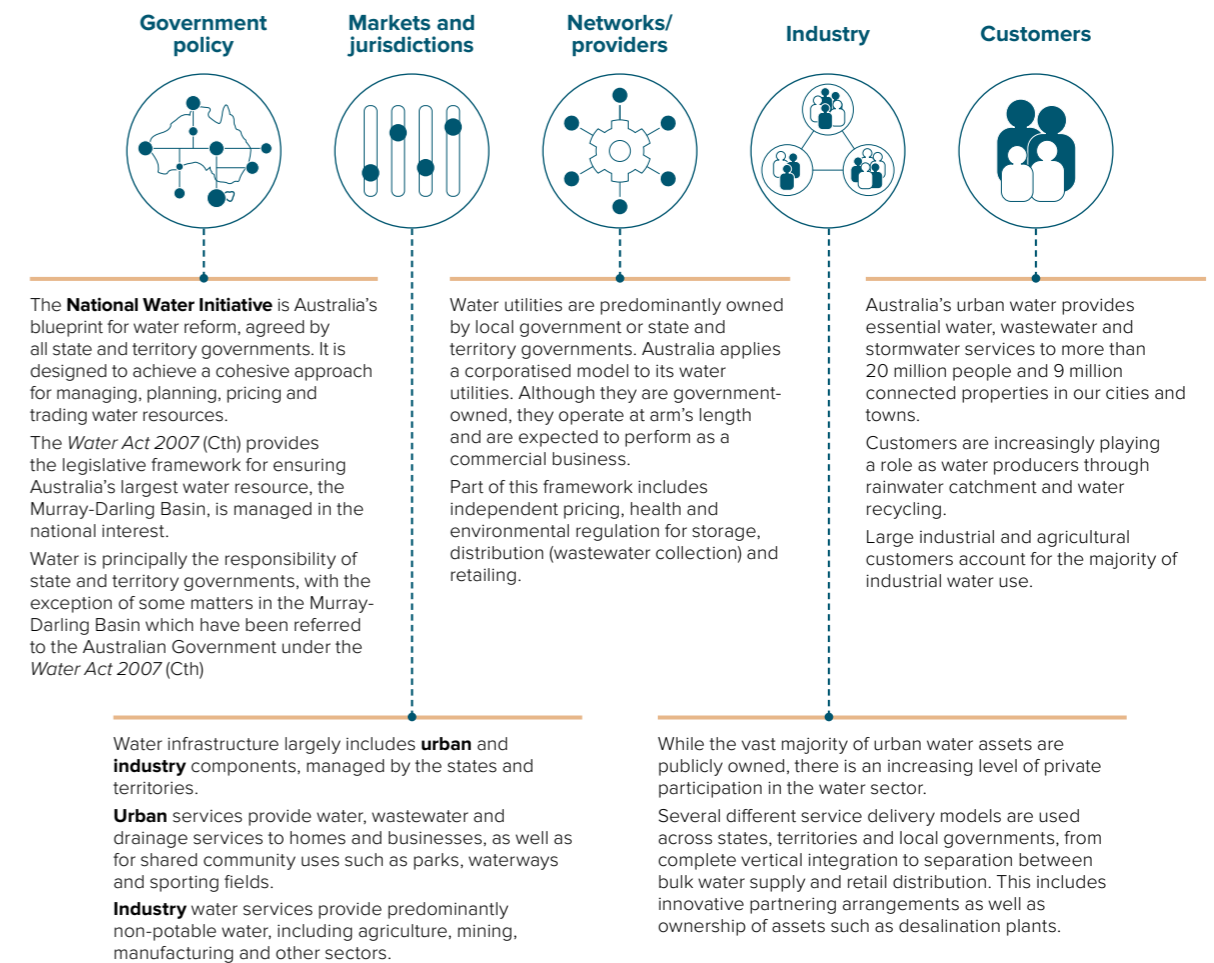
Executive summary
Introduction
1. Place
2. Sustainability
3. Industry
4. Transport
5. Energy
6. Water
7. Telecommunications and digital
8. Social infrastructure
9. Waste
Methodology and results
Next steps

Key messages

- As with many other infrastructure classes, **water management is the responsibility of states and territories**. The Australian Government has a role in facilitating engagement between states and territories to improve water resource management.
- **Water is critical** for liveable cities and healthy environments. It is also a key economic enabler.
- All Australians have **a right to safe, reliable water and wastewater services**.¹ This is essential to meet basic human needs and vital for strengthening outcomes for health, wellbeing, economic prosperity and sustainable development.
- The security of Australia's water resources is **under increasing pressure** from climate change, weather extremes, population growth, changing user expectations, changing land use and ageing infrastructure.
- During 2019 and 2020, drought, extreme bushfires, floods and the impacts of the COVID-19 pandemic highlighted how **severe these pressures are**.
- With **water security the most pressing issue** for the sector, there needs to be a consistent and clear national approach to defining and understanding the risks.
- The water sector, communities, businesses and governments must all shift in the way they view and value Australia's water resources. Empowering the community will **encourage efficient behaviours and attitudes** when water is plentiful and when it is scarce.
- This country must extend access to alternative sources of water and diversify its water supply portfolio. Governments must **remove outdated barriers** that prevent access to all options for water supply.



Water sector overview



Introduction to water

Preparing Australia's water infrastructure for the future

Australia's water infrastructure has performed well. It delivers reliable and affordable services while maintaining high levels of liveability in cities and towns. This is an achievement in a country characterised by droughts and floods.

However, recent extreme events have tested its capacity to continue delivering high levels of service and meet the needs of all Australians into the future. During 2019 and 2020, enormous bushfires raged through parts of the country that were already struggling with drought, and there were record high temperatures. Then the global COVID-19 pandemic hit Australia, and its effects are still ongoing.

Changing climate and increasing water scarcity will define the future of the water sector. The increasing frequency and intensity of extreme events will also strain water infrastructure networks.

With these challenges taking place against a backdrop of growing population and ageing assets, there is a pressing need for the industry to implement a new approach.

Australians will have to move from an expectation that water is always available in all circumstances to an understanding that this country needs a more resilient network using a broader set of potential water sources.

This fundamental change will require community support.

A refreshed water sector will see:

- a coordinated focus on managing water security risks
- greater community involvement in how water is managed and valued
- resilient and liveable cities
- equitable access to water
- a balanced vision for water that considers productive, urban, cultural, environmental and other needs, including emerging industries.

“Australians will have to move from an expectation that water is always available in all circumstances to an understanding that this country needs a more resilient network using a broader set of potential water sources.”

There has been progress in the past five years

The *2016 Australian Infrastructure Plan* identified several areas for water reform.² Many of its recommendations have progressed over the past five years, although some remain on Infrastructure Australia's reform agenda.

The *2016 Plan* recommended that the Murray-Darling Basin Authority investigate issues inhibiting the efficient functioning of the Basin's water markets. In 2019, the Australian Government asked the Australian Competition and Consumer Commission (ACCC) to make recommendations that support markets for tradable water rights in the Murray-Darling Basin. The ACCC released their final report on 26 March 2021. It addressed enhanced operations, transparency, regulation, competitiveness and efficiency.

One area where progress has been slow since the *2016 Plan* is the recommendation to transfer state-owned metropolitan water businesses to private ownership. Infrastructure Australia continues to acknowledge the important role of contestability in supporting innovation and reform, and the important and growing role of the private sector in enabling operations across the sector. Public Private partnerships and collaborative partnerships between water utilities have delivered significant value to consumers and taxpayers.

We recognise that some governments are reluctant to prioritise these reforms against a backdrop of other policy challenges in the sector.

Opportunities remain

Several recommendations from the *2016 Plan* are on the agenda for the *2021 Australian Infrastructure Plan*.

They include the **need to source better data and information** on the economic viability and sustainability of water resources. Robust, up-to-date data is essential. It will support informed public and private investment, and more successful drinking water improvements in regional communities.

Resilience to climate for water supplies remains a priority area for reform in the *2021 Plan*. Furthermore, issues highlighted in delivering safe, high-quality, fit-for-purpose and sufficient water to remote communities have a significant bearing on economic, social and cultural outcomes in these areas.

New approaches are needed to managing water infrastructure to cope with the pressures of climate change and population growth

The *2019 Australian Infrastructure Audit* concluded that, although Australia's water sector is performing well overall under challenging circumstances, there needs to be further work to safeguard water resources.³

The *2019 Audit* identified 180 opportunities and challenges across five infrastructure sectors: transport, energy, water, telecommunications and social infrastructure. Of these, the water sector had nine challenges and four opportunities:

- improving the security of Australia's water resources under a changing climate and population growth
- managing a growing number of assets reaching the end of their lifecycle
- protecting the health of people as well as urban waterways.

A key finding was that customer and community expectations and understanding will need to shift around:

- embracing alternative water sources for drinking
- finding new ways to improve water efficiency
- the value of water in urban environments.



The *2019 Audit* also identified significant issues in regional communities, where water service providers struggle to deliver the same level of service as metropolitan communities receive. In some cases, services in remote communities do not meet Australian health and environmental standards.

This means Australia is failing to meet national water targets and its commitment to the *2020 National Agreement on Closing the Gap*.⁴ Water performance also forms part of this country's international obligations, such as the Australian Government's pledge to the United Nations' Sustainable Development Goals.⁵

The water sector avoided the immediate impacts of COVID-19

In 2020, Infrastructure Australia collaborated with global management consulting firm L.E.K Consulting to produce the *Infrastructure beyond COVID-19* report. Its main findings regarding the relationship between the COVID-19 pandemic and Australia's water infrastructure were that:

- The pandemic has had a **relatively minor direct impact** on the water sector, as water infrastructure lasts from 30 to 200 years and is built in response to long-term projections of population and climate.⁶
- Projections predict **Australia's population growth will slow down** because of the pandemic, so increased demand on water services is not expected until two and a half years later than previously anticipated.
- Because the pandemic has changed work and social behaviour, more people are **moving from cities to regional areas** than before the pandemic. If this trend continues, it could put pressure on regional water utilities.
- More customers are **seeking hardship support** from water utilities, potentially affecting capacity to invest in future capital programs.

How we developed the *Plan for Water*

This chapter of the *2021 Plan* responds to the challenges and opportunities identified in **Chapter 9: Water** of the *2019 Audit* and reflects the key priorities and concerns of water sector stakeholders.

Infrastructure Australia has undertaken an extensive stakeholder engagement process in analysing

the views and advice of key water sector bodies. From August 2019 to February 2020, Infrastructure Australia received 17 formal submissions to the Water chapter of the *2019 Audit*. We consulted with water industry stakeholders representing: key industry bodies; consultancies; Australian, state and territory and local governments; and jurisdictional infrastructure bodies.

In October 2020, we ran a water sector workshop (co-hosted by Water Services Association Australia) that brought together leaders from the water sector, including government, industry and academia. Together, we discussed the opportunities and challenges faced by the industry.

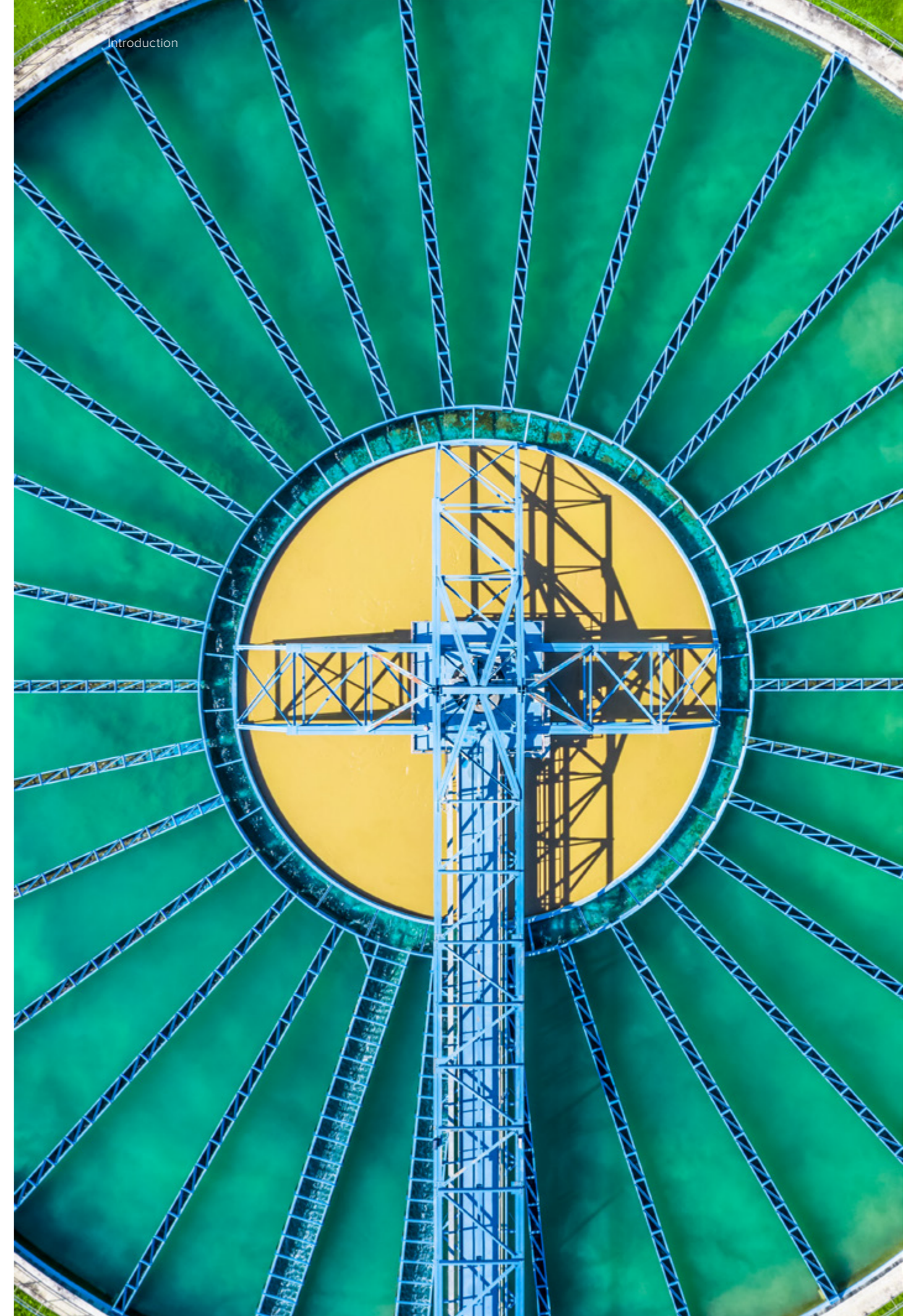
In addition, Infrastructure Australia held several working group sessions with Engineers Australia and the Central NSW Joint Organisation.

The **Water chapter** is also supported by findings from resilience workshops that Infrastructure Australia delivered in partnership with Infrastructure NSW during 2020. These workshops aimed to identify sector priorities to recover from recent extreme events and identify a pathway to long-term resilience.

We acknowledge the important work of others

Infrastructure Australia acknowledges the important work of others in developing the *2021 Plan's* water infrastructure recommendations:

- the ACCC's inquiry into markets for tradable water rights in the Murray-Darling Basin
- the Productivity Commission's second triennial assessment of progress towards achieving the objectives of the National Water Initiative
- agencies and industry bodies, including the ACCC, Aither, Aurecon, Australian Water Association, Central NSW Joint Organisation, CSIRO, Engineers Australia, eWater, National Water Grid Authority, Productivity Commission, Water Directorates and Water Services Association Australia
- researchers from Melbourne University, University of Canberra and University of Queensland
- public sector agencies from governments of all levels, particularly state and territory infrastructure bodies.



6.1 Securing our water future

Key messages

- As with many other infrastructure classes, **water management is the responsibility of states and territories.** The Australian Government has a role in continuing the water reform journey, ensuring best practice water resource management.
- **Water security is a top priority** for the water sector. However, there is no definition of what a water-secure nation looks like and no consistent approach to measuring water security.
- A **national water security framework** will provide a single, authoritative definition of what water security is and how to assess Australia's position.
- The national water security framework should form the basis of national, regional, state and territory infrastructure **planning and growth strategies.**
- Water shortages due to the Millennium Drought sparked a major increase in water efficiency in households, businesses and water utilities. However, water restrictions can have adverse impacts. Water-efficient practices have also tapered off as water security risks ease.⁷
- To adapt to an unpredictable future, Australia must now enter **a new phase of water efficiency** driven by water-literate communities.
- More than 80% of Australia's urban water supply is from surface water, which is highly dependent on rainfall.⁸ With climate change likely to shift rainfall patterns, relying so heavily on **water sources that depend on climate no longer makes sense.**
- Australia cannot afford to limit access to alternative sources that will allow a diversified water supply portfolio. **Governments must remove outdated barriers** that prevent the use of all water supply options.
- Water planning that considers the **whole of the water cycle and embeds a fit-for-purpose approach** will deliver increased value to communities, including public health, environmental health and water security outcomes.
- To keep customers' bills affordable, state and territory governments should ensure water providers can **access best practice asset management practices and processes** so they can realise all the benefits.
- The water sector needs to get better at **collaborating and sharing asset management information and resources** between metropolitan and regional areas and across states and territories.

Putting a strong focus on core needs

Water security is a pressing challenge for Australia. Tackling it will require a focused effort from industry and balancing of governance, social, economic and environmental outcomes.

The catastrophic events of the past two years have revealed just how much Australia's water security is under increasing pressure from climate change, weather extremes, population growth, changing land use and ageing infrastructure.

At the peak of the 2019–2020 drought, 10 regional cities and towns were within six months of reaching 'day zero' – when water resources are so low that residential taps are turned off and water is carted to local collection points.⁹ While many people may not relate to these extreme circumstances, this was reality for the residents of Stanthorpe in Queensland when they officially ran out of water in January 2020.^{10 11}

“ The catastrophic events of the past two years have revealed just how much Australia's water security is under increasing pressure. ”

Larger centres like Tamworth, Dubbo and Armidale were at a high risk of running out of water. Tamworth has a population of around 62,500¹² and is heavily dependent on agriculture — it came within six months of water resources running dry after enduring two years without rain.¹³

Droughts and dry periods have significant socioeconomic effects on farming communities and businesses in nearby townships.

The next big drought in Australia is inevitable. It is vital to implement measures for water security now.

The sector needs a **clear, agreed goal for achieving water security** for the whole country.

It also needs **better tools and data** for measuring water security in any place at any time. This will ensure the industry is prepared for future challenges and can make confident planning and investment decisions.

Every person must **change how they view and value water resources** and be involved in the discussion about solutions, with communities taking the lead in how their water resources are used and valued. Creating a nation of water-literate Australians is the best way to deliver a more efficient, adaptable water sector that can deliver greater long-term benefits to communities.

It should be possible to **access the entire range of water sources**, including alternative water sources such as recycled water for drinking. This will reduce the overall risk of not having enough quality water to meet every Australian's needs.

Finally, ensuring knowledge is shared among all parts of the sector and having access to these resources through greater collaboration are both key to managing ageing assets and meeting future expectations.

Changing land use impacts the availability of water

Changing land use is also a key factor in planning for water security. Land use and management practices can have a significant impact on the quantity and quality of water in supply systems. Changing land use, including agriculture, forestry, mining and urbanisation, can alter the flow regime, accelerating the transport of pollutants and increasing the spread of pest plants or animals.

Some land use practices change with seasons and from year to year. It is necessary that governments invest in data collection and scientific methods that can assess the impacts of changing land use on water security.

Planning for water security should incorporate the impacts of land use, alongside the impacts of climate change, population growth, user expectations and ageing infrastructure.

6.1 Recommendation

Secure long-term water supply for urban, rural, environmental and cultural users by developing a national approach to water security, including independent national ownership.

Proposed sponsor: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

When this should impact:



Where this should impact:



5-10 6.1.1 Achieve a common approach to water security planning by developing a new National Water Initiative incorporating a national water security framework. A national water security framework must include an agreed definition of ‘water security’ within a whole-of-system context and provide an approach to assessing risks and opportunities.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Ensure a consistent national approach to water security by developing and committing to a renewed National Water Initiative that incorporates a national water security framework.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Ensure long-term water security challenges and risks are understood and opportunities identified on a nationally consistent basis by developing a national water security framework. A national water security framework must include:

- a definition of ‘water security’ within a whole-of-system context (including urban and rural systems), with reference to: safety, quality, quantity and for meeting users’ needs over time on an economic, environmental, social (including cultural) and governance basis

- a method to measure the water security of a place or catchment over time and incorporate best available demographic, scientific and economic data. This method should also be capable of identifying water deficits or surpluses.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Improve reliability of water accounting within the total system by maintaining registers of all water entitlements and allocations aligned to the renewed National Water Initiative. Mineral and petroleum industries should also be incorporated within entitlement and planning arrangements under a renewed National Water Initiative.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

5-10 Meet the needs of water users into the future and ensure long-term water security objectives are considered in strategic decision-making. This includes:

- incorporating the national water security framework into business case development for state, territory and nationally significant water infrastructure proposals

- incorporating the national water security framework into existing national infrastructure investment assessment frameworks, including the *Infrastructure Australia Assessment Framework* and the *National Water Grid Investment Framework*.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments, Infrastructure Australia, National Water Grid Authority

0-5 Ensure ongoing commitment and application of the national water security framework by assigning independent ownership of the National Water Initiative, including the national water security framework.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments, National Water Grid Authority

0-5 6.1.2 Normalise water-efficient practices and decisions by increasing water literacy in communities and businesses.

Proposed lead: Communities

Supporting by: Department of Agriculture, Water and the Environment, water utilities

0-5 Champion water-wise behaviours and increase water literacy. This includes water-wise campaigning and voluntary reporting of water use in business processes.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: Communities

0-5 Support community and businesses to embed a water-wise culture. This includes ongoing public education to improve water literacy and rebates on water-efficient products. Regulatory bodies must implement pricing structures that signal the full value of water and an economic water conservation method backed by community engagement.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Increase transparency of water consumption and dependency (water footprint) by disclosing meaningful water data in environmental, social and governance (ESG) reporting.

Proposed lead: Professional associations, such as Australian Institute of Company Directors, Governance Institute of Australia, CPA Australia, Chartered Accountants ANZ

Supported by: Department of Finance, Australian Prudential Regulation Authority, Australian Securities Investment Commission, Australian Stock Exchange

5-10 6.1.3 Meet users’ long-term water needs by ensuring that all options are fully evaluated in infrastructure planning.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments, state and territory planning departments

0-5 Strengthen resilience of water supply infrastructure and meet outcomes for users’ long-term needs by:

- removing policies that unnecessarily restrict water supply options, including bans that prevent suitably treated wastewater or stormwater from augmenting potable water supplies, and bans that prevent the urban use of rural water
- removing mandates, targets and subsidies for the use of certain types of water, including recycled water
- removing regulatory barriers that discourage recycled water investments
- ensuring that water infrastructure planning decisions consider all options for expanding water supply fully and transparently. This includes determining the optimal mix of water supply options with consideration given to the national water security framework.

Proposed lead: Department of Agriculture, Water and the Environment.

Supported by: State and territory water departments, state and territory planning departments, state and territory essential service economic regulators

0-10 Ensure water infrastructure decisions meet users' long-term needs through removing community perception barriers to the use of alternative water sources, particularly recycled water for drinking, by:

- publicising a position of support for alternative water sources, especially recycled water for drinking
- running public education and engagement campaigns on the benefits and risks of recycled water for drinking, including how water travels through the water cycle. Public education campaigning must be based on recognised positive messaging and avoid language or images that might cause stigma or negative reactions
- partnering with influential community representatives or businesses to champion the use of recycled water for drinking.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments, water utilities

0-5 **6.1.4 Improve the long-term reliability of water infrastructure to meet future needs and expectations by advancing whole-of-life asset management and preventative maintenance.**

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Support maturity for water service providers in asset management and long-term planning by coordinating a national centre of excellence for resource sharing, and coordination of partnerships.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Coordinate asset management planning and support progression towards whole-of-life asset management in regional water utilities by facilitating regional partnerships or alliances (collaborative arrangements). Collaborative arrangements must support members to achieve predictive asset management plans through addressing skill shortages, sharing resources and improving data collection.

Proposed lead: State and territory water departments



Measuring progress



Social

Water Security Framework

National adoption of the OECD Water Security Framework or equivalent to provide a whole-of-system context to assess risks and opportunities

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Quality

Maintenance and asset management

Australian water utilities in the top quartile of International Leakage Index

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Affordability

Affordable, climate-independent water

Average water and wastewater bill as a percentage of average annual gross household income

Target: Less than 3%

Timeframe: 0-5 5-10 **10-15** 15+



Making water security a shared goal

Water policy departments and industry must agree to common goals for water security by investing in a national water security framework. A framework will align Australia-wide efforts to a common goal as well as provide a consistent means of defining and measuring progress and identifying system deficits or opportunities for growth.

There has been significant work in this space, particularly for defining and measuring urban water security. This work must be expanded to encompass total water use within the system, including both urban and productive water settings.

Without being clear about what water security means, any efforts towards securing water resources for all users will be unfocused or unbalanced, diminishing the effectiveness of reform. Also, significant opportunities for sustainable economic prosperity may be missed.

For example, growth opportunities include the Tasmanian Irrigation program – the Pipeline to Prosperity – that is leveraging Tasmania’s potential to expand irrigation. The program looks to implement a further 10 irrigation projects that will deliver up to

78,000 megalitres of water, contributing \$114 million a year to the Tasmanian economy. The program will also deliver up to 2,600 full-time positions, in addition to jobs created during the construction period.¹⁴

Investing in a framework that uses best available data and information aligns Australia’s efforts towards achieving water security and supports economic prosperity.

Give water security a national focus

Water management rests with states and territories. The Australian Government plays a role by providing leadership on national water reform.

The Australian Government should set a national strategic direction in alignment with states and territories to ensure consistency and focus attention on water security.

The national water security framework provides a mechanism for coordinating the agreed outcomes for water security. To ensure its agreement and application in all states and territories, the framework should be included under a renewed National Water Initiative (NWI).

6.1 Securing our water future

To ensure ongoing commitment to the national water security framework, the NWI should be assigned an owner. The Productivity Commission in its draft review of the NWI has recommended that ownership should sit with Water Ministers. Its draft recommendation includes that Water Ministers should meet periodically to oversee development of a renewed NWI and to receive, consider and act upon advice that comes out of any periodic review of the new agreement.¹⁵

It is imperative that the owner of a renewed NWI has a sufficiently robust governance model, independent of government, with clear terms of reference and a transparent work plan.

Agree on a common definition

There are several definitions for water security, yet not one provides an agreed benchmark for its meaning in Australia.

Defining water security is a complex undertaking. It means more than stored volumes of water to meet specific human needs. Multiple factors affect water security, including infrastructure, climate, quality, consumer behaviour, policy, land use and allocation rights. Balancing public health, social, cultural, environmental, economic and governance aspects is also important, and sometimes these can be in conflict.

Infrastructure Australia has reviewed several existing definitions for water security. We consider the OECD definition provides a good basis for developing an Australian Water Security Framework.¹⁶

“A national water security framework would make the agreed definition for water security operational and create a clear vision for the water sector.”

The OECD defines water security through a risk-based framework that recognises water security means more than ensuring water access. It means reducing or avoiding water risks too.

Taking a risk-based approach ensures any response to water risk in one area does not defer that risk or transfer it to another area.

The OECD’s framework considers these risks:

- risk of shortage
- risk of inadequate quality
- risk of excess (including floods)
- risk of undermining the resilience of freshwater systems (such as exceeding the coping capacity of surface and groundwater bodies).

Create a national framework

Infrastructure Australia considers there is an opportunity for the Australian Government, in collaboration with states and territories, to play a greater leadership role in promoting best practice in water policy.

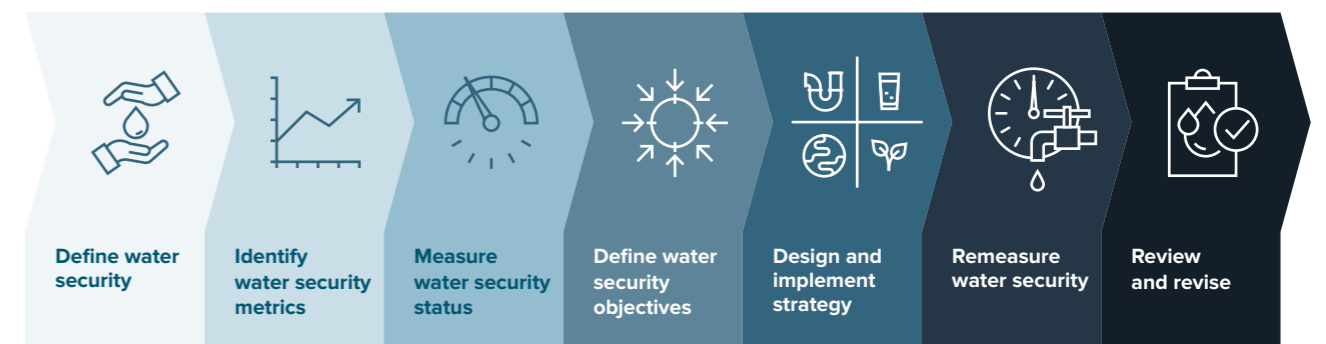
A national water security framework would make the agreed definition for water security operational and create a clear vision for the water sector. It would allow Australia to assess progress towards water security, identify growth opportunities, mitigate risks and support economic prosperity.

The framework should become the authoritative approach to assessing water supply versus needs over time. It would form the basis of national growth strategies and infrastructure planning, helping the Australian Government and state and territory governments to develop stronger business cases for significant investment.

To support the framework, governments would need to invest in robust scientific data, including climate and hydrology information.

Infrastructure Australia considers that implementing a national water security framework should include seven major pillars (see **Figure 6.1**). A national water security framework based on these pillars would set a clear vision for water security and an approach to understanding Australia’s water security risks, as well as identifying opportunities.

Figure 6.1: Australia needs a national water security framework based on seven pillars



Ensure water efficiency is the norm

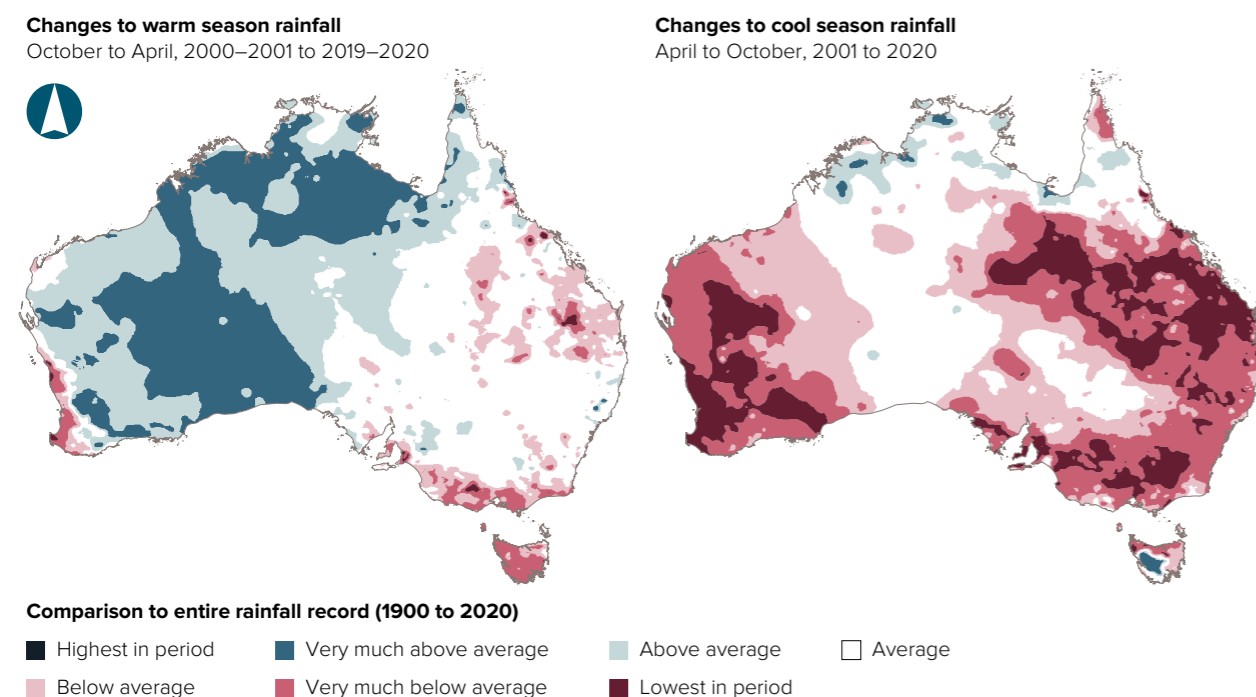
Over the past two decades, Australia has faced a dramatic reduction in rainfall. At the same time, there has been rapid population growth.¹⁷

The maps in **Figure 6.2** show the dramatic shift towards drier conditions between 2000 and 2020, especially across southern and eastern Australia. There have been more years of below-average

rainfall, especially in the cool season months of April to October. In 17 of the last 20 years, rainfall in southern Australia has been below average in these months.

If Australians are to have enough water to meet all their needs, they need to learn to do more with less.

Figure 6.2 : Cool season rainfall has declined over the past 20 years



Note: Rainfall decile maps for warm season (left) and cool season (right). These maps show where rainfall was above average, average or below average for 2000 to 2020, in comparison with the entire rainfall record from 1900 to 2020.
Source: Bureau of Meteorology (2020)¹⁸

Increase community education

A community that values water will show efficient behaviours and attitudes when water is plentiful as well as when it is scarce. This will support a new phase in water efficiency and lead to changes in how businesses behave as consumers and shareholders exert their influence.

Outmoded, reactive and short-lived responses to drought and other water scarcity events may lead to a rapid reduction in water use but only create short-term behaviour change.¹⁹ Additionally, their cost is high, with a disproportionate impact on vulnerable consumers and industries requiring large volumes of water.²⁰

Australians need to make systemic, lasting consumption changes, and that means everyone must become less complacent about changes in water availability and use.

This new phase in water efficiency must be characterised by strong water-valuing attitudes all the time, whatever the water supply situation. This means making people more water-literate by improving their knowledge of water availability, sources, management and related issues.^{21 22}

When water literacy increases, it influences individual behaviour. People are more likely to use water-saving strategies and devices.²³

Improve voluntary business reporting

Water-literate individuals and communities expect the businesses they support to show water-valuing behaviours and attitudes.

To allow the community to engage with businesses they support, and shareholders with businesses they own, the coverage of water in Australian environment, social and governance reporting requires greater emphasis.

Organisations that operate in water-intensive industries should be encouraged to meet the expectations of water-literate customers and shareholders through greater accountability of their water consumption and water efficiency practices. This may include information on water consumption and water reduction and efficiency activities, where water is sourced or extracted, how it is used, including any recycling or reuse, and details on water disposal.

Industry reports suggest that only around one-third of Australian companies have water efficiency policies, with just 11% holding specific targets.²⁴

Lack of shareholder and market interest is a key barrier to improving water efficiency policies and reporting.²⁵ To overcome these barriers, companies, including superannuation and public investors, should engage with shareholders in contextualising water risks to their business and disclose meaningful water data in environmental, social and governance reporting.²⁶

Implement government initiatives

All levels of government have a role to play in catalysing and supporting the shift towards a new phase of water efficiency.

State and territory governments must reinvigorate consumer education programs to highlight the discrepancy between water use in high-consumption communities as well as the contribution of water-efficient appliances.

In addition to their role as educators, governments should update eligibility criteria for businesses applying for water infrastructure grants. These should require participating entities to establish and maintain water efficiency programs and associated targets. Enhancing eligibility criteria for programs such as the National Water Infrastructure Development Fund would provide a meaningful opportunity to support increased water reporting in water-intensive industries.

Support new tools with new pricing models

State and territory pricing regulators should implement a best-practice approach to developing a method for the economic level of water conservation. This method should be informed by national research to determine customers' willingness to pay for conservation and their

specific capacity to pay. Water utilities should be entitled to recover efficient costs where their customers have demonstrated a willingness for these services.

Without effective water consumption metering, consumers cannot effectively monitor their water use and do not receive price signals to modify their behaviour. While greater use of individual or sub-metering in apartments carries costs and regulatory complexity, transitioning to smart metering would provide an opportunity to unlock additional consumer benefits, including reduced water and energy bills.

Regulators and water utilities should jointly develop pricing models that allow the water utility to recover the costs of individual metering, and the rollout of smart meters, from customers.

To coincide with smart meter rollout, there needs to be improved transparency, complemented by informative user interfaces with meaningful usage data. These could take the form of dedicated mobile phone apps and websites where people can track their consumption.

These tools, along with increased maturity in consumer waste-sorting practices (such as food organics and garden organics), could create a step-change shift in the culture of resource consumption in the home. For more information, see the **Waste chapter**.

With one in 10 Australians expected to increase their pattern of working from home following the COVID-19 pandemic, there is a greater need to manage the strain on infrastructure networks in suburban areas through managing household resource consumption and associated municipal services.²⁷

Put all water supply sources on the table

The impacts of climate change, and the resulting shift in precipitation patterns and reliability, requires a broader investigation of supply options that are less climate-dependent.

All water supply options must be available for consideration and assessed equally, based on their full merits for meeting this country's long-term needs. Where possible, supply managers should aim to boost the resilience of their supply network and deliver better outcomes for communities by integrating multiple options into the network.

Currently, 82% of Australia's urban water supply is from surface water, a source highly dependent on rainfall.²⁸ As **Figure 6.2** shows, rainfall patterns across the country are becoming increasingly unreliable. It is no longer feasible to expect rain to fall within local catchment boundaries and replenish surface water storage facilities.²⁹

It is essential to diversify Australia's water supply portfolio. This will include embracing alternative water supply sources such as recycled water and stormwater harvesting.

Gain community support

The National Health and Medical Research Council affirms protecting public health must be paramount and the community consulted on any proposed introduction of recycled water.³⁰ In line with this requirement, the quality of recycled and harvested stormwater can be assured in Australia if properly treated.

However, according to a recent Water Services Association Australia report, *All options on the table*, ‘community support can be a particular challenge for purified recycled water, more because of the “yuck factor” than any technical aspects.’³¹

Across the country, policies prevent the use of some types of water, even though bans on certain supply options can lead to significant community costs. For example, the Toowoomba Pipeline in South East Queensland carries untreated water from one dam to another. It cost \$100 million more than the proposal for recycling wastewater (the preferred option based on cost, environmental concerns and reliability), which was rejected in a local referendum.³²

Yet the introduction of treated recycled water for drinking has been successful around the world. It already happens in some parts of Australia, such as Perth and the regional New South Wales town of Orange.^{33 34 35}

The Australian Government and state and territory governments must remove barriers that prevent infrastructure planners from fully considering every water source. They should:

- strongly support the use of appropriately treated alternative sources of water and fund them
- widely promote their position and explain the benefits
- incorporate alternative water projects into water efficiency programs to show the role they play.

Invest in public education

Community information programs are particularly important. Research shows it is possible to gain broad community acceptance for recycled water if there is an open public dialogue that educates the community through words and images that avoid causing stigma or an emotional response.^{36 37} Stigma or negative reactions to drinking recycled water can occur by using images, words or phrases that suggest treated recycled water is unclean. Changing community perception is difficult once recycled water has been labelled in this way.

Increased public communication about the appropriate treatment and management of recycled water, and its safety, should be a priority for the Australian Government.

Future-proof Australian water infrastructure

The *2019 Audit* identified that urban water and wastewater infrastructure is deteriorating, with much of it reaching the end of its expected useful life.³⁸

Australia’s growing population will increase the load on these strained assets and more frequent extreme weather events will test their resilience.

At the same time as facing these challenges, communities expect their water infrastructure to deliver increased service, provide better governance, social and environmental outcomes and be more affordable.

Encourage more collaboration

Australia’s water sector holds world-class technical knowledge and asset management practices.

For example, SA Water, the major metropolitan utility in South Australia, has converted its supply network into a smart network. This identifies immediate issues in a particular area so that communities of similar geography (size, scale and demography) can be assisted proactively, making the utility’s investments more efficient.³⁹

Unfortunately, access to this kind of knowledge is uneven. Physical and jurisdictional boundaries often prevent innovation or sharing of best-practice approaches.

Through industry bodies, water directorates and joint organisations of councils, local governments have strengthened their collaboration and business continuity.⁴⁰ However, larger metropolitan water utilities that have the scale to trial innovative approaches to address shared challenges are not included in these forums.

Ensuring knowledge and resources are shared by the whole sector is key to managing ageing assets and meeting future expectations.

One way to promote knowledge exchange across the sector would be to establish a national asset management group that connects regional alliances and larger water utilities, so that communities of similar geography can share asset management expertise and resources (see **Figure 6.3**).

Journey towards whole-of-life asset management

For both major asset upgrades and brownfield urban renewal, an important strategic consideration should be identifying opportunities to use a holistic water cycle management approach.

With whole-of-life asset management strategies, assets are not replaced on a like-for-like basis but designed to meet evolving conditions. This continuously improves the water supply chain and the network.

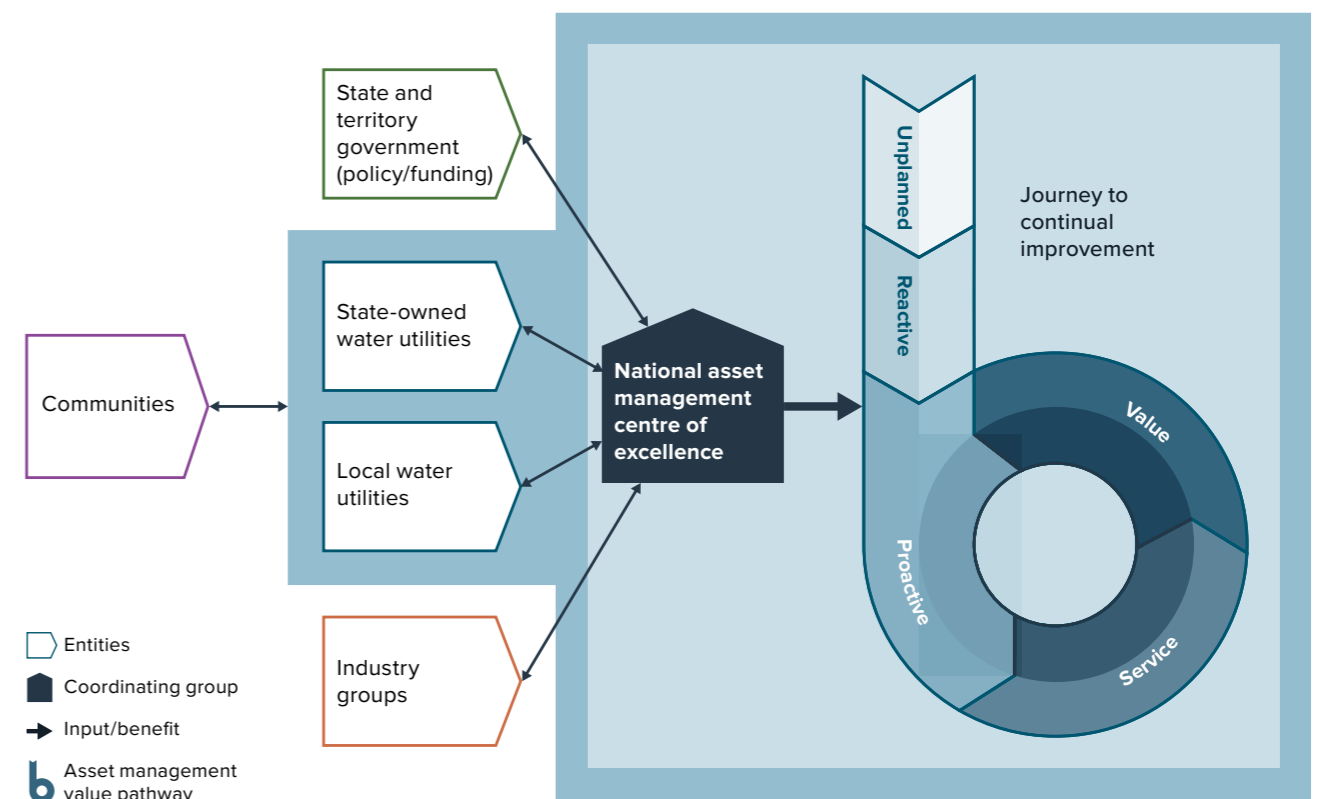
The result is better service delivery, more liveable outcomes and strengthened network resilience.

Some metropolitan and regional water utilities’ asset management practices are already applying whole-of-life asset management approaches as they respond to the challenge of ageing assets. The regional New South Wales town of Parkes is one example (see **Parkes case study**).

Collaboration is particularly critical for this form of asset management because it lets water providers look for solutions, approaches and resources beyond their own.

A national asset management group would support cooperation between the diverse policy areas and subject matter experts within governments and water utilities who wish to develop and implement a whole-of-life asset management strategy, leading to more communities benefiting.

Figure 6.3: Continuous improvement journey towards best-practice asset management



Case study: Parkes looks to the future

In regional New South Wales, Parkes Shire Council recognised that the need to repair an ageing water supply system was a step-change opportunity to overhaul its water network, including its water and sewage treatment plants and associated transfer infrastructure.

The new Recycled Water Scheme includes an Integrated Water Infrastructure Program with new water and sewage treatment plants and an advanced water recycling facility.

The new scheme strengthens Parkes’ water security and brings its water recycling activities up to industry best-practice standards.

The scheme provides an additional source of water for non-potable use that is climate-resilient and cost-effective, saving 185 megalitres of drinking water per year that would otherwise be used for municipal irrigation⁴¹

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Introduction
1. Place
2. Sustainability
3. Industry
4. Transport
5. Energy
6. Water
7. Telecommunications and digital
8. Social infrastructure
9. Waste
Methodology and results
Next steps



6.2 Valuing water to create liveable communities

Key messages

- The water sector is central to **ensuring the liveability and resilience** of Australia's urban environments.
- Australians **value water-dependent urban features**, including parks, sporting fields and urban waterways.
- **Integrating management of water infrastructure and incorporating water managers into urban planning** helps ensure the benefits of water in urban environments can be maximised.
- High-quality water is **essential to meet basic human needs**.
- High-quality water is also critical for **strengthening Australians' health and wellbeing**, ensuring **economic prosperity** and **supporting sustainable development**.
- **All Australians have a right to safe, high-quality reliable water and wastewater services**.⁴²
- The Australian Government **recognises this right** and the commitment in the 2020 *National Agreement on Closing the Gap* and in its pledge to the United Nations' Sustainable Development Goals.^{43 44}

Water's role in creating prosperous, resilient and liveable places

Water has significant value to communities in the urban environment, supporting prosperity, amenity, liveability and health.

With Australia's growing population and increasing densification, as well as the impacts of climate change, the value of water in the urban landscape is increasing. This means prioritising an integrated whole-of-water cycle management approach. By fully embedding a whole-of-water-cycle approach and realising the opportunities that integrated water management can achieve, Australia can adapt to changing conditions while providing greater benefits to communities.

Valuing water at all stages of the water cycle, coordinating water infrastructure management and moving to fit-for-purpose water consumption can deliver improved outcomes for water security, public health, environmental health, urban resilience and amenity.

Australia's major cities contribute nearly 80% of the national Gross Domestic Product (GDP).⁴⁵ Urban liveability and resilience to future stresses will be critical to the continuing role of cities as major economic generators.

Cities that are cool and green, with water and urban habitat as a central feature, will attract people and businesses as desirable places to live and work.

Sophisticated urban water management also improves cities' resilience to extreme events such as heatwaves, droughts and flooding.

6.2 Recommendation

Value water in communities by prioritising a whole-of-water-cycle management approach and applying fit-for-purpose, fit-for-place and fit-for-people approaches.

Proposed sponsor: Department of Agriculture, Water and the Environment

Supported by: State and territory planning departments

When this should impact:



Where this should impact:



10-15 **6.2.1 Provide enhanced community benefits, including water security, public health, environmental health and urban resilience, by integrating management of water infrastructure throughout the whole water cycle.**

Proposed lead: Local governments, water utilities

Supported by: Department of Agriculture, Water and the Environment, state and territory water departments, state and territory essential service economic regulators

0-5 Clarify roles and responsibilities by reviewing stormwater infrastructure management, including governance, regulatory, pricing, physical and operational constraints.

Proposed lead: State and territory water departments

Supported by: State and territory essential service economic regulators, water utilities, local governments

5-10 Establish a national stormwater management framework that includes:

- objectives and principles for total water cycle management, including urban amenity and community and waterway health
- guidelines on roles and responsibilities for planning, operation and maintenance
- cost recovery mechanisms.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

5-10 Assess existing stormwater infrastructure condition, capacity, location and management, and assess integration options.

Proposed lead: State and territory water departments

Supported by: Local governments, water utilities

5-10 Integrate potable water, wastewater, and stormwater infrastructure planning by assigning a single planner across the water cycle for greenfield development sites.

Proposed lead: State and territory planning departments

Supported by: Local governments, water utilities

10-15 Formalise roles and responsibilities for integrated water cycle management in established urban areas in alignment with a national stormwater management framework.

Proposed lead: State and territory water departments

Supported by: Local governments, water utilities

10-15 Establish sustainable and community-driven recovery of efficient costs, such as value sharing or levies, for stormwater infrastructure management. This should include urban waterway enhancements and re-naturalisation in alignment with a national stormwater management framework.

Proposed lead: State and territory water departments

Supported by: State and territory essential service economic regulators, local governments, water utilities

5-10 Embed a whole-of-water cycle management approach into long-term, large-scale (city or catchment – including both metropolitan and regional settings) urban planning by defining and implementing community-driven outcomes for public health, environmental (including ecological) health, amenity and urban resilience:

- Define clear community-driven objectives for water cycle management over the long term.
- Align long-term growth planning to community objectives.
- Ensure long-term growth plans recognise the value of water within the entire water cycle and identify dependencies of urban growth on water by incorporating best available data and water modelling.
- Identify water security risks and growth opportunities by applying the national water security framework.

Proposed lead: State and territory planning departments

Supported by: Department of Agriculture, Water and the Environment, state and territory water departments, water utilities, local governments

0-5 Embed whole-of-water cycle management at the commencement stage of local land-use planning through formal arrangements between land-use planners and the water cycle planner.

Proposed lead: State and territory planning departments

Supported by: Local governments

10-15 **6.2.2 Deliver safe, high-quality, secure, sustainable and fit-for-purpose water and wastewater services to remote and isolated communities by partnering with communities and water utilities, developing a funding pathway and monitoring strategies.**

Proposed lead: Department of Agriculture, Water and the Environment

Supporting agencies: State and territory municipal services departments, local governments, water utilities

0-5 Deliver secure, sustainable water and wastewater services to remote and isolated communities by implementing a funding pathway that considers whole-of-life cycle infrastructure and whole-of-water-cycle services.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory water departments

0-5 Develop a comprehensive understanding of community dynamics that relate to water consumption, including access, use and preferences, as well as an assessment of water and wastewater infrastructure performance and condition. This should be done by undertaking a whole-of-service assessment.

Proposed lead: State and territory municipal services departments

Supported by: State and territory planning departments, local governments, water utilities, communities, local Aboriginal land councils

5-10 Deliver resilient and sustainable water and wastewater infrastructure that meets communities' needs by applying fit-for-purpose, fit-for-place and fit-for-people approaches that directly respond to whole-of-service assessments.

Proposed lead: State and territory municipal services departments

Supported by: State and territory planning departments, local governments, water utilities, communities, local Aboriginal land councils

10-15 Improve community health outcomes and introduce a total water cycle approach, including fit-for-purpose water use, by including sewerage services alongside potable water as part of minimum service standards for settlements in Remote Areas.

Proposed lead: State and territory first minister's departments

Supported by: State and territory planning departments, state and territory health departments, local governments, water utilities, communities, local Aboriginal land councils

5-10

Deliver co-designed, co-delivered water education and demand management strategies focusing on outdoor water use by partnering with community leaders and Aboriginal land councils. Education strategies should be delivered through schools and key community forums, incorporating preferred language and traditional knowledge.

Proposed lead: State and territory municipal services departments

Supported by: State and territory planning departments, state and territory health departments, local governments, water utilities,

10-15

Ensure community outcomes are being met consistently by implementing ongoing risk-based monitoring strategies.

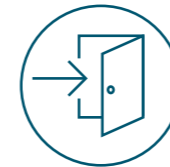
Proposed lead: State and territory municipal services departments

Supported by: State and territory planning departments, state and territory health departments, local governments, water utilities, communities, local Aboriginal land councils, state and territory Aboriginal and Torres Strait Islander affairs agencies

communities, local Aboriginal land councils, state and territory Aboriginal and Torres Strait Islander affairs agencies



Measuring progress



Access

Safe water

Percentage of population with access to sustainable, affordable and safely managed drinking water services⁴⁶

Target: 98%

Timeframe: 0-5 5-10 10-15 15+



Quality

Safe sanitation services

Percentage of population with access to safely managed sanitation services, including a hand-washing facility with soap and water⁴⁷

Target: 98%

Timeframe: 0-5 5-10 10-15 15+



Environmental

Stormwater management framework

National stormwater management framework adopted

Target: 100%

Timeframe: 0-5 5-10 10-15 15+

Water will be key to adapting to change

Centre for Population forecasts indicate Australia's population will likely reach close to 29 million by 2031.⁴⁸ With over 70% of the current population residing in cities, and much of the post-pandemic population growth predicted to do the same, the demand on existing water and wastewater infrastructure is expected to grow.⁴⁹ ⁵⁰ Pressure on waterways that receive run-off or treated effluent will also grow.

The expansion of urban areas increases hard surfaces and reduces green cover. This in turn increases surfaces that absorb, store and radiate heat, contributing to the urban 'heat island effect'. Under this phenomenon, an urban area is warmer than the surrounding environment.⁵¹

Resistant surfaces such as concrete footpaths also increase run-off and diffuse pollutant loads to receiving waterways.

Greening and re-naturalising public spaces can support community resilience and liveability, mitigating the impacts of heat and pollution and reducing the impacts of flooding.

Integrated water cycle management approaches aligned with fit-for-purpose water consumption also have the potential to deliver significant benefits to regional communities. For some regions, the impacts of climate change are likely to be extreme, so the benefits that an integrated fit-for-purpose approach can deliver are significant. However, implementing such approaches in some regional communities is challenging due to costs and complexity. Also, it may not be feasible to recover the costs of these approaches.

With some small local water service providers, it is important to recognise they may not be able to recoup the costs of maintaining a basic level of service. In these instances, Community Service Obligation (CSO) payments operate as an arrangement where government provides support for a utility to provide a range of urban water services to a set of users. This arrangement should continue in line with the renewed National Water Initiative.

For more information about CSOs and the need for transparency and effectiveness, see the **Place-based outcomes for communities chapter**.

As discussed under **Reform 6.1**, collaborative arrangements can support the delivery of water cycle management approaches in regions by improving coordination, resourcing and scale.

Leverage how much Australians value water in the urban environment

Whether it is blue infrastructure or water-dependent green infrastructure such as parks and sporting fields, water-dependent features are highly desirable locations for Australians. Urban blue and green infrastructure is essential to the community's sense of wellbeing, and critical for resilience and sustainability, while reducing the impacts of heat, storms and other natural hazards.

The COVID-19 pandemic has further highlighted the value that residents place on water-reliant features in the urban environment. For example, a survey on how Sydney residents use green spaces found a 100% increase in people using the tracks and trails in Western Sydney Parklands since the start of the pandemic.⁵²

The *2019 Audit* identified the importance of these assets and their contribution to people's sense of wellbeing. They are also prepared to pay for it. The *2019 Audit* found Australians will pay up to 16% more for a house with greater access to open space and that residents in Sydney and Melbourne will pay an average of between \$104 and \$278 per year for stormwater projects that restore stream quality.⁵³

This premium presents the potential for developing self-funding urban enhancement programs that leverage value sharing and other beneficiary-pays models.

Achieve better value through total water cycle management

Water is currently an undervalued resource. Locally collected water could play a larger role in the urban environment, reducing our reliance on potable water.

State and territory planning bodies must accelerate their progress towards better integrating water management. This will involve clarifying the roles and responsibilities of planning departments, water utilities, local governments and industry involved in land-use planning.

A sophisticated approach to managing water in the urban environment incorporates total water cycle and circular economy principles. Not following this approach could adversely affect the wellbeing, population growth and economic prosperity of Australia's cities.

For further information about the resilience of urban areas, see the **Sustainability and resilience chapter**.

To read more about improving access to green and blue infrastructure, see the **Social infrastructure chapter**.

Consult communities to agree on the full benefits of urban water

State and territory planning departments and water utilities must establish clear objectives for water-dependent aspects of urban liveability, informed by community engagement.

Communities are best placed to understand the value of waterway health and must play a leading role in developing these objectives and defining accountabilities.⁵⁴

At a minimum, water-reliant liveability objectives should consider the benefits to communities that extend beyond the costs of building and maintaining infrastructure. These include the city's resilience to flooding and heatwaves, increased attractiveness to businesses and residents, and avoided health costs.

Integrated management for an integrated water cycle

State and territory water policy departments must clearly define water management responsibilities throughout the total water cycle. In particular, the responsibilities for stormwater and drainage management must be clearly articulated and integrated into the broader planning and management of water.

Currently, stormwater management is largely the responsibility of local government, while water supply and wastewater management is the responsibility of water utilities (except for some regional areas of New South Wales, South Australia and Queensland).⁵⁵

State and territory planning departments must better integrate water managers at the commencement stage of land-use planning. The South Creek catchment in Western Sydney (see **case study**) is an example of how early incorporation of water management into land-use planning can enhance liveability.

State and territory economic regulators should value stormwater and determine a sustainable funding mechanism for stormwater harvesting.

Local government, water utilities and developers have different responsibilities for funding waterway management and stormwater projects across jurisdictions.⁵⁶ Deploying nationally consistent mechanisms for recovering costs from beneficiaries (direct and indirect) and defining funding responsibilities among agencies will deliver better outcomes.

Case study: Liveability through water infrastructure at South Creek, Sydney

The South Creek catchment of Western Sydney is the hottest, driest and least vegetated area of Greater Sydney. The population of the Western Parkland City located within the South Creek catchment is expected to increase to 1.5 million people by 2056.⁵⁷

This population growth will radically change the landscape and increase the amount of water moving through it, placing pressure on the health of waterways and creating challenges for managing stormwater, wastewater, and floods.

Infrastructure NSW, in collaboration with the Greater Sydney Commission, is developing a whole-of-government initiative to manage water in the landscape to improve waterway health and liveability.

The business case for the area found that adopting an integrated land-use and water cycle management strategy would best deliver the New South Wales Government's Western Parkland City Vision. It will also provide \$6.5 billion in value for the community.

The opportunity for integrated water cycle management in the South Creek catchment is a Priority Initiative on the *2021 Infrastructure Priority List*.⁵⁸

For the next stage of planning for the area, via the South Creek Sector Review, the NSW Department of Planning and Industry — Water is leading stormwater and waterway governance.

Source: Greater Sydney Commission⁵⁹; Water Services Association Australia (2019)⁶⁰; Department of Planning, Industry and Environment — Water (2021).

Better serving remote communities

Water and wastewater services in remote communities do not consistently nor reliably meet adequate standards. Also, past approaches to address the problem have not always adequately considered the dynamics of these communities. These include cultural needs and preferences, the ongoing maintenance and reliability of infrastructure solutions, and the impacts of an often-extreme climate on infrastructure and user behaviour.

There are more Aboriginal and Torres Strait Islander peoples than other Australians living in Remote Areas and, as a result, Aboriginal and Torres Strait Islander peoples are disproportionately impacted by the shortfall in services in these areas. While most Aboriginal and Torres Strait Islander people live in urban areas, approximately 20% of all Aboriginal and

Torres Strait Islander peoples live in rural and Remote Areas, compared to only 1.7% of other Australians.⁶¹

The Australian Government recognises the right to safe and reliable water and wastewater services, as reflected in its commitment to the 2020 *National Agreement on Closing the Gap* and its endorsement of the United Nations' *Sustainable Development Goals*.^{62 63 64}

However, as identified in the *2019 Audit*, Australia has not met its national commitment to provide safe drinking water in many remote communities.^{65 66}

In 2015, the Office of the Auditor-General for Western Australian reported that drinking water in 80% of remote Aboriginal communities in the state failed to meet health standards some of the time.⁶⁷ Other Remote Areas face similar problems.



Address poor water quality

Water contamination is a key driver of negative health outcomes for Aboriginal and Torres Strait Islander peoples living in remote communities, resulting in reduced life expectancy in addition to broader social disadvantage.⁶⁸

For example, Australia is the only developed nation in the world to have endemic trachoma, the leading preventable cause of blindness. The impacts are seen in many Rural Communities and Remote Areas in the Northern Territory, South Australia and Western Australia. Yet functioning water services and making soap available can prevent these infections.⁶⁹

State and territory municipal services departments must make a genuine commitment to deliver fit-for-purpose, fit-for-place and fit-for-people water services to Australians living in remote and isolated communities. These must be delivered through approaches that recognise and respond to conditions in these parts of the country as distinct from other places.

Delivering against this commitment should be aligned to Infrastructure Australia's place-based approach to creating vibrant and sustainable communities, as discussed in the **Place-based outcomes for communities chapter** of the *2021 Plan*.

Mitigate the impact of overcrowding

In many remote communities, state and territory governments or community housing providers manage housing and infrastructure. Around two in five Aboriginal and Torres Strait Islander people in Remote Areas are living in overcrowded housing conditions.⁷⁰

In addition to health and social impacts, overcrowding can affect the performance of in-home water-based infrastructure or 'health hardware' (which includes toilets, washing machines and taps). Having properly functioning health hardware is an essential step towards improving the performance of water services in remote communities.

State and territory municipal service agencies and social housing departments must improve water services to remote communities. This will involve addressing both the shared infrastructure that delivers water and wastewater services to dwellings and the provision and maintenance of facilities within the housing.

Since 2019, the *Infrastructure Priority List* has identified remote housing overcrowding as a High Priority Initiative. The **Social infrastructure chapter** of the *2021 Plan* addresses the topic of reforming social housing, including in remote communities.

Understand the challenges

The challenges to providing essential water services are not the same in each remote community. State and territory governments should collaborate with local community leaders or the local Aboriginal land council to co-design and co-deliver 'whole-of-service' assessments of water services.

These assessments should identify communities at the greatest risk of receiving inadequate water services, including water source unsustainability. For those communities at risk of receiving health-threatening water services, including where there is no service information, a rectification plan is needed.

The suitability of new infrastructure for communities should be assessed according to its alignment with community preferences, population dynamics, skills requirements and long-term maintenance resources. Wherever possible, these assessments should include local traditional knowledge. The whole-of-service assessment should guide selection of new infrastructure.

A whole-of-service assessment helps identify best solutions for communities

There is no 'one size fits all' approach to ensuring remote communities have safe and reliable drinking water and wastewater services.

Undertaking a whole-of-service assessment identifies the root cause preventing acceptable water, sanitation and hygiene (WASH) standards in remote communities. It includes a broader look at issues that extend beyond traditional infrastructure performance audits to consider community, location, culture and climate among other factors.

A whole-of-service assessment includes listening to the local community, understanding the limitations of existing infrastructure, its maintenance and operation, and the behaviours or conditions that contribute to poor health outcomes or unsustainable water use.

This assessment will provide valuable insights to optimise infrastructure spend and outcomes.

The costs of supplying adequate water services to remote communities can be expensive. There are already successful examples of lower-cost approaches for remote communities (see **Gillen Bore case study**).

Case study: A collaborative solution at Gillen Bore

Delivering water and wastewater infrastructure solutions to remote communities should be fit-for-purpose, fit-for-place and fit-for-people.⁷¹

- Fit-for-purpose means providing water that is the right quality for its intended use, not just providing potable water for all uses.
- Fit-for-place considers the unique environmental and climatic conditions of remote areas.
- Fit-for-people means incorporating community preferences and values into the design.

The Gilghi trial project at Gillen Bore (75 km from Alice Springs) is a valuable case study for how to supply a lower-cost, fit-for-purpose, fit-for-place and fit-for-people solution to delivering safe drinking water to a remote community.

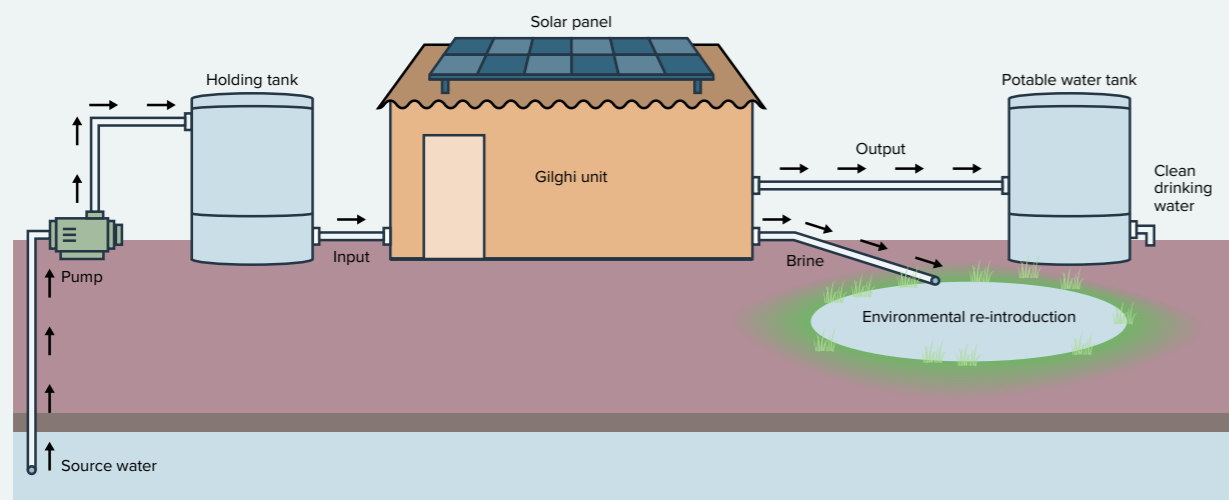
The project was a partnership between Aurecon and Ampcontrol.

The Gilghi remote water system (see **Figure 6.4**) is an off-grid, containerised water treatment system that can provide up to 250 kilolitres of potable water per day, which is enough water for 500 people.

Established approaches for providing water to remote communities are often energy-intensive and costly as they operate continuously. The Gilghi system uses available solar power to run the plant and charge batteries during the day.

The concept was developed using a people-centred approach that focused on addressing the community's wants and needs. The design is simple, which allows for streamlined ongoing maintenance.

Figure 6.4: Potable and modular water treatment systems, such as the Gilghi system, are now cost-effective



Source: CPS National (2020)⁷²

Change community behaviour

There is an opportunity for state and territory municipal services departments to address how people use water in remote communities, with the goal of reducing demand.

Inappropriate outdoor water use such as hosing roofs to cool buildings or suppress dust is often widespread, with outdoor water use accounting for 60% of total water demand.⁷³

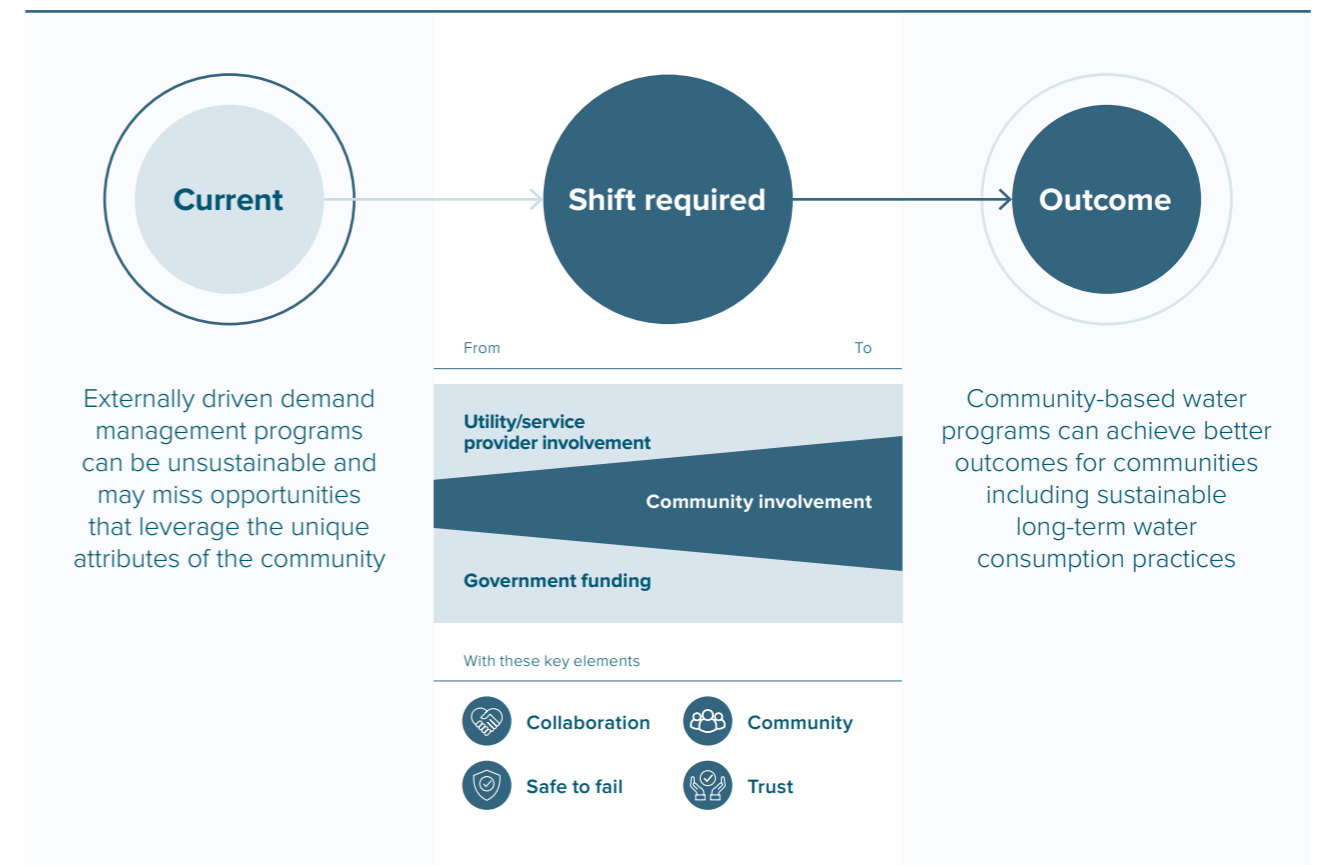
Poor housing infrastructure, harsh environmental conditions and low community knowledge about water security can contribute to high water use.^{74 75}

Municipal services departments should co-develop community-based demand management and water education strategies that target outdoor water use as a priority.

Approaches that consider community dynamics such as preferred language, and incorporate traditional knowledge, practices and values, support effective strategies for delivery. Local community leaders could be engaged to champion education strategies in schools and at community forums.

As shown in **Figure 6.5**, a co-developed approach whereby the community is supported to drive its own demand management programs leads to better long-term outcomes.

Figure 6.5: Achieving better results from a community-based water demand management approach



Source: Based on Beal et. al (2019)⁷⁶



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7

Telecommunications and digital



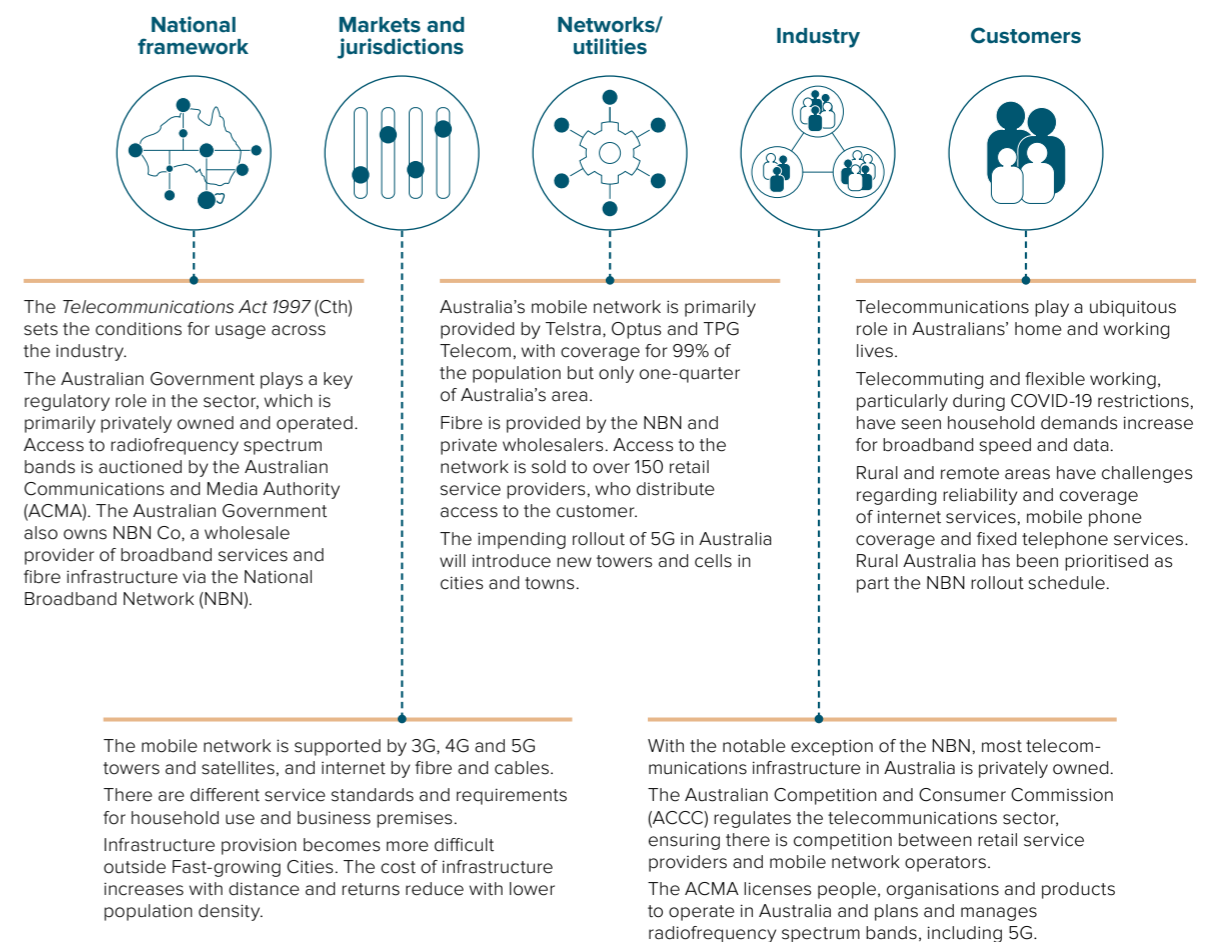
What you will read in this chapter

- **Reform 7.1: Improving the resilience of Australia's telecommunications** – What needs to be done to create a robust digital infrastructure that can cope with risk and sudden change. This reform considers learnings from the bushfire season of 2019–2020 and the COVID-19 pandemic.
- **Reform 7.2: Putting customers at the heart of digital infrastructure** – How to build infrastructure that offers greater levels of equity, value and quality to every Australian. This reform considers the digital inclusion gap, the NBN and the considerable investment needed to improve regional mobile coverage.
- **Reform 7.3: Enabling Australia's digital future** – This reform examines how Australia can seize the existing digital opportunity and fully enable a new generation of technology. It also considers the implications of the sustainable use of data as advanced computing continues to innovate.

Key messages

- As telecommunications and digital services continue to develop, **they are playing an increasingly important role in Australians' everyday lives.** As well as keeping people connected, the national digital infrastructure supports Australia's economy, health system, education, productivity and ability to innovate.
- The COVID-19 pandemic marked a new era in people's relationship with technology. There was a growing reliance on digital services and a huge shift from face-to-face to digital interaction. Australia's digital infrastructure must be resilient enough to **ensure all Australians can get fast, affordable and reliable internet.**
- Before COVID-19 emerged, Australia experienced devastating natural disasters. In 2019 and 2020, many communities were affected by floods and one of the worst bushfire seasons on record. Each emergency made telecommunications services more essential, and sometimes less reliable. These risks underline the need for **more resilient networks and comprehensive back-up options.**
- Being able to access, afford and use digital services is now essential for full participation in society, employment prospects and preserving mental health. However, there is a digital divide, with many Australian households still not effectively online.¹ The *Digital Business Plan*, which was published by the Australian Government in September 2020², should be prioritised as a vehicle for delivering a **national digital strategy and roadmap to make sure every Australian is included.**
- The **reach, speed and reliability of Australia's National Broadband Network (NBN) have improved greatly**, and it kept Australia connected during the pandemic. Despite these improvements, a small number of NBN users on specific access technologies, such as Fibre to the Node and Fixed Wireless, still experience slower data speeds. **NBN Co should continue to prioritise actions that deliver uniform minimum service levels to end customers.**
- The coverage, speed and reliability of mobile and fixed telecommunications in regional and remote Australia have improved because of government subsidies for **regional commercial networks. Many regional sites that cover low-density areas are simply not commercially viable and require partnerships and subsidies to bring a new site online**, but the future of regional mobile funding requires reform. The growing importance of telecommunications and sheer size of Australia make it vital to **find a sustainable regional investment model that supports wider terrestrial mobile coverage.**
- Many **Australian communities, businesses and local economies already benefit from emerging technologies** such as 5G, smart cities and the Internet of Things (IoT). To make the most of these opportunities, there needs to be more awareness of the beneficial use cases, greater investment and closer cooperation between standards bodies, industry and government.

Telecommunications sector overview





Introduction to telecommunications and digital

All Australians deserve access to high-quality telecommunications networks

Over the past 50 years, advances in telecommunications have transformed Australians' lives. Cashless payments, digital collaboration and videoconferencing are used so much that digital connectivity is now essential for everyday life and Australia's economic growth. Technological advances have turned homes into workplaces for millions of Australians.

Access to digital technology is a defining factor in people's ability to connect with friends, family, work and institutions, but there is a large gap across places and groups that must be addressed.

“ Access to digital technology is a defining factor in people's ability to connect with friends, family, work and institutions. ”

COVID-19 highlighted a digital divide

During the COVID-19 pandemic, Australia's digital infrastructure kept most people consistently connected, despite unprecedented network demand.³ Australia's telecommunications providers, regulators and governments acted decisively and effectively to ensure Australia could stay connected during the national lockdown that began in March 2020. At the height of the pandemic in 2020, digital services enabled businesses to continue operating and virtual alternatives to working in the office flourished.

While digital connectivity can unlock economic growth and connect people socially, the pandemic has highlighted significant challenges because of the nation's growing reliance on telecommunications.

Australian Communications Consumer Action Network (ACCAN) research from 2018 indicates over 1 million Australian households could not afford home broadband access.⁴ Other research shows around 4 million Australians lack the ability or confidence to use digital services.⁵ During the lockdown, this affected their everyday lives as they had limited general participation in society.

Regional differences remain

Providing widespread terrestrial mobile coverage to regions is inherently difficult because Australia is so geographically vast. Over 99% of the population can receive a terrestrial mobile signal in their homes and neighbourhoods, but staying connected across Australia's regional places and remote roads remains a challenge.

The pandemic has had a considerable financial impact on the sector for reasons such as lost roaming revenues and accommodating customer hardship.⁶ Also, the ongoing costs of building new 5G networks in areas outside cities and towns mean funding for sites in remote areas is less certain. All levels of government need to consider how base stations in regional areas can be sustainably funded, approved and rented in the long term.

Low Earth orbit satellites

Satellites that circumnavigate the Earth at altitudes of under 1,000 km, making them low enough to support internet connections in remote, rural and wilderness areas.

The recent proliferation of low Earth orbit satellite technology provides an opportunity for additional broadband coverage in many parts of regional Australia. This technology tends to provide services of 50-150 megabytes per second (Mbps) and lower latency (the lag between data being transmitted and received). However, services are highly weather-dependent and can be less reliable than alternative methods.

Cross-sector coordination is vital

NBN Co has responded to Australians' rapidly shifting needs during the pandemic. The recent acceleration in rollout, the mixed technology solution and ongoing upgrades have led to improved coverage, faster internet speeds and more reliability.⁷ Its *2021–2024 Corporate Plan* shows NBN Co's commitment to further improvements.⁸ The priorities include line upgrades that bring the fibre network closer to the home, improving connections in regional Australia and investing in new technologies to deliver ultra-fast speeds to millions of premises. Together, these activities will provide more coverage, faster average speeds, uniform basic service levels and better reliability.

Smart cities

Urban areas that use different sensors and technologies to collect data to improve liveability, sustainability and movement.

Internet of Things

The growing number of devices connected to the internet, from sensors to appliances and wearables, all connected together.

In addition to NBN Co's progress, innovation continues to transform Australia's digital landscape. Digital transformation, 5G and the Internet of Things (IoT) are revolutionising everything from traffic management, environmental impacts and waste management to energy consumption and agribusiness.⁹

At the same time, IoT technology solutions applied in smart cities can use digital technologies to enhance urban services by improving quality and performance and reducing cost and resource use.

With so much changing so fast, there need to be more alignment, coordination and standardisation between the telecommunications sector, other industries and governments. This will avoid wasteful duplication of effort, unlock economy-wide benefits and ensure every Australian can join the digital revolution.

There has been great progress in the past five years

In early 2021, Infrastructure Australia commissioned a report to examine how well the *2016 Australian Infrastructure Plan* had been delivered. It found that in the telecommunications and digital sector there has been considerable progress overall since 2016.¹⁰

“ In the telecommunications and digital sector, there has been considerable progress overall since 2016. ”

Rapid NBN rollout: When NBN Co released its initial progress report in 2016, it had made 2.9 million premises ready to connect and connected 1.1 million premises to the network.¹¹ Once the initial build phase was completed by 30 June 2020, NBN Co achieved its stated targets, with 11.73 million Australian homes and businesses ready to connect and 7.3 million already connected. Six months later, 11.9 million premises were ready to connect and 7.9 million premises were connected.¹²

Improving speeds: As part its *2021–2024 Corporate Plan*, NBN Co announced a \$4.5 billion investment package. It allocated \$3.5 billion to network upgrades, \$700 million to improve business-grade fibre broadband and \$300 million to improve fixed broadband in regional Australia.¹³

Under the plan, the highest NBN wholesale speed tier of up to 1 Gbps will be made available to around 75% of homes and businesses on the fixed-line network by 2023.

NBN Co will enable further upgrades in many communities that are already serviced by Fibre to the Node (FTTN) technology. This will enable customers in these communities to upgrade to a Fibre to the Premises (FTTP) connection allowing them to access faster service speeds when they order a higher-speed plan.

NBN Co expects to extend fibre past around two million FTTN premises by the end of 2023.

It will also invest in newer technologies in its Hybrid Fibre Coaxial (HFC) and Fibre to the Curb (FTTC) networks that will enable premises on these networks to order speeds of up to 1 Gbps.

FTTN: Fibre to the Node

Fibre optic cable is laid to a neighbourhood node then existing copper wiring completes the connection to the premises.

FTTC: Fibre to the Curb

Fibre optic cable is laid to the kerb or driveway then connected to the premises through the copper phone line.

FTTP: Fibre to the Premises

Fibre optic cable runs from the nearest available node directly to the premises.

HFC: Hybrid Fibre Coaxial

Uses the premises' pay-TV or cable network for the NBN connection.

Long-term approach to public ownership: While the NBN has been built, there are no current plans to proceed with privatisation. The government is instead focused on maximising the benefits of the completed infrastructure. Before privatisation can proceed, a number of legislative milestones need to be addressed.¹⁴ They include a Productivity Commission review and report, a Parliamentary Joint Committee examination of that report, and a declaration by the Minister for Finance that conditions are right for a sale. This remains an appropriate approach.

Strengthened community obligations: There have been ongoing enhancements to the Statutory Infrastructure Provider (SIP) regime, which obligates NBN Co and some other fixed broadband wholesale networks to supply services to premises upon request. This approach ensures all premises are connected, regardless of commercial viability. For more information, see **Reform 7.2**.

Better access for regional Australians: There have been major improvements to broadband services in regional Australia as a result of the NBN rollout. Around 73% of premises outside major urban areas can access fixed-line services through a mix of FTTN, FTTP and FTTC services.

The NBN fixed wireless network now comprises 2,200 towers and 13,000 cells, providing coverage to 250,000 km². This is 3% of Australia's total geographic landmass and covers 610,000 premises. To complement this coverage, two Sky Muster satellites cover more than 7 million km², providing access for around 400,000 premises.

The Australian Government has committed \$380 million to the Mobile Black Spot Program to improve mobile coverage across Australia. The first five rounds of this program have generated \$836 million in new investment, funding the delivery of more than 1,200 new base stations across regional, rural and remote parts of the country,¹⁵ providing over 150,000 km² of new handheld mobile coverage. For more information about the program, see **Reform 7.2**.

The Australian Government is also improving digital connectivity in the regions through the Regional Connectivity Program. The Regional Connectivity Program is an important part of government investment in regional telecommunications, providing up to \$83 million in grants to deliver new or upgraded digital connectivity to regional, rural and remote Australians. The funded infrastructure will complement the NBN and the Mobile Black Spot Program by delivering new and improved access to broadband and mobile connectivity in areas of high economic and social value outside the NBN fixed-line footprint.

Further reform in regulation and legislation:

There have been significant legislative and regulatory changes since 2016. The Telecommunications Reform Package and amendments to the *Telecommunications Act 1997* (Cth) have promoted further competition.¹⁶

The SIP regime was established, obliging NBN Co and a number of other infrastructure owners to connect premises to networks, supply wholesale broadband services and (on fixed-line and fixed wireless networks) supply wholesale services that facilitate voice calls.¹⁷

The Package also established the Regional Broadband Scheme to provide sustainable funding for NBN Co's fixed wireless and satellite networks.

Measures announced by the Australian Government in late 2017 and implemented in 2018 have improved the NBN end user experience. They include rules to ensure service continuity when consumers migrate to the NBN and guidance on how industry should advertise broadband speed claims.¹⁸

There is still a digital divide

The *2019 Australian Infrastructure Audit* noted the increasingly central role that telecommunications services are playing in how Australians work, do business and live their everyday lives.¹⁹ It also described the significant economic opportunities for Australia if it further embraces digital services and innovation and the associated risks.

NBN must stay fit for the needs of the nation:

With people using more and more data, it is a priority to build a comprehensive national fast broadband network and continually improve it so it keeps up with the changing needs of society.

It is important to mitigate inherent risks:

Newer digital technologies such as 5G and the IoT are considerable economic opportunities that will support business growth in Australia and lead to more innovation. However, more people using newer technology brings inherent risks. Cybercrime, privacy and data protection are growing concerns. Governments need to fully enable these technologies but also protect both people and businesses against these risks with up-to-date public information, legislation and standards.

Digital inequality must be tackled: Despite improvements delivered by Australian Government programs such as the Mobile Black Spot Program, national studies such as the *2018 Regional Telecoms Review* have reported that some Australian communities, typically in Remote Areas, still have problems with basic access to fixed and mobile services and reliability and repair times.²⁰ The *Australian Digital Inclusion Index* has also highlighted that, while digital inclusion has improved every year, affordability and the ability to use digital services remain key issues in Australian society across several demographics, such as older Australians, people with disability, Aboriginal and Torres Strait Islander peoples and low-income families.²¹

COVID-19 has accelerated digital transformation

The COVID-19 pandemic changed the relationship between Australian society and the telecommunications industry, increasing reliance on telecommunications like never before and accelerating the mix of interactions with businesses and government that take place digitally. It also caused short and long lockdown periods, which have led to widespread remote working and demand surges.²² As a result of these factors, end users are using more data and require plans that deliver faster speeds.

Responding to pandemic challenges and changing user demand patterns, NBN Co has offered more superfast plans and developed a strategic plan that will deliver faster broadband to millions of homes and businesses.

These initiatives are part of the positive overall response by the telecommunications sector, which was vital to Australia's economic performance during the crisis. Telecommunications operators used flexible policies, fast decisions, rapid investment and agile change as they responded to fundamental shifts in the nature of internet usage.

“ The COVID-19 pandemic changed the relationship between Australian society and the telecommunications industry, increasing reliance on telecommunications like never before. ”

This meant the sector was able to address both the unique challenges of lockdown and some of the pre-existing national digital inclusion issues.

Despite some localised network problems and wider issues with customer service operations, the nation stayed connected.

Meeting increased demand

As use of digital technologies has increased and evolved, telecommunications providers have tried to minimise network congestion.

Domestic connections have had to handle combined recreational and home office usage, often simultaneously. This has increased demand on suburban broadband networks. In particular, video and content streaming have surged in the evening 'busy hour' between 7 pm and 11 pm.²³ Data-intensive gamer services have increased sharply, with a national survey indicating 44% of Australians are playing more video games.²⁴

Embracing digital engagement

Lockdowns also led to greater use of online collaboration tools and cloud services, accelerating digital transformation for many businesses. Organisations that had not previously embraced digital engagement with customers and employees quickly developed digital services so they could keep trading.

Similarly, the healthcare and education sectors used modern technologies to continue operating as well as remaining connected to patients and students.

Reacting to decentralised data traffic

In addition to increased data volumes, there have been fundamental changes to data traffic during the pandemic. With millions of people working from home, there has been a shift away from the city centre to the suburbs. Separately, the typical number of simultaneous devices using a single connection has increased. Upgrades to higher-priced plans offering faster speeds have increased the household spend on broadband for many.

Suburban data traffic has gone from mostly passive (downloading and browsing, some streaming) to mostly active (using bandwidth-intensive services such as videoconferencing and high-demand services such as Virtual Private Networks).

All telecommunications networks acted to address the situation in 2020, so there were only isolated examples of local congestion and relatively few complaints to the Telecommunications Industry Ombudsman.²⁵

According to data published by the Ombudsman, the biggest issue for both large and small telecommunications businesses was customer service.²⁶ National lockdowns, particularly in offshore customer service operations, greatly reduced the number of customer service staff.

Many network operators have learned from this experience. They have revised their risk management strategies and decided to move from offshore to onshore customer service models.

Vision: A fully connected and digitally equitable Australian society

For some communities, 2020 marked a clear increase in digital adoption. For others, it highlighted a deep digital divide. The recommendations of the *2021 Australian Infrastructure Plan* will bridge this gap over the next 15 years. The *2021 Plan's* intended goals are simple and bold: To enable every Australian to reach their full digital potential (see **Figure 7.1**).

Figure 7.1: The *2021 Plan's* goals will make Australia more resilient, more equitable and more future-ready



Fully accessible Australia

All homes and businesses in all communities, served by accessible, high-quality fixed and mobile services. All major roads covered by contiguous fast data mobile coverage.

Resilient and reliable

Scalable, reliable, resilient infrastructure able to serve a growing economy in Australia's cities and regions.

Equitable and accessible

A fully bridged digital divide across demographics, closing gaps in affordability, accessibility and the ability to use services.

Future-ready Australia

A digitally built Australia that is a leader in connectivity, embracing innovation in every corner of society.

Confident and secure

Comprehensive protection against the growing concerns of cybercrime, data misuse and privacy breaches.

Executive summary
Introduction
1. Place
2. Sustainability
3. Industry
4. Transport
5. Energy
6. Water
7. Telecommunications and digital
8. Social infrastructure
9. Waste
Methodology and results
Next steps

The 2021 Plan complements other Australian Government planning

Infrastructure Australia is delivering the *2021 Plan* to a telecommunications sector that is changing rapidly and responding to several crises, including the COVID-19 pandemic and natural disasters.

We have not attempted to address issues being covered by the work of other agencies, and acknowledge:

- the *Strengthening Telecommunications Against Natural Disasters (STAND)* package of May 2020
- the Royal Commission into National Natural Disaster Arrangements (September 2020)
- state-level bushfire inquiries such as the NSW Bushfire Inquiry (August 2020)
- ongoing industry regulation work by the Australian Communications and Media Authority (ACMA) and the Australian Competition and Consumer Commission (ACCC)
- the Australian Government's Mobile Black Spot Program, which is focusing on high-priority natural-disaster-prone areas, lower population density areas and regional transport corridors in its latest funding round (Round 5A).

How we developed the Plan for Telecommunications and Digital

The *2021 Plan* was developed collaboratively, in partnership with the Australian Consumer Communications Action Network (ACCAN). We would like to acknowledge and thank ACCAN for its assistance and input.

The *2021 Plan* also responds to the findings of Infrastructure Australia's *2019 Audit* and *Infrastructure beyond COVID-19: A national study on the impacts of the pandemic on Australia* report.²⁷

Acknowledgements

The content of this chapter responds to feedback made through the *2019 Audit* submissions process and stakeholder workshops.

We acknowledge and thank everyone who participated, including the Australian Digital Inclusion Alliance, Australian Competition and Consumer Commission, Communications Alliance, Good Things Foundation, Leep, Better Internet for Rural, Regional and Remote Australia, Internet of Things Alliance Australia and Smart Cities Council of Australia and New Zealand.



7.1 Improving the resilience of Australia's telecommunications

Key messages

- Australia has recently encountered many catastrophic events, including a pandemic, bushfire and floods. These **crises and disasters often affect telecommunications networks**, placing additional demands on them and, in some cases, disrupting their operations.
- With digital services so essential for Australians' everyday lives and the economy, **governments and industry should work together to identify, treat and mitigate network reliability risks**.
- Most **fixed and mobile network operators reacted quickly** to the COVID-19 pandemic. They prevented service disruption by scaling up network capacity, optimising network traffic and activating emergency response plans. As a result, **Australia's digital infrastructure passed a monumental test**. However, we must not rest on our laurels.
- The **frequency, complexity and severity of natural disasters is growing**. In the summer of 2019–2020, Australia experienced the worst bushfire season in recorded history. Regional, rural and remote communities were particularly affected. In a disaster, people rely on essential telecommunications to stay safe and connected, but fires and floods can bring down power and transmission lines, causing mass outages. While it is important to note there is no way of making infrastructure 100% resistant to disruption, **it is imperative to improve the resilience of networks that serve at-risk communities**.



Addressing network resilience to disasters

Australia faced unprecedented compounding crises in 2020. The year brought drought, a devastating bushfire season, floods and a global pandemic. Securing economic and social continuity during these crises highlighted a growing reliance on digital services and their importance to society, and the need for networks that continue to operate under all circumstances.

The pandemic highlighted the clear need for all telecommunications service providers to have professional plans for risk management, capacity and network scalability. In many ways, digital services operated at mostly normal service levels during lockdowns because of service providers' mature approach to risk management and capacity planning. Australians could work from home, continue their education, get medical assistance and buy food and other essential items.

“Australia needs policies and processes that make it easier to restore telecommunications services and support first responders.”

The Communications Alliance has developed a series of guidelines to standardise the telecommunications industry's interactions with emergency service organisations, energy companies and Australian Government agencies.

Providing digital services for everyone is essential

Not every Australian benefited from this digital normality. Before the pandemic, the *2019 Audit* highlighted that lack of digital inclusion is an ongoing issue for many Australians. Access, affordability and the ability to use digital services are key issues across several demographics, including older Australians, people with disability, Aboriginal and Torres Strait Islander peoples and low-income families.

Unfortunately, some people are digitally disadvantaged because they cannot afford services or do not know how to use them. Social isolation has hit these groups particularly hard during the pandemic. This inequity needs to be addressed so everyone has reasonable support during a crisis.

Network resilience and coverage are equally important

Facing compounding crises in a single year emphasised that focusing on network coverage alone is not enough. Resilience across and between assets and networks is essential too. Additionally, further focus on infrastructure interdependencies is crucial, with the majority (89%) of telecommunications outages in 2019–20 caused by power network outages.²⁸

Public Safety Networks need more coverage and capability

The 2019–2020 bushfires highlighted some coverage and capability limitations in Australia's public safety communications networks. There are gaps because of sparse coverage in regional areas and an inability to use data services over traditional two-way digital radio services.

Australia needs policies and processes that make it easier to restore telecommunications services and support first responders. For example, emergency services rely on access to network asset data. The telecommunications industry should provide standardised, aggregated, real-time network incident data to help emergency services and other infrastructure operators respond more quickly and efficiently.

State and territory infrastructure bodies and emergency services should invest further in increasing coverage of Public Safety Networks, with emergency services given the ability to use data services to better deal with emergencies and natural disasters alongside more effective integration between jurisdiction-based systems.

States and territories are currently developing a proof-of-concept trial to use spectrum offered by the Australian Government to provide Public Safety Mobile Broadband for Australia's emergency services.

Investments should also be considered in non-traditional technologies that can provide first responders with the capabilities they need. These include satellite connectivity technologies, 4G technology and low-frequency solutions that can provide 'push-to-talk' capabilities as well as the ability to send and receive packet data.

7.1 Recommendation

Ensure every Australian can rely on digital services by providing transparency of the resilience of Australia's telecommunications infrastructure.

Proposed Sponsor: Department of Infrastructure, Transport, Regional Development and Communications

When this should impact:



Where this should impact:



0-5 7.1.1 Enable emergency services and network operators to better respond to emergencies by classifying telecommunications as an essential service and continue to develop management policies such as infrastructure protection, risk planning and vegetation management.

Proposed lead: Department of Home Affairs
Supported by: State and territory emergency services, telecommunications network operators – fixed and mobile

0-5 Create a clear legislative framework for improved policies and processes for state and territory governments and network operators to plan, manage and provide resilient services by consistently classifying telecommunications as an essential service in state and territory emergency management legislation.

Proposed lead: State and territory Attorneys-General
Supported by: State and territory resilience agencies

0-5 Increase preparedness for dealing with outages caused by natural disasters with clearly defined plans to address power resilience and back-up power for telecommunications sites.

Proposed lead: National Recovery and Resilience Agency
Supported by: State and territory resilience agencies

0-5 Protect communities from lost power and communications outages caused by emergencies, with a roadmap for Australia's energy networks to introduce more power line shielding and line undergrounding in areas at high risk of disaster.

Proposed lead: Critical Infrastructure Centre and Department of Home Affairs

0-5 7.1.2 Empower and educate consumers by providing easy-to-understand information about the reliability and performance of all fixed and mobile networks through a public web portal, with scores available at point of sale.

Proposed lead: Australian Competition and Consumer Commission

0-5 Give consumers and businesses comprehensive, easy-to-understand information about network reliability and other key network features by further improving the Measuring Broadband Australia tool to include more reliability measures and simplifying the format of measurements presented as a grading system.

Proposed lead: Australian Competition and Consumer Commission

0-5 7.1.3 Protect communities from emergencies by developing a comprehensive response and recovery plan, investing in tools, hardware and networks for use by state and territory governments, emergency services and industry.

Proposed lead: State and territory resilience departments

0-5 Protect lives in high-risk bushfire areas with improved cut-through for emergency alert warning system national emergency broadcast messages through the introduction of Emergency Cell Broadcasting across all mobile operators.

Proposed lead: Australian Communications and Media Authority
Supported by: Telecommunications network operators – mobile



0-5 Enable network operators and state and territory emergency services to better respond and make better decisions during emergencies by creating a system that enables two-way, real-time access to emergency data and standardised network asset information.

Proposed lead: Telecommunications network operators – fixed and mobile
Supported by: State and territory emergency services

0-5 Improve resilience and coverage in high-risk areas and along evacuation routes with new investment in programs such as the Mobile Black Spot Program and the Mobile Network Hardening Program. The investment should prioritise improved mobile coverage and mobile network resilience in areas prone to natural disasters such as bushfires.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications
Supported by: Telecommunications network operators – mobile

5-10 Provide emergency services with more coverage and more capability for national public safety networks through a coordinated network expansion plan and capability strategy for improving coverage, capacity and the ability to transmit data.

Proposed lead: State and territory resilience agencies
Supported by: Department of Home Affairs

Measuring progress



Quality

Telecoms as an essential service

Percentage of Australian, state and territory governments that classify telecommunications as an essential service

Target: 100%

Timeframe:



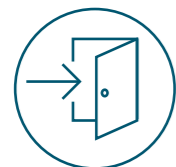
Access

Emergency broadcast

Percentage coverage of Emergency Cell Broadcasting across mobile operators

Target: 100%

Timeframe:



Access

Public Safety Network interoperability

Interoperability of communications for emergency services across jurisdictions

Target: 100%

Timeframe:



Case study: COVID-19 – a lesson in getting things right

Every crisis is a learning opportunity for individuals, organisations and, sometimes, whole industries. It can reveal both weaknesses and strengths. The COVID-19 lockdowns in 2020, which coincided with the end of the NBN rollout, demonstrated that Australia's telecommunications network operators are generally well equipped to respond to a crisis that places significant unforeseen pressure on national networks.

During the initial COVID-19 lockdown in April 2020, demand on the NBN network increased by an average of 71%.²⁹ Videoconference operators reported an 85% rise in adoption rates.³⁰ Australia's telecommunications networks could handle this rapid growth because:

- the NBN had upgraded many areas of the national network with latent capacity to accommodate growth
- all the larger service providers had comprehensive contingency plans, mature capacity planning and the ability to rapidly upgrade transmission network capacity and optimise network traffic.

The NBN was ready

By the time the pandemic hit, 99% of the NBN was complete, allowing almost all households to get a broadband connection. Parallel work on network capacity enabled Australia to conduct the national lockdown without closing down the economy.

Network providers were responsive

At the height of the pandemic, millions of people worked from home, enjoyed at-home digital entertainment, relied more on online shopping and spent more time on data-intensive applications such as gaming.³¹ This placed significant extra demand on all networks.

More importantly, a shift to upstream data usage through Virtual Private Networks (VPNs) and videoconferencing profoundly changed the nature of internet traffic. It created data demand levels in some suburbs that would normally only be seen in a central business district.

Responding to the increased data traffic, major fixed and mobile networks made adequate network capacity available. Major video content providers agreed with NBN Co to reduce video definition for streamed content, which brought the data load for such applications down by 25%.³² NBN Co also took steps to mitigate the impact of extra demand by:³³

- allocating 40% free CVC capacity (network bandwidth that is allocated to each customer of a retailer) to all retail service providers to reduce the risk of congestion without burdening retail service providers with unforeseen extra wholesale costs
- making adequate capacity available where needed to ensure the busiest nodes could cope
- launching a \$150 million financial relief and assistance fund to help customers in hardship.

Due to the comprehensive actions taken by NBN Co and changes to streaming protocols made by major content providers, average downstream speeds improved for most NBN speed tiers.³⁴

In parallel, each of Australia's mobile network operators took a wide range of actions to ensure Australia remained connected. This included data traffic optimisation, emergency capacity upgrades in high-demand areas, debt relief for customers in hardship, and moving maintenance windows to overnight so services for people working from home were not interrupted.

Considering the experience of other countries in responding to COVID-19, Australia may have been digitally well prepared to deal with the pandemic.

Addressing network resilience to disasters

The Australian bushfire season of 2019–2020 was unprecedented in its scale and damage. A Climate Council Study indicated that 14% of the adult population (2.9 million adults) were directly impacted.³⁵

Both mobile and fixed services were affected by widespread fires. There were 888 outages of over four hours and 20,000 NBN services were disrupted.³⁶ While direct fire damage to a site accounted for less than 1% of outage incidents, 88% of extended outages (across fixed and mobile networks) were due to a power supply interruption when, for example, power lines came down (see **Figure 7.2**).³⁷

The subsequent Royal Commission into Natural Disaster Arrangements concluded telecommunications reform should focus on improving resilience, network coverage, recovery policies and the relationships between network operators and emergency services.

Given the expanse of Australia's energy infrastructure in at-risk areas, there is no one single solution to improving resilience overall or providing complete resilience against mass national emergencies.

To improve the resilience of telecommunications networks in at-risk areas, operators and governments need to find ways to work around power failures. In this regard it will be important for the telecommunications and energy sectors to continue to work together to improve the resilience of their respective networks. We note that the energy sector and telecommunications sector have already put in place a memorandum of understanding to further improve cooperation.³⁸

Develop mobile back-up batteries

Networks usually use heavy-duty batteries and liquid fuel generators to provide short-term power.³⁹ However, the logistics of transporting these items was a key issue during the 2019–2020 summer bushfires. Normal routes were blocked and it was difficult to secure escorts from emergency services as they were occupied directly for fighting fires.

The Mobile Network Hardening Program (MNHP) is focusing investment on strengthening back-up power supplies to keep mobile infrastructure operating for longer during these kinds of emergencies.

Stage 1 of the MNHP is providing \$13.2 million in government funding to the three mobile network operators (Telstra, Optus and TPG Telecom) to extend battery back-up at 467 mobile base stations funded under rounds 1 and 2 of the Mobile Black Spot Program. This will ensure at least 12 hours of back-up power in an emergency situation.

Stage 2 of the MNHP will include a new competitive grants program that will fund upgrades to telecommunications infrastructure at priority regional and remote locations. Upgrades under stage 2 could include further back-up power upgrades, increasing resilience in the backhaul transmission network or other measures that harden the mobile network. In addition, round 5A of the Mobile Black Spot Program prioritises a focus on natural disaster-prone areas, such as high-risk bushfire areas.

To improve the resilience of telecommunications networks in at-risk areas, the MNHP should continue to receive investment to cover more high-risk areas. In addition, energy networks should consider funding selective undergrounding of power cables in high-risk corridors.

Case study: Adapting infrastructure to meet bushfire risk

While 10 operational NBN infrastructure sites were directly damaged by bushfires during the summer of 2020, technicians were typically able to restore service within days.

One exception was Mallacoota in Victoria, where the infrastructure was catastrophically damaged. NBN Co rapidly performed extensive undergrounding of the fibre optic line, laying 62 km of cable, ducts, pits and joints.

These efforts not only restored services to over 1,000 premises, they made the network more resilient against future bushfire seasons.

This is a good-practice example for Australia's network operators. All-out undergrounding of cables may be commercially unviable, but selectively targeting key routes and towns that are high risk can provide an affordable solution that improves resilience in the longer term.

Figure 7.2: Telecommunications networks depend on power supply, so when bushfires threaten power lines, communications and other infrastructure can be disrupted



Continue to prioritise community safety during emergencies

Warning Australians of danger and delivering targeted safety information to people in affected areas is crucial for public safety, but it can be challenging during emergencies.

There are several opportunities to improve this situation, some of which are underway and some that should be investigated or actioned.

Improve emergency network capability and coverage

Public Safety Networks are the communications networks that support first responders by allowing them to communicate. They are typically managed at the state or territory level.

One of the biggest is the New South Wales Government Radio Network. This is geographically one of the world's largest trucked radio networks (two-way digital networks used for voice services). It covers around 80% of the population across 266,000 km² — one-third of the total New South Wales landmass.⁴⁰

Both the Royal Commission into Natural Disaster Arrangements and the NSW Bushfire Inquiry found several issues with Public Safety Networks.^{41 42} They included inadequate coverage, lack of redundancy and poor interoperability and protocols across state borders.

The inquiries also highlighted the important role of a Public Safety Mobile Broadband capability so visual and location data can be shared with and by emergency services in real time.

Several witness statements, along with the final report of the Royal Commission, recommended

the Australian Government and state and territory governments expedite delivery of a Public Safety Mobile Broadband capability.⁴³

However, they also cautioned that spectrum asset requirements would be significant and have major commercial value. It is therefore important to examine other alternatives to traditional terrestrial mobile networks that can support data solutions, such as satellite telecommunications.

Broaden messaging options

Australia uses a National Emergency Warning System, which sends SMS emergency warning messages to mobile phones and dials directly to landlines.⁴⁴ Since this system became operational in December 2009, it has been used more than 1,250 times nationally and issued close to 11 million messages. However, the messages may not reach people who only have wi-fi coverage or are in an area of inadequate mobile coverage and where the network is down.

One option is to use broadcast media, such as commercial television and public radio networks such as CB Radio, UHF and VHF radio stations, all of which are widely used in regional areas.

A robust solution could involve planning for and investment in an Emergency Cell Broadcast System, to allow emergency warning messages to be sent to all users regardless of the network they are using.

Emergency Cell Broadcast is an internationally recognised standard and already used in the United States, Japan, New Zealand and Canada. The technology enables authorities to send a message to all mobile phone devices in the vicinity of a mobile tower, regardless of which carrier the device is connected to. Messages would be delivered in seconds and operate despite network congestion.

Figure 7.3: When power and communications lines are down, back-up equipment such as portable generators keep emergency services crews and community members connected



Source: Darrian Traynor/The Age



Use in-field hardware to support resilience

Funding more emergency hardware will make emergency services more effective. It will also help at-risk communities to be more resilient and aid their recovery.

Network operators use a range of temporary solutions during emergencies to make sure network technicians, communities and emergency crews can stay connected:

- **Satellite handsets** have near-universal coverage across Australia so they can be used when normal telecommunications networks are down.
- **Liquid fuel generators and heavy-duty batteries** provide short-term power when traditional power is interrupted (see **Figure 7.3**).

- **Cell on Wheels (CoW)** units are a portable base station that fits on a trailer. They can provide temporary coverage to areas and are portable, cost-effective and quick to assemble. Some take several days to set up; some 'rapid deployment units' can provide coverage very quickly.
- **The NBN-operated Road Muster truck fleet** (see **Figure 7.4**) is made up of large vehicles that are designed for use near evacuation centres, and other rugged vehicles. They can be driven to an emergency area and activated immediately to provide wi-fi and charging points for small devices.

By prioritising and locating this equipment near community evacuation shelters to support resilient network connections, people can stay in touch with each other and keep informed about local conditions.

Figure 7.4: An NBN Road Muster truck provides emergency fixed wireless, wi-fi and device charging



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Classify telecommunications as an essential service

Greater clarity and consistency across policies, processes, vegetation management and access to support resources would help with disaster management. It would enable state and territory emergency services, network operators and local governments to respond to disasters more effectively.

One reform that would help is a consistent approach across Australia to essential service classification.

Currently, essential services tend to be defined in jurisdictional legislation—for example, *Essential Services Act 1988* (New South Wales), *Disaster Management Act 2003* (Queensland) and *Essential Services Commission Act 2001* (Victoria). Across Australia, only Queensland specifies telecommunications as an essential service at state level.⁴⁵

It is true that, during an emergency, telecommunications is generally treated in practice as an essential service. However, during normal conditions, telecommunications infrastructure does not receive the same protection or proactive management as other infrastructure types, such as dry vegetation management or emergency planning. As a result, some maintenance is not carried out to the same standard as it would be if telecommunications were an essential service.

For example, Schedule 3 of the *Telecommunications Act 1997* (Cth) provides telecommunications carriers with the powers to access land and install and maintain certain facilities and provides some immunity from certain state and territory laws when doing so. The Act also permits vegetation removal. However, this right is not used by network operators as much as it could be outside bushfire season, so overgrown vegetation can become an issue. Telecommunications infrastructure is typically situated in geographically and topographically higher areas to maximise coverage, so gaining access to clear the vegetation from towers and lines is difficult, adding to the risk of fire damage.

If all states and territories classified telecommunications as an essential service, the sector could receive specific support and protection from state and territory emergency services to resolve these and other logistical challenges, both before and during an emergency. There could also be a clearer obligation for operators to restore services quickly.

Share network asset information

The Royal Commission into National Natural Disaster Arrangements highlighted the urgent importance for all telecommunications network operators to share key asset information with governments, emergency services and utility providers.

This data helps emergency responders to make critical decisions. However, existing processes for sharing information with emergency responders and other relevant organisations could be improved.

Sharing of basic data assets already occurs. NBN Co has real-time data-sharing agreements in place with all state and territory emergency services; telecommunications providers have their own data-sharing agreements with them. Separately, mobile telecommunications infrastructure asset locations are already available online.

Further enhancements are possible, including making the exchange of data two-way and providing information on the status of outages in real time.

In April 2021, the Australian Government agreed that jurisdictions should work more closely together to develop an intergovernmental data-sharing agreement. The Communications Alliance has developed a set of industry guidelines to standardise the sharing of information with emergency service providers.⁴⁶ The industry should be mandated to implement the guidelines as soon as practically possible.

Other improvements that are being progressed include:

- The National Data Commission and other organisations are working to facilitate data-sharing across jurisdictions.
- The Resilience Data Collective has formed an advisory board to identify, map and connect members to create data-driven insights and bring together platforms and an evidence base to inform investment in resilience projects.
- The Emergency Management Spatial Information Network Australia is building a platform to begin data collection across the ecosystem.
- The Australian Research Data Commons is building bushfire data intelligence infrastructure. This should be adopted, sponsored and developed with open application programming interfaces to provide maximum benefit.



7.2 Putting customers at the heart of digital infrastructure

Key messages

- The National Broadband Network (NBN) is Australia's largest ever telecommunications infrastructure project. By every measure, **the network has improved greatly since its launch, and it has achieved its major milestones.** The latest NBN strategic plan commits to **major further investment over the coming years.** This includes improving data speeds for people with slow or inconsistent service on Fibre to the Node and Fixed Wireless technologies.
- Businesses and consumers connected to the NBN have a direct relationship with one of the many retail service providers in the broadband market. While **retail providers have welcomed several steps by NBN Co to make wholesale pricing more affordable,** the industry has repeatedly called for a **different pricing model,** moving away from the Connectivity Virtual Circuit (CVC) model (the second component of the NBN Co wholesale cost) and towards **lower overall wholesale prices.** Both **large and small retailers in the industry cite process complexity, high wholesale costs and poor network performance as key barriers that erode profitability and customer satisfaction.**
- The regional Mobile Black Spot Program has improved mobile coverage to many hundreds of communities across Australia, **but there are areas in regional and remote Australia where the coverage, quality and reliability of mobile telecommunications services still need to improve.** This issue requires a **strategic approach** by governments and industry to **identify key communities, transport corridors and businesses** that require the improvement of existing terrestrial mobile services or new terrestrial mobile coverage.
- Smartphones play a central role in modern life. Australians tend to embrace the latest digital and telecommunications advances and appreciate the economic and social benefits. **Digital technologies will become even more important in the near future,** with government services, smart wallets, employment opportunities, education and health care all requiring a smart device with a data-enabled connection.
- Despite progress, a digital divide continues to split Australia.** Affordability, digital literacy, accessibility, digital device availability and other obstacles are preventing older Australians, Aboriginal and Torres Strait Islander peoples, people with disability, regional Australians and lower-income families from enjoying the same digital benefits as the rest of society.

Connecting every Australian with high-quality digital infrastructure

Australia's reliance on telecommunications has been growing for many years. As a result, everyday life has changed for most people. Digital tools and services have reached critical mass and are now essential for this country's economic growth and Australians' full participation in modern society.

Each year, billions of dollars are invested to continually improve networks and secure Australia's digital leadership. Despite this investment, many of Australia's most vulnerable groups are failing to enjoy the benefits of digital connection because of barriers to affordability, accessibility and the ability to use digital services.

The Australian Digital Inclusion Association has identified several groups: Older Australians, Aboriginal and Torres Strait Islander peoples, people with disability, lower-income families and people with incomplete basic education.

As technologies keep advancing, and interactions become digital by default, these groups risk being further marginalised. If the Australian Government embraces digital inclusion as a key national strategic priority, it will ensure no Australian is left behind.

The National Broadband Network (NBN) has kept Australia connected during the pandemic. The NBN strategy and ongoing future investment are crucial to building the digital capability that Australia needs to take advantage of accelerating digitalisation.

“Digital tools and services have reached critical mass and are now essential for this country's economic growth and Australians' full participation in modern society.”

There has been extensive investment in building and improving terrestrial mobile coverage in regional, remote and rural Australia. However, given the size of landmass, low-density networks and diverse spread of communities in Australia, there are inevitable economic and practical challenges to providing universal mobile coverage.

A practical strategy is needed that brings focused, sustainable government investment to key objectives, including building community safety, growing remote communities' connectivity and stimulating key regional economic sectors.

7.2 Recommendation

Give Australians improved telecommunications coverage, quality and access by taking strategic actions to improve digital inclusion, regional telecommunications and broadband quality levels.

Proposed sponsor: Department of Infrastructure, Transport, Regional Development and Communications

When this should impact:



Where this should impact:



0-5 **7.2.1 Connect regional Australians by improving the coverage, quality and reliability of telecommunications, through continued government investment in infrastructure outcomes that are not commercially viable in Rural Communities and Remote Areas.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 Empower customers by stipulating clear performance levels for data speed, reliability and key processes such as installation or repair times in the Statutory Infrastructure Provider Regime. The Regime should clarify and publish basic performance levels and ensure these evolve to include specific targets for repair times and service uptime.

Proposed lead: Australian Communications and Media Authority

0-5 Deliver increased mobile coverage to regional communities under a future approach to funding for mobile telephony in regional areas, to succeed the Mobile Black Spot Program after its sixth round.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

10-15 **7.2.2 Reduce the digital divide in Australian society by launching a national digital inclusion strategy and a rolling national study on key affected groups**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 Close the gap in digital inclusion with a national strategy and roadmap for digital access, affordability, ability and accessibility. A national program should drive a clear strategy for inclusion, set objectives, run studies, develop roadmaps and allocate funding to initiatives.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 **7.2.3 Ensure the NBN delivers against the customer needs set out in its Statement of Expectations by continuing to invest in upgrade pathways and ensuring basic performance standards are met for all end users.**

Proposed lead: NBN Co

0-5 Deliver improved coverage, speed and reliability to all Australian broadband customers under a published Minimum NBN Customer Charter that obliges all companies involved in delivering a connection (Statutory Infrastructure Providers and retail service providers) to meet a basic guarantee for the end-to-end customer experience. The Charter should include speed (relative to plan selected), reliability, installation times, repair times and rebates.

Proposed lead: NBN Co

Supported by: Australian Communications and Media Authority

0-5 Ensure NBN end users with slower-performing lines are covered by a prioritised upgrade plan for fixed-line and fixed wireless services, under a published suburb-level plan to upgrade copper lines that are unable to consistently deliver 25 Mbps upstream and 5 Mbps downstream speeds.

Proposed lead: NBN Co

Supported by: Department of Infrastructure, Transport, Regional Development and Communications

Measuring progress



Economic

OECD business use

OECD global ranking in business use of broadband

Target: Top 10

Timeframe:



Economic

National land transport coverage

Percentage coverage of the National Land Transport Network

Target: 100%

Timeframe:



Economic

Mobile economic coverage

Percentage mobile coverage of terrestrial economic activity

Target: 99%

Timeframe:



Social

Digital inclusion

Percentage reduction in the number of Australians not actively online

Target: 50% (1.25M)

Timeframe:



Getting it right in regional Australia

Sparse coverage, slower data speeds, lack of competition, lower reliability and extended repair times are the norm in some regional, rural and remote areas of Australia.

For many years, all levels of government have actively invested in a series of communications infrastructure initiatives to improve regional access and quality.

Under the Mobile Black Spot Program, the Australian Government co-invests with industry to build infrastructure in regional areas where it is not commercially viable for a single telecommunications operator to build a base station. To date, the first five rounds of this program have delivered:

- more than 925 new base stations that would not otherwise have been built
- over 160,000 km² of new and upgraded handheld coverage, including to more than 106,000 premises
- over 242,000 km² of new external antenna coverage
- new mobile coverage for over 8,300 km of major transport routes.⁴⁷

The Australian Government's 2018 *Regional Telecoms Review* has led to further action. As a result of the Review⁴⁸, the Regional Connectivity Program is providing \$83 million of targeted investment in place-based telecommunications infrastructure projects.

The response has also included establishment of the Regional Tech Hub to provide independent advice on telecommunications services for people in regional, rural and remote parts of Australia.

The Australian Government also committed to developing the *Indigenous Digital Inclusion Plan*. The 2021 Regional Telecommunications Review, now underway, will report on opportunities to improve digital inclusion for Aboriginal and Torres Strait Islander communities.

Underpinning these actions, the Universal Service Guarantee obliges NBN Co, other Statutory Infrastructure Providers (SIPs) and Telstra to provide broadband and voice services to all Australian homes and businesses.



The role of the NBN

The NBN rollout is providing broadband services with peak wholesale speeds of at least 25 Mbps in all regional areas through fixed-line, fixed wireless and satellite services. In recent years, there has been a renewed focus on improving both satellite and fixed wireless services in regional areas. There are now 2,200 fixed wireless towers and 13,000 fixed wireless antennas providing coverage for 250,000 km² and two Sky Muster satellites launched in 2015 that cover 7 million km².

NBN Co's new investment plan will provide upgrades to Fibre to the Node (FTTN) services in many regional areas, with FTTN premises unable to access this upgrade eligible for a \$50 million line speed uplift program to improve in-home speeds.

The upgrade plans will provide access to gigabit speeds for all premises on Fibre to the Curb (FTTC) technology in regional areas, and for 85 regional Business Fibre Zones (with \$50 million available to create additional zones across Australia).

NBN Co has also created a \$300 million fund to co-invest with the Australian Government, state and territory governments and councils to deliver access to higher-speed wholesale broadband services over the NBN network to households and businesses in regional and remote areas of Australia.

The fund is expected to assist in transitioning more regional areas from fixed wireless or satellite to fixed-line access technology.

Providing regional infrastructure investment

For mobile operators, building new telecommunications infrastructure in regional and remote areas is sometimes not commercially viable because of low population density and high building costs. As a result, there is a gap in telecommunications network quality between Australia's Fast-growing Cities and regional areas.

While the NBN is able to provide almost every address with a broadband connection, there is still a gap in mobile network coverage, data speeds and infrastructure reliability between cities and the places people live and work in Small Towns, Rural Communities and Remote Areas.

Identify and map priority areas

Access to reliable telecommunications services is more critical than ever for regional communities. Given regional population growth and economic diversification, as well as the increasing risk of bushfires and the COVID-19 pandemic, the need for further investment is crucial.

An evolving approach to the investment mix, investment criteria, partnerships and decisions is needed. The Department of Infrastructure, Transport, Regional Development and Communications, as well as state and territory planning and transport departments, should continue to work with local government and the telecommunications industry to identify priority communities, highways and high-risk areas that require extra coverage.

Remaining candidate areas will become increasingly challenging to fund, so incremental funding, more contributing partners or other alternatives to a traditional funding model are required.

Additionally, it is currently difficult to establish which remote communities have especially poor access to mobile services. Creating a national infrastructure model that tracks the availability of coverage would enable governments, regulators, network operators and non-government organisations to track and better prioritise community investment.

The model should match infrastructure capability to community demographics, identifying and addressing growing service gaps. This approach should focus on isolated settlements, Aboriginal and Torres Strait Islander communities and areas at high risk of natural disaster.

Case study: Mobile Black Spot Program making a difference

Under the Mobile Black Spot Program, the Australian Government co-invests with industry and local government to build infrastructure in regional areas where it is not commercially viable for a single telecommunications operator to build a base station.

The 2018 *Regional Telecoms Review* noted that the Mobile Black Spot Program represents 'the largest and most successful public investment in improving mobile coverage that has ever been undertaken in Australia.'⁴⁹

Leverage the benefits of low Earth orbit satellite technology

Since 2015, NBN Co has operated the Sky Muster satellite service to provide broadband connectivity to regional and remote Australia. It has two satellites in geostationary orbit at an altitude of 35,786 km. The two satellites are located in fixed positions to cover east and west Australia.

These kind of geostationary satellites provide wide coverage and fast speeds, but are associated with slower latency.

In contrast, low Earth orbit satellites operate closer to the Earth's surface, normally at an altitude of 1,000 km or less, and they orbit the Earth at least 11 times a day. The satellites are not in a fixed position relative to the Earth's surface, so it takes hundreds of them to provide full coverage to a nation the size of Australia. This technology is not new — low Earth orbit telecommunications satellites have been in service since the early 1990s.

In recent years, several global companies have begun to invest significant capital in low Earth orbit satellite networks and are now offering commercial services. At present, they come with several drawbacks, such as self-installation, higher monthly costs, variable speeds and intermittent coverage. However, as this technology grows in scale, there is an opportunity to complement existing Sky Muster geostationary assets to address capacity, speed and latency issues.

This opportunity should be considered as part of the NBN's future strategic review on how best to reach remote Australia with satellite technology and inform a strategic roadmap to provide the coverage, speed, reliability and value Australia needs.

Monitor regional transmission services

Transmission (also known as backhaul) refers to high-capacity, dedicated datalinks that carry large volumes of data. These services are supplied by telecommunications network owners to other service providers wishing to carry data traffic between two locations.

The Domestic Transmission Capacity Service is a high-capacity transmission service that enables service providers to provide downstream wholesale and retail services to end users. Some transmission lines are regulated through a regulatory declaration by the Australian Competition and Consumer Commission (ACCC) in force until 2024, when competitive transmission routes will become less regulated than those with only one provider.⁵⁰

In many regional areas, Telstra is the only transmission provider on many routes. Without regulation and competition, they could charge high prices and limit investment in new services.

Adequate and competitive backhaul will become more crucial for the future of the NBN and 5G and for ensuring growing regional communities are well served with telecommunication services. There will need to be ongoing regulation to ensure fair pricing of regional transmission services where there is only one backhaul provider.

ACCC regulation has supported better value and quality. It should be a priority for the Australian Government and state and territory governments to continue monitoring the competitiveness of pricing, reliability and speed of key routes servicing Australia's Smaller Cities and Regional Centres so there is more coverage, quality and choice.

Improve fixed wireless services

NBN Co operates two wireless networks — the fixed wireless and Sky Muster satellite networks. Together, these networks provide essential broadband services to around 8% of premises across Australia where it is impossible to economically provide access to a cable network.

The fixed wireless network is available to around 610,000 premises, of which 350,000 have an active connection. While it has successfully delivered broadband to parts of regional Australia, there have historically been many complaints about its capacity constraints.

As well as spending \$200 million per year on fixed wireless capacity upgrades, NBN Co's \$300 million co-investment fund is helping fixed wireless and satellite premises to transition to fixed-line technology.

NBN Co should continue to upgrade its fixed wireless network capacity to maintain quality ahead of demand and prioritise the conversion of fixed wireless services to a cabled connection in fixed wireless areas.

NBN Co should also extend the fixed wireless network into existing Sky Muster satellite areas where this is technically practical and economically viable.

Increase service levels

The Universal Service Guarantee (USG), which has subsumed the Universal Service Obligation (USO), is a regulated consumer protection regime managed by the Australian Communications and Media Authority (ACMA).

Under their customer service obligations, NBN and other SIP carriers, and Telstra as the USO provider, must provide reasonable access to broadband and voice services to all premises in Australia. As a result, every address must have access to a broadband connection and telephone line on request, regardless of the commercial cost of connection.

The USO and USG provide for access to baseline services across Australia, and NBN coverage is now nearly ubiquitous. However, areas of end user experience such as data speed and an understanding of outages could be further improved with better communications and customer education.

The USO and USG framework has resulted in millions of homes and businesses being connected. In future, there are opportunities to further improve customer protections for regional Australia, addressing the issues identified in the *2018 Regional Telecoms Review*.⁵¹ Protections should cover network service levels such as installation time, repair time and frequency of outages.

Closing the digital divide in key demographics

The Australian Digital Inclusion Index (ADII) highlights that many demographic groups are being left behind in Australia's digital evolution. While the divide has narrowed, there are still many parts of society that cannot take advantage of the educational, health, social and financial benefits of being connected.⁵²

The Australian Digital Inclusion Alliance (ADIA)⁵³ defines being digitally included as:

- having **affordable access** (connection and a device) to **high-quality internet**

- being able to use the internet in an **accessible** way, whether the person is living with disability, from a culturally or linguistically diverse background, or has other special needs
- having the **ability, skills and confidence** to complete tasks on, and benefit from, the internet.

The COVID-19 pandemic accelerated the pace and urgency of investment in digital transformation as people's reliance on digital services became more important than ever. The shutdown of schools, businesses and retail services across the country created a rapid shift to digital services for everyday needs (see **Figure 7.5**).

The telecommunications sector responded with comprehensive actions to ensure digitally disadvantaged populations could afford to stay online. In April 2020, all major telecommunications providers agreed to comprehensive hardship principles to provide extra relief to consumers and businesses in financial hardship.⁵⁴ In addition, NBN Co provided a hardship fund of \$150 million to help ensure internet service providers could connect low-income families with home schooling and assist households and businesses facing financial hardship.⁵⁵

The pandemic drove a scale of digital transformation in months that would normally occur over many years.⁵⁶ For many communities, this was a clear turning point in digital adoption. For others, it revealed a wide digital gap that must be closed.

Figure 7.5: Almost all Australian children studied from home in 2020, increasing suburban demand for digital services



Address affordability

Not being able to afford telecommunications services is a key challenge. For some households it was made worse by the impact of lockdowns on businesses and jobs.

Overall, the cost and affordability of telecommunications services has improved, as services in real terms have become far more affordable. Australian Bureau of Statistics Consumer Price Index (CPI) data shows telecommunications prices have fallen 14% since 2000, while the CPI overall has increased by 68%.⁵⁷ By comparison, the cost of food has increased by 63%, energy costs have doubled, and the cost of health care has gone up by 134%.

Telecommunications pricing trends are partly due to high levels of competition across fixed and mobile markets. Another factor has been the NBN Co's introduction of lower-cost, entry-level broadband services to ensure low-income families and people with simple connectivity requirements could still get access. There has also been an overall decrease in NBN wholesale prices.

Conversely, some households are now spending more money on internet services because they are having to buy more data.⁵⁸

Other research shows a widening gap in affordability between the lowest-income and highest-income segments, according to the Australian Communications Consumer Action Network (ACCAN).⁵⁹ While the average household spends 3.5% of disposable income on communications, the lowest income decile spends around 10%. The ADII shows the proportion of household income spent on internet access by those living in the lowest household income quintile has increased every year since 2014.⁶⁰

The Australian Government currently offers the telephone allowance, a quarterly payment to help with phone and internet costs.⁶¹ This provides a safety net to recipients of certain government payments.

“ While the average household spends 3.5% of disposable income on communications, the lowest income decile spends around 10%. ”

While competition remains the most effective way to deliver good value to the market, the Department of Infrastructure, Transport, Regional Development and Communications should monitor entry-level pricing of broadband services to ensure families on a tight budget can get online and stay online.

Focus on disadvantaged groups

The ADII reveals that some key groups remain particularly digitally disadvantaged and score low in the Index:⁶²

- **Mobile-only users** are the most digitally excluded group.
- **Older Australians** are the least digitally included age group, impeding their lifelong learning and increasing their isolation.
- For **people with disability**, accessibility and ease of use are key barriers to full use of digital services.
- Australia's **lowest-income families** score 40 points below the highest-income group for digital inclusion.
- **Remote Aboriginal and Torres Strait Islander peoples** are isolated geographically and can be socio-economically disadvantaged. These remote communities risk being digitally left behind. They continue to record lower ADII affordability scores than the general Australian population and typically pay more for each unit of data because of their remote location.

During the COVID-19 lockdowns, children and young people have been especially disadvantaged if they cannot not use online tools to connect with their peers, teachers and lessons. Previously, schools were able to rely on hard-copy lessons or USB sticks as an option for such students. Drawing on the last Census (2016), the Australian Education Union has highlighted that about 125,000 (approximately 5%) of public school students do not have home internet access.⁶³

There have been many successful initiatives to improve digital inclusion, particularly around accessibility standards and community learning. However, the increased importance of being able to get online means digital inclusion now requires a national strategic approach that is owned at a high level within the Australian Government. This strategy should look at creating programs for each demographic group that improves accessibility, affordability and ability to use digital services. Only then will all Australians be digital equals.

Including everyone in Australia's National Broadband Network

Following the completion of the initial build phase of the NBN on 30 June 2020, the Australian Government declared the NBN should be treated as being built and fully operational in December 2020. Its progress was evaluated against many predefined criteria, with 99% (11.9 million) of Australian premises ready to connect.

The NBN has progressed significantly in recent years, with coverage, speed and reliability all improving:

- In 2016, just 16% of users had a download speed of over 50 Mbps. This had increased to over 90% by early 2021.
- Bandwidth congestion during busy hours has come down. Most retailers now report average speeds exceeding 80% of the plan maximum.
- While affordability remains an issue for many low-income Australians, NBN wholesale costs have reduced,⁶⁴ with the effective price per gigabit falling from 33 cents in 2016 to 15 cents in early 2021. This is creating value and competition in the market at a time when costs for other utilities continue to increase.

Today, 3.9 million premises that are ready to connect have yet to do so, and a further 17,000 premises are flagged as not yet ready to connect as they are properties with complex installation needs.⁶⁵

“ The increased importance of being able to get online means digital inclusion now requires a national strategic approach that is owned at a high level within the Australian Government. ”

The NBN has become the bedrock of Australia's ability to create a fixed telecommunications market that offers everyone access, value, choice and quality. Now it is operational, it is important to focus on delivering consistent speed and reliability for those Australians who still have connection issues, so it truly is a network for everyone.

There are a growing number of options to help improve and address gaps in regional coverage. The NBN Co should plan strategically and build partnerships with third parties to maximise coverage, reliability and speed in remote areas.

Address slower performing connections

As at mid-2021, some customers with slower performing connections are unable to receive speeds of 25 Mbps.⁶⁶ They are usually those connected to the network by FTTN technology. FTTN uses copper wires to connect the 'last mile' between a broadband node and the premises. Some of the copper can be particularly old, or the links especially long. The average line is around 450 m long, but the further away from the node a user is, the slower their connection because of attenuation (reducing signal amplitude over longer distances). Speeds tend to particularly reduce on copper lines over 1,000 m long.

By contrast, FTTC tends to deliver faster and more consistent speeds with greater reliability than FTTN.⁶⁷ There is a simple upgrade pathway from FTTN to FTTC that involves relocating optical fibre closer to the boundary of the premises than the road. This still involves considerable civil works and cost but is faster, simpler and less expensive than an FTTP upgrade.

An ongoing NBN program focuses on especially damaged, old or long copper lines. Either they are replaced or the network connection is brought closer to the customer's home using FTTP or FTTC technology. These line upgrades provide immediate and transformative improvements to connection speeds.

Closing ADSL legacy lines can improve low speeds

As of April 2021, 90% of NBN fixed-line services could achieve download speeds of 50 Mbps. However, a small number of connections (less than 2%) are not yet capable of normal speeds of 25 Mbps during off-peak times.

In most cases, this is because some NBN lines still must support both NBN technology (such as FTTN) and legacy ADSL technology on the same line. To avoid interference to legacy services, NBN has had to temporarily reduce the power levels used to transmit signals on these copper lines.⁶⁸

As more ADSL services are phased out over 2021 and 2022, the speed of more lines will improve.

Ensuring equality as technology advances

In September 2020 NBN Co announced a new \$4.5 billion strategy for the next stage of network growth.

Around \$3.5 billion will pay for 2 million homes to upgrade from FTTN to FTTP technology by the end of 2023. The upgrade program is being led by customer demand, so users have the option to request a high-speed connection.

The investment also announced a further \$400 million for Hybrid Fibre Coaxial (HFC) capacity upgrades and \$100 million for FTTC upgrades that will enable access to NBN Co's higher-speed plans before premises are connected directly to fibre.

A further \$50 million will be spent on improving speeds for customers on FTTN connections. In addition, \$700 million has been allocated to business broadband upgrades, and \$300 million to improve broadband access and quality in regional areas.

Given the new strategy and accompanying roadmap and policies, there is a sufficient upgrade pathway to high-speed broadband for businesses and consumers that want it, as long as the current momentum of investment keeps up with user demand and data growth each year.

NBN Co has increased the transparency of its operating performance, particularly during the COVID-19 pandemic. Continuing to be open about its plans, objectives and targets will help ensure it delivers against public interest objectives and that the project remains on track.

Realise the potential of emerging technologies

Emergent, innovative technologies are critical to the future of the NBN.

G.fast is an innovation for NBN connections that rely on shorter lengths of copper. It can deliver ultra-fast speeds on existing copper lines that are relatively short without requiring a full FTTP upgrade.

Data Over Cable Service Interface Specification Standard (DOCSIS) is a global standard that enables high-bandwidth data transfer by doubling the downstream capacity of lines on existing HFC networks. NBN Co has begun rolling out DOCSIS 3.0 across selected HFC lines that can support it. It already serves around 3 million premises across the country.

These technologies offer an affordable route for delivering super-fast speeds to many millions of Australians quickly. Their rollout and investment should be prioritised by NBN Co.

Harness regulation and competition to deliver choice and value

A competitive market across the wholesale and retail sectors is critical.

The ACCC should continue to ensure a competitive regulatory environment across the wholesale and retail broadband markets, with an increased focus on wholesale costs, viable competition and good value across Australia's broadband market.

Mitigate supply chain risks

The supply chain for digital network termination devices was briefly interrupted in February 2021 following a global shortage of a particular chip set. This forced NBN to pause HFC connections.

Also, the global supply chain for telecommunications labour and equipment has been heavily disrupted by the COVID-19 pandemic at a time when the demand for new equipment and specialist labour is very high.

These challenges present strategic risks and illustrate how all network operators should be doing more to mitigate global supply chain risks and equipment shortages. Australia's 5G mobile network operators are particularly vulnerable, with a small number of high-tech hardware suppliers catering to the needs of many hundreds of technology companies worldwide.

The Department of Infrastructure, Transport, Regional Development and Communications should work with the telecommunications industry to identify and mitigate the risks of low supply chain resilience.

Prioritise locations that need the most focus

With many more FTTP services being converted to FTTP, line upgrades should be prioritised according to quality of service and community needs. Suburbs with extensive coexistence, slower speeds and extended runs of copper should be top of the list.

Developing a similar approach for regional fixed wireless areas with slow speed or congestion issues, allowing more locations to be upgraded to cabled connections where this is practically possible and economically viable, should be a priority.

Making information about ADSL shutdowns, upgrade pathways and associated investments (broken down by suburb) publicly available would demonstrate NBN Co's transparency, promote choice and build trust with customers, users and other stakeholders.

Simplify the NBN customer experience

A wholesale-based national broadband network with a multi-technology mix is a complex undertaking. The NBN ecosystem is made up of more than 150 retail service providers, and hundreds of technicians work to deliver different access technologies using multiple modem models.

With such a huge undertaking, there are always opportunities to improve the end-to-end customer experience with better alignment, processes and customer communications.

Provide helpful customer education

Despite its scale and complexity, only a small number of connection investigations find a technical NBN line fault. There is usually a simple explanation. Sometimes the user's NBN plan is inadequate, or the modem is faulty or inadequate for the property or customer usage.

More education would go a long way towards reducing customer dissatisfaction when there is a perceived fault. The whole industry must work together on this. The goal would be to better educate customers using easy-to-understand communications that simplify the technology and improve troubleshooting.

Introduce service levels for repairs and installations

The Department of Infrastructure, Transport, Regional Development and Communications has proposed standards, rules and benchmarks for SIPs, the telecommunications carriers that provide wholesale broadband services such as NBN.

“With such a huge undertaking, there are always opportunities to improve the end-to-end customer experience with better alignment, processes and customer communications.”

The proposed rules relate to timeframes for connections, repairs and appointments, and address speeds, remediation and rebates. They are a significant step forward in ensuring telecommunications services are reliable, regardless of where a consumer lives.

Multiple companies are involved in most customer touchpoints with the NBN. Misalignment between the wholesaler, third party technicians and retailers is a frequent cause for complaints. Rules should promote the alignment of all parties, obliging retailers and wholesaler to deliver together for the end user.



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7.3 Enabling Australia's digital future

Key messages

- **Individuals, businesses and local economies are starting to benefit from 5G**, which is already live in 100 Australian cities and towns. More than 75% of Australia's population have access to at least one 5G network.
- **5G will power new industries and enable many new features.** These include faster speed, a greater number of devices in any given area, ultra-low latency (the time it takes for data to travel between user and the target destination) and ultra-high reliability.
- To create a comprehensive and competitive 5G landscape, **the cost of building new telecommunications base stations needs to be sustainable.** The most significant costs are hardware, site rental (frequently on public land) and spectrum licenses. More can be done to ensure costs are reasonable both for spectrum and for renting sites on public property.
- **Smart infrastructure is more efficient, lower-cost and better maintained.** 'Collecting, communicating and crunching' related data in Australia's cities and regions is the basis of a smart nation vision that can build prosperity.
- The data universe is doubling in size every two years. Quintillions of bytes of data are generated every day. **Innovations such as the Internet of Things, 5G and artificial intelligence are bringing new business opportunities and economic growth.**
- The **increasing collection and processing of a growing amount of personal data present multiple risks.** They include data misuse, invasion of privacy and ethical concerns such as algorithmic bias.⁶⁹ To protect consumers, there should be industry codes that encourage responsible application of solutions and regular updates to privacy legislation.
- **Australia's Internet of Things (IoT) infrastructure is evolving into a dynamic ecosystem.** Many different technologies complement many different uses. The technology is transformative and growing fast but needs to be better supported by spectrum, standards, interoperability and regulation.
- Digital innovation can support the better maintenance, optimised productivity and lower-cost operation of Australian infrastructure across all sectors. Shaping and accelerating ongoing investment in new and emerging technologies is now critical. Digital technology is not yet the default application for every new Australian infrastructure project. To maximise its benefits, there must be **clearer ownership, adoption of standards, industry alignment and effective governance for infrastructure data.**

Government needs to fully support innovation

The telecommunications and digital sector is dynamic, innovative and has undergone dramatic change over the past decade.

Digitalisation has been behind step-changes in many industries, including education, health, tourism, research, transport and manufacturing.

Actively supporting digital innovation is a significant opportunity to boost Australia's productivity. Neglecting this could lead to less effective standards, industry's misaligned application of these standards, and reduced competition.

On the other hand, over-regulation could stifle innovation, cause delays and deter investors.

Governments need to optimise levels of support, regulation, alignment and coordination.

Getting this right will help bring a new generation of technologies to life and ensure access for Australia's citizens and businesses to transformative digital opportunities.

Reforms enabling Australia's digital future are also addressed in the **Industry productivity and innovation chapter.**

7.3 Recommendation

Fully realise the digital economic dividend by better enabling emerging technologies such as 5G, the Internet of Things and smart cities across Australia through regulation, investment and coordination.

Proposed sponsor: Australian Communications and Media Authority

When this should impact:



Where this should impact:



5-10 **7.3.1 Ensure Australian communities and businesses can rapidly access competitive, sustainable and contiguous 5G coverage in urban centres across Australia by increasing spectrum flexibility, ensuring sustainable pricing and simplifying planning processes.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Enable maximum contiguous coverage of Australia's emergent 5G networks by creating more affordable ways for network operators to locate 5G small cells on public assets (such as street furniture, public buildings and road trenches) in a way that resembles the arrangements made for other major utilities, with nominal or zero rental costs and wider facility-sharing of public infrastructure.

Proposed lead: state and territory planning departments

Supported by: State and territory transport departments, local governments

0-5 Provide communities with commercially viable, unobtrusive and contiguous coverage across Australia's suburbs by encouraging local governments to build telecommunications towers and poles (for network operators to mount small cells) for the public good in key suburbs and precincts.

Proposed lead: State and territory planning departments

Supported by: Local governments

0-5 Facilitate the introduction of 5G to regional areas by giving flexibility to operators to utilise any low-band spectrum to roll out 5G coverage in these areas.

Proposed lead: Australian Communications and Media Authority

0-5 Consider adding the adoption of 5G technology to the evaluation criteria for regional Mobile Black Spot Program funding applications.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Increase access to choice in connectivity for mobile and smart applications by accelerating the rollout of Open Radio Area Network technology, including by prioritising this technology in regional connectivity programs and 5G pilot programs.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

5-10 **7.3.2 Improve the sustainability, liveability and efficiency of Australian communities by adopting a strategic approach to smart cities and the Internet of Things that facilitates investment and enables scalable projects.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australian Communications and Media Authority

Executive summary
Introduction
1. Place
2. Sustainability
3. Industry
4. Transport
5. Energy
6. Water
7. Telecommunications and digital
8. Social infrastructure
9. Waste
Methodology and results
Next steps

0-5 Enable a smart infrastructure step-change by adopting best-practice policies that reduce friction and increase interoperability at a place level, including policies addressing:

- shared applications
- systems and processes
- capabilities
- data exchange, storage and federation.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Local governments, state and territory planning departments

0-5 Accelerate the delivery of smart places through a refresh of the Smart Cities and Suburbs Program to focus on co-funding high initial cost, yet scalable, regional initiatives that align with the national digital infrastructure roadmap.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: State and territory planning departments

5-10 **7.3.3 Protect and educate all corners of society to become more digitally confident as new technology continues to evolve, with the launch of national initiatives addressing health concerns, data privacy, technology risks, cybercrime and digital confidence.**

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australian Cyber Security Centre

5-10 Ensure the Australian Privacy Principles are ready to deal with an entirely new generation of processing capabilities, with a review of the *Privacy Act 1988* (Cth) to consider the risks presented by artificial intelligence, quantum computing and machine learning.

Proposed lead: State and territory Attorneys-General

Supported by: Office of the Australian Information Commissioner

0-5 Protect the public from misinformation and cyber risks by investing in public education and communication programs addressing 5G health concerns, data privacy, technology risks and cybercrime. The engagement should extend previously successful public education and engagement campaigns around digital innovation.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Australian Communications and Media Authority, Australian Radiation Protection and Nuclear Safety Agency, Department of Health, Office of the Australian Information Commissioner

Measuring progress



Access

5G coverage

Coverage of 5G across Fast-growing Cities, Smaller Cities and Regional Centres by at least one provider

Target: 95%

Timeframe: 0-5 5-10 **10-15** 15+



Economic

Knowledge investment

Investment in knowledge-based capital as a share of GDP (UN Sustainable Development Goal 9.5.2)

Target: 3.96%

Timeframe: 0-5 5-10 **10-15** 15+



Economic

OECD computer problem-solving

Percentage of adult population that has level 1 capabilities in computer problem solving in technology-rich environments (UN Sustainable Development Goal 9.5.2)⁷⁰

Target: Above OECD average rates

Timeframe: 0-5 5-10 **10-15** 15+

Australia is ready for a 5G-led transformation

Next-generation mobile technology (5G) offers substantial improvements in mobile network speed, latency and reliability. It also supports having more devices simultaneously using the same cell.

This will be an enabler of an Internet of Things (IoT) ecosystem where networks can cost-effectively serve billions of connected devices with an optimal mix of speed, capacity and latency.

Machine learning

Applications that can find and apply patterns in massive amounts of data.

Digital twin

A digital manifestation of a physical asset.

Internet of Things (IoT)

The interconnection, via the internet, of computing devices embedded in everyday objects, enabling them to send and receive data.

Artificial Intelligence (AI)

Simulation of human intelligence in machines that are programmed to think like humans.

5G relies on more spectrum becoming available and an extensive network of base stations. Its real benefits will only be realised if industry and government simultaneously embrace and enable complementary technologies.

These include the Internet of Things, artificial intelligence, machine learning, digital twins and advanced analytical capabilities.

Benefits go beyond speed

The true benefits and advantages of 5G are not always well articulated. While 5G does enable ultra-high-speed data downloads, most transformative use cases for 5G are not consumer facing. Advertised speed claims will make little difference to the average mobile phone user undertaking everyday internet browsing or video streaming.

The real power of Australia's 5G network will be in delivering the greater capacity, reliability and lower latency that enable new technologies to transform Australian industries. For example:

- **Enhanced mobile broadband (eMBB):** Mobile broadband over 5G enables very large volumes of data transfer at extremely fast speeds, with data typically exchanged using mobile phones, tablets and mobile broadband connections.

- **Ultra-reliable low-latency communication (URLLC):** URLLC exploits the low latency and high reliability of 5G. It supports sectors such as robotics, remote surgery, remote emergency response management, connected vehicles and augmented reality.
- **Massive machine-to-machine communications (mMTC), also known as massive Machine-Type Communications:** Commonly associated with the enhanced IoT, the focus of mMTC is on providing connectivity to many millions of simple narrow-bandwidth devices that infrequently send or receive small volumes of data. Common use cases include low-cost sensors, meters, actuators, trackers and wearables.
- **Smart vehicles, roads and traffic management:** A connected intelligent transport system allows vehicles to communicate with other vehicles, traffic signals and roadside infrastructure to share real-time, safety-related warnings. Other uses with simple data needs (such as traffic signal management) can also be enabled by 5G because of the extra reliability.
- **Smart agriculture:** The extensive capacity of 5G allows for the automation of tractors, livestock sensors, soil monitors and water controls. Agribusinesses are using multiple sensors and machine learning to practise precision farming, which optimises irrigation and maximises yields.
- **Smart mining:** 5G is creating safer, more efficient and more productive mining. The extended connectivity enables advanced AI capabilities that are providing miners with 3D visualisation, managing automated vehicles, operating robots and removing humans from potentially hazardous situations.

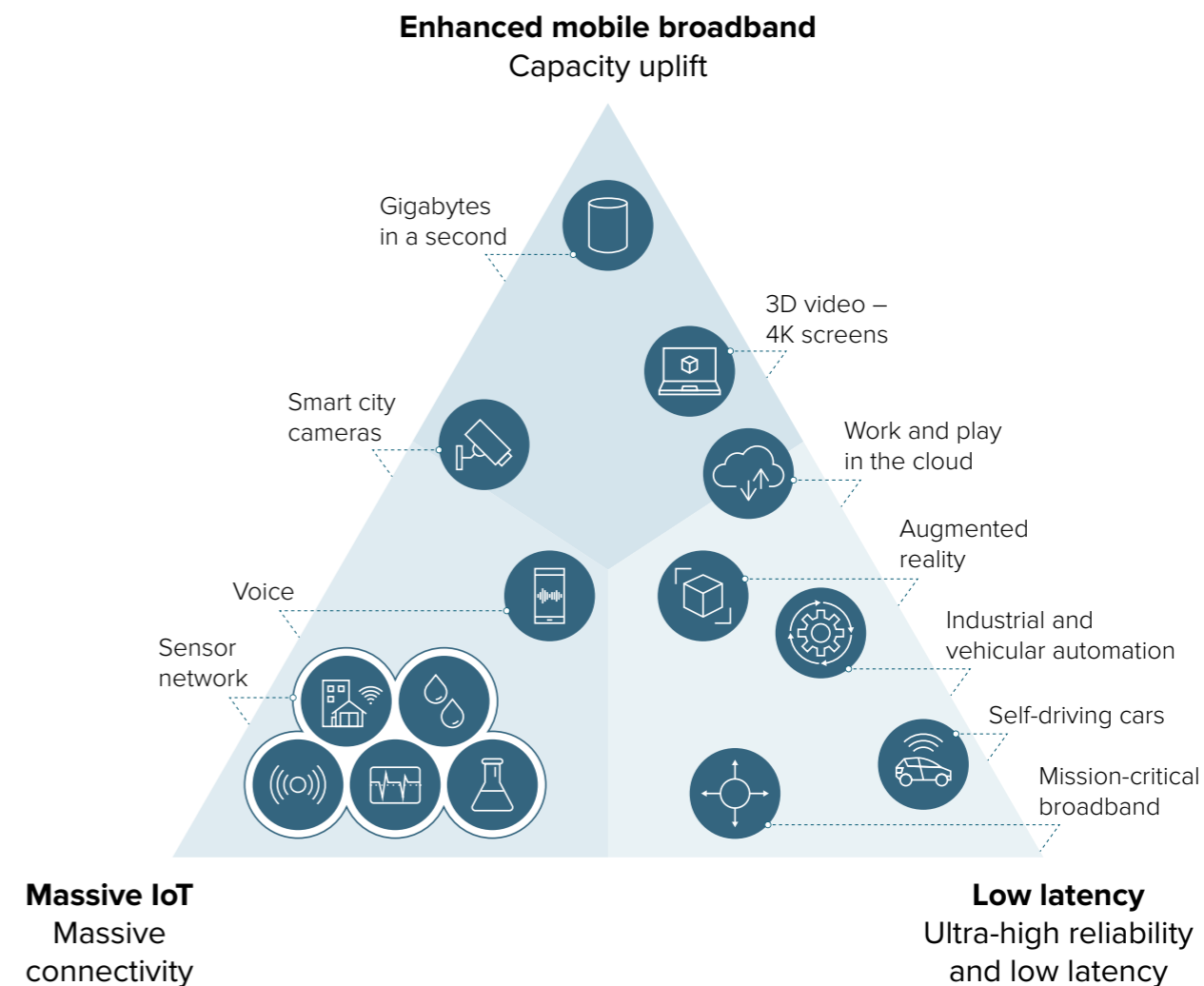
Establishing a nationwide 5G ecosystem (see **Figure 7.6**) that supports high-impact new technologies such as the IoT is a significant economic opportunity. Modelling from 2018 shows 5G technology could yield a productivity benefit of 0.2% each year, equating to more than \$50 billion in the first decade.⁷¹

With the potential to generate such a positive national economic effect, Australia needs to seize and fully enable 5G.

There was a step towards this goal in September 2020, when the Department of Infrastructure, Transport, Regional Development and Communications announced the Australian 5G Innovation Initiative. This open, competitive grants program is helping businesses to test and develop 5G uses, products and IoT applications.

While funding is important to meet Australia's 5G's aspirations, it is only part of the role that governments must play.

Figure 7.6: 5G Ultra-reliable low latency communication (URLLC) is a feature of the IoT ecosystem targeted at services like traffic control or remote control, which require both high reliability and low latency



Source: Qorvo (2021)⁷²



Ensuring 5G reaches its full potential in Australia

5G will require more sites than 2G, 3G or 4G because the radio spectrum used for 5G in metropolitan areas is generally higher frequency and less able to travel long distances than that used for earlier generations. 5G can be combined with other technologies such as 'edge computing' to deliver its potential. Edge computing is a distributed computing framework that brings enterprise applications closer to data sources (such as IoT devices or local edge servers), delivering faster insights, improved response times and better bandwidth availability.

Lower frequencies are generally good for coverage, but not speed. Higher frequencies are generally good for speed, but not coverage. As illustrated in **Figure 7.7**, networks need a mix of three frequency bands to offer users the best possible 5G experience across all places in Australia.

- **Low-band 5G** uses frequencies under 1 GHz. It provides wide-area coverage, excellent indoor coverage and is ideal for regional areas, although it offers little speed improvement compared to 4G. ACMA is reallocating the 850–900 MHz band for 5G use in 2021. Spectrum in the 700 MHz band

is also available to mobile network operators for 5G and Telstra has announced its intention to roll out low-band 5G on this frequency. Additionally, the Australian Government's *2020 Media Reform Green Paper* proposes a pathway for television broadcasters to operate using less radio frequency spectrum, enabling the release of spectrum in the 600 MHz band.⁷³

- **Mid-band 5G** (Sub-6) uses frequencies between 1 GHz and 6 GHz. Its frequencies are slightly higher than 4G and are a trade-off between coverage and speed. The 3.6 GHz band, which was auctioned and allocated in 2018, is optimal for general metropolitan and suburban use. The Australian Government is also working to improve arrangements in the 3.4 GHz band that will make it more suitable for 5G.
- **High-band 5G** (mmWave) uses frequencies higher than 6 GHz. It provides ultra-fast speeds but can only bring coverage to shorter distances and has difficulty penetrating walls. This frequency is used mostly to cover high-density urban and central business district areas. The 26 GHz band will be made available to industry in 2021.

Encourage infrastructure sharing

Initially, 5G areas are being created by upgrading existing telecommunications sites. However, the nature of 5G (particularly for mmWave in metropolitan areas) means each network will need to build many more base stations to provide deep coverage.

The number of small cells that will be needed to fully deploy 5G will be considerable, with Optus noting in a Parliamentary submission that to offer 1 Gbps speeds, cells would have to be around 200 to 300 m apart.⁷⁴

Mobile network operators are obliged to offer access to transmission towers, tower sites and eligible underground facilities to other network operators under the ACCC's Facilities Access Code (FAC). However, for commercial operators to make these assets available, the commercial case for other uses must be clear. The cost and rollout speed of small cell deployment can be significantly reduced if three players share the same infrastructure.⁷⁵







Physical access will have a diminishing importance as alternative solutions, such as Open Radio Area Network (Open RAN), become more widely adopted. The potential benefits extend beyond cost. Sharing

means less installation of excessive equipment, reducing urban disruption and minimising visual pollution.

Other countries, including geographically smaller countries such as the United Kingdom, offer several examples of well-established network-sharing agreements, between very large network operators, that have expedited 4G and 5G network rollout and reduced costs for operators and customers without compromising competition. The case for both passive and active asset sharing has never been stronger.

Australia's mobile telephony market is highly competitive and has delivered world-class levels of coverage, speed, innovation and value. The substantial investment needed to deliver 5G infrastructure presents the risk that only one dominant provider, such as Telstra, will be able to profitably build a truly national 5G network. Greater incentives and standardised processes for sharing infrastructure would lead to a faster 5G rollout, comprehensive 5G coverage and more choice, ultimately creating better value for users.

Figure 7.7: Networks need a mix of all three bands to offer the best possible 5G experience

	Low-band 5G 'Blanket' range	Mid-band 5G Sub 6 range	High-band 5G mmWave range
 Spectrum used in Australia	850 MHz / 900 MHz	3.6 GHz	26 GHz
 Sites required to fully cover a typical suburb with 5G	A couple Big, macro sites	A few Mix of macro sites and small cells	A few dozen A couple of macro sites and many small cells
 Maximum reach	A few kilometres	Up to a kilometre	A few hundred metres
 Coverage and wall penetration	Great Excellent propagation	Good Gets through walls	Poor Struggles to penetrate brick walls
 Maximum speeds and latency	Fast Similar to 4G	Faster About 5–10 times faster than 4G	Lightning fast Up to 20–30 times faster than 4G
 Ideal areas for deployment	Outer metro and regional	Metro and suburban	High-density urban and CBDs



Make spectrum flexible and affordable

Lack of easy, timely access to affordable spectrum will limit how much the telecommunications sector can expand network capacity to accommodate Australia's growing data demand. It will also stifle competition in the telecommunications market. The volume of Australian data download traffic grew 38% between 2019 and 2020. Even if this reflects the exceptional demand driven by the pandemic, such growth rates are not unusual.⁷⁶

“To cope with such a huge increase in data volume, Australia needs an assured and long-term pipeline for radio spectrum, the raw material for mobile communications.”

To cope with such a huge increase in data volume, Australia needs an assured and long-term pipeline for radio spectrum, the raw material for mobile communications. As a natural, finite resource, spectrum is becoming scarcer and more in demand.

The Australian Mobile Telecommunications Association (AMTA) estimates that, after current auctions of high-frequency mmWave spectrum end, all mobile operators will still need more of each spectrum band.⁷⁷

In December 2020, the Australian Parliament passed the *Radiocommunications Legislation Amendment (Reform and Modernisation) Act 2020* (Cth), which provides expanded decision-making powers for ACMA to support more efficient and effective spectrum allocation. The reform provides ACMA with greater flexibility to develop spectrum allocation arrangements so it can bring spectrum to market within shorter timeframes.

The telecommunications industry needs a long-term pipeline for new spectrum. ACMA should ensure operators are provided with a roadmap for spectrum availability, along with the flexibility and sustainable pricing needed to deliver 5G networks to the vast majority of Australians.

Support agile spectrum management

Fit-for-purpose legislation and investment in spectrum management and allocation are critical to optimise the economic benefit derived from spectrum.

The licensing and allocation of radio spectrum in Australia has been historically slow. For example, the process of reallocating the 'digital dividend' (the 694–820 MHz spectrum released in the process of transitioning to digital television) took approximately three years and 16 legislative instruments.

However, things have been improving. The new *Radiocommunications Legislation Amendment (Reform and Modernisation) Act 2020* (Cth) gives spectrum users greater flexibility, longer licence terms and a lower administrative burden.

Spectrum auctions will now be digital, with the ACMA investing \$7.1 million in a digital auction and spectrum management system. This is an essential step towards faster and simpler radio spectrum selling and management.

Solve the investment conundrum

The opportunities for network operators to realise new revenue from 5G fall into three broad categories:

- **Enhanced mobile broadband:** 5G delivers ultra-fast data speeds.
- **IoT:** 5G provides the ability to connect many millions of new devices.
- **Mission-critical applications:** 5G can deliver ultra-high reliability and low latency.

Such use cases require network performance to improve 10-fold over current levels of latency, throughput, reliability and scale.⁷⁸

The associated investment requirements are significant, with the need for capital expenditure in new spectrum, new large and small base stations to make networks denser, upgraded fibre transmission (backhaul) and new core networks. Industry analysis predicts network-related capital investment would need to increase 60% from 2020 through to 2025 in one European country, roughly doubling the total cost of ownership.⁷⁹

This comes at a time when the financial performance of telecommunications operators has been negatively impacted by a longer-term trend of declining revenues. This is being driven in part by highly competitive markets and the entrance of 'over-the-top' technology applications (content, social media, data and cloud computing). This has been compounded by the shorter-term impact of the COVID-19 pandemic, which resulted in less revenue from products such as roaming and international calling and put more customers in a state of financial hardship.⁸⁰

Price plans now offer generous or effectively unlimited levels of data. The associated sharp increase in data demand (partly driven by the pandemic) has required immediate capacity investment by wireless and fixed operators but has not tended to translate into incremental revenue.

Conversely, the 'over-the-top' services providers that stand to benefit most from 5G play little part in network or spectrum investment.

Together, high capital expenditure costs and the relatively lower potential for returns present the risk that Australia may not realise a fully competitive 5G market without active support to ensure building a national network is a sustainable investment.

To mitigate this risk, governments and regulators should ensure mobile network operators can invest efficiently in the provision of 5G services. The telecommunications industry provides significant government revenue through spectrum auctions and site rental. Site rental fees tend to be high and access costs for building on public property are generally high.

The ACCC has observed that, while large revenues from spectrum auctions are attractive for governments, they can be anti-competitive if operators overpay.⁸¹ The auctions are designed to gauge the market value of spectrum, which depends on competition for access as well as the value of different use cases for the relevant band. High spectrum costs can affect financial sustainability, leading to lower network investment and poorer-quality services that deliver a sub-standard user experience.

To address this, the Australian Government has in the past introduced allocation and price limits for spectrum auctions, to promote competition and ensure spectrum is accessible to all key parties.

Prohibitively high costs for spectrum, difficulty in accessing public assets to build telecommunications infrastructure and complex spectrum licensing will only serve to constrain the sector's ability to deliver comprehensive and high-quality 5G, which is a critical enabler for Australia's future economic growth. For end users, this situation will manifest as higher costs and less competition.

Tackle misinformation to grow community confidence

The 5G rollout has attracted some negative commentary in the Australian media and on social media platforms about the safety of the technology, even though many scientific studies in Australia and overseas have found no health risks.

In 2020, Australia's Chief Medical Officer confirmed there is no evidence telecommunications technologies, including 5G, cause adverse health impacts.⁸² Two subsequent studies conducted by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) and Swinburne University of Technology reached similar conclusions.

Many health concerns focus on the safety of radiation levels and links to chronic diseases and the COVID 19 pandemic. Yet, while 5G will use higher radio frequencies than 3G and 4G networks, the radiation is far lower than the strictly regulated limits set by the ARPANSA.⁸³

Despite the scientific and health advice, community confidence in 5G has been shaken by misinformation. Some telecommunications hardware has been criminally damaged, risking community safety.

The Standing Committee on Communications and the Arts was asked by the Minister for Communications, Cyber Safety and the Arts to inquire into and report on the deployment, adoption and application of 5G in Australia. The Committee received hundreds of submissions from action groups and individuals with concerns about perceived 5G-related health issues, many to do with electromagnetic radiation.⁸⁴

In 2020, the Committee made several recommendations, including that the ARPANSA should consult more with members of the public about their concerns.⁸⁵

Building on work already undertaken by the Australian Government to build community confidence in 5G safety, further communications that address misinformation should be prioritised as part of the public dialogue.

Making smart places for Australia

A smart city uses technology and data to accelerate liveability, workability and sustainability. Over the past 15 years, hundreds of cities around the world have adopted these technologies.

Case studies from the Smart Cities Council of Australia and New Zealand show positive impacts for people living in smart cities include:⁸⁶

- new markets, export opportunities and capabilities
- new, higher-paying jobs
- greater productivity in the design and construction process
- more effective delivery of public infrastructure and services
- reduced greenhouse gas emissions
- operational savings on assets
- more effective disaster management
- greater resilience.

Australia can be a smart nation if it creates more smart cities. To achieve this, there need to be strategic planning and investment, enabled technology innovation, and alignment across industries and governments.

Designate more smart places

Around Australia, smart places are improving the productivity, liveability and resilience of cities, towns and communities. Sensors and other communications technologies are integrated into the natural and built environment to capture and convey data and insights. wi-fi hotspots, connected transport, traffic monitoring and water level monitoring are good examples.

The collected data is analysed and used to help people and governments make better-informed decisions.

While there are clear applications for this technology in urban areas, Australia's regional areas and primary industries stand to benefit significantly. In some rural areas, IoT technologies and data services are already transforming agribusiness and livestock management. However, for many farmers, online data collection is mainly associated with compliance monitoring, such as livestock tagging and tracking systems. While farmers could benefit from the improved integrity of supply chains, data collection can seem a burden and carries severe economic consequences for non-compliance, such as suspended rights to sell cattle. A compliance mindset is not the place to start when promoting the benefits of digitalisation.

A strategic approach is required. There should be a greater focus from key regional stakeholders and industry on promoting smart technology and smart places. Regional Development Australia, and regional development departments in each state and territory, should further focus on helping key industries understand smart places and realise how they can benefit from them. This includes providing best-practice case studies and supporting scalable pioneering projects.

Take a strategic approach to smart cities

The Australian Government should develop a top-down, strategically aligned approach to creating smart infrastructure in smart cities through specific strategies, objectives and outcomes. These should incorporate a full strategic policy, standard common definitions and an investment attraction program.

It is critical to have these foundational building blocks in place to fully realise the economic and societal benefits of smart cities.

Over the past four years, the Australian Government has invested \$50 million to help catalyse a smart cities marketplace through the Smart Cities and Suburbs Program. The Program is showing that local government, in partnership with the private sector and academia, can turn ideas into workable projects with real economic value to communities.

The related City and Regional Deals programs have created unique platforms for collaboration between all tiers of government centred on transformational infrastructure. This enables them to work with communities to identify priorities, and supports co-investment in infrastructure and services. Place-based programs are helping to better align planning, investment and governance with the specific needs of participating cities.

Extended programs provide the opportunity to consider smart technology deployment in regional industries such as agribusiness, tourism and logistics.

Further investment should prioritise scalable projects that encourage businesses and communities to accelerate their smart cities strategies.

The Australian Government should provide guidance, joint funding opportunities, capacity building and collaboration mechanisms to help to scale and replicate place-based programs across Australia.

Create infrastructure that is digital by default

Infrastructure could be optimised by ensuring a digital by default approach, particularly where new assets are built with smart connected capabilities delivered from day one, and provision made for future enhancement. Infrastructure can use the latest technologies to improve its impact on the people and communities who use it. This technology plays an important role in:

- reducing energy consumption and carbon emissions
- managing health, safety and security
- improving the occupant experience
- enabling better facilities management.

Australia could do these things even better if it had connected infrastructure that was digital by default — where embedding digital technologies, such as sensors, in infrastructure is normal. Reaching this state will require new approaches to building standards, major publicly funded projects and best-practice efforts by architects and designers. There need to be:

- more coordination and standardisation across relevant industries and governments
- clearer regulation
- improved digital and building standards
- a maturing of risk assessments and management
- digital champions who are involved in all major government infrastructure projects
- effective governance.

These simple digital by default building blocks will reduce the need to retrofit new technologies to infrastructure, which is time-consuming and expensive.

Invest in smart places at different scales

Smart cities around the world have frequently demonstrated a significant return on investment.⁸⁷ They deliver economic, environmental, governance and social benefits.

Being smart should not be confined to Fast-growing Cities. Smaller Cities, Regional Centres, Small Towns and Rural Communities can be transformed with smart technology. However, many of these areas face infrastructure challenges that large cities generally do not, including reliance on a single critical infrastructure asset. These challenges need to be considered when planning smart infrastructure.

The Australian Government should also review its current approach to funding for smart centres. This has enabled some high-value projects, but is 'bottom-up' in its nature. It is based on competitive bids. Funded initiatives are varied and do not always provide scalable approaches that can be redeployed.

The model should evolve into a collective 'top-down' approach. Strategically aligning funding for smart places, the IoT and 5G initiatives with consistent goals, objectives and outcomes will be a better way to help Australia advance towards being a smart nation.

Laying down the foundations of a smart nation

With the advent of the IoT, many millions of devices will be connected to the internet. A sensor can measure or communicate almost anything, be placed almost anywhere and connect anything to almost anything else.

Vehicles, wearable devices, home appliances, medical diagnostic devices and billions of other everyday physical objects will soon be collecting and sharing data around the world. Once they are connected to the internet, they can collect information, send and receive it, and act on it.

There are limitless applications for the analysed data, from livestock monitoring and soil management to crime detection, digital health and fleet management. Another example is infrastructure management, with sensors monitoring structural integrity and providing an early warning system for potential and emerging issues.

The possibilities across different geographies and sectors are endless. The IoT presents a significant economic opportunity for Australia. Many hundreds of applications present the opportunity to significantly increase efficiency, enhance sustainability, improve quality, reduce failure and make people safer.

5G will provide the massive capacity and processing capability the nation needs to simultaneously manage many millions of devices at once, enabling a smart nation.



Make better use of the data generated by infrastructure

Building a smart nation requires national leadership and strategic investment so Australia's infrastructure can:

- **collect data** using world-leading IoT sensing devices and other technologies
- **communicate data** across the highest-performing telecommunications networks to safe, secure storage facilities
- **crunch data** using a sophisticated data analytics capability powered by leading-edge processing power, AI and visualisation.

These capabilities will turn raw data into actionable information that enables better monitoring and control of assets and systems from utilities and transport networks to human services and public safety operations. In smart cities, public transport journeys are quicker, water leaks are detected more quickly and energy networks are optimised.

One learning from the COVID-19 pandemic has been that governments around the world generally have not fully understood the requirements for comprehensive storage of, access to and sharing of public data until it has been urgently required. Australians have realised the importance of mature systems and applications during the pandemic — most pointedly through the contact tracing regime. However, at the moment data across different levels of government is fragmented, inconsistent and difficult to share, whatever its source.

The Australian Government should continue to develop data strategies with a wider array of requirements, standardisation and applications to share data across governments. States and territories, local government and industry should work in partnership with the Australian Government to identify and share valuable data.

Move from open data to data exchange

Open data is the idea that public information should be accessible, used, modified and shared by anyone for any purpose without restrictions. It should be technically open (accessible, usable and functional) and legally open (within an accessible licensing framework).

Some Australian Government agencies are readily applying open data policies, as are state and territory agencies. The Transport for NSW Open Data Program provides access to more than 100 datasets and 300 other resources. The program has provided over 7 million

passengers with faster, simpler journeys by enabling them to interact with transport data using third-party apps.

Nationally, the Digital Transformation Agency has commissioned an open data program. To support ambitious IoT projects, the Australian Government should invest further in this initiative. In addition, all levels of government should encourage more open data sharing and exchange.

Grow Australia's IoT ecosystem

The Australian IoT market stood at \$7.9 billion in 2018 and is projected to grow at a compound annual growth rate of 21% to exceed \$25 billion by 2024. This rapid and significant increase is because of the rising demand for smart devices, growing government initiatives and increasing demand for analytics.⁸⁸

The agribusiness sector, a multi-billion-dollar industry in Australia, is already exploring the potential of IoT. For example, sensors can help improve crop management (see **Figure 7.8**) and animal monitoring (see **Figure 7.9**).

One challenge is making sure telecommunications networks can keep up with the increased demand. Australian IoT devices connect to several different networks. Some use traditional mobile telephony while others access networks through a dedicated IoT infrastructure. IoT networks tend to use low frequencies so they can span large distances using a small number of base stations.

Long-range, wide area networks (LoRaWAN) use low-power, low-frequency radio waves to cover very large areas and are being rolled out by councils, utility providers, infrastructure companies and other organisations.

The City of Gold Coast has invested in a LoRaWAN so it can deploy IoT projects on a large scale, including smart water meters and smart waste management. Satellite systems could also support IoT services. They would provide widespread coverage but might require specific changes to regulatory frameworks.

The Department of Infrastructure, Transport, Regional Development and Communications and ACMA should work closely with the Internet of Things Alliance Australia across multiple policy areas to set national priorities, strengthen regulatory coherence, identify investment opportunities for projects in the national interest and ensure standards are fit-for-purpose.

Case study: The IoT in action in Australia

Telstra has built extensive coverage to support the IoT through a **Cellular Low-Power Wide Area Network** with approximately 3 million km² of LTE-M (low-power wide area network radio technology) coverage and 4 million km² of Narrowband (NB) IoT coverage.⁸⁹ Both these technology standards are designed to support the IoT.

IoT networks can support many millions of devices. In December 2020, almost four million IoT devices were connected to Telstra's IoT networks alone and, on average, 2,000 devices are being connected to the networks every day.

Satellite systems enabling IoT services are also growing the use base. Several Australian companies offer IoT services using nanosatellites that make IoT solutions possible outside traditional coverage areas. For example, **Myriota** has supported IoT applications across a diverse range of use cases, including wind turbine management and agricultural monitoring. In addition, systems developed by **Fleet Space Technologies** underpin IoT applications such as dam and gas pipeline management.

Another example of satellite-enabled IoT in action is **Ceres Tags**, which provide farmers with real-time information on livestock location, lost livestock, feed intake, distress indicators and health.

Figure 7.8: Reducing costs and protecting the environment: Weather station in a wheat field. Precision farming equipment helps this crop farmer to save kilolitres of water



Figure 7.9: The Dairymaster MooMonitor+ is an IoT wearable for cattle that improves animal husbandry



Source: Dairymaster Inc

Make governments early adopters

All levels of government stand to benefit from greater efficiency and responsiveness if they are early adopters of IoT technology for key functions such as infrastructure management, fleet management and emergency response services.

Governments will need to collaborate in adopting a clear roadmap that brings together plans and standards for cybersecurity, interoperability, privacy, maintenance, data, analytics, applications and sensor connectivity.

Governments should lead the way with IoT because they are among the largest data consumers in the

country. Their full involvement would provide a model for similar projects and encourage other organisations to take the risk, speeding up IoT investment across the country.

Another role governments can play is removing barriers to IoT adoption in relation to funding, data management, standards and enablement, which are all key areas to get right.

Many organisations that would benefit the most from IoT technology cannot deploy infrastructure themselves. They need active and passive support (see **Table 7.1**), and governments are well placed to meet their needs.

Table 7.1: How governments can help make Australia a smart nation

Active support	Passive support
<ul style="list-style-type: none"> • Smart Cities and Suburbs Program • Directly funding IoT and smart city initiatives • Using City Deals to demonstrate smart cities deployment • Leading by example with demonstration projects and further open data programs 	<ul style="list-style-type: none"> • Supporting industry-led standards and interoperability development • Providing guidance and resources for cataloguing solutions, case studies and best practices • Educational outreach to assist local government in aggregating demand and benchmarking

Source: Internet of Things Alliance⁹⁰

Overcome security concerns

A network is only as strong as its weakest point. A device with inadequate security protection can provide backdoor entry into an otherwise secure network. Currently, the combination of unclear security standards and millions of low-cost IoT devices with poor security settings is a weak point in the IoT ecosystem.

Most IoT devices are connected to cloud platforms, so a major security breach could have wider implications than impacting a single service, solution, organisation or person.

“To protect all Australians, it is critical legislative frameworks can accommodate risks presented by new and emerging technologies.”

As the use of IoT devices grows, the risk of compromised security will grow too. The Australian Cyber Security Centre should ensure end-to-end standards for IoT-enabled devices are clear and enforced so users are protected against cybercrime.

Australians generally have among the highest levels of distrust of AI and big data in the developed world. A 2019 poll found 44% of Australians believed AI would harm them in the next 20 years, compared to a 30% global average.⁹¹

There should be a clear focus on addressing misinformation and the genuine concerns of Australians, thereby enabling informed choices about IoT adoption.

Legislate to protect consumers against new risks

AI can be used to process and make decisions on data collected through IoT devices, so the two technologies are highly complementary. As the scale and complexity of IoT systems continues to grow, emerging technologies, such as machine learning and AI, are likely to lead to exponential growth in the volumes of data processed.

Any emergent technology presents new risks. Algorithmic bias, for example, is seen in decision-support systems that use machine learning and AI. With automation technology rather than humans making decisions, there is a risk of discrimination based on gender, race or sexual orientation.⁹²

One example is an algorithm that was discarded by a major multinational business after it became clear it was unintentionally biased against women when applied to the hiring process.⁹³ The algorithm was learning from previous applications to identify the optimal traits of potential candidates and, since most of the previous successful applicants were men, it was automatically favouring men over women in its decisions.

To protect all Australians, it is critical legislative frameworks can accommodate risks presented by new and emerging technologies. While this should include the review of the *Privacy Act 1988* (Cth) announced in 2020, the need for ethical use of AI may be better met using voluntary industry codes of ethics and improved standards for how to avoid bias in automated decision-making.

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8

Social infrastructure



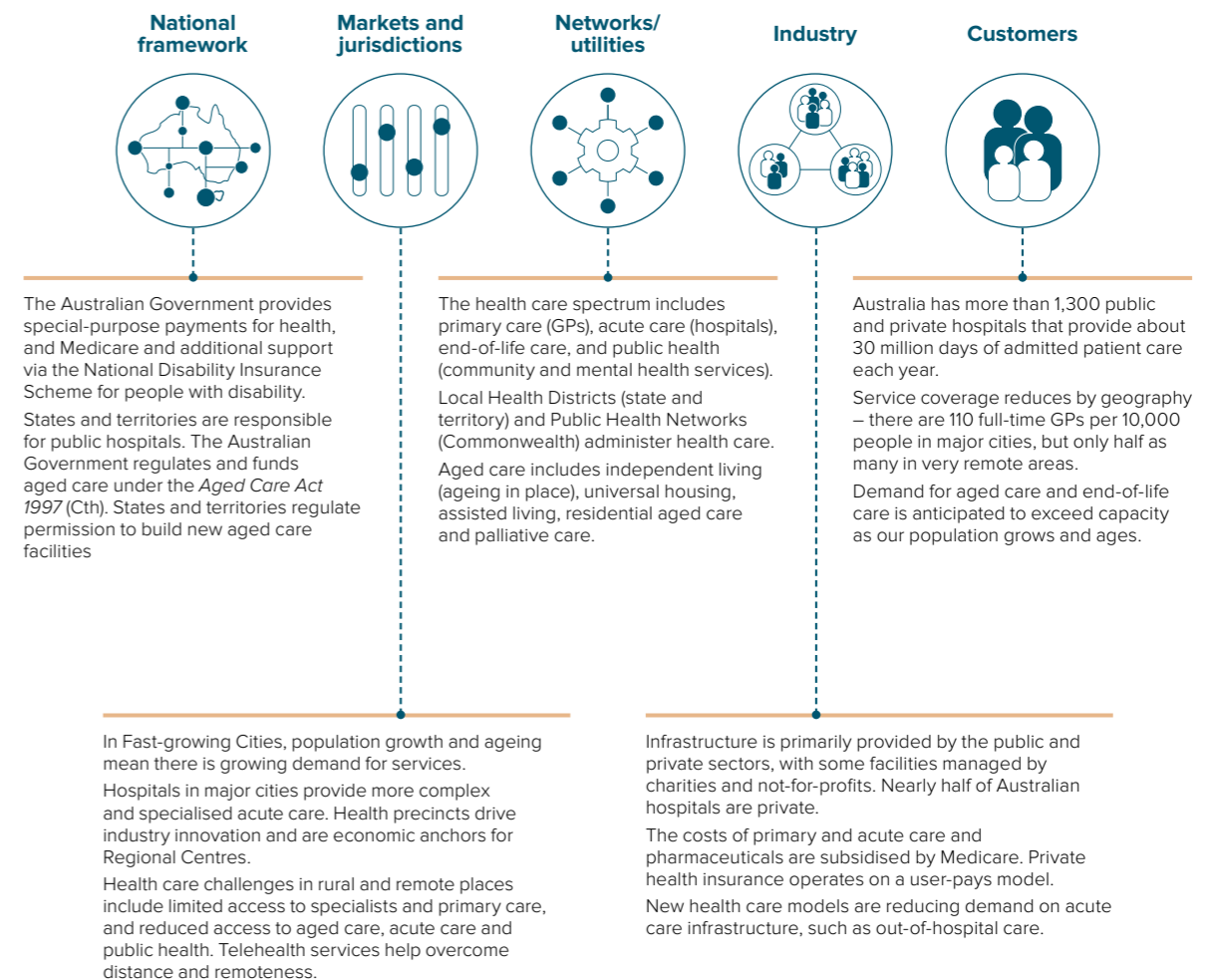
What you will read in this chapter

- **Reform 8.1: Transforming social infrastructure to enhance quality of life** – What Australia must do to deliver social infrastructure that supports more equitable access to affordable, high-quality social services and opportunities.
- **Reform 8.2: Partnerships to build communities** – How government and community collaboration and shared-use approaches will enable more integrated, multi-functional and cost-effective social infrastructure.
- **Reform 8.3: Social infrastructure is economic infrastructure too** – Why recognising and valuing the significant direct and indirect economic benefits derived from social infrastructure — both collectively and by each sector — is essential for its future development.

Key messages

- Social infrastructure **connects people and communities to services and opportunities** that enhance their quality of life, enable them to live together and help each other, keep them safe and healthy, and boost national productivity.
- To drive more appropriate and effective investment, **Australia needs a consistent national framework for valuing social infrastructure.**
- Australians expect high-quality social infrastructure that is easy to access. However, **experiences differ depending on where people live. Alternative models of funding and delivery** will enable more well-located, maintained and fit-for-purpose facilities.
- The COVID-19 pandemic has demonstrated **agile, high-functioning social infrastructure can quickly adapt** to the health, educational and social needs of communities. **Innovation and technology should be harnessed** to drive more cost-effective and sustainable infrastructure and services that communities value.
- **Australia's health infrastructure must evolve** in response to changing health needs, such as an ageing population and increasing chronic disease. There needs to be more investment in **preventative health and virtual care** to deliver more equitable and affordable health care, and in **improving digital connectivity and literacy** so citizens and health workers can use these services effectively.
- The quality, functionality and accessibility of **public education infrastructure are inconsistent** and do not meet population and technology demands. There must be **increased funding for maintenance, design and renewal** to provide contemporary, fit-for-purpose education facilities that support the skills of the future and become hubs for lifelong learning.
- **Social housing quality, supply and design are inadequate** across the country. The case must be made to drive more investment, **improve the standard of dwellings, address the growing shortfall** and provide **a greater range of housing types.**
- Arts, culture and recreation facilities **define Australian cultural identity.** Along with public green and blue spaces (parks and waterways), they **improve physical and mental health and make communities more liveable.** All levels of government should **collectively plan to bring these areas to life** through better accessibility and precinct development and renewal.
- **Collaborative partnerships** create shared, well-used facilities that co-locate health, education and other social facilities in mixed-use precincts (where residential, commercial, retail and community facilities co-exist). This **drives collaboration, job creation, learning and innovation** and requires **enduring governance models and appropriate incentives** to create real change.

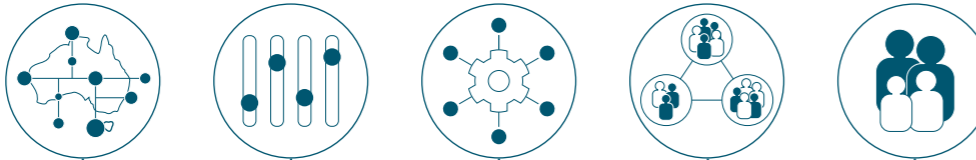
Health and aged care sector overview



Education sector overview



National framework **Markets and jurisdictions** **Networks/ utilities** **Industry** **Customers**



The Australian Curriculum sets national expectations for key learning outcomes and student capabilities. Responsibility is shared between the Australian and individual state and territory governments.
Federal funding of schools is provided under the *Australian Education Act 2013* (Cth). The Australian Government also funds Commonwealth Supported Places for university enrolments. States and territories are primarily responsible for education assets and the allocation of funding, and are the regulatory bodies for private and public schools.

The education network consists of early childhood education, primary and secondary education, and tertiary education (this includes vocational training and universities). Infrastructure includes buildings, facilities and campuses.
States are responsible for providing and funding school infrastructure.
Primary and secondary schools are available to students aged 5–18

In 2020 there were 4,006,974 students enrolled in 9,542 schools around Australia.
Government schools accounted for 65.6% of enrolments, followed by Catholic schools (19.4%) and independent schools (15%).
New demands are being placed on school infrastructure to support 21st-century learning.

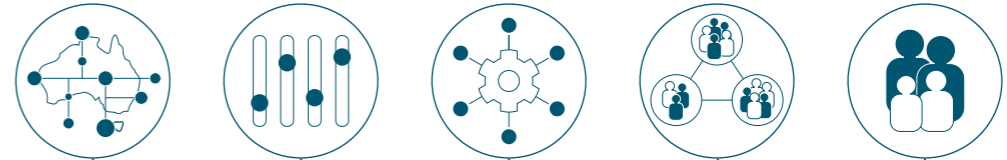
Demand varies across geographies. It is rising for schools in Fast-growing Cities. Demand is also increasing for tertiary education, with campuses generally in state capital cities and Regional Centres. Australia's tertiary education market increasingly also caters for international students.
Limited access to education in rural and remote areas affects rates of skills and training and employment outcomes. Digital education seeks to overcome distance.

Education and training in Australia are either government or privately funded.
Early education centres and preschools can be provided by local governments or private entities. Schools can be provided by state or territory governments, religious or independent organisations.
Tertiary education institutions are provided by public and private entities.

Social housing sector overview



National framework **Markets and jurisdictions** **Networks/ utilities** **Industry** **Customers**



The Australian Government provides subsidies such as Commonwealth Rent Assistance to support housing costs for social housing. They also support Specialist Disability Accommodation for eligible National Disability Insurance Scheme participants.
State and territory governments are responsible for social housing portfolios. Portfolios are also held by not-for-profit Community Housing Providers (CHPs). State Planning Schemes include community housing growth targets.

Infrastructure includes **crisis accommodation** (shelters, hostels), **social housing** (public housing, community housing) and **affordable rental housing**.
Community members are eligible if they have registered either with the state government or CHPs. Allocation is prioritised according to greatest needs.
Dwelling types include detached houses and multi-storey unit blocks (also known as 'estates'). Stock needs to consider accessibility, to better meet tenant demographics including elderly tenants and people with disability.

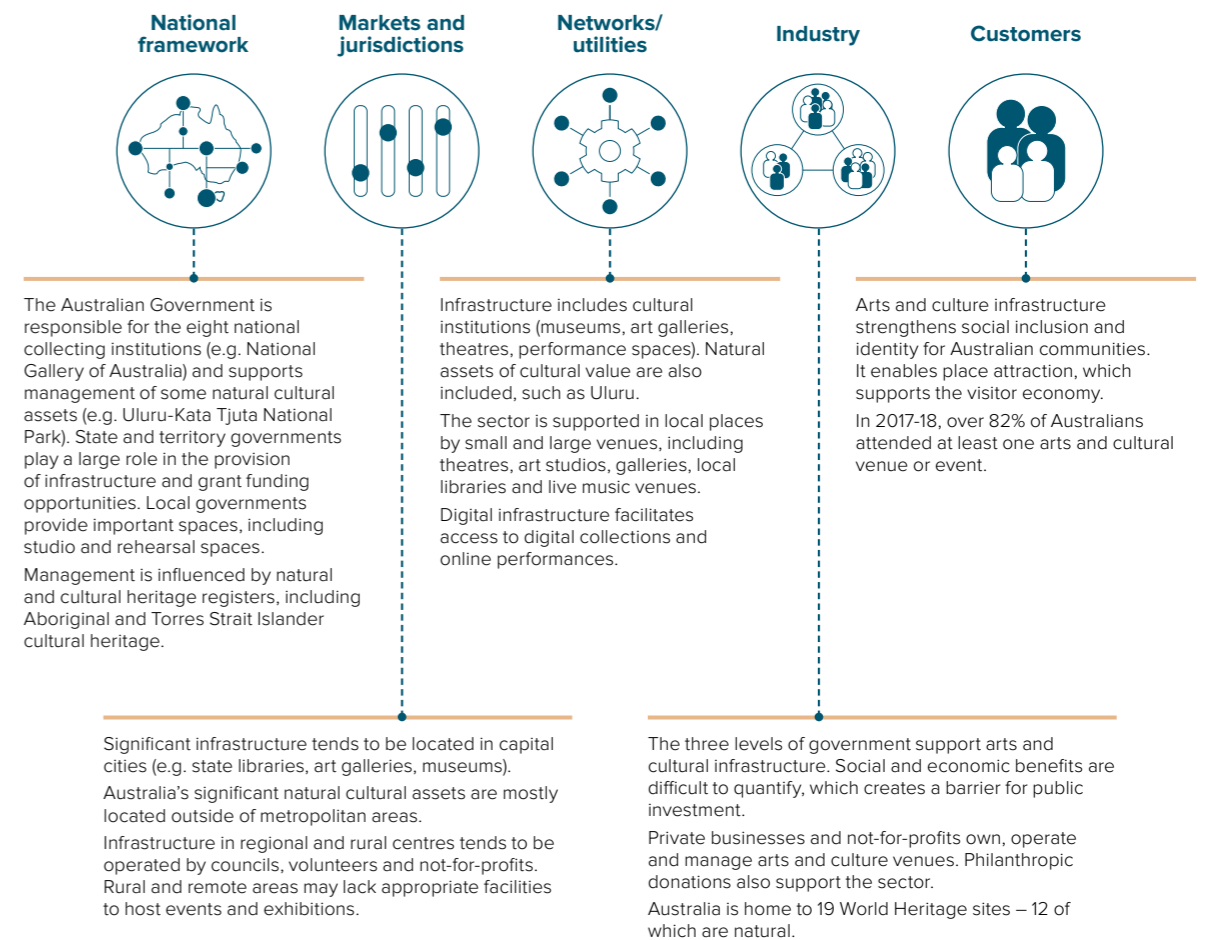
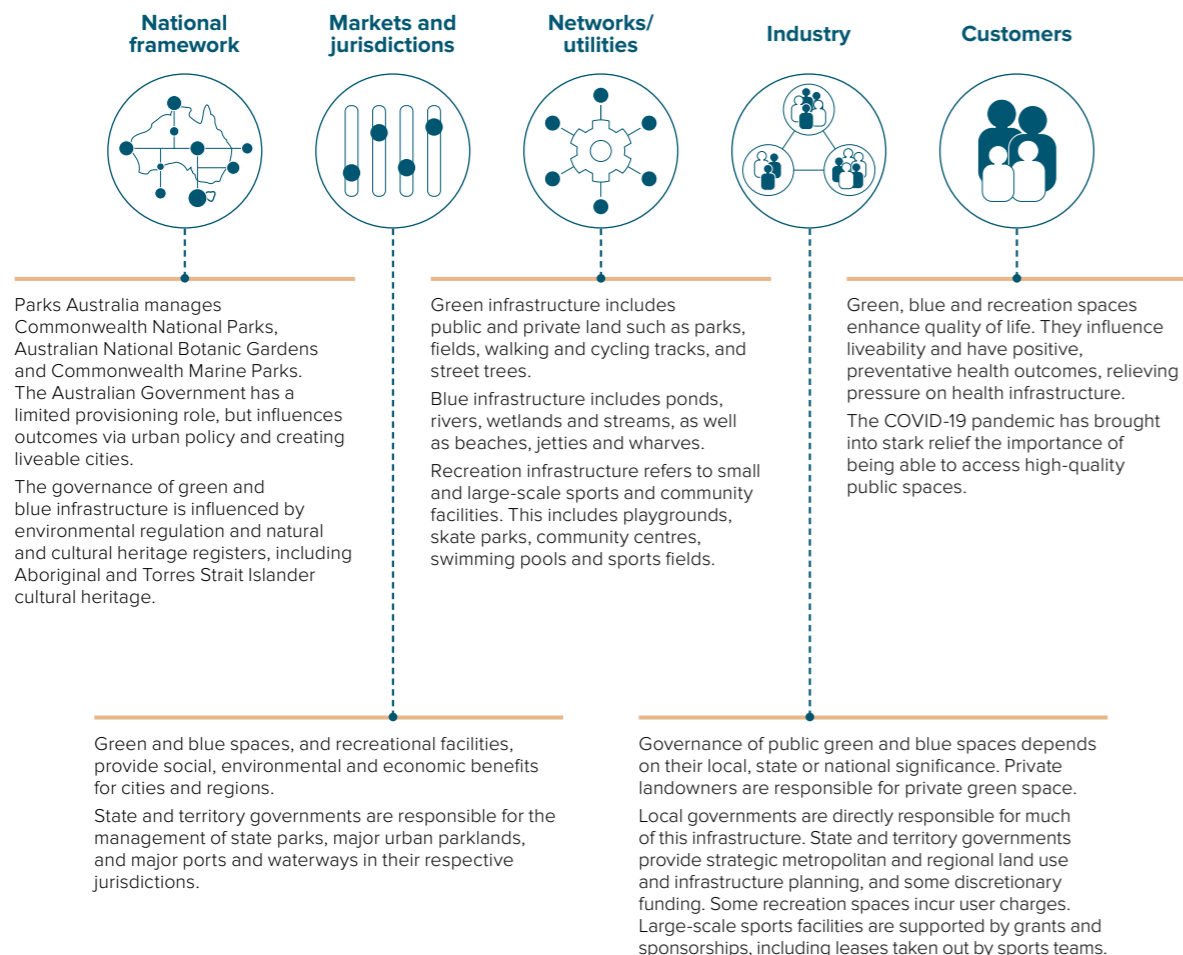
Social housing is a system of housing assets that provides rental housing at below-market prices. Housing location is closely tied to health and education outcomes and impacts access to services and employment opportunities.
While more social housing stock is in major cities, the pathway to tenancy can be easier in the regions due to shorter wait times. However, social housing assets in rural and remote areas face overcrowding due to limited stock.

Portfolios are owned and managed by state and territory governments (public housing) or CHPs (community housing). Crisis accommodation is delivered by charities and not-for-profit organisations.
The role of CHPs is increasing as governments transfer tenants from the public housing system. CHPs also support the supply of affordable rental housing.
The sector has growing demand – in some places the wait time is more than 10 years. Stock is also ageing and requires maintenance and upgrades.

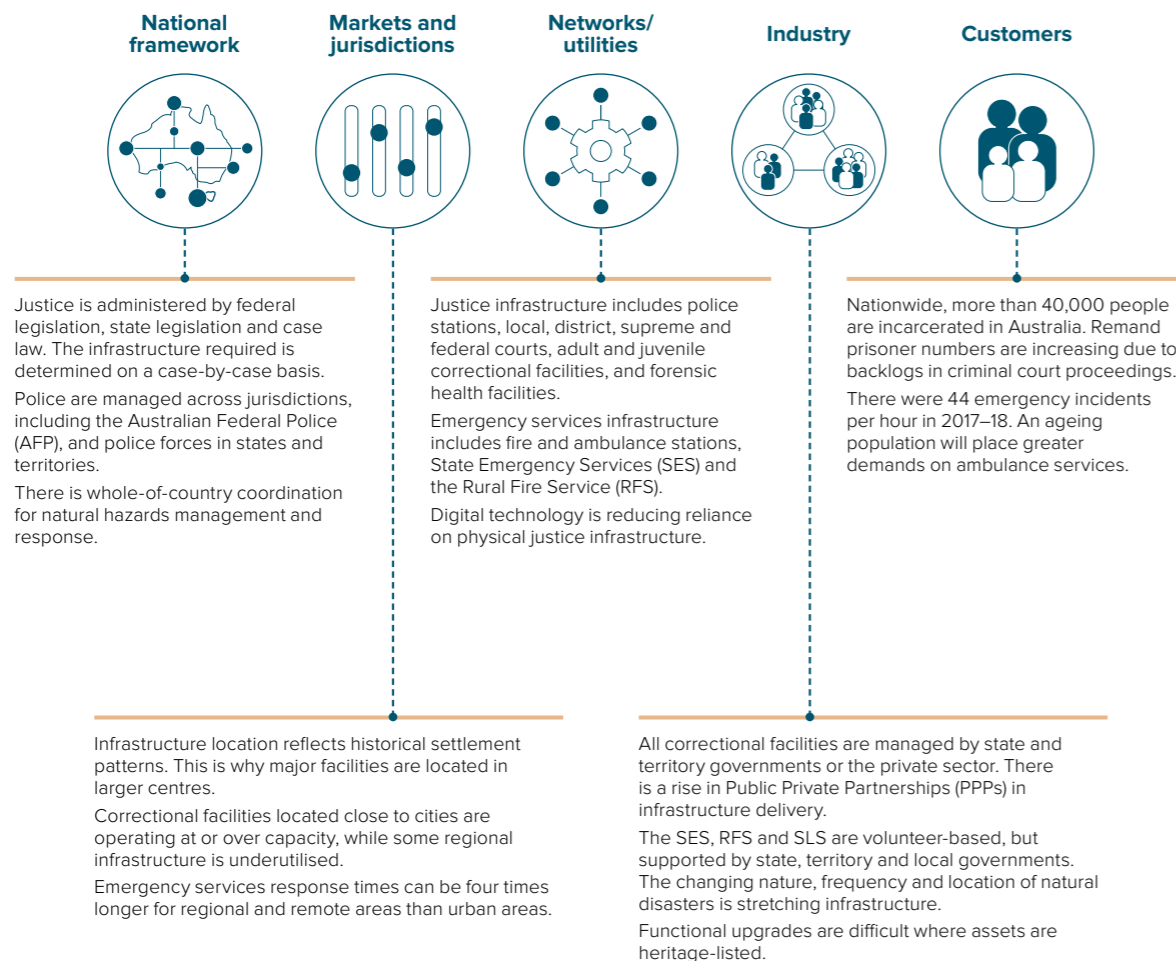
Recreation sector overview



Arts and culture sector overview



Justice and emergency sector overview



Introduction to social infrastructure

Social infrastructure is under pressure

This is the first time the *Australian Infrastructure Plan* has included social infrastructure.

Its inclusion acknowledges the critical role these physical spaces and assets play in the nation's wellbeing and in making Australia a great place to live.

It also reflects the pressures on social infrastructure sectors, which will only increase as Australian communities continue to evolve and place greater demands on them.

Factors such as a growing and ageing population, life-changing events (such as bushfires, floods and the COVID-19 pandemic) and advances in technology are changing how people live and work.

These are just some of the complex considerations for today's social infrastructure planners that are addressed in the *2021 Plan*.

It recommends how ongoing improvements to the planning, design, delivery and use of social infrastructure assets can contribute to a better quality of life for every Australian.

The importance of social infrastructure

Social infrastructure helps to create healthy, happy, thriving communities.

It is made up of the facilities, spaces, networks and services that support individual and community health and wellbeing, promote a cohesive society and support economic prosperity.

The *2021 Plan* focuses on the physical facilities and spaces that support the delivery of social services and does not explore social service planning. We do provide recommendations to accelerate digitalisation, such as telehealth, where this will optimise the use of physical infrastructure.

Social infrastructure falls into six categories:

- education
- health and aged care
- arts and culture
- social housing
- green, blue and recreation
- justice and emergency services.

Giving all Australians equal access to social infrastructure is important, because it has a direct impact on liveability — that is, how much a neighbourhood, town or city supports quality of life for the people who live, work and visit there.¹

“ Giving all Australians equal access to social infrastructure is important, because it has a direct impact on liveability. ”

Social infrastructure also builds human capital (the collective skills, knowledge and experience of individuals that creates economic value) and social capital (the networks of relationships that enable society to function effectively).

The *2021 Plan* helps Australians to develop the skills and resilience to create strong, prosperous communities that make a substantial contribution to their nation's economic growth.²

A stronger cross-sector approach will benefit communities

Overall, the *2019 Australian Infrastructure Audit* found Australia has high-performing social infrastructure sectors by international standards.

However, access and quality vary for different infrastructure types, places and groups of Australians.³

The *2019 Audit* cited research showing Australians rate their experience with social infrastructure differently across sectors. They believe that, while the quality of social services is high, the assets that deliver them are often old and unsuitable.

For instance, over a quarter of Australians think the quality and accessibility of social housing have declined over the past five years.⁴

The *2019 Audit* also found Australians often access multiple and overlapping services and would benefit from better integration between social infrastructure providers.

Governments are recognising the need for greater collaboration, even if it makes planning and delivery of social services more complex.⁵ Some agencies are already collaborating with providers across social infrastructure sectors for planning, delivery and use, producing mutually beneficial outcomes for communities and government.

This collaboration should be promoted and supported.

The COVID-19 pandemic has uncovered challenges

The COVID-19 pandemic exposed vulnerabilities in the social infrastructure sector and highlighted the need to strengthen it, not only to support recovery but to deliver essential services to all Australians.

The major pandemic impacts and trends included:

- **Expanded critical health facilities:** Vast amounts of specialised medical equipment and supporting infrastructure were needed. Intensive Care Unit (ICU) capacity was made seven times bigger and the number of invasive ventilators more than doubled.⁶ Meeting these needs highlighted the value of having adaptable facilities that can quickly respond to vital community needs.
- **Additional pressure on social and affordable rental housing:** The economic downturn strained a system that was already severely restricted. It highlighted the shortage of fit-for-purpose dwellings, particularly in Victoria and New South Wales.⁷
- **The move to online services:** Many social infrastructure sectors leveraged digital technology. Education quickly turned to online learning for schools, vocational education and universities. There was an accelerated uptake of telehealth (remote consultation between a patient and a medical professional, using audio or video technology) so patients could access health care. Art and cultural offerings, including community engagement and creative development, shifted to online digital experiences. These changes highlighted the limitations of Australia's digital networks and inequitable digital access.
- **Greater use of community spaces:** Local neighbourhoods and public spaces, particularly open green and blue spaces such as parks and waterways, became vitally important for community recreation and maintaining mental health and wellbeing. Governments moved quickly to improve access and support physical activity by reallocating public spaces — for instance, opening up golf courses to other uses and creating 'pop-up' cycle lanes.

As the impact of the pandemic has amplified the call to action in so many areas, it has had a major influence on the recommendations in the *2021 Plan*.

Creating a stronger and healthier future

The *2021 Plan* makes recommendations for improving the lives of all Australians. It opens up new possibilities for making Australia a healthier, more socially cohesive and economically productive nation.

Given the significant scale of social infrastructure, it will not be possible to address every challenge in the *2021 Plan*. However, the proposed reforms will improve how social infrastructure is prioritised, planned and delivered.

They are designed to transform how Australians live over the next 15 years and beyond.

Infrastructure Australia's vision for social infrastructure is for it to become multi-purpose and closely integrated within communities. This would see more accessible, adaptable and high-quality facilities and spaces that can effectively respond to changing community needs.

Achieving the right facilities in the right places means: providing social infrastructure that can best accommodate the needs of all Australians; considering the diversity of users such as older Australians and people with disability; and ensuring effective delivery and use.

This includes providing inclusive and culturally safe services and places for Aboriginal and Torres Strait Islander peoples.

Reform initiatives

Investment in social infrastructure is essential for the health, wellbeing and economic prosperity of Australian communities.

Successful approaches include: Making better use of existing infrastructure by repurposing or sharing facilities; using alternative methods like technology to deliver services; and collaborating on solutions that leverage funding or encourage co-location.

These initiatives need to be supported by a robust, nationally consistent framework to capture and measure the real economic value of social infrastructure, to inform effective and balanced investment.

Under the reforms Infrastructure Australia proposes, compatible facilities such as schools, Technical and Further Education facilities (TAFEs), health care assets and sporting fields would be available for shared use all year and all week round.

In addition, planning for new or renewed facilities (such as hospitals, universities and research and training facilities) will involve co-locating them in economically significant innovation precincts.

This will optimise collaboration and innovation across sectors, leading to job creation, knowledge transfer and improved productivity.

These precincts should be strategically located. They will need to be close to services and affordable housing for staff, students and their families and integrated with transport networks so they are easily accessible.

Vision for the future

Health: People want to be more proactive in their health care. The increased use of digital health (see **Figure 8.1**) creates opportunities to improve access, equity and quality. New models of patient-centred care and greater consumer choice will affect the form, use and location of health facilities.

Education: Facilities will be multi-use and highly accessible. TAFEs, universities and Vocational Education and Training (VET) facilities will be planned, designed and strategically repurposed in industry-centric locations. This will enhance their quality, adaptability and functionality while delivering more flexible learning that is aligned with contemporary teaching practices.

Social and affordable rental housing: There will be a larger stock of well-maintained dwellings. They will be better suited to different household types and located in accessible areas that connect people with employment opportunities, health services, education and recreational spaces.

Arts and culture: These facilities will become more accessible and affordable across cities, towns and regional and remote locations. There are opportunities to harness digital experiences and include arts and culture when planning new precincts or renewal projects.

Public spaces: Highly valued public spaces such as parks and urban spaces (including green space around hospitals, justice and educational facilities) will be more durable and multi-purpose. They will also be better connected through walking and cycling paths and public transport so more people can enjoy them.


Government agencies will strategically and collectively plan, fund and deliver this social infrastructure.

To help ensure investment optimises the social, economic and environmental outcomes for all Australians, it will be supported by effective social infrastructure valuation frameworks and governance models.

Figure 8.1: What is digital health?

What is digital health?

A range of technologies used to treat patients, and collect and share health information. Examples include mobile health, telehealth, wearable devices, electronic prescriptions, My Health Record and medical robotics.





How we developed the *Plan for Social Infrastructure*

The recommendations and supporting content for this plan for social infrastructure were developed using stakeholder consultation and thorough analysis of well-documented evidence, including the *2019 Audit*.⁸

What the *2021 Plan* does not address

This chapter explores Australia's social infrastructure but does not include every element of this diverse and complex network of facilities. It recommends reasonable, tangible and actionable first steps to initiate change in social infrastructure that will benefit communities, now and into the future.

Infrastructure Australia has reviewed and considered other recent or parallel government reviews and Royal Commissions. We have excluded aspects of social infrastructure covered by these investigations, including:

- **Aged care**, as this sector is mainly delivered by private providers and was comprehensively reviewed by the Royal Commission into Aged Care Quality and Safety, which released its *Final Report* in March 2021.
- **Emergency services**, as the Royal Commission into National Natural Disaster Arrangements reported at the end of 2020. Its report includes recommendations regarding the capacity and capability for fire and emergency services, resource sharing and capability building. Emergency services is discussed in the **Sustainability and resilience** and **Telecommunications and digital chapters** of the *2021 Plan*.
- **Justice and correctional services** are discussed briefly in **Reform 8.2: Partnerships to build communities**. While the *2019 Audit* found demand for correctional facilities is partly impacted by population growth, demand is also driven by policy settings around minimum sentencing and criminalisation, which are beyond the scope of the *2021 Plan*.

There are many cross-sectoral complexities and layers across social infrastructure that are addressed in the other chapters of the *2021 Plan*. Due to the place-based nature of social infrastructure and the essential role it plays in connecting people to a range of services and opportunities, the **Place-based outcomes for communities** and **Transport chapters** have particular relevance.

Acknowledgements

This chapter has been developed through extensive research, analysis, engagement and consultation. Infrastructure Australia acknowledges the contribution

of a wide range of stakeholders across multiple sectors and jurisdictions that have provided feedback on the *2021 Plan*.

We particularly thank the Australian Housing and Urban Research Institute, our partners on this chapter. We would also like to acknowledge the valuable contribution of public sector agencies from governments at all levels, in particular the state and territory infrastructure bodies.

We also received valuable assistance with content from Swinburne University of Technology and Queensland University of Technology.

We particularly value the specific feedback on social infrastructure that Infrastructure Australia received in response to the *2019 Audit*.

This included submissions from the ACT Government, Ausfilm, Australian Academy of the Humanities, Australian Constructors Association, Australian Housing and Urban Research Institute, Australian Library and Information Association, Australian Local Government Association, Australian Museums and Galleries Association, Australian National University – Next Generation Engagement Program, Australian Sustainable Built Environment Council, Australian Urban Research Infrastructure Network, Balonne Shire Council, Brimbank Shire Council, Cairns Regional Council, RMIT Center for Urban Research, City of Perth, Climate Change Equity, Committee for the Hunter, Community Housing Industry Association, Consult Australia, Council of Capital City Lord Mayors, Federation of Australian Historical Societies, GLAM Peak, Global Gardening Trust, Green Building Council of Australia, Homes for Homes, Hunter Business Chamber, Industry Super, Infrastructure Sustainability Council of Australia, Infrastructure Tasmania, Infrastructure Victoria, Kororoit Institute, Libraries Tasmania, Maridulu Budyari Gumal: Healthy Urban Environments Collaboratory, Master Builders Australia, MediaWise, National Affordable Housing Consortium, National and State Libraries Australia, National Growth Areas Alliance, National Heart Foundation, Northern Beaches Council, Northern Territory Department of Industry, Tourism and Trade, Norton Crumlin and Associates, NSW Business Chamber, Our Children Our Schools, Penrith City Council, Planning Institute of Australia, Queensland Government, Shelter, South Australian Department of Environment and Water, South West Group, Sport Australia, St Bartholomew's House, St Vincent de Paul, Synchrony, Tennis Australia, Universities Australia, Urban Development Institute of Australia, Water Services Association of Australia, Western Australian Government, Western Australian Local Government Association and Western Sydney Leadership Dialogue.



8.1 Transforming social infrastructure to enhance quality of life

Key messages

- **During the COVID-19 pandemic, Australia's social infrastructure adapted quickly** to meet Australians' health, educational and social needs.
- **This transformation must continue**, using technology and innovative delivery models to improve the accessibility, quality and efficiency of services.
- New service delivery models (such as virtual health) are **improving choice and access**, providing **patient-centred health care** closer to home and alleviating pressure on hospitals and other health facilities.
- **With sustained investment and sustainable infrastructure planning**, governments can continue digitally transforming the health system and building the digital capacity of citizens and the health workforce.
- **Pandemic health infrastructure response planning** must be kept current.
- Education infrastructure must **continue to adapt to contemporary educational needs**, embracing technology and digital learning and optimising its use through high-quality, flexible design.
- **Training and higher education infrastructure should be strategically located** to maximise learning and job creation opportunities.
- Australia's governments must **address the growing shortfall of social housing**. Government agencies should work with the sector to **harness new investment options** and provide high-quality social and affordable rental housing in **the right configurations and locations**.
- To **create more liveable local areas**, people should have increased access to high-quality green and blue public infrastructure and spaces.
- Better alignment across arts, cultural and recreational planning will **create new avenues for innovation, investment and growth**, and build resilience in the face of future challenges.

Harnessing the potential of social infrastructure

The location, design and condition of Australia's social infrastructure are inextricably linked to the quality and productivity of the services it delivers. These assets also play an important role in attracting people to live and remain in regional communities.

Getting it right is a significant challenge in a country where social infrastructure is located in disparate geographies and communities that have diverse needs.

However, there is now the opportunity to apply lessons learned from the COVID-19 pandemic and transform the sector by making the infrastructure fit-for-purpose, digitally equipped and flexible.

High-quality, well-functioning and adaptable social infrastructure will always meet a community's changing service needs responsively and efficiently.

For example:

- Flexible learning spaces are linked to better educational outcomes.
- Well-maintained and designed social housing provides many community benefits, supporting individual and societal wellbeing and productivity, and reducing costs in health and justice services.⁹
- A combination of contemporary health facilities and digital technology can transform the Australian health system so it delivers higher-quality, integrated and accessible care.¹⁰

By embracing these and similar innovations, Australia can enjoy appropriately designed, future-focused and accessible facilities that improve people's lives.

8.1 Recommendation

Support Australians to enjoy a healthier, safer, more connected and fulfilled quality of life by facilitating targeted investment in the right physical and digital social infrastructure.

Proposed sponsors: Department of Health, Department of Education, Skills and Employment, Department of Social Services, Australian Treasury

Supported by: State and territory health departments, state and territory social housing providers, community housing providers, state and territory education departments

When this should impact:



Where this should impact:



10-15 **8.1.1 Improve equity of access and facilitate safe, high-value, high-quality care for all Australians by accelerating the transition to digital health service delivery. This will help to achieve National Health Reform Agreement 2020–2025 goals.**

*Proposed lead: Department of Health
Supported by: State and territory health departments*

5-10 Improve the value and quality of virtual health care services by developing digital health infrastructure transformation plans that identify and prioritise enhancements to existing hospitals, health services and primary care services.

*Proposed lead: State and territory health departments
Supported by: Local health districts, primary health networks*

5-10 Provide seamless connections to existing state and territory digital health capabilities through a program to increase primary health providers' digital capability.

*Proposed lead: Department of Health
Supported by: State and territory health departments, Digital Technology Taskforce, Australian Digital Health Agency, primary health networks*

5-10 Accelerate the adoption of high-quality virtual care across Australia by identifying and examining existing platforms, sharing successful digital health technologies, educating platform users and developing behaviour change programs based on learnings and practices.

*Proposed lead: Department of Health
Supported by: State and territory health departments*

10-15 Enable different digital health systems to work together and share meaningful information by developing a collaborative work program that integrates health services to provide targeted, patient-centred care across human services sectors, including disability, aged care and community welfare services.

*Proposed lead: Department of Health
Supporting agencies: State and territory health departments, Australian Digital Health Agency*

5-10 Improve digital health literacy for citizens and the health workforce through targeted education programs, with a particular focus on vulnerable communities.

*Proposed lead: Department of Health
Supported by: State and territory health departments, Australian Digital Health Agency, primary health networks*

5-10 8.1.2 Ensure Australia is always fully prepared for pandemics across all jurisdictions by preparing an effective national pandemic health infrastructure response program.

Proposed lead: Department of Health

Supported by: State and territory health departments

5-10 Ensure consistent readiness for pandemics by retaining and continuously improving COVID-19 pandemic infrastructure planning and preparations for emergency response hospitals, and make ongoing national arrangements to access private hospital infrastructure during pandemics.

Proposed lead: Department of Health

Supported by: State and territory health departments

5-10 Ensure appropriate supply of emergency facility materials by establishing national contracts with major supply chain providers for personal protective equipment (PPE), critical medical devices and other essential facility materials.

Proposed lead: Department of Health

Supported by: State and territory health departments

5-10 Progress the recommendations in the *National Review of Hotel Quarantine* to ensure Australia has appropriate quarantine infrastructure to respond to emergency situations, emergency evacuations or urgent scalability needs.

Proposed lead: Department of Health (or other to be determined by National Cabinet)

5-10 8.1.3 Deliver higher-quality school and early childhood education facilities that are well maintained and readily accessible to their communities by embedding place-based planning and asset management best practice.

Proposed lead: State and territory education departments

Supported by: Department of Education, Skills and Employment

0-5 Enable more equitable access to early childhood education centres by facilitating cross-sectoral partnerships between centre operators and planning and transport departments to support better access and transport connectivity, especially in the planning of new centres.

Proposed lead: State and territory education departments

Supported by: State and territory planning departments, state and territory transport departments

5-10 Continue to develop state asset registers that identify the quality, condition and performance of early childhood education facilities, including best-practice asset performance methodology (such as a Value Rating Tool), to inform evidence-based decision-making on future infrastructure investment.

Proposed lead: State and territory education departments

Supported by: Department of Education, Skills and Employment

5-10 Extend the longevity of existing school infrastructure through long-term asset management plans to progressively address maintenance and refurbishment needs.

Proposed lead: State and territory education departments

Supported by: State and territory treasuries

10-15 8.1.4 Ensure Vocational Education and Training (VET) aligns with industry-specific skills building and jobs growth objectives by designing, delivering and operating VET infrastructure appropriately.

Proposed lead: State and territory education departments

Supported by: Vocational Education and Training providers, Department of Education, Skills and Employment

10-15 Provide contemporary education facilities by investing in VET facilities that are appropriately located, integrated into the local area, fit-for-purpose and digitally enabled, and include contemporary industry equipment.

Proposed lead: State and territory education departments

Supported by: State and territory treasuries

5-10 Deliver industry-specific VET skills training and tertiary programs in targeted industry precincts by developing and implementing more industry partnerships and programs that share infrastructure and learning spaces.

Proposed lead: State and territory economic development departments

Supported by: Vocational Education and Training providers, universities

5-10 Ensure enduring skills development opportunities and jobs are created in line with the infrastructure pipeline by continuing to mandate industry-relevant onsite training facilities and skills legacy initiatives in infrastructure development programs.

Proposed lead: State and territory economic development departments

Supported by: State and territory infrastructure departments

5-10 Support workplace-based learning accreditation schemes in industry precincts by actively participating in developing micro-credential curricula and accreditation.

Proposed lead: Vocational Education and Training providers

Supported by: Industry representative groups

5-10 8.1.5 Enable greater social and economic participation by designing programs to increase the supply and improve the quality of social and affordable rental housing.

Proposed lead: State and territory social housing providers, community housing providers, National Housing Finance and Investment Corporation

Supported by: Department of Social Services, Australian Treasury

5-10 Expand the pipeline of well-located, high-quality social and affordable rental housing by prioritising and implementing efficient medium- to long-term financing programs.

Proposed lead: National Housing Finance and Investment Corporation, state and territory social housing providers, community housing providers

Supported by: Australian Treasury, Department of Social Services

5-10 Improve housing quality by developing and implementing innovative efficient programs to reduce the maintenance backlog of social

dwellings within their remaining economic life while recycling stock that has reached or passed the end of its economic life.

Proposed lead: State and territory social housing providers, community housing providers

Supported by: Department of Social Services, National Housing Finance and Investment Corporation, Australian Treasury

5-10 Meet the *Closing the Gap* target for 88% of Aboriginal and Torres Strait Islander peoples to be living in appropriately sized housing by 2031 by:

- addressing maintenance and utility deficiencies for existing and future housing stock
- renewing life-expired housing stock and developing new housing stock
- addressing tenure issues
- providing infrastructure to prepare for land development.

Proposed lead: State and territory social housing providers, community housing providers, Department of Social Services, Coalition of Peaks

Supported by: National Indigenous Australians Agency

5-10 Support community housing providers by continuing to develop and implement programs that build capacity and capability.

Proposed lead: State and territory social housing providers, National Housing Finance and Investment Corporation

Supported by: Department of Social Services, Australian Treasury

0-5 8.1.6 Support mental and physical health through appropriate investment in green and blue and recreational infrastructure.

Proposed lead: State and territory planning departments

Supported by: Local governments

0-5 Improve health and wellbeing by developing an appropriate methodology for analysing public space performance, including green and blue infrastructure. Review methodologies used in Australia and develop place-based access benchmarks across geographies.

Proposed lead: State and territory planning departments

Supported by: Local governments

Measuring progress



Social

OECD Better Life Index

Quality of life for Australians, relative to all OECD countries¹¹

Target: Top 5

Timeframe: 0-5 5-10 **10-15** 15+



Quality

Closing the Gap

Percentage of Aboriginal and Torres Strait Islander peoples living in appropriately sized housing¹²

Target: 88%

Timeframe: 0-5 **5-10** 10-15 15+



Access

Wait time for social housing

Percentage reduction in the wait time for social housing (from 2021)¹³

Target: 80%

Timeframe: 0-5 5-10 **10-15** 15+



Using smart infrastructure to improve wellness and prevention

While the Australian health system ranks highly against other Organisation for Economic Co-operation and Development (OECD) countries,¹⁴ it still faces significant challenges.

They include responding to changing user needs and continuing to provide high quality and value.

Health care infrastructure quality will play a vital role in Australia's ability to meet these challenges.

“ It is time to fully embrace innovative, smart models of health care service delivery beyond traditional bricks and mortar. ”

This country's immediate and highly successful health response to the COVID-19 pandemic showed how important adaptable, responsive and high-functioning health infrastructure is to continued quality of life.

However, an ageing population, increasing rates of chronic disease,¹⁵ growing facility maintenance costs and unsustainable infrastructure funding models are set to put pressure on Australia's ability to meet health infrastructure demand.¹⁶

The challenges being faced by the health care system are not new, nor are they specific to Australia. A 2016 OECD report showed that health care spending has grown faster than economic growth in all OECD countries, and will become unaffordable without reform.¹⁷

It is time to fully embrace innovative, smart models of health care service delivery beyond traditional bricks and mortar.

To meet the needs of Australians into the future, health care must be designed around prevention and early intervention.

By embracing new approaches, governments can improve standards and accessibility, reduce the need for hospitalisation and drive a transition to integrated care that is planned around patient needs and supported by technology.¹⁸

Build infrastructure that supports digital health solutions

The COVID-19 pandemic has accelerated the rollout of alternative models of health care, particularly technology-enabled options such as digital health.¹⁹

The shift to digital health is transforming the patient experience and service delivery while improving the quality, accessibility and affordability of care.²⁰

This is a systemic change. Continued evolution of the Australian health system will rely on building quality health infrastructure in the right locations, and support from digital infrastructure that overcomes the uneven distribution of traditional health care facilities around the country.

Increase investment in digital infrastructure

Digital infrastructure systems allow the exchange of real-time clinical data to provide more integrated care.

They enable digital health services that have a greater focus on targeted treatment, wellness and prevention services tailored to individual needs.²¹

To make the most of the potential of digital health, Australia's health infrastructure must adapt, and the associated digital infrastructure must be upgraded to enable more reliable and equitable health care, regardless of location. This depends on improving the coverage, quality and reliability of Australia's telecommunications networks.

Improve access and service delivery

Smarter approaches to digital infrastructure are already improving access and service delivery. They are enhancing health capabilities and facilities where it is required to deliver better health outcomes.

For example, virtual health services are transforming the health system²² by allowing people to be safely treated from home. For older Australians living with chronic diseases, benefits included a 40% reduction in the mortality rate and a 24% saving over the year to the healthcare system.²³

Governments need to invest more in improving digital infrastructure by addressing gaps, strengthening connectivity and enabling patient information to be shared securely.

This will reduce pressure on overburdened health care facilities and provide valuable, sustainable and flexible medical care, especially for Rural Communities and Remote Areas.²⁴

The move to virtual health care will also rebalance the health workforce across the country, with specialists providing virtual consultations to areas with fewer onsite clinicians.²⁵

Develop digital health literacy campaigns

Alongside the expansion of digital health, there should be additional government investment in improving digital health literacy.²⁶

This will include training the health care workforce to use this technology to its full potential and educating and empowering people to manage their own health and wellbeing.²⁷

As part of this initiative, vulnerable people who lack the income, ability or digital literacy to access these services must be prioritised.²⁸

For more information about the need to improve digital connectivity and inclusion across Australia, see the **Telecommunications and digital chapter** and **Industry productivity and innovation chapter**.

Collaborate so Australia is always pandemic-ready

When responding to the COVID-19 pandemic, the Australian Government and state and territory governments separately developed comprehensive response plans.

They swiftly converted community assets into health care facilities, built supporting infrastructure and worked with industry to provide urgent health, emergency and construction services.

These important planning capabilities must be maintained and continuously improved so Australia is always prepared for a pandemic.

To ensure consistent readiness, all levels of government should collaborate with industry to implement the following arrangements:

- consistent and ongoing national arrangements for accessing private hospital infrastructure
- Australia-wide contracts with major providers for personal protective equipment (PPE) and other essential medical devices and materials
- processes to draw on industry capacity to urgently construct emergency facilities if required.

The Australian Government should also establish a national quarantine facility for use in emergency situations, for emergency evacuations or in response to urgent scalability needs, as recommended in the *National Review of Hotel Quarantine*.²⁹

In formulating plans, a systemic approach to resilience should be applied. See the **Sustainability and resilience chapter**.

Improving the quality and accessibility of education facilities

School infrastructure planners are routinely challenged by how to create a school (or a school system with buildings in different locations) that will best facilitate the educational process. This requires a very clear vision of the current situation and the expectations of all stakeholders.

Common parameters are required for facilities to deliver solutions that meet current and long-term needs. Some of the most important are school and class size.

The education sector includes:

- early childhood education and care
- primary, secondary and special schools (also known as schools for specific purpose)
- tertiary education (including VET, TAFE and higher education).

Each relies on contemporary, purpose-built facilities, located in the right places and supported by connecting infrastructure.

School buildings are deeply rooted in the communities they serve, and both students and teachers interact with the social and built environment around each school. Providing the community with shared use of these facilities can yield many benefits. This is covered further under **Reform 8.2: Partnerships to build communities**.

Enable better access to early childhood education

The *2019 Audit* highlighted the variable quality of Australia's early childhood education centres, which operate under different providers and governance regimes.³⁰

Poor access is a particular area of concern. Getting to many centres by public transport can be challenging.³¹

In Rural Communities and Remote Areas, the distance between centres leads to reduced access, contributing to lower participation rates for regional and Aboriginal and Torres Strait Islander children.³²

To overcome this challenge, state and territory governments should facilitate cross-sectoral partnerships where childcare operators collaborate with planning and transport departments.

These partnerships would address how well public transport services and active travel infrastructure (footpaths and cycleways) intersect with early childhood centres.

They would also consider improving access to shared amenities such as open green spaces and other facilities that centres use.

Adapt school planning to post-pandemic conditions

There are just over 9,500 schools in Australia supporting 4 million students.³³ Around 70% are government schools, which are attended by 2.6 million (65.7%) students.³⁴

Before the pandemic, demand for schools across Australia had begun changing. This included increasing student enrolments in larger cities and a decreasing demand in Smaller Cities, Rural Communities and Remote Areas.³⁵

At this stage it is too early to determine if this trend has changed, and to what extent, in response to the pandemic.

Recent trends in settlement preferences can provide rich data that could be incorporated into the planning for school infrastructure, whether it be for established or new schools.

The planning process should also consider the role of the non-government sector, which comprises approximately 30% of schools.³⁶ Access to non-government school enrolment data, held by the Australian Government, should be made available to state and territory education departments. This will inform future planning for school infrastructure and assist the efficient allocation of resources.

Another demand-related area of school education is the use of demountable classrooms, which may have further implications for the pandemic response.

“ Governments should facilitate cross-sectoral partnerships where childcare operators collaborate with planning and transport departments. ”

Demountables usually provide short-term relief when enrolment demand increases. However, they can also be used for disaster response and to assist with the staged development of new schools. Their versatility and practicality mean high-quality, functional and contemporary demountables should be factored into short- to medium-term school infrastructure asset planning.

Technology has an important role to play in education, but the technologies chosen need to be appropriate for each specific school environment. More research is required to align the use of technology with the needs of schools, including not only learning spaces but also school planning and construction.

Productivity benefits can be unlocked through modularisation, prefabrication and offsite construction. Read more about this in the **Industry productivity and innovation chapter**.

Improve school asset quality

A dynamic student population is forcing a rethink of school facilities, which are responding to new needs with more flexible, innovative designs.

There is strong evidence that high-quality education facilities enable better teaching, improve student outcomes and reduce dropout rates.³⁷ It is crucial that school facilities and assets have the appropriate quality and functionality, are suitable for contemporary learning and meet the educational needs and culture of each community.

The *2019 Audit* found that many Australian schools are ageing and there are schools in Fast-growing Cities, particularly in inner areas, currently accommodating more students than their stated capacity.³⁸ In at least one jurisdiction, some facilities have not been adequately maintained.³⁹

Robust and consistent asset management systems can provide higher-quality data and information, which in turn can enable improved investment decisions. State and territory education departments should continue to develop their state asset registers to address maintenance and refurbishment planning, and extend the life of assets where possible.

To assist in evidence-based decision-making on future infrastructure investment, states and territories should continue their work on evaluating the performance of facilities, including the contribution of facilities to student and teacher performance and wellbeing. Best-practice methodologies (such as a Value Rating Tool⁴⁰), which link maintenance and renewal funding to value-for-money infrastructure, can be effectively used to guide and support investment decisions.

Over time, governments should explore opportunities to provide greater transparency to school communities about the use of facilities. This could enable more meaningful engagement about the nature and quality of facilities, and the delivery of school education in local areas. This information could also assist in building relationships with community groups who may be able to access such facilities.

All schools should develop medium- to long-term asset management plans, which take maintenance into consideration and are linked to funding arrangements, to maximise the useful life of their assets. See more in the **Industry productivity and innovation chapter**.

Align VET facilities with student and industry needs

Training and higher education will play a vital role in reorienting the economy after the pandemic.

They will facilitate crisis-accelerated transitions across industries and support millions of workers to prepare for future jobs — both new entrants to the labour force and existing workers displaced by the pandemic and its after-effects.

Australia's VET system is undergoing extensive reform. This will help ensure it can support new skills acquisition, job creation and participation opportunities, including for young people, women, workers in regional communities and other population segments hit hard by the crisis.

More than 4,000 registered training organisations (RTOs) deliver VET to over 4 million Australians.⁴¹

VET is also part of the school system, with nearly 236,000 school students undertaking VET studies at school in 2019.⁴²

The COVID-19 pandemic has had a significant impact on the sector. Current projections see a 30% drop in new apprenticeships (with 130,000 fewer positions) to 2023.⁴³

There have been significant efforts to reform Australia's complex VET system, and a new national partnership agreement was signed in 2020.

However, more can be done, particularly around infrastructure quality. While government funding for the sector was \$6.36 billion in 2019, only \$181 million was spent on capital projects.⁴⁴

The Australian Government is taking steps and has committed \$50 million over two years from 2020–21 to 2021–22 for the Revitalising TAFE Campuses Across Australia program. This program aims to improve vocational education infrastructure so that TAFEs are equipped to deliver training to the standards expected by industry and students.⁴⁵

Future VET funding needs to make adequate provision for infrastructure to support digitally enabled solutions, industry-centric equipment and maintenance.

A set of principles for place-centric TAFE developments should also be developed and implemented that maximises their community benefit by locating future TAFEs in fit-for-purpose buildings and targeted industry precincts. Collaborative and shared-use opportunities will be enabled by supporting co-location and joint investment with other social infrastructure providers, industry, local governments and RTOs. For more on this see **Reform 8.2: Partnerships to build communities**.

Facilities should be integrated with planning for transport and other surrounding infrastructure, ensuring they are well located for access, close to where most students live and near industries that will ultimately employ the students.

These principles should also support the delivery, in partnership with Australia's universities and industry, of skill-development programs that produce a workforce capable of delivering tomorrow's infrastructure pipeline. Read more about this in the **Industry productivity and innovation chapter**.

New forms of collaborative infrastructure will also support micro-credentials. These are specific short courses in higher education that are flexibly delivered, allowing Australians to gather skills and knowledge across a range of education or industry settings, to create a culture of continual learning.

Investing in social and affordable rental housing

Types of housing covered in the 2021 Plan

Social housing is housing provided outside the market and allocated to tenants who meet various criteria of need. It includes:

- **public housing** provided and managed by state and territory housing authorities for people on very low incomes who are considered to be in greatest need. Rent is set as a proportion of income.
- **Aboriginal and Torres Strait Islander housing** managed by some state and territory governments or by community housing providers for the benefit of the community. Rent is set as a proportion of income.
- **community housing** managed by not-for-profit community housing providers. Access and rent are determined by tenant income and other criteria.

Affordable rental housing refers to dwellings provided at below-market rent to low- to moderate-income tenants, including key worker accommodation. Rent is usually determined as a proportion of the market rent for similar dwellings.

Safe, adequate and affordable housing is a vital component of social infrastructure.

It is crucial for physical and mental wellbeing and it can reduce the costs that governments would otherwise pay for health, justice and emergency services.⁴⁶

In 2019–20, total Australian Government and state and territory government recurrent expenditure for social housing and specialist homelessness services was \$5.3 billion, around 1.9% of total government expenditure.⁴⁷

Despite this, the proportion of households living in social housing in Australia decreased from 4.7% in 2010 to 4.3% in 2019.⁴⁸ More social housing is required to keep pace with the growth in the overall number of households in Australia.

Match supply to demand

Australia needs an appropriate supply and range of social and affordable rental dwellings that give people access to different types of low-cost housing.

Providing a variety of housing options has several benefits, including:

- supporting people as they move between different forms of housing, including the private rental and ownership markets⁴⁹
- catering for different household types and income brackets
- recognising the needs of Aboriginal and Torres Strait Islander peoples
- enabling older Australians to stay in their communities
- providing nurses, aged care workers, teachers and other key workers with affordable accommodation close to their employment.

Access to social housing is managed through waiting lists, which are large and growing due to insufficient supply. As at 30 June 2019, there were 148,500 households around Australia on a waiting list for public housing and 12,100 households awaiting Aboriginal and Torres Strait Islander housing.⁵⁰

Also, while the majority (80%) of social housing residents live in dwellings that are considered adequate for their household composition,⁵¹ the mix of housing types does not always match tenant requirements.

Ensuring the best housing for tenant requirements is challenging. Dwellings are often underutilised. This occurs when two or more bedrooms are surplus to a household's needs. The 2020 Australian Institute of Health and Welfare housing assistance report shows underutilisation has remained relatively stable over the long term. It sits at 17% for public housing and 11% for community housing, but increases to 26% for Aboriginal and Torres Strait Islander households in some areas.⁵²

At the same time, while there has been progress, overcrowding continues to be a significant issue for Aboriginal and Torres Strait Islander households, especially in Remote Areas. In 2019, 50% of very remote and 31% of remote Aboriginal and Torres Strait Islander housing residents were living in overcrowded conditions.⁵³

Ongoing investment would ensure suitable low-cost housing continues to be available to Australians through all stages of their lives.

Change policies and approaches

There needs to be a fundamental change to the policy settings for the provision of social and affordable rental housing so more well-located, high-quality, greener dwellings enter the sector.

Increased investment will not only support people on low incomes with housing needs, but also support the country's economic recovery in both the immediate and long term.

A genuine commitment by the Australian Government and state and territory governments will support the provision of suitable and financially sustainable social and affordable rental housing.

Governments should ensure the basic requirements for social housing are met, by making it:

- integrated with the community
- located where there is easy access to jobs, training, educational opportunities and active and public transport services
- safe and of adequate quality, including being energy-efficient, configured with appropriate health and accessibility hardware (for example, functioning taps) and designed for thermal comfort.

The future of social and affordable rental housing in Australia will continue to be shaped by a number of factors. They include changing demographics, socio-economic and environmental realities, housing market evolutions, and the changing nature of work and related policy decisions as Australia charts a path towards economic recovery.

The approaches to planning and delivering this infrastructure must recognise and respond to the specific conditions in each location and be aligned with Infrastructure Australia's *Principles for sustainable infrastructure delivery in Small Towns, Rural Communities and Remote Areas*, as discussed in the **Place-based outcomes for communities chapter**.

“ There needs to be a fundamental change to the policy settings for the provision of social and affordable rental housing so more well-located, high-quality, greener dwellings enter the sector. ”

To learn more about sustainability outcomes, see the **Sustainability and resilience chapter** and the **Water chapter**.

Towards a better social and affordable rental housing system

Provision of social housing is slowly shifting from a model of public supply (owned and managed by governments) to a mixed model.

Community housing providers are playing a greater role, through both title and management transfers of former public housing and new housing development.

However, more should be done to assess the future demand for social and affordable rental properties and develop strategies for meeting it.

More developed business cases must be tested and applied that incorporate the broader community returns derived from appropriate social and affordable rental housing, such as lower health and hospital expenditure.

Collecting comprehensive and consistent housing data across different government departments and housing providers is vital in developing these use cases. It would allow governments to establish a pragmatic and accurate basis for assessing social housing supply and demand as a form of infrastructure. For more on this topic, see **Reform 8.3: Social infrastructure is economic infrastructure too**.

Enabling equal access to green and blue infrastructure

Freely accessible and well-maintained open green spaces are hallmarks of many places in Australia. Together with waterways, beaches and other blue spaces, they help to define this country's cities and towns.

The COVID-19 pandemic has changed Australians' relationship with nature and the outdoors and provided the opportunity to reconnect people to these areas.

Green and blue infrastructure is used to describe natural areas and features (land, vegetation and waterways) that deliver a broad range of the ecosystem services (such as air quality) that underpin a healthy environment.

Along with the physical facilities that support them (such as walking and cycling tracks, jetties and wharves), green and blue infrastructure make a significant contribution to people's physical and mental wellbeing and to the economic productivity of communities. Green space is particularly important in higher-density and socio-economically disadvantaged areas.⁵⁴

As well as size and attractiveness, good accessibility greatly increases the use of these public spaces.⁵⁵ However, fragmented planning and a lack of prioritised investment mean access can be inequitably distributed.⁵⁶

Without coordination in the planning and control of blue and green spaces, viable opportunities to improve accessibility, such as integration with land-use planning and public and active transport networks, may be missed.⁵⁷

Governments at all levels must work together to embed an approach to developing green and blue infrastructure that is grounded in the varied needs of the local community.

They have a role to play in:

- providing new, good-quality green and blue space that is inclusive, equitable and improves liveability
- improving, maintaining and protecting existing green and blue infrastructure
- increasing green and blue infrastructure within public spaces and promoting healthy streets
- improving transport links, pathways and other means of access to green and blue space.

This work should include benchmarks for improving accessibility and quality, which will create more liveable local areas. They should be built around understanding what people value most about being able to access nature and green space, and how these spaces could be improved to meet the current and future health and wellbeing needs of the population.

To support strategic decision-making, there should also be a consistent methodology for capturing data across jurisdictions, categorising types of infrastructure and quantifying the social, economic and environmental benefits of green and blue infrastructure.

This topic is covered further in the **Sustainability and resilience**, **Transport** and **Water** chapters.

Integrating planning for arts, culture and recreation

Australia's arts, cultural and recreational infrastructure promotes social cohesion and improves liveability.

Arts and cultural assets and spaces such as museums, art galleries or natural assets of cultural value make cities and regions attractive, creative and sustainable.

Recreational infrastructure, such as sporting and community facilities, **and open spaces** promote positive health and improve social participation.

Together, they enable Australians to share experiences, nurture their physical and mental wellbeing,⁵⁸ experience a sense of place and celebrate people's local and national identities.

Among Aboriginal and Torres Strait Islander peoples, taking part in arts, cultural and recreational activities not only supports wellbeing and community connectedness, it can provide pathways to better education and employment outcomes.⁵⁹

Across all levels of government, there is an opportunity to align arts, cultural and recreational infrastructure.

Governments need to better understand the sector's current performance and identify opportunities for rebuilding a stronger and more resilient arts, culture and recreation sector post-pandemic. This will help to build stronger communities and increase social and economic benefits.

“ Across all levels of government, there is an opportunity to align arts, cultural and recreational infrastructure. ”

Priorities should include coordinating infrastructure planning (including promoting the use and development of land for arts and cultural activity) and developing highly targeted community strategies that prioritise arts, cultural and recreational infrastructure.

Some of the issues that could be considered for national, sector-wide analysis and review are:

- infrastructure use, service performance and condition
- assets, expenditure and governance
- operational criticality and resilience.

For more information, see **Reform 8.3: Social infrastructure is economic infrastructure too**.

Ensuring social infrastructure is resilient and contributes to emissions reduction targets

Social infrastructure assets are generally long-lived and need to be resilient to a wide range of potential shocks and stresses.

The investments that are made today must also consider a net zero future, including investing in technology that enables it.

The **Sustainability and resilience** chapter outlines ratings tools and sustainability approaches to ensure climate mitigation and resilience are considered in social infrastructure investment and services. It also provides a pathway for embedding a systemic approach to resilience that informs land-use and infrastructure planning and decision-making.



8.2 Partnerships to build communities

Key messages

- **Productive partnerships are vital** for providing effective social infrastructure and enabling more equitable access to services.
- Effective cross-government systems help to **maximise social, economic and environmental outcomes for communities**.
- **New consistent governance models** are required to lead social infrastructure partnerships across jurisdictions.
- The benefits of collaborative strategic planning and the shared use of social infrastructure include **more connected and healthier communities, better use of assets and optimised government investment**.
- Co-locating facilities in health and education innovation precincts will lead to **more integrated, accessible and higher-quality services** and **unlock economic benefits**.
- Cost-effective social infrastructure and services that communities value can be delivered through **new models and operating processes** that create efficiencies and drive innovation.

Collaborative partnerships for better community outcomes

Effective social infrastructure assets support high-quality service delivery. To be successful, their planning and delivery must be coordinated and fostered by collaborative and inclusive partnerships.

Ideally, these will look beyond physical assets and direct services to understand the holistic contribution social infrastructure makes to wellbeing and liveability for the whole community.

However, because a wide range of social services serve communities, the supporting infrastructure is usually planned, delivered and maintained by different agencies.

With community service needs changing in Australia, social infrastructure providers should collaborate across governments and sectors to apply strategies that achieve the best possible solution for each place.

A coordinated approach to planning and delivery based on providing what communities need will deliver better outcomes than the conventional approach of standalone decisions. These approaches will provide all Australians with access to the right services, no matter where they live.

The result will be social infrastructure that is more connected, well used and highly valued by the community.

Productivity, learning and job creation will be driven by co-locating major health and education facilities in mixed-use precincts.

To support these partnerships, there must be governance frameworks that reject disconnected, business-as-usual approaches and put community needs first.

The Australian Government and state and territory governments also need to embrace different funding and delivery models, such as:

- outcomes-based procurement, which encourages innovation by focusing on achieving outcomes, not on how they are achieved
- Public Private Partnerships that share costs and risks.

As well as delivering significant cost savings, alternative models can fund shared community use facilities and improve delivery outcomes.

Specialised infrastructure agencies should also be established within social infrastructure portfolios to improve delivery competence. These agencies would manage significant capital programs for health and education and be supported by standalone capital project offices.

8.2 Recommendation

Maximise social and economic community benefits by supporting shared use of social infrastructure through future agreements and capital funding programs prioritising shared use of facilities.

Proposed sponsors: Department of Health, Department of Education, Skills and Employment, Australian Treasury

Supported by: State and territory treasuries, state and territory planning departments, state and territory health departments, state and territory education departments

When this should impact:



Where this should impact:



5-10

8.2.1 Allow community access outside core operating hours by developing shared-use plans for new and upgraded social infrastructure such as health facilities, schools, VET, TAFE, universities and sporting facilities.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure bodies

5-10

Support shared use of social infrastructure by establishing national principles for place-based, cross-agency infrastructure governance.

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies

5-10

Promote shared use of social infrastructure by developing incentives and measures that support agencies to implement shared-use arrangements and place-based, collaborative planning and delivery.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure bodies

0-5

Increase community access to social infrastructure by benchmarking, compiling and sharing best-practice examples of shared-use models that could be adapted or scaled nationally.

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies

5-10

Enable place-centric TAFE developments by developing principles to support this approach, including collaborative and shared-use opportunities. Review existing TAFE assets against these principles and migrate new or refurbished assets where there are benefits.

Proposed lead: State and territory education departments and state and territory planning departments

Supported by: State and territory treasuries

0-5

Enable the use of infrastructure during crises by identifying and funding fit-for-purpose facilities that would be available for rapid multi-purposing and shared use at these times.

Proposed lead: State and territory emergency management agencies

Supported by: State and territory treasuries

5-10

Support third-party use by establishing insurance and security arrangements, payment systems and associated services.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure bodies

5-10

Enable a shift in agencies adopting shared-use models by including principles for maximising shared use and associated community outcomes in business case policies.

Proposed lead: State and territory treasuries
Supported by: State and territory infrastructure bodies



5-10 **8.2.2 Increase economic and social benefits by implementing strategic planning governance structures for health and education precincts, and innovative procurement and delivery models. Specialised agencies should also be established to deliver major social infrastructure capital projects.**

Proposed lead: State and territory health departments, state and territory education departments, state and territory treasuries, state and territory first minister's departments

Supported by: Department of Health, Department of Education, Skills and Employment, Department of the Prime Minister and Cabinet, universities, local governments, local health districts, local education officers

5-10 Drive the development of health and education precincts and innovation districts by developing and implementing place-based governance agreements that involve associated local institutions and community representatives.

Proposed lead: State and territory health departments, state and territory education departments

Supported by: State and territory planning departments, universities

5-10 Yield the benefits of innovation districts by adopting a precinct maturity model to:

- assess the maturity of existing health and education precincts
- prioritise precincts to move along the precinct maturity pathway
- develop investment attraction strategies, master plans and incentives to attract aligned industry sectors into precincts
- include social and affordable rental housing in innovation districts.

Proposed lead: State and territory treasuries

Supported by: State and territory health departments, state and territory education departments, state and territory economic development departments, universities

5-10 Promote and accommodate innovative approaches to procuring social infrastructure delivery services, including updating existing Public Private Partnership guidelines and models.

Proposed lead: State and territory treasuries

Supported by: Infrastructure Australia

5-10 Deliver better capital outcomes by establishing standalone infrastructure agencies and major project offices for significant social infrastructure sector portfolios.

Proposed lead: State and territory first minister's departments

Supported by: State and territory health departments, state and territory education departments

Measuring progress



Governance

Shared use framework

Deployment of common principles for place-based, cross-agency infrastructure governance

Target: National

Timeframe: 0-5 5-10 **10-15** 15+



Economic

Integrated innovation precincts

Percentage of Fast-growing Cities and Smaller Cities with integrated social infrastructure innovation precincts

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Governance

Innovative social infrastructure

Public Private Partnership guidelines include innovative approaches for social infrastructure delivery

Target: National

Timeframe: 0-5 5-10 **10-15** 15+



Governance

Social infrastructure assets

Standalone infrastructure agency, and major project office, responsible for social infrastructure delivery in every jurisdiction

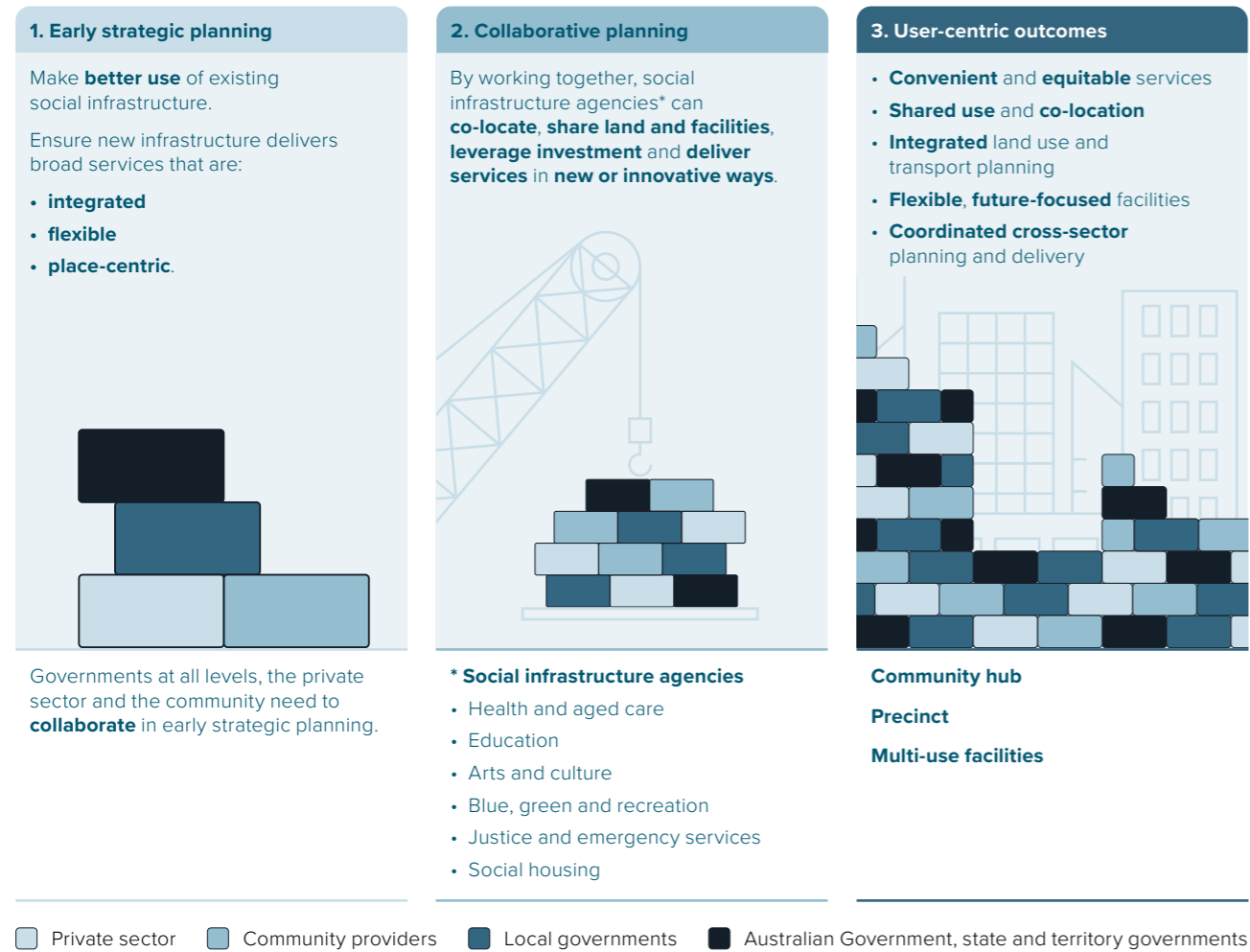
Target: National

Timeframe: 0-5 5-10 **10-15** 15+

Coordinating social infrastructure to lift service quality

High-performing social infrastructure enhances community wellbeing. By delivering integrated, complementary and shared services, it helps people to take part in social and economic activities (see **Figure 8.2**).

Figure 8.2: Cross-sector collaboration supports more integrated, accessible, user-centric outcomes



Move to integrated planning

High-quality assets have the potential to lift overall service outcomes, so all social infrastructure providers must take explicit steps to acknowledge that asset planning is a critical component of successful service planning.

As these organisations become more mature, they should move beyond standalone, sector-specific asset planning to integrated planning.

Data-sharing arrangements should be negotiated with public and private schools to improve infrastructure planning. This includes sharing private school enrolment data that is currently exclusively held by the Australian Government.

This will make it possible for public services to be more flexible and better able to respond to diverse community needs, because they are planned and delivered across a variety of physical and digital government assets.

Additionally, the roles played by transport, telecommunications and digital infrastructure in helping people access these services should be considered in social infrastructure service planning.

Acknowledge the role of land-use planning

As the *2019 Audit* observed, in Australia social infrastructure is too often an afterthought in land-use planning.

Right now, a growing, demographically changing population is driving demand for social infrastructure services, which has major implications for land-use planning.

In this environment, the interdependence between strategic land-use planning and social infrastructure asset and service planning should be more publicly acknowledged.

When recognising their interdependence, governments should consider:

- how to develop supporting transport, telecommunications and digital infrastructure so people can access social infrastructure services
- the potential for scalable and multi-use facilities.

They should also direct funding to places where there are new or evolving service needs.

The trend of regional growth apparent before, during and after the COVID-19 pandemic has changed local social service needs. Conversely, urban growth has slowed.⁶⁰

These conditions provide an opportunity for governments to consider whether the thresholds for triggering infrastructure improvements should change to reflect the new conditions.

Facilitating shared use of assets

Social infrastructure assets should be multi-functional so they can be used by different groups for different purposes.

A good example is school facilities such as halls, pools and sporting fields, in both the public and private sectors. Many community health facilities may also be suitable for community use. These are commonly regarded as community assets that support everyone's health and wellbeing.

“ Social infrastructure assets should be multi-functional so they can be used by different groups for different purposes. ”

Sharing these assets builds a strong sense of community ownership that connects people and further enhances liveability (see **Figure 8.3**).⁶¹

However, multi-purpose community facilities at many schools, TAFE and universities are consistently underused.

Making better use of these assets while ensuring they remain fit for their original purpose is equally valuable in cities, where space is scarce, and in regional and remote locations, where such facilities are often at the heart of communities.

Security and safety concerns, and associated policies, can be inflexible barriers. They often restrict the use of facilities as shared spaces, deterring viable opportunities for the co-location of complementary providers such as local government, sporting and community groups, or independent and Catholic schools.⁶²

State and territory education, health and treasury departments, and school and health governance bodies, must work together to overcome these barriers and make it easier to access and use infrastructure outside core operating hours.

Some schools have already established ongoing access arrangements with councils that allow sporting or community groups to use school facilities at agreed times. In return, councils provide funding for capital works or maintenance at the school.

To work effectively, all partners need to establish mature frameworks, streamline processes and put in place the necessary insurances, security and payment systems.

This will maximise the value of assets to the community and generate revenue that can be allocated within facilities.

Figure 8.3: Sharing community assets such as school facilities contributes to whole-of-community wellbeing



Doveton College in Victoria is a successful cross-sector partnership between the Victorian Government, the Colman Foundation and the Australian Government. The College provides community access to education, health and family services, as well as the College's performing arts centre, fitness centre and community meeting places.

Image source: Doveton College, Victoria (2021)

Introduce incentives that encourage collaborative asset use

Social service delivery agencies operate within finite budgets. Funding their core services takes priority over funding to enable wider asset use.

To drive collaborative planning and cross-agency initiatives, including infrastructure sharing or co-location, there must be appropriate incentives to allow third parties to use assets.

Simplifying processes to enable access, support revenue collection and allow the revenue to be kept locally will all play a part.

The Australian Government and state and territory governments should review the processes used to allocate funding, rewarding demonstrable collaboration by prioritising projects that enable it when they make funding decisions.

Support strong governance

Stakeholders stress the importance of strong cross-sector governance processes in planning and delivering social infrastructure. It helps to avoid duplication and ensures the right services are provided.

However, a complex system of overlapping jurisdictions and funding between the three levels of government often impacts the effective planning, delivery and operation of these facilities.

It is possible to reduce this fragmentation by establishing cross-sector governance arrangements that support multi-disciplinary planning.

To succeed, they must be informed by, and delivered in partnership with, the private sector, not-for-profit organisations and the community.

To support this approach, Infrastructure Australia and state and territory infrastructure bodies should develop consistent principles and models that govern shared-use and collaborative planning.

Enable effective delivery

Significant challenges are associated with delivering and operating complex infrastructure in today's marketplace and they often result in variable project outcomes.

Specialised agencies should be created that sit within social infrastructure portfolios to plan, design and deliver assets. They should comprise building and procurement experts, project managers, architects and other specialists.

Agencies should be supported by standalone offices to manage large capital projects (over \$250 million), build and maintain commercial partnerships and expand work on precinct developments.

Victoria and New South Wales have both created dedicated infrastructure agencies to manage their significant school and health capital programs and other states and territories should follow suit.

Also, more effective use of real-time data and analytics should be harnessed to increase transparency and improve collaboration throughout the supply chain. By using technology to generate value for each project or program, all partners and contractors will deliver benefits across the entire asset lifecycle, and so will the construction industry overall.

Redefining communities through innovation precincts

Around the world, industry, universities and governments are creating innovation precincts together.⁶³

Located in cities and larger regional centres, these precincts specialise in many fields, from advanced manufacturing to information technology and health and education.

They benefit businesses and communities by creating a critical mass that:

- supports higher wages and skilled jobs
- encourages collaborative and integrated service delivery
- attracts investment
- has a multiplier effect on the economy.⁶⁴

Creating a social infrastructure precinct involves designing and co-locating health, education and research facilities that bring together a range of partners.

By operating in a single precinct, they can share knowledge, promote learning and foster collaboration. The outcome is higher-quality, innovative and integrated services.

To be globally competitive and attract significant investment, a social infrastructure precinct must house the major sectors (community, government, tertiary education and industry).

It also needs to include integrated transport facilities, residential development (such as affordable accommodation for frontline workers) and cultural and recreational facilities and spaces.

This will involve close collaboration between state and territory treasuries and economic development, social infrastructure and transport departments, as well as tertiary education organisations such as universities.

Precinct planning should be underpinned by a strong governance framework that outlines the role and purpose of different partners and integrates planning with mobility solutions.

Integrated, place-based planning is also covered in the **Place-based outcomes for communities chapter**.

Getting it right: Creating a successful precinct

As precincts evolve, they follow a maturity pathway (see **Figure 8.4**).⁶⁵

Precincts maximise available economic and social benefits by attracting industry, mixed-use business and housing for workers and students.

The most successful health and education precincts become innovation districts that are highly accessible.

One example is the Gold Coast Health and Knowledge Precinct, which incorporates the Gold Coast University Hospital and Griffith University. This area is well-served by light rail, road, cycling and walking networks.

This enhanced connectivity supports the precinct's ongoing development as a vibrant mixed-use community where residential, commercial and open spaces are co-located with the hospital and university.⁶⁶

The benefits of creating precinct approaches to develop social infrastructure include staging infrastructure investment to unlock the strategic outcomes of the precinct, which opens up opportunities across a range of sectors.

Figure 8.4: Precincts mature over time, unlocking ongoing value

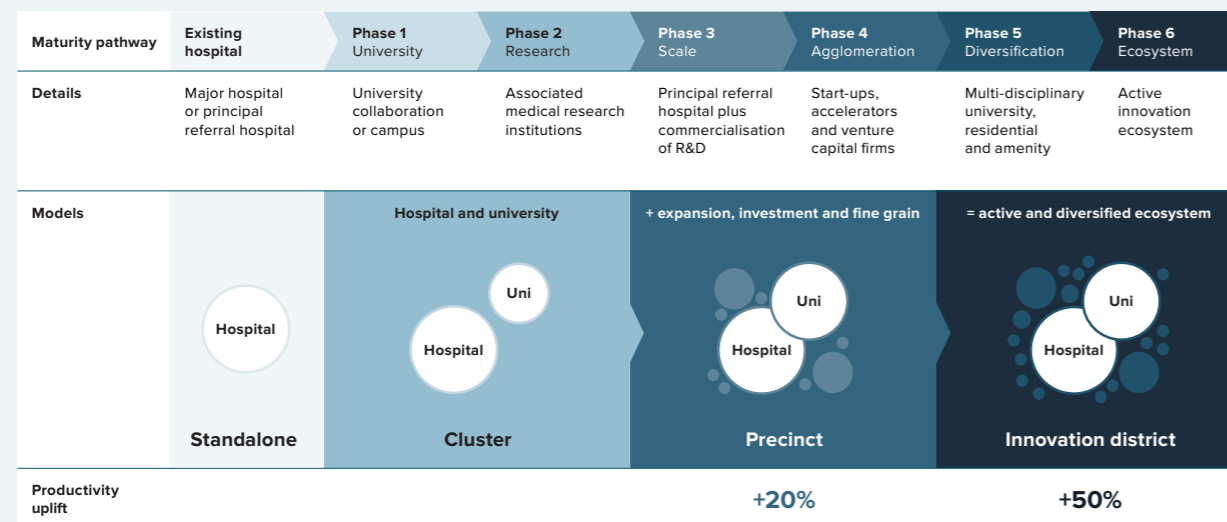


Image source: Based on Greater Sydney Commission (2018)⁶⁷

Unlocking innovation with new service delivery models

A key challenge for governments is how to fund social infrastructure expansion so it always meets community expectations.

They need to identify and expand innovative procurement models that support shared access to assets and leverage private sector funding.

Innovative practices include collaborative contracting, and establishing panels of qualified contractors, to enable longer-term private sector investment in capability development.

In particular, partnerships that access private capital and work across the not-for-profit and private sectors will greatly expand available infrastructure funding options.

Public Private Partnerships (PPPs) are a non-traditional but proven way to deliver school facilities that are designed to be shared with the local community.

The 2015 Victorian Schools PPP is one successful example. It provided community-use assets in

each school, including gyms, ovals, early learning centres and commercial kitchens (for after-hours VET sector teaching use).

As well as benefiting the community, this arrangement provided a 4.6% saving for the Victorian Government on conventional service delivery.⁶⁸

“Partnerships that access private capital and work across the not-for-profit and private sectors will greatly expand available infrastructure funding options.”

Other examples include innovative contracts for justice facilities that deliver social outcomes as part of financial incentives.⁶⁹

By adopting these innovative funding models, government investments can deliver both economic and social returns.



8.3 Social infrastructure is economic infrastructure too

Key messages

- Social infrastructure, and the services it supports, not only enables Australians to live better lives, it **delivers substantial direct and indirect benefits to the nation's economy**.
- Australia needs a **nationally consistent approach to identifying and evaluating the quadruple-bottom-line value** of all social infrastructure investments.
- Together, the **health and education sectors made up 13% of Australia's GDP** in 2020, more than mining, finance, construction and manufacturing.
- Education leads to **higher levels of wages and employment** and boosts job satisfaction and productivity, while lifelong learning produces a skilled workforce. Both require high-quality, cost-effective, digitally enabled **educational infrastructure that is well located and fit for purpose**.
- Investment in safe and adequate social housing **generates positive wellbeing, health and productivity outcomes** for individuals and contributes to the effective functioning of society.
- To support more informed investment decisions, there need to be more fully developed business cases that capture and assess the **wider societal and economic benefits of social and affordable rental housing programs**.
- Active recreation and sport and Australia's world-class natural assets **generate a wealth of health, social and economic benefits, and cultural and creative activity contributed more than \$115.2 billion to the economy in 2017–18**.⁷⁰
- Governments should drive economic growth by coordinating arts, cultural and recreational infrastructure strategies that **capitalise on the unique strengths of Australia's regions**.

Acknowledging social infrastructure's economic role

The health, wellbeing and other community benefits of social infrastructure are well understood. Its significant contribution to Australia's economic growth is less well known and should be appropriately valued.

Social infrastructure provides stable employment, attracts and retains people in communities, catalyses local economies and helps businesses to flourish.

The substantial direct and indirect economic benefits significantly outweigh initial capital costs.⁷¹

The economic outcomes delivered by social infrastructure include:

- productivity gains from employment
- education, tourism and export services
- economic wealth created during construction
- attracting investment through innovation and research
- a lesser burden on social services due to health savings and reduced crime.

It is clear the economic contribution of social infrastructure is yet to be appropriately recognised.

To guide future investment and support ongoing prosperity, Australia needs a consistent, national valuation framework that captures, measures and assesses the quadruple-bottom-line value (social, economic, environmental and governance) of social infrastructure. For more information on the quadruple bottom line, see the **Sustainability and resilience chapter**.

“The economic contribution of social infrastructure is yet to be appropriately recognised.”

Underlying frameworks are also required that value sectors of explicit need, including: social and affordable housing; arts, culture, green, blue and recreational infrastructure; and Australia's significant natural assets.

8.3 Recommendation

Support economic development by recognising the value of investment in social infrastructure.

Proposed sponsor: Infrastructure Australia

Supported by: State and territory infrastructure bodies, Australian Treasury

When this should impact:



Where this should impact:



5-10 **8.3.1 Guide better social infrastructure investment by developing a consistent, national valuation framework that captures, measures and assesses the quadruple-bottom-line benefits of social infrastructure.**

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies

0-5 Guide social infrastructure investment by establishing a cross-jurisdictional, multi-sector panel to lead the collaborative development of an overarching social infrastructure valuation framework. This will strengthen existing approaches and draw on expertise from government, industry, environmental, First Nations and community leaders.

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies

0-5 Support the effective evaluation of the economic contribution of social infrastructure by developing associated tools, methodology and guidance materials that can be used by infrastructure providers.

Proposed lead: Infrastructure Australia
Supported by: State and territory infrastructure bodies

5-10 Enhance investment decisions by continuously improving and updating the framework by sharing information and best practice. Support the development of evaluation approaches for specific social infrastructure sectors to fill out the framework.

Proposed lead: State and territory infrastructure bodies

Supported by: State and territory treasuries, state and territory education departments, state and territory health departments, state and territory housing departments, state and territory justice departments

5-10 **8.3.2 Support healthy and productive futures for all Australians by establishing a consistent approach to capturing, measuring and assessing the quadruple-bottom-line benefits of social and affordable rental housing.**

Proposed lead: National Regulatory System for Community Housing, state and territory social housing providers, community housing providers, Department of Social Services, Australian Treasury

Supported by: Australian Institute of Health and Welfare, Australian Bureau of Statistics, Infrastructure Australia

0-5 Assess the quadruple-bottom-line benefits of social and affordable rental housing by building on existing frameworks and developing an agreed, consistent approach to measuring its economic impact. Use the approach to inform and support the national valuation framework.

Proposed lead: Department of Social Services, state and territory social housing providers, community housing providers

Supported by: State and territory treasury departments, Australian Institute of Health and Welfare, Australian Bureau of Statistics, National Regulatory System for Community Housing

0-5 Harmonise the collection and availability of data across different government departments and housing sectors by developing a housing and homelessness reporting process and dataset that are comprehensive and consistent.

Proposed lead: Department of Social Services, state and territory social housing providers, community housing providers, Australian Treasury

Supported by: State and territory treasuries, Australian Institute of Health and Welfare, Australian Bureau of Statistics, National Regulatory System for Community Housing

5-10 Deliver improved social and affordable rental housing outcomes by adopting the quadruple-bottom-line approach to prioritise investment.

Proposed lead: State and territory social housing providers, community housing providers, National Housing Finance and Investment Corporation, Australian Treasury

Supported by: Department of Social Services

5-10 **8.3.3 Drive economic growth and improve social cohesion and liveability by establishing a consistent approach to capturing, measuring and assessing the quadruple-bottom-line benefits of arts, culture, green, blue and recreational infrastructure.**

Proposed lead: State and territory treasuries

Supported by: State and territory arts, cultural, recreational and tourism departments, local governments

0-5 Improve growth and liveability by assessing the quadruple-bottom-line of arts, culture, green, blue and recreation infrastructure, building on existing frameworks and developing an agreed, consistent approach to measuring its economic impact. Use the approach to inform and support a national valuation framework.

Proposed lead: State and territory arts, cultural, recreational and tourism departments, state and territory planning departments

Supported by: Local governments, communities

5-10 Catalyse economic development by using the new framework to collaboratively plan, develop and invest in arts, cultural, green, blue and recreational infrastructure that enhances unique regional identities and brands. Apply this approach when planning new precincts and renewal projects. Update existing plans every five years.

Proposed lead: State and territory arts, cultural, recreational and tourism departments, state and territory planning departments, state and territory economic development departments

Supported by: Local governments, communities

5-10 **8.3.4 Support and protect economic growth and the environment by valuing Australia's significant natural assets and their quadruple bottom line benefits.**

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory environment departments

0-5 Inform and prioritise investment by developing a framework to assess the quadruple bottom line of significant natural assets, building on existing frameworks and developing an agreed, consistent approach to measuring their economic impact. Use the approach to inform and support a national valuation framework.

Proposed lead: State and territory environment departments

Supported by: Department of Agriculture, Water and the Environment

0-5 Inform decision-making by developing an agreed and integrated register of significant natural assets, with a stocktake undertaken by individual levels of government.

Proposed lead: State and territory environment departments

Supported by: Department of Agriculture, Water and the Environment

Measuring progress



Governance

Social infrastructure valuation framework

Deployment of a valuation framework for social infrastructure

Target: National

Timeframe: 0-5 5-10 **10-15** 15+



Governance

Housing dataset

A consistent dataset for housing and homelessness

Target: National

Timeframe: 0-5 5-10 **10-15** 15+



Governance

Natural assets accounting standard

A consistent approach to environmental-economic accounting for natural assets, in line with global standards

Target: National

Timeframe: 0-5 5-10 **10-15** 15+



Planning to harness economic value

Nationally, social service sectors contributed 15% of Australia's GDP in 2020.⁷² The sectors employed over 3.5 million people — around one-quarter of Australia's workforce.

To support economic growth and resilience, social infrastructure must be planned and delivered in a way that is appropriate to the needs of each community.

In **Smaller Cities and Regional Centres, and Fast-growing Cities**, governments should be super-charging performance and productivity by co-locating major infrastructure such as hospitals, universities, research and industry in precincts or innovation districts.

When designed, planned and developed in the right locations, precincts strengthen innovation and collaboration, boost wages and productivity and anchor employment, creating a multiplier effect on the local and national economy.

In **Smaller Cities and Regional Centres**, social infrastructure investment must plan ahead for, and respond to, population changes and infrastructure priorities.

It is vital governments assess and plan for the critical mass of social infrastructure Australia needs to attract people to live and thrive in communities and stay there.

Schools, health care facilities, cultural amenities and social and affordable rental housing all contribute to thriving communities.

“It is vital governments assess and plan for the critical mass of social infrastructure Australia needs to attract people to live and thrive in communities and stay there.”

There are opportunities to share resources and facilities between governments and communities to reduce costs and improve access for users.

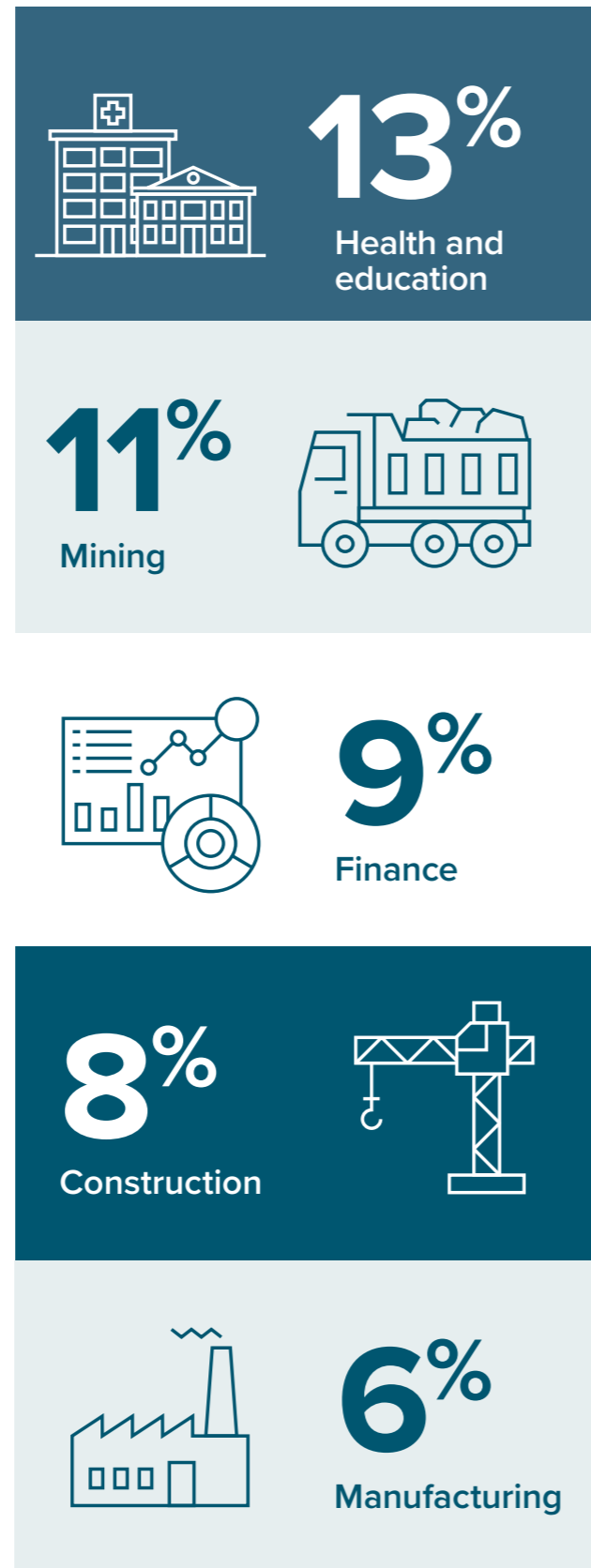
For more insights into all these topics, see **Reform 8.2: Partnerships build communities**.

Develop smart health and education infrastructure

The combined output of the health and education sectors is economically significant for Australia.

In 2020, it was larger than the sector contributions of mining, finance, construction and manufacturing (see **Figure 8.5**).⁷³

Figure 8.5: Health and education made a large GDP contribution in 2020



Source: Reserve Bank of Australia (2021)⁷⁴

Invest strategically in education and training

The education and training sector contributes significantly to the Australian economy in several ways:

- through direct employment — it employed nearly 1.1 million people in November 2020⁷⁵
- by improving people's employability
- by increasing workforce productivity.⁷⁶

For example, in 2018 the Regional Universities Network of seven regionally based universities contributed \$2.4 billion in Gross Regional Product to their local economies. The Network is growing Australia's skilled workforce, increasing people's wages and building research and knowledge capital.⁷⁷

To increase the economic contribution this sector makes to Australia's GDP, all levels of government need to invest in high-quality, well-located, future-focused educational facilities.⁷⁸ This is required to meet demand and compete internationally.

Support new models for delivering services

The COVID-19 pandemic provided a unique opportunity to explore, trial and further develop low-cost service delivery through digital technologies.

As well as making access to health care, education and arts and culture more equitable,⁷⁹ these new social service delivery models have economic value.

Telehealth alone has the potential to save the health care system billions of dollars a year simply by reducing hospital admissions by one annual visit per person.⁸⁰

To increase their economic contribution, these smarter digital infrastructure approaches must be improved and implemented by governments.

For more details about how governments can enhance the economic value of the health and education sectors, see **Reform 8.1: Transforming social infrastructure to enhance quality of life**.

Consider cross-sector impacts

Governments should take a considered, strategic and standardised approach to evaluating the quadruple-bottom-line benefits of social infrastructure sectors by considering both their separate and their combined economic value.

For example, recreational infrastructure such as playing fields, swimming pools and sports centres help to relieve the significant economic burden of preventable disease on the health system by encouraging physical activity. These infrastructure assets also contribute to a healthy community by providing a hub for connection.

A 2019 Australian study found the burden of physical inactivity on annual health expenditure can be as high as \$840 million. It also costs the economy up to \$15.6 billion in annual production losses.⁸¹

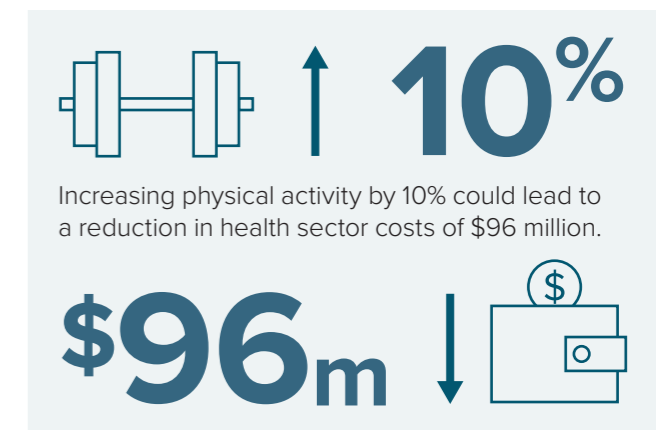
“Governments should take a considered, strategic and standardised approach to evaluating the quadruple-bottom-line benefits of social infrastructure sectors.”

Supporting active lifestyles has the potential to substantially reduce health costs (see **Figure 8.6**).

Similarly, safe, stable and appropriate social housing has a flow-on effect, reducing costs to the health, education and justice systems.

A consistent national social infrastructure valuation framework needs to be established to appropriately capture, prioritise, measure and assess the total economic value of social infrastructure so investment is more effective. The **Sustainability and resilience chapter** outlines the goal of establishing a quadruple bottom line for all infrastructure policy and investment decisions.

Figure 8.6: Recreational facilities reduce health care costs by supporting active lifestyles



Source: Cadilhac et al. (2011)⁸²

Capturing social housing's total economic contribution

Social housing serves a social and economic purpose and contributes to the effective functioning of Australian society.⁸³

There is growing evidence of the broader social and economic benefits provided by safe, stable, appropriate and affordable housing.⁸⁴

They include improved individual wellbeing, higher worker productivity and monetary and societal benefits, such as offsetting public sector costs for health, justice and specialist homelessness services.

When social housing is combined with targeted support services that help people with health and other wellbeing issues, the social and economic outcomes can multiply.⁸⁵

Despite its contribution, Australia's social housing is facing challenges:

- The available housing assets are ageing and maintenance costs continue to grow.⁸⁶
- Supply does not meet demand.
- Overcrowding is leading to poor health and social outcomes for Aboriginal and Torres Strait Islander peoples in Remote Areas.⁸⁷

Australia needs 728,600 new social housing properties and 295,000 affordable rental homes by 2036.

Filling the social housing gap can meet current and future demands and provide opportunities for people to transition to different types of housing — from crisis accommodation to private ownership.⁸⁸

In 2018, the Australian Government created a new affordable housing investment pathway through the National Housing Finance and Investment Corporation, to deliver cheaper and more efficient financing.⁸⁹ However, the sector and governments need to do more to generate efficient financing and progress initiatives aimed at closing the funding gap to deliver the social housing Australians need.⁹⁰

Introduce a different approach to valuation

Improving how the wider social and economic benefits of social housing are measured and assessed will help demonstrate the service need to support further investment.

There needs to be a robust, nationally consistent and agreed methodology for assessing and quantifying these benefits that fully captures their quadruple-bottom-line value.

Decision-makers would use it to better assess social and affordable housing projects, justify future investment and deliver a better-balanced housing system.

The methodology should consider the unique circumstances of each location, such as Aboriginal and Torres Strait Islander peoples living in remote communities. Accessing this information would rely on high-quality, consistent, standardised and real-time data being collected across Australia's states and territories.

The data would cover the location, availability and quality of existing social housing stock and identify where new stock may be required based on changes in demographic demands.

The cost–benefit analysis would be substantially more comprehensive if there was also evidence around:

- building standards and dwelling design to better inform the quality and form of housing
- environmental cost offsets
- connectivity to other social facilities
- the provision of open spaces
- disposable income benefits from reduced rents (especially in affordable rental housing)
- tenant outcomes regarding wellbeing and economic participation
- the impact on social justice and community cohesion.

Coordinating and promoting arts, culture and recreational infrastructure

Arts and culture play an important role in Australian society. According to the 2019 National Arts Participation survey, 98% of Australians surveyed engaged with arts and culture.⁹¹

They also drive substantial economic benefits by employing people and attracting tourism income. Australia Council research found that domestic arts tourism spending in 2018 was \$16 billion⁹² and, in 2017, international arts tourism spending was \$17 billion.⁹³

Cultural and creative activity contributed more than \$115.2 billion to the economy in 2017–18 and employed 6% of the national workforce.⁹⁴ During the same year, governments allocated \$6.86 billion overall to the arts.⁹⁵

During 2020–2021, the COVID-19 pandemic has decimated this sector. Without a collaborative and coordinated effort to reboot it across all levels of government, Australia risks diminishing its cultural fabric and the benefits realised.⁹⁶

Green, blue and recreational infrastructure such as waterways, national parks and sporting and community facilities also attract tourism and generate substantial economic returns.

Community sport infrastructure alone has an estimated annual value of more than \$16.2 billion, including \$6.3 billion of economic benefits.⁹⁷

Now and over the coming years, the Australian Government must fill the gap created by losing international visitors and capitalise on domestic tourism opportunities, in parallel with strengthening community sporting clubs and facilities.

This will involve reigniting the creative industries and promoting recreational infrastructure.

Build stronger cross-sector connections

To guide investment decisions, the *2021 Plan* recommends building on existing frameworks to develop an agreed and consistent approach to measuring the full economic impact of arts, culture, green, blue and recreational infrastructure.

To help the social infrastructure sector recover from the profound effects of the pandemic and catalyse growth, it is also vital to strengthen the connection between arts, culture, sports and tourism.

All levels of government should actively work together to better align the planning and delivery of arts, cultural and recreational infrastructure.

This will help to ensure the facilities and spaces that are maintained and created are those that best serve the unique needs of each community.

The objectives should be to build social cohesion, leverage cross-sector opportunities and strengthen local economies.⁹⁸

For this approach to be successful, there needs to be:

- **coordinated, place-based strategic planning** that aligns with regional identity statements (which define local attractions, needs and opportunities) and is undertaken in conjunction with land-use planning and tourism strategies
- the **inclusion of arts, cultural and recreational infrastructure** in planning for precinct developments and renewal projects, clustered around strong transport nodes
- **principles that promote multi-purpose use** of new and existing facilities (see **Reform 8.2**) to drive economic development through tourism and job creation and diversify the use of community and commercial assets.

Supporting sustainable infrastructure delivery through collaborative initiatives such as these is especially important for Small Towns, Rural Communities and Remote Areas. For more information, see the **Place-based outcomes for communities chapter**.

“All levels of government should actively work together to better align the planning and delivery of arts, cultural and recreational infrastructure.”

Assess the true value of Australia's natural assets

This country's extraordinary natural assets are highly valued by Australians and visitors for their beauty, contribution to the health of society and positive impact on quality of life.

They also have a rich social, cultural and spiritual significance.

However, fewer people appreciate that the value of natural assets extends beyond these intrinsic features to directly benefit economic activity.

Rich soils are central to the agriculture sector, canopy cover helps with heat management, and natural assets such as sand dunes and beaches act as natural buffer zones, supporting resilience. These are just a few examples.

The significant economic value of Australia's natural assets is best demonstrated by the Great Barrier Reef. It contributed an estimated \$6.4 billion to the national economy in 2015–16 and employed 64,000 people.⁹⁹

The Great Barrier Reef is worth even more because it is an Australian economic, social and iconic asset. A 2017 report by Deloitte Access Economics estimated its value to this country at \$56 billion.¹⁰⁰

While individual valuation studies like this can be useful, integrated and standardised approaches that understand the relationship between the economy and the environment will inform more balanced decision-making.

The Australian Bureau of Statistics (ABS) is compiling various environmental-economic accounts annually to help quantify the contribution the natural environment makes to the Australian economy.¹⁰¹ The Australian Government and state and territory governments have agreed a strategy and action plan to build on the efforts of the ABS.¹⁰² This aims to integrate environmental and economic information into decision-making by developing a nationally consistent approach to environmental-economic accounting.

Beyond this, the Australian Government and state and territory governments should develop an inclusive and consistent approach to capturing and measuring the real value of Australia's significant natural assets, including natural Aboriginal and Torres Strait Islander locations that have outstanding heritage value to the nation.

The approach should incorporate social, economic, environmental and governance components.

This would allow different investment options to be evaluated in response to infrastructure challenges, including their contribution to quality of life, and consider nature-based interventions and solutions.

Governments could then prioritise options and identify the best overall outcome for their investment, helping to secure the future of Australia's natural assets.



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9

Waste



What you will read in this chapter

- **Reform 9.1: Valuing resources to enable a circular economy** – The role of infrastructure and community education in accelerating Australia’s transition to a circular economy.
- **Reform 9.2: Waste data to drive innovation** – How coordinating data and policy will enable waste sector transformation by benchmarking performance, supporting landfill diversion and informing waste policy.

Executive summary
Introduction
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9. Waste
Methodology and results
Next steps

Key messages

- **The waste sector is being transformed** by new market dynamics, with the **waste export ban a catalyst for short-term reform**.
- Challenges such as **increasing resource consumption, waste generation and greenhouse gas emissions** further support the case for change.
- The transformation presents compelling **opportunities for cost reduction and new business creation**.
- Australians are among the **largest generators of waste per capita in the world**. Yet Australia's waste market is underdeveloped, its waste culture is immature and community understanding of resource recovery activities is low.
- **Inconsistent and unclear policy**, including constitutional impediments, often deters state and territory collaboration and further investment in resource recovery solutions.
- The sector is also held back by **insufficient, unreliable data**, which is currently collected at different points within the system without clear frameworks for its use.
- To meet the long-term needs of all Australians, **Australia needs a tailored nationwide approach to developing waste infrastructure** that is secure, integrated and meets its primary functions of cost-effectively maintaining public health with lower environmental impacts.
- Investing in domestic waste and resource recovery infrastructure would **stimulate local economic activity** by creating new jobs, products and revenue streams. It provides an opportunity to **retain valuable resources** within the local economy and **reduce Australia's reliance on virgin materials**.
- Diverting more waste from landfill will require **new or enhanced local resource recovery infrastructure and services**.
- Australians have an overly consumptive lifestyle, there are imbalances between production and consumption, and the **waste management system contends with excessive amounts of discarded materials**.
- Transformation needs **all Australians to embrace a zero-waste culture**. This means changing deeply entrenched consumption trends and countering pressures that have emerged during the COVID-19 pandemic.
- Australia's waste challenges can only be mitigated if **multiple stakeholders undertake systems-level change work to transform the whole system**, rather than addressing individual parts of it in isolation.

Waste sector overview



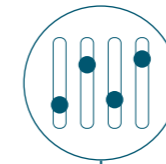
Government policy



The *National Waste Policy 2018* provides a national framework for waste and resource recovery. State and territory governments regulate domestic waste management and pollution. Local governments are mostly involved in municipal waste, and own and operate landfill sites and recycling facilities.

The *Recycling and Waste Reduction Act 2020* (Cth), which bans the export of unprocessed waste, is driving change in the industry. Many states and territories are banning single-use plastic and have implemented container deposit schemes.

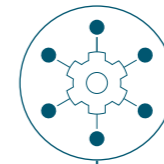
Markets and jurisdictions



The waste sector primarily manages three source streams: municipal solids waste, commercial and industrial waste, and construction and demolition waste. Waste infrastructure covers:

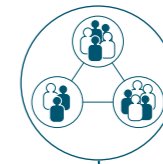
- waste to disposal (landfill)
- waste to recycling (material recovery facilities, resource recovery facilities)
- recycled product creation (remanufacturing and processing for reuse)
- energy recovery flows (incinerators, hazardous waste treatment facilities).

Networks/providers



Waste management assets need to be located at, or near, waste-generating activities, such as sourcing, manufacturing, and transportation. Landfill sites near major urban centres are approaching capacity. New ways of operating are being prioritised, including resource recovery centres. Approaches differ depending on geography. Remote and regional communities in particular face challenges, including logistical costs and lack of scale. These can make waste recovery infrastructure less economical.

Industry



The waste sector is a significant economic contributor, with waste management services in Australia valued at \$17 billion per annum. Australia currently lacks market demand for products that utilise recovered resources, diminishing the need for resource recovery infrastructure. There is also a need to deliver more sustainable solutions across the entire waste value chain.

Customers



A growing awareness of sustainability and the impact of consumer behaviour are leading to better oversight of products in an effort to reduce waste. A shift in mindset could transform Australia's waste culture. This will require community education, both to improve general understanding of the waste management system and to influence consumer behaviour to address issues such as illegal dumping and low recovery rates.



Introduction to waste

A fragmented sector ready for reform

Responding to significant changes in the sector as a result of the Australian Government’s waste export ban and the impacts of COVID-19, the *2021 Australian Infrastructure Plan* includes waste for the first time.

Australia is one of the world’s largest waste generators per capita, yet waste infrastructure has traditionally been a peripheral consideration in land-use planning, zoning and design.¹ This reflects that waste management is not considered an essential public service like energy and water.

However, having an efficient waste production and processing cycle is fundamental to the quality of life and amenity of metropolitan and regional communities.

The waste sector is currently under enormous pressure because of recent legislative and behavioural changes. The sector needs fundamental reform to overcome the current challenges, meet future needs and reduce Australia’s impact on the environment.

Waste volumes are increasing

Australians produced 100% more waste in 2016–2017 than in 2002–2003.² The waste sector primarily manages three source streams: municipal solid waste, commercial and industrial waste, and construction and demolition waste. Construction and demolition waste is our largest waste stream, followed by commercial and industrial waste and municipal residential waste (see **Figure 9.1**).

“Australia relies much more on landfill than other developed nations.”

The percentage of domestic waste could become even higher, following increases during the COVID-19 pandemic. Waste volumes shifted from industrial and commercial centres to residential areas as people spent more time at home. This led to a rise in online shopping and takeaway food delivery, so the volume of associated waste products also increased.³



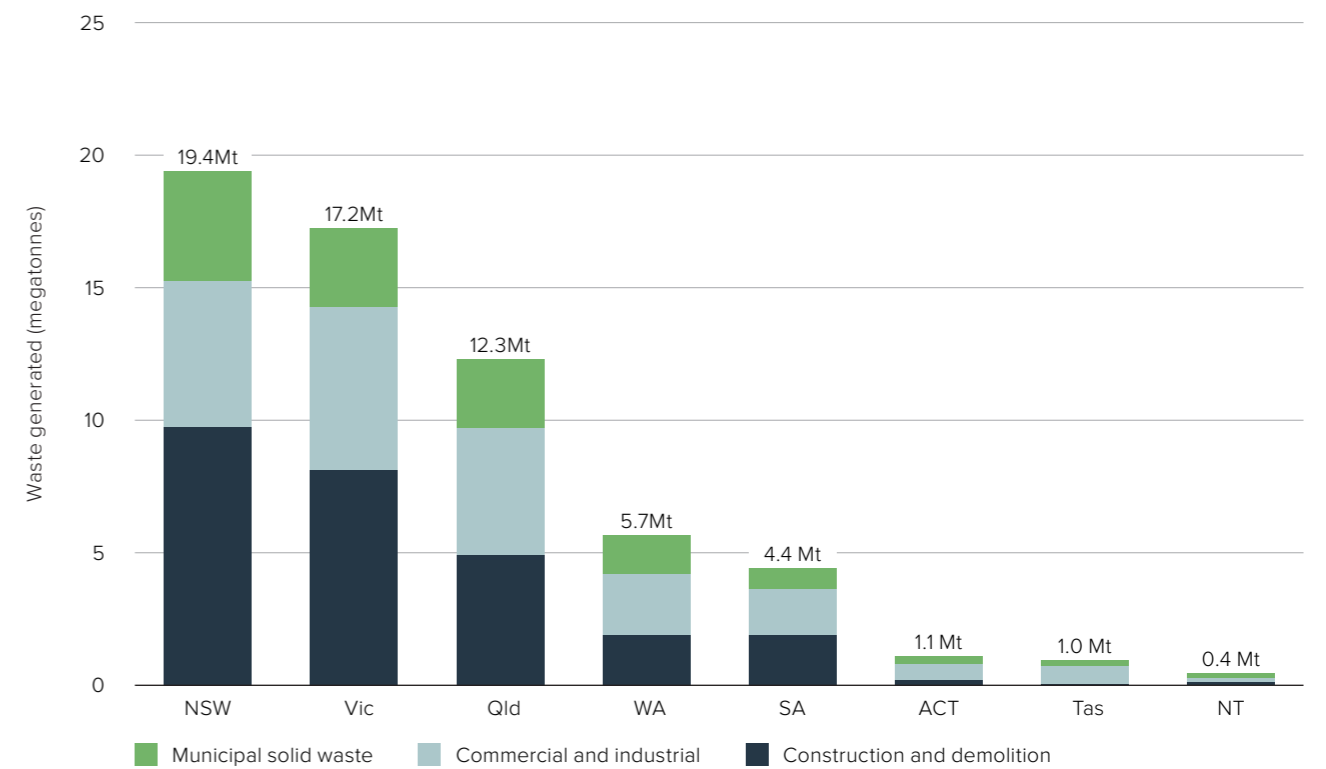
Unprecedented levels of investment in housing and infrastructure have also generated record volumes of construction and demolition waste in recent years.⁴ Municipal solid waste and commercial and industrial waste have also grown, but more slowly.⁵ With a projected population of 37 million people in 2050, Australia’s waste production could rise to 81 megatonnes a year by then.⁶

Waste volumes are heavily influenced by changes in population growth rates, demographics and disposable income levels. They also depend on society’s attitudes towards waste disposal.

Australians are relatively enthusiastic recyclers, recovering 62% of waste materials through recycling and energy recovery in 2016–2017. Yet Australia relies much more on landfill than other developed nations.⁷

As the waste this country generates increases, traditional methods of disposing of, transporting and exporting waste are being impacted by legislative and policy changes, as well as growing community expectations due to a heightened awareness of people’s impact on the environment.⁸

Figure 9.1: 20% of Australia’s waste is generated in homes



Source: Department of Agriculture, Water and the Environment (2020)⁹

The waste sector is currently managed through a patchwork system of government regulations, with responsibility typically devolved to local government.¹⁰ While overall responsibility for waste management remains with state and territory governments through various health Acts, local governments have assumed an operations policy and compliance role focused on environmental protection, development approval and operational licensing.

The Australian Government’s role is shaped by international treaties and objectives such as the Montreal Protocol, the International Convention for the Prevention of Pollution from Ships (MARPOL), the Basel Convention and broader environmental sustainability commitments.

Along with constitutional limitations, this piecemeal approach to policies and regulations has created distinct waste markets in each state and territory. One consequence is that waste is sometimes transported long distances from where it was generated to cheaper facilities.¹¹

In addition, each form of waste is associated with differing supply chains, processing facilities, transport methods and regulatory frameworks.¹²

This interlaced network of waste transport, facilities and markets is under pressure on multiple fronts, and its complexity is blocking community understanding.

There are market failures in every component of the sector:

- Knowledge and compliance among consumers **varies widely**.
- Primary materials are **increasingly expensive**.
- Recovered/recycled products are often **more expensive than primary materials**.
- Supply chains are **underdeveloped**.
- Domestic end markets for recycled products and domestic secondary material manufacturing are **lacking**.

The *2019 Australian Infrastructure Audit* identified a range of opportunities to boost economic growth and create employment by substantively reforming the waste sector.¹³ A critical first step will be implementing consistent, nationwide regulations, standards and policies.

The waste sector is a large system with many dependent aspects. Solving Australia’s waste challenges can only be achieved by adopting a systems approach, rather than addressing individual components of the system in isolation.

While the *2021 Plan* identifies key principles and components missing in the sector, Infrastructure Australia has focused on recommendations for governments and the sector that will:

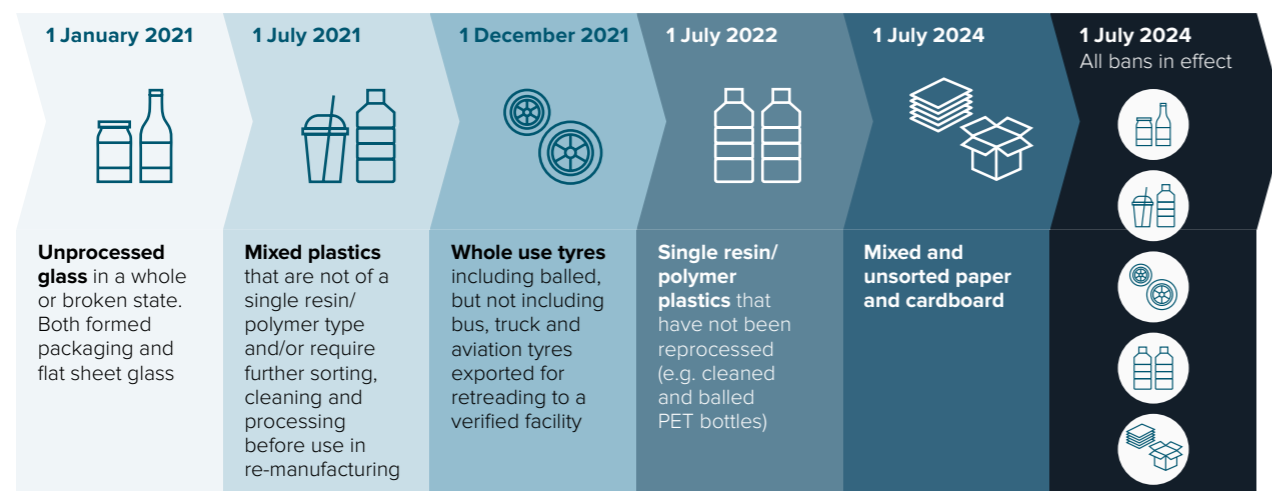
- improve coordination and transparency
- develop a clear and equitable basis for assessing infrastructure need and its performance in the appropriate context
- identify the infrastructure needed for a domestic resource recovery market
- support the transition to a circular economy, acknowledging that systems-level change led by multiple stakeholders is required.

Need to strengthen domestic processing

Changes in the global market and a greater awareness of community waste production have shifted market dynamics for the waste processing sector. In response, the Australian Government announced a comprehensive waste export ban in August 2019.¹⁴

A staged timetable for different waste types begins in 2021, and most waste materials will need to be managed or pre-processed (in preparation for export) domestically by July 2024 (see **Figure 9.2**).¹⁵

Figure 9.2: An export ban will transform the waste sector between 2021 and 2024



Source: Council of Australian Governments (2020)¹⁶

The ban represents a positive step towards creating a circular economy that will make Australia’s approach to waste management more sustainable. For a detailed explanation of how this works, see **Figure 9.4** in **Reform 9.1** of this chapter.

However, this is a long-term goal. In the short term, the ban will put major pressure on domestic waste processing facilities.

To cope with increasing waste volumes, Australia needs the ability to recycle and reprocess much higher volumes of waste locally.

Unfortunately, a historical over-reliance on international markets to accept Australia’s recyclable commodities has left domestic reuse markets and resource recovery infrastructure underdeveloped.¹⁷

The increased municipal waste volumes and border closures caused by the COVID-19 pandemic have further highlighted the need for change.

The waste export ban is an opportunity for reform across the sector that will deliver better economic and environmental outcomes. For example, developing new resource recovery markets that will enhance economic growth and create local jobs.

The waste sector is already a significant economic contributor. Approximately 50,000 people are directly employed in waste-related activities, and waste management services in Australia are valued at \$17 billion per annum.¹⁸

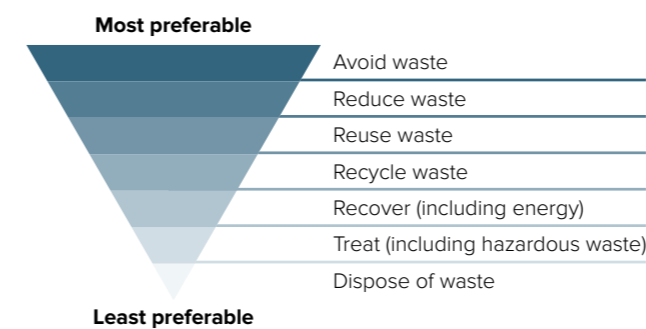
To generate further economic growth, current perceptions of waste need to change so Australians recognise its value as a resource.

A more educated public

Embedding new attitudes will involve community education programs that improve people’s general understanding of the waste management system. They also need to influence consumer behaviour, addressing issues such as illegal dumping and low resource recovery rates.¹⁹

Changing awareness and understanding could transform Australia’s consumption and production culture. It would cultivate greater self-sufficiency and product stewardship and create more markets for waste processing and recycling products. Ideally, Australia will stop producing waste where possible (see **Figure 9.3**).

Figure 9.3: Producing no waste is the ultimate goal of the waste reform hierarchy



Source: Australian Government (2018)²⁰

Community understanding is already shifting. According to some studies, Australians say they are now more knowledgeable about landfills, household waste collection services and the use of recycled materials in new products.²¹

“ A historical over-reliance on international markets to accept Australia’s recyclable commodities has left domestic reuse markets and resource recovery infrastructure underdeveloped. ”

For household generated waste, solutions relying on consumer behaviour, such as changing purchasing and consumption behaviour and separating waste for recycling, need to be supported by an increased understanding of the entire waste and recovery system.²²

As CSIRO’s *Circular Economy Roadmap* notes,²³ it will take multiple communications channels to change people’s thinking and guide their behaviour at home and work. There will need to be consistent public campaigns, product labelling for recycling, and instructions for households, industry and governments.²⁴

The waste sector has fundamentally changed since 2016

While the waste sector did not feature in the *2016 Australian Infrastructure Plan*, significant changes over the past five years have led to its inclusion in the *2021 Plan*.

Impact of the waste export ban

Government activity has increased since the comprehensive waste export ban introduced in August 2019.²⁵

State and territory governments have been pursuing a range of waste management policies that stimulate job creation, drive innovation and deliver better resource recovery. They have all implemented or announced container deposit schemes (CDSs) that make manufacturers more responsible for the entire product lifecycle, with Victoria and New South Wales announcing bans on single-use plastics.

Apart from the Northern Territory, they have also announced long-term landfill diversion targets. Queensland has recently introduced landfill levies and New South Wales, Victoria and South Australia have increased them.

The waste industry is now a major focus for the Australian Government. In 2019, it appointed the first Assistant Minister for Waste Reduction and Environmental Management.

The Australian Government also created the *National Waste Policy Action Plan 2019* to support implementation of the 2018 *National Waste Policy*.²⁶ The Action Plan's key initiatives focus on:

- expanding markets for products made from recycled content
- improving waste data capture
- consistent national tracking
- co-investment in recycling infrastructure.

The 2019 Audit recognised challenges and opportunities in the sector

The 2019 *Audit* examined some of the challenges faced by Australia's waste sector. They included:

- growing pressure due to population growth
- an unsustainable reliance on export solutions
- how inconsistent and unclear policy in the waste sector is deterring further investment in resource recovery solutions.²⁷

The 2019 *Audit* focused on challenges around waste logistics, as well as inefficient waste services outside Australian cities. Waste is often transported large distances from where it is generated, adding to road congestion and degradation.²⁸

A lack of scale and access in remote communities means waste freight volumes are inconsistent and local processing is often not cost-effective for consumers or taxpayers.²⁹ As Australians generate more waste, locally relevant services in these areas will need to be developed to ensure community needs are being satisfied without imposing an unsustainable cost burden.

The 2019 *Audit* also noted that transporting waste can have a high impact on urban amenity, such as pollution, noise and road safety.

New technologies could make waste transport more efficient and environmentally friendly. For example, waste collection is well suited to zero-emission and autonomous vehicles.³⁰

The COVID-19 pandemic turned a downward trend upward

The pandemic had a significant impact on waste generation in Australia. Household waste increased 20% during 2020, reversing a long-term decline.³¹

The reasons were working from home, higher levels of takeaway food delivery and online shopping. This led to substantial increases in paper and plastic packaging waste and single-use waste, and to increased organic waste in some parts of Australia.³²

Conversely, commercial waste declined in 2020, mainly because there were fewer office workers. Workplaces shifted to online and digital-based working during the pandemic, accelerating a pre-existing trend towards paperless offices.³³

This shift in volumes from commercial to municipal waste has placed additional pressure on a sector that is already adapting to the waste export ban. It also puts households at the centre of the transition to a circular economy, which may bring forward policy reform.

Compounding these changes is that the COVID-19 pandemic has led to a reduction in oil and pulp prices, which in turn has driven down the price of recovered materials such as plastic resins.³⁴

Having a lower price for recovered materials reduces the economic viability of recovery facilities, which were already marginal before the pandemic.

All these factors may impact Australia's ability to achieve the Australian Government's national target of reducing waste to landfill by 80% by 2030.³⁵

How we developed the *Plan for Waste*

Informed by industry

Infrastructure Australia acknowledges the significant amount of work being done in Australia and overseas to identify viable, innovative initiatives that will help reform the waste sector and move this country towards a circular economy.

When developing this chapter, we drew from the submissions and expertise of a diverse range of stakeholders.

Acknowledgements

This chapter, and Infrastructure Australia's more detailed *Plan for Waste* (which will be published after the 2021 *Australian Infrastructure Plan* is released), were developed with Edge Environment, PwC and Sphere Infrastructure Partners.

Other contributors and sources included:

- CSIRO: Commonwealth Scientific and Industrial Research Organisation
- Key government departments, including the Department of Agriculture, Water and the Environment, and Sustainability Victoria
- Australian Academy of Technology and Engineering
- Centre of Excellence for Product Stewardship
- Engineers Australia
- NSW Circular
- Open Cities Alliance
- Waste sector investors, including Macquarie Capital.



9.1 Valuing resources to enable a circular economy

Key messages

- Prioritising the delivery of a circular economy through relevant standards, guidelines and procurement can **reduce costs for business, support new industries and jobs and enable the efficient use of natural resources.**
- The transition to a circular economy means everyone who imports, produces, designs, constructs, sells and disposes of a product will **share responsibility over its lifecycle.**
- Transitioning also involves **developing the necessary resource recovery infrastructure** to re-circulate recovered resources.
- A **consistent national approach to sustainable waste policies** that encompasses all aspects of the waste value chain would accelerate Australia's transition to a circular economy.
- **Product development and innovation for using recycled materials** as an industry resource is a significant opportunity for Australia, domestically and globally.

Transitioning to a circular economy

The introduction of export restrictions on waste products, increasing pressure on landfill sites and the depletion of natural resources, are forcing countries to move from a linear waste management model to a circular economy that addresses waste management and resource security challenges.³⁶

Regulatory and commercial mechanisms and design approaches that support a circular economy model are already emerging.³⁷

By shifting from a linear waste management model to a circular economy, Australia can move from being one of the highest per capita waste generators in the world to a recycling and remanufacturing powerhouse.³⁸

To ensure everyone in the value chain benefits, the whole system must change, from procurement, governance and financing to delivery mechanisms.³⁹ There also needs to be more emphasis on waste being a valuable resource, better product stewardship, and clearly defined stakeholder roles and responsibilities.

Every industry generates a unique waste footprint. In the infrastructure sector, the waste footprint depends on the type of project. Road systems, railway networks, sports facilities and social

infrastructure such as schools and medical facilities all have a different waste footprint, and can produce construction and demolition waste.

Some sectors face a greater challenge than others. The 2020 *National Waste Report* estimated that annually the construction and demolition industry (C&D) produces 27.0 Mt — 44% of all generated core waste.⁴⁰

From 2006–07 to 2018–19, C&D waste in Australia increased by 32% per capita, making waste disposal in this industry a considerable problem. Encouragingly, C&D waste recycling over the same period doubled to 20.5 Mt. However, with waste volumes continuing to increase, the need for increased capacity is urgent.

As a result, what was previously a convenient way to dispose of infrastructure waste to landfill is becoming unviable. As volumes increase, bottom-line costs will also be impacted.

For all sectors, a key component of supporting the transition away from the 'take-make-waste' model is changing industry and community perceptions. Waste needs to move from being something that requires disposal to a resource that has further economic value and can be reused.

For more reforms relating to sustainability, refer to the **Sustainability and resilience chapter.**

9.1 Recommendation

Avoid waste, improve resource recovery and build demand and markets for recycled products by integrating the circular economy in national waste policy and infrastructure projects.

Proposed sponsor: Department of Agriculture, Water and the Environment

Supported by: Department of Industry, Science, Energy and Resources

When this should impact:

0-5

5-10

10-15

15+

Where this should impact:



0-5 **9.1.1. Increase understanding of the role of consumers in the circular economy through community education on responsible waste behaviour.**
Proposed lead: Department of Agriculture, Water and the Environment
Supported by: State and territory environment departments

0-5 Increase understanding and compliance through community education which highlights the benefits of landfill diversion and the importance of correct separation of materials for household waste collection services.

Proposed lead: State and territory environment departments

Supported by: Local governments

0-5 Increase consumer understanding by reviewing the effectiveness of current recycling labels.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory environment departments

0-5 Increase consumer participation in product stewardship by applying these recycling label insights to a broader range of materials and products.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory environment departments

0-5 **9.1.2. Reduce the impact of plastic on the environment by implementing the National Plastics Plan.**
Proposed lead: Department of Agriculture, Water and the Environment
Supported by: State and territory waste departments

0-5 Increase plastic recycling by providing guidance on aligning requirements and timeframes between state and territory governments and industries.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory waste departments

5-10 **9.1.3 Build support for the circular economy and embed circular practices by developing a circular economy roadmap for the infrastructure sector, including annual progress reports.**

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: Department of Infrastructure, Transport, Regional Development and Communications, CSIRO: Commonwealth Scientific and Industrial Research Organisation, Department of Industry, Science, Energy and Resources

5-10 Improve uptake and consistency in the use of recycled and recyclable materials in infrastructure and construction projects by incorporating targets in building and design codes.

Proposed lead: Department of Infrastructure, Transport, Regional Development and Communications

Supported by: Department of Industry, Science, Energy and Resources

- 0-5** Ensure greater use of recycled materials within government infrastructure projects by developing procurement targets and timelines.
Proposed lead: State and territory infrastructure departments
Supported by: State and territory chief engineers
- 0-5** Support the piloting and early deployment of innovative technologies and processes through structured co-investment programs for products incorporating recycled materials.
Proposed lead: State and territory infrastructure departments
Supported by: State and territory chief engineers
- 5-10** **9.1.4 Support co-location of circular economy facilities by undertaking collaborative land-use planning.**
Proposed lead: State and territory planning departments
Supported by: Local governments
- 5-10** Improve waste infrastructure in Rural and Remote Areas by developing land-use plans that include resource recovery facilities.
Proposed lead: State and territory planning departments
Supported by: Local governments
- 5-10** Improve levels of service in Rural Communities and Remote Areas by identifying locations for hub-and-spoke models of waste management services.
Proposed lead: State and territory planning departments
Supported by: Local governments
- 5-10** **9.1.5. Reduce organic waste to landfill through mandating local council food organics and garden organics (FOGO) collection services.**
Proposed lead: State and territory waste departments
- 5-10** Reduce waste to landfill and emissions by introducing FOGO collection and processing for households when renewing existing waste management contracts.
Proposed lead: Local governments
Supported by: State and territory place management agencies
- 0-5** Increase uptake of FOGO services and encourage positive waste behaviours by implementing ongoing education and communications with households before and during the life of the collection service.
Proposed lead: Local governments
- 0-5** Account for local factors such as geography, climate and storage when developing place-based guidance on FOGO implementation for local government.
Proposed lead: State and territory waste departments
Supported by: Local governments
- 5-10** Enable FOGO collection in apartments by amending complying development provisions to allow retrofitting for facilities in existing apartments, and by incorporating FOGO and other collections in the design of new builds.
Proposed lead: State and territory planning departments
Supported by: Local governments
- 5-10** Reduce mixing of waste by commercial and industrial operators by creating an opt-in program to separate organic waste into a different stream.
Proposed lead: State and territory waste departments
- 0-5** Develop end markets for reprocessed organics by developing a FOGO recovery strategy that tests new uses for recovered materials.
Proposed lead: State and territory waste departments, state and territory industry departments
Supported by: Department of Agriculture, Water and the Environment
- 0-5** Improve distribution of FOGO material to regional areas for further processing and use by consolidating collected FOGO material.
Proposed lead: State and territory waste departments
Supported by: Local governments
- 0-5** Avoid food waste across the supply chain by working with industry to connect with alternate markets for the quick and direct sale and redistribution of FOGO.
Proposed lead: State and territory waste departments

Measuring progress



Environment

Organic waste reduction

Amount of organic waste sent to landfill

Target: 3.3 million tonnes **Timeframe:** 0-5 5-10 10-15 15+ (reduction of 50%)



Economic

Total waste generated

Total waste generated in Australia

Target: Reduce 2021 volume by 10% **Timeframe:** 0-5 5-10 10-15 15+



Economic

Recovery rate

Average recovery rate from all waste streams

Target: 80% **Timeframe:** 0-5 5-10 10-15 15+



A circular economy delivers economic and productivity benefits

Five principles underpin waste management, recycling and resource recovery in a circular economy:⁴¹

- 1. Avoid waste** by prioritising waste avoidance and encouraging efficient use, reuse and repair. Design products so waste is minimised, they are made to last and recovering materials is easier.
- 2. Improve resource recovery** by enhancing material collection systems and recycling processes to improve the quality of recycled materials produced.
- 3. Increase use of recycled materials** by building demand and creating markets for recycled products.
- 4. Better manage material flows** to benefit human health, the environment and the economy.
- 5. Improve information collection and analysis** to support innovation, guide investment and enable informed consumer decisions.

If Australia could develop even a partial circular economy, it could reduce business costs, support new industries and jobs, reduce greenhouse gas emissions and increase efficient use of natural resources such as water and energy.⁴²

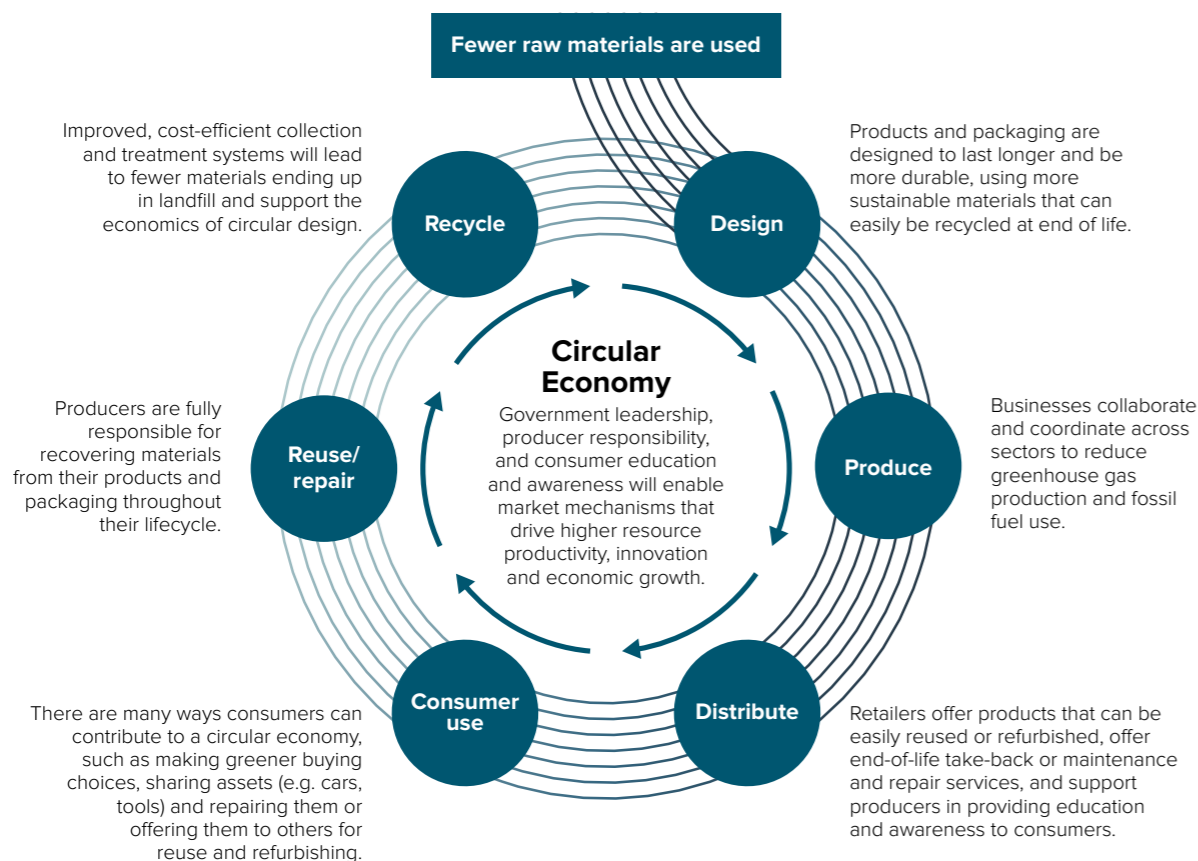
According to South Australian research, a circular economy could create 25,700 more full-time equivalent jobs for the state compared to ‘business as usual’ and reduce its greenhouse gas emissions by 27% (7.2 tonnes of CO₂).⁴³

Moving towards a circular economy

Circular economy

A circular economy (see **Figure 9.4**) aims to use resources for as long as possible, draw the maximum value from them while in use, then recover and regenerate their components for reuse at the end stage of their service life.⁴⁴ It is based on the principles of ‘designing out’ waste and pollution, keeping products and materials in use, and regenerating natural systems.⁴⁵

Figure 9.4: The circular economy keeps resources in use for as long as possible



Source: Based on Government of Ontario (2017)⁴⁶

Embedding the circular economy in policy

Many states and territories now have, or are developing, circular economy strategies,⁴⁷ and a circular economy forms a central part of the *National Waste Policy*.⁴⁸

Waste management became an area of Australian Government responsibility in 2019. For most of Australia’s history, federal governments have not been involved in waste management policy, so this move signalled a positive recognition of the area’s importance.

However, there needs to be better coordination and standardisation across the country to achieve the vision outlined in the *National Waste Policy* of reducing waste by 10% per capita by 2030.

A coordinated approach to developing and implementing waste policy and regulation across the nation is needed for broader adoption of circular economy principles. With significant industry evolution underway and the opportunity to increase sector employment, the Department of Agriculture, Water and the Environment should highlight best practice and drive policy leadership to coordinate Australia’s transition to a circular economy.

“ A coordinated approach to developing and implementing waste policy and regulation across the nation is needed for broader adoption of circular economy principles. ”

One pressing area is rolling out the *National Plastics Plan*. This endorses targets for reducing or recycling a range of plastic and packaging types by 2025 but provides no guidance to industry on differing requirements and timelines between states and territories.⁴⁹

Catalysing change through government procurement

Governments have an important role to play in initiating and embedding the different phases of a circular economy. They can establish standards and guidelines and use government procurement to accelerate market development.

This has already begun in Australia. For example, recycled content is being used in infrastructure projects overseen by many jurisdictions, including Transport for NSW and the Queensland Department of Transport and Main Roads.

The *National Waste Policy Action Plan 2019* emphasises the importance of governments using their purchasing power to address barriers to the

adoption of a circular economy. By doing this, they can stimulate demand and create certainty for potential product and materials suppliers.⁵⁰

Increasing demand for recycled products is a critical first step towards reducing Australia’s reliance on export markets and developing domestic markets.

The Department of Agriculture, Water and the Environment recently released the *Sustainable Procurement Guide* to help Australian Government agencies buy more sustainably. It recommends purchasing goods and services that contain recycled content.⁵¹

“ Increasing demand for recycled products is a critical first step towards reducing Australia’s reliance on export markets and developing domestic markets. ”

To support this approach, the Department of Agriculture, Water and the Environment and state and territory infrastructure delivery agencies should publish procurement targets for the use of recycled materials. The Department of Agriculture, Water and the Environment should also work with the Department of Infrastructure, Transport, Regional Development and Communications and agencies directly involved in the procurement of infrastructure to develop and embed procurement targets for recycled materials in government infrastructure projects.

One example of this approach is the Victorian Government’s Ecologiq program and *Recycled First* policy. These aim to encourage the reuse of waste material by working across government to optimise the use of recycled and reused materials when constructing and maintaining infrastructure assets.⁵²

Improving accountability for product stewardship

Product stewardship schemes are designed to support the environmentally sound management of products and materials over their whole lifecycle. They oblige producers and importers of certain materials to ensure adequate processing, which creates demand for the associated recycling infrastructure.

This approach recognises that every organisation and individual that produces, imports, sells, uses or disposes of a product is responsible for reducing its environmental and health and safety impacts. However, current models of product stewardship do not extend through the entire product chain.

The *National Waste Policy Action Plan 2019* outlines the critical role product stewardship will play in Australia’s move towards a circular economy.⁵³

The Australian Government's *Recycling and Waste Reduction Act 2020* also recognises the importance of product stewardship. It puts in place several measures to encourage new schemes and expand existing ones.

They include a new streamlined process for government accreditation of voluntary product stewardship arrangements. Government accreditation demonstrates to businesses and consumers that the scheme has the Australian Government's stamp of approval.

The *Minister's Product List* is another mechanism for encouraging industry-led product stewardship schemes. It can give notice that if an industry is not capable of developing such a scheme within a reasonable period, alternative options will be considered, including regulation.

The *Minister's Product List* has effectively encouraged numerous schemes, including those for mobile phones, paint and plastic oil containers.

“ Every organisation and individual that produces, imports, sells, uses or disposes of a product is responsible for reducing its environmental and health and safety impacts. ”

The National Product Stewardship Investment Fund (NPSIF) has also contributed to developing these and other product stewardship arrangements by providing grant funding. This helps with initial development or enables expansion to cover a broader range of products.

The Product Stewardship Centre of Excellence⁵⁴ was established with the support of an NPSIF grant. It provides advice and assistance to industries wanting to develop product stewardship arrangements, using mentoring, best-practice approaches and technical guidance.

The Centre also builds consumer awareness of the benefits of choosing environmentally sustainable products. In addition, it works with the Australian Government to encourage and celebrate leaders in Australian stewardship innovation and performance through awards and public recognition.

Where an industry is not able to develop a product stewardship scheme, there are alternative options for pursuing Australia's waste and recycling objectives. They include:

- co-regulation, such as the National Television and Computer Recycling Scheme
- mandatory regulation, such as the Product Stewardship for Oil scheme, which is designed to provide incentives to increase the recycling of used oil.

Implementing the Product Stewardship Review recommendations

In July 2020, the Australian Government responded to a Review of the *Australian Product Stewardship Act 2011*, (the Review) which provides the framework for effectively managing the environmental, health and safety impacts of products.⁵⁵ It accepted all 26 recommendations.

Many have been either implemented or are in the process of being implemented by the Australian Government. They include:

- community and industry engagement that encourages the application of product stewardship to a broader range of materials and products
- reforming the *Minister's Product List* process to include new co-regulatory approaches to address groups that free-ride efforts of others in waste recycling, or where industry-led proposals are not forthcoming within set timeframes
- developing a central organisational source to create efficiencies across multiple schemes, encourage the creation of new schemes and assist with compliance and enforcement.⁵⁶

It is important for the Australian Government to continue implementing the Review recommendations to further support and develop Australia's product stewardship framework.

Transforming Australia's local recycling industry

The waste export ban on all specified materials by July 2024 means Australia will have to manage the majority of waste materials domestically.

This is a significant opportunity for transformational change. However, Australia currently lacks a competitive remanufacturing sector, the market demand for the results of resource recovery, and the associated infrastructure.

To support the transition to a circular economy and divert waste from landfill, this situation will have to change.

Infrastructure needed for a domestic recycling industry

There is a need to deliver tailored waste management solutions across the entire waste value chain, including collection, separation, recovery and disposal.

The Australian Government recently introduced a Recycling Modernisation Fund⁵⁷ to build the local recycling industry through co-funding with state and territory governments and industry.

When planning these facilities, the priorities should be:

- increasing source-separation and processing infrastructure to expand the end market for recycled materials.
- planning co-located or adjacent facilities to avoid the transport and environmental costs associated with facilities being far apart, and to facilitate collaboration and sharing of materials.
- integrating the domestic logistics networks linked to these facilities.

“ There is a need to deliver tailored waste management solutions across the entire waste value chain, including collection, separation, recovery and disposal. ”

Australia's diverse geography does not allow for a one-size-fits-all waste infrastructure planning model. European models could be applied in metropolitan areas in southern states, but they are much less relevant in decentralised large states and territories such as Western Australia, Queensland and the Northern Territory.

Remote and regional areas present logistical and economic challenges

Waste services in Small Towns, Rural Communities and Remote Areas are often inconsistent and not as cost-effective as those in urban areas.⁵⁸ The *2019 Audit* noted that regional and remote communities have limited access to recycling schemes and face logistical challenges such as poor transport access, seasonal isolation and weak economies of scale.

These areas present several logistical and economic challenges to developing and delivering resource recovery infrastructure.

Lower population levels and dispersed residential and industrial waste generators mean the project economics may deter waste recycling and recovery outside Australia's metropolitan areas.

When there are no local resource recovery facilities, councils face the high cost of transporting waste to urban areas and delivering kerbside waste services, putting their budgets under strain. Better targeted waste resource recovery services in smaller communities will reduce costs and encourage positive waste habits.

In addition, coordinating waste collection and transport between several local councils could build enough volume to create the market conditions for recycling investment.⁵⁹ More collaborative land-use planning and exploring hub-and-spoke models of

service delivery should allow enough waste resource recovery services to offer communities this essential service, regardless of their geographical location.

Guiding the infrastructure industry towards circularity

A circular economy is one of the megatrends that will shape the next phase of sustainability in the built environment.⁶⁰

There are strong motivations for the sector to adapt, as building construction industries are a major source of Australia's waste. While government policy will provide a valuable signal to the market, developing circular economy practices at scale is expected to be driven by the industry.⁶¹

Typically, circular practices are embedded at individual component or asset level, for example as a component of modular, prefabricated offsite construction.⁶²

Introducing a circular economy impacts the whole system, so it requires both the overall system and its individual components to change. This means regulation, governance and business models are as important as design and engineering for a smooth transition.⁶³

To guide the transition, the Australian Government should collaborate with industry to develop a dedicated circular economy roadmap for the infrastructure sector. It should focus on the business case for change; provide sector-specific targets, risk reduction standards and reporting; and leverage existing leading practice through the states and territories. It should also integrate remanufacturing as part of completing the circular economy.

For further reforms relating to the infrastructure sector, refer to the **Industry productivity and innovation chapter**.

Increasing opportunities for processing and recovering organics

Food organics and garden organics (FOGO) waste makes up the largest percentage of material sent to landfill in Australia, at 31%.⁶⁴ It captures a variety of waste types, including garden organics, food waste, biosolids, clean timber, wood chips, non-recyclable paper and cardboard, grease trap waste, food processing residues and agricultural waste.

FOGO waste is created along the entire supply chain, from the moment food is gathered or harvested to when it is either eaten or disposed of.

Approximately 6.7 Mt of organics go to landfill each year, producing methane-heavy greenhouse gases as they decompose.⁶⁵ Methane gas is 25 times more

potent as a greenhouse gas than carbon dioxide. Diverting organics from landfill will not only prevent a significant proportion of waste from ending up in landfill, it will reduce Australia's greenhouse gas emissions.

Industries and companies that generate and separate FOGO waste are acting to reduce it by:

- exploring bioenergy opportunities
- incentivising businesses that reduce FOGO generation
- discounting food
- using packaging and food branding to educate consumers and reduce waste.⁶⁶

Despite this activity, substantial amounts of FOGO waste are still being sent to landfill.

Treating organics

There is an opportunity to maximise the value of organics through composting and other forms of treatment. Businesses and the economy can grow through FOGO collection and processing, which generates composted products to sell to the agriculture and anaerobic digestion biogas production industries.

To process the large quantity of organics in the system, the existing infrastructure needs to be upgraded and new infrastructure developed. This includes:

- **Open windrow composting:** This form of treatment, where organic waste breaks down naturally in an open environment, is acceptable for green waste but not suitable for food organics.
- **Fully enclosed, in-vessel composting:** Organics are treated in a temperature-controlled, enclosed environment then mixed to create different composting products. This is more expensive than open windrow composting but does not have the same odour issues.
- **Bioconversion:** Food waste is converted into insect larval biomass and organic residues.

Increasing organics processing capacity will create jobs in additional collection services, organics processing facilities and compost delivery services. At an estimated 6.4 additional full-time jobs per 10,000 tonnes, there is the potential to create 4,294 new jobs for Australians.⁶⁷

Separation at source

More waste needs to be separated at its source of generation into different bins. For municipal solid waste collections in 2018, only 22% of Australian local councils offered a garden organics (GO) bin service, and just 16% offered a FOGO service.⁶⁸

Separate FOGO collection services across the municipal solid waste and commercial and industrial waste streams are required. Noisy collection vehicles and more road traffic may pose challenges for local communities. Waste operators must respond to community challenges with operating models that balance congestion and amenity impacts.

However, separation at source is essential to lower the operational processing effort involved in improving raw materials.

This reform would require a substantial change in community, commercial and industrial behaviours.





9.2 Waste data to drive innovation

Key messages

- Successful policy and regulatory decision-making, community and industry behaviour change and private sector participation and investment all rely on **meaningful, transparent data**.
- Waste and recycling **data collection is insufficient and inconsistent** because it is delivered through a variety of legislative and regulatory initiatives — both voluntary and mandatory — that are governed by each state or territory.
- Australia needs a **comprehensive, coordinated national waste data strategy** that outlines stakeholder roles and responsibilities and supports the production of comparable and timely data.
- Landfill levies are a **powerful regulatory tool** that can divert more waste away from landfill by shaping community and commercial behaviour.
- **Interstate inconsistencies in landfill levies** are causing negative waste disposal behaviours instead of supporting resource recovery and environmental protection.
- The Australian Government has an important role to play in **facilitating the coordination of nationally consistent landfill levies**.

Providing data that supports sector innovation

For industry reform to succeed, access to quality data is essential. It provides the building blocks for developing stronger policies and regulations, changing community and commercial behaviour, and attracting private sector participation and investment.

At the moment, government and industry decision-makers are unable to make informed choices about the waste and recycling sector because data collection and processing is inconsistent. This limits the identification of waste management needs and the opportunities for appropriate system development.

The data is collected and analysed by industry and governments using a variety of regulatory, legislative and commercial initiatives (both voluntary and mandatory). Each organisation, state and territory applies its own standards and definitions.

This patchwork approach makes the data inconsistent, limited and opaque, creating knowledge gaps.⁶⁹ The use of the data and how it is analysed to make informed decisions is limited in scope and reach, leading to narrow responses to community and industry waste management needs.

As a result, there is a lack of clarity about how waste moves around Australia, how kerbside recycling collections are processed and reused, and how high-value recycled commodities are moved and exported.

If the waste sector is to change, the consistency, timeliness and clarity of data must improve.

Quality data is important

Providing access to consistent, complete, reliable and clear information will lead to more robust decisions around waste and recycling infrastructure and reform. It will help government and industry decision-makers to:

- **Produce more relevant and effective policies** and programs by tracking actual sector performance against targets and highlighting trends.
- **Continually improve policies** because they can monitor policy effectiveness, assess compliance and monitor the environmental effects.
- **Support sector growth** by analysing emerging trends and challenges, leading to informed choices about research and development needs, commercial capital investment and waste infrastructure planning.
- **Look for new market opportunities** by identifying where the materials produced by the waste sector can be meaningfully incorporated into complementary sectors such as agricultural production.
- **Encourage industry efficiency** by identifying underperforming areas and providing a clear view of volume and flows of materials through the system, leading to more efficient operations and better targeted waste collection and processing services.
- **Change community, commercial, operator and contractor behaviour** by highlighting the value of waste and showing the financial and environmental cost of devaluing it, resulting in more waste-aware attitudes in the sector and more informed end markets.

9.2 Recommendation

Encourage market development through government and industry partnerships to accelerate and extend the implementation of the *National Waste Policy's* data actions and bring national consistency to the household waste collection and landfill levy system.

Proposed sponsor: Department of Agriculture, Water and the Environment

When this should impact:



Where this should impact:



0-5 9.2.1 Support coordinated policy through an integrated whole-of-life waste data strategy for priority resources.

Proposed lead: Department of Agriculture, Water and the Environment

0-5 Enable nationally consistent reporting of waste data by developing a common approach to standards and definitions.

Proposed lead: Department of Agriculture, Water and the Environment

0-5 Improve decision-making and investor confidence by implementing an integrated data strategy that leverages agreed definitions.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory waste departments, local governments

5-10 9.2.2 Create a high-quality recycling system with lower processing costs by developing common benchmarks for each material stream, consolidating services and targeting infrastructure investment.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory waste departments, local governments

5-10 Support efficient resource recovery by prioritising investment in separation and processing infrastructure by material volumes.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: Department of Infrastructure, Transport, Regional Development and Communications

0-5 Create clarity for consumers and industry by implementing common benchmarks between states and territories for the collection, transportation and sorting of each material stream.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory waste departments, local governments

0-5 Reduce contamination of material streams through correct disposal and improved source separation by standardising household bins for each material type within states and territories.

Proposed lead: State and territory waste departments

Supported by: Local governments

0-5 Reduce congestion, amenity and road safety impacts by consolidating services to minimise transport congestion impacts.

Proposed lead: Local governments

0-5 9.2.3. Increase landfill diversion by developing a waste levy pricing strategy and national levy protocols.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory environment departments, state and territory treasuries

0-5 Address cross-border waste issues by developing national levy protocols that define which wastes should be levied, levy liabilities, levy administration and maximum transportation limits.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory environment departments, state and territory treasuries

0-5 Increase resource recovery by introducing a national levy pricing strategy to minimise interstate levy differences.

Proposed lead: Department of Agriculture, Water and the Environment

Supported by: State and territory environment departments, state and territory treasuries



Executive summary

Introduction

1. Place

2. Sustainability

3. Industry

4. Transport

5. Energy

6. Water

7. Telecommunications and digital

8. Social infrastructure

9. Waste

Methodology and results

Next steps

Measuring progress



Governance

National waste reporting

Implement agreed national data and reporting improvements, harmonised data classifications and definitions for reporting, and sharing arrangements across jurisdictions

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Affordability

Waste Levy

A nationally consistent waste levy

Target: 100%

Timeframe: 0-5 5-10 **10-15** 15+



Environment

Minimum substitution rates

Minimum rates of substitution for non-virgin materials across the ten major commodities in the infrastructure sector

Target: 100%

Timeframe: 0-5 **5-10** 10-15 15+



Taking a coordinated approach to waste policy and regulation

All tiers of government share responsibility for waste policy in Australia.

This leads to inconsistencies across the waste management and recycling sector, including differences in landfill bans or even the way waste is collected on the same street.⁷⁰ Such inconsistencies can have major consequences — for example, cross-border shipment of waste to take advantage of lower fees and levies.

A coordinated approach to developing and implementing waste policy and regulation across the nation will encourage domestic recycling and reprocessing facilities and greater consumer and industry compliance.

Create clean, consistent waste streams

Inconsistencies in forming waste policy have presented major challenges for waste management in Australia, with different approaches across, and sometimes within, jurisdictions.

For example, Infrastructure Victoria's review of the Victorian waste market highlighted differences in household bin collection methods across the state, noting that recycling services and collections differed across local councils, especially with organics collection.⁷¹

Most councils offer no organics collection services, some offer food organics and garden organics or some just garden organics. Bin lid colours and their meanings also vary across councils, leading to potential community confusion that contributes to contamination.⁷²

The large volumes of waste sent to landfill across Australia reveal a lack of separation at source. Separating waste streams at their generation source can reduce contamination and improve the end market for recycled materials. The Infrastructure Victoria report identified that increasing the separation of waste would require supporting infrastructure for both separation and processing.⁷³

When introducing a separate stream such as FOGO, governments need to be aware of community concerns about traffic congestion due to additional waste collection vehicles. To address this issue, several local councils that have introduced FOGO services also reduced the number of residual waste collections, resulting in minimal overall impact on the transport network.

Lifting data standards

Wide-ranging standards, definitions and goals across Australia makes it difficult to have a holistic view of how much waste is being generated, where it is being received and how it is being used, particularly when it is transported interstate.

With harmonised standards, waste data could be more quickly and accurately collected and released to consumers, industry, regulators and government.

Harmonising standards requires funding and close coordination. The Australian Government and each state and territory government would need to change licence conditions and schemes, regulations and protocols, and commit to carrying out data reform.

Meet the need for national tools

The Australian Government is making a significant investment in developing a national tool for non-hazardous waste reporting, the Waste Data Visualisation Platform. The Department of Agriculture, Water and the Environment is planning this tool, which will provide a national platform for identifying existing data. Their work is highlighting data gaps that need to be addressed through industry engagement, policy or regulation.

The Department has previously created waste data and reporting standards, but only for hazardous waste.⁷⁴

Currently, there are no standardised national tool and dataset for the whole waste sector, and no national standards.

Infrastructure Australia has identified key areas of focus for this data coordination, including:

- creating common definitions, particularly for waste with cross-border flows, interstate transfers and hazardous waste
- identifying a common point or points in the process chain where data is collected and reported
- comprehensive data capture from either the generating jurisdiction or the receiving jurisdiction, including landfill waste composition⁷⁵
- developing standards for key waste streams processing and transfer facilities and waste-producing and resource-consuming facilities
- understanding waste-to-product processing cycles⁷⁶
- producing common waste generation, recycling, energy recovery and disposal metrics.

Supporting data collection and reporting priorities

Building on the *Improving National Waste Data and Reporting* report⁷⁷ and the Victorian Auditor-General Office's 2019 Audit into the resource recovery sector⁷⁸, Infrastructure Australia has identified key priorities for data collection and reporting, which include:

- having consistent **quality assurance** measures
- obtaining a higher volume of clear data about **waste generation volumes by waste stream and location**, including: local government waste management, product waste, tip shops, litter and dumping, container deposit schemes, mining waste, stockpiles, approved long-term storages, waste infrastructure and international waste flows
- generating datasets that **analyse different community types** based on geography, including Northern Australia, regional, rural and remote areas
- introducing better **waste facility auditing**
- improving **industrial wastewater treatment infrastructure data**⁷⁹
- collecting **detailed resource recovery facilities data** including location, waste processed, capacity, capability and output
- tracking **waste flows from generation to end use** including collection, transfer, sorting, recycling or reuse, and disposal
- using **non-weight-based measures** such as carbon assessment to increase understanding of the economic, environmental and social impacts of waste
- having **higher-quality inputs for refined waste management**, such as existing packaging, imports and stockpile management
- being able to access **comprehensive information on interstate waste transfer** and cross-border flows
- reporting on **hazardous and non-hazardous waste stockpiling**
- producing data on **markets for recycled waste and circular economy metrics**⁸⁰
- reporting in detail on **disaster waste collection and disposal**

- knowing **where recovered materials go and the demand** for them, including the requirements, needs and challenges of other sectors that the waste management sector can address.

Data collection should also be directed to inform waste policy on emerging challenges. One example is the increasing number of multi-unit dwellings and their high rates of waste contamination.⁸¹

Improved data would provide governments and councils with valuable information about separation and contamination rates, differing attitudes within buildings, and storage constraints.⁸² These could be analysed alongside urban amenity, traffic and development considerations to design solutions that reduce the amount of waste ending up in landfill.

Developing a national data strategy

Australia does not have a clear, comprehensive and coordinated national waste data strategy.

To reform the industry, there must be a common data strategy that supports clear action. It should outline the roles and responsibilities of stakeholders and result in timely, relevant, comparable and consistent data.

If the strategy is developed and implemented correctly, governments and the waste industry will be able to:

- track and report waste from the point of generation to its final destination or use
- monitor progress against waste and recycling targets
- support and monitor the transition to a circular economy
- benchmark performance against national and sector standards and metrics
- explore new approaches to collecting and reporting data that embraces digital solutions⁸³
- develop the use of non-weight-based measures (such as lifecycle analysis and net environmental benefit) to increase understanding of the economic, environmental and social impacts of waste⁸⁴ and allow the assessment of problems and solutions in a locally relevant manner
- collect and report waste data that is reliable, relevant and up to date, and can be shared in an integrated, coherent and open format⁸⁵
- identify which waste materials to track and the methods required to measure and monitor waste flow movement⁸⁶

- develop intuitive and easily accessible standard data protocols for users, industry and governments
- monitor the efficiency and effectiveness of data gathering.⁸⁷

A national waste data strategy will provide a common framework for advancing the long-term interests of users and taxpayers.

“Australia does not have a clear, comprehensive and coordinated national waste data strategy.”

Encouraging landfill diversion

Australia's size means landfills have remained a viable solution to waste disposal for longer than in more densely populated developed geographies such as Europe and Japan. During 2018–2019, Australia's core waste resource recovery rate was 63%.⁸⁸

Australia can considerably increase landfill diversion by enabling market solutions through clear, enduring policy frameworks and by developing more resource recovery and recycling infrastructure.

There is already some progress. For example, South Australia recorded a landfill diversion rate of 85% in 2018–2019, setting the benchmark for other states and territories.⁸⁹

Better utilise levies

Landfill levies are recognised as the primary economic tool for diverting waste from landfill to higher and better uses.

Levies currently operate in New South Wales, South Australia, Victoria, Western Australia and Queensland and in 2019–20 they raised an estimated \$1.54 billion.⁹⁰

Levy revenues have funded waste and recycling initiatives. They have also supported the development of local resource recovery businesses such as processing facilities, alternate waste treatment plants and material recovery facilities.⁹¹

However, not all states and territories have transparent levy regimes that show how the landfill levy revenues were used.⁹²

Reducing cross-border waste issues through levy reform

Significant differences in landfill levies across states and territories are leading to levy avoidance. Each year, an estimated 1.5 to 3 million tonnes of waste is transported significant distances, dumped, stockpiled or mislabelled to reduce or avoid state levies.⁹³

Most worryingly, hazardous material is sometimes taken across state borders and disposed of inappropriately.⁹⁴

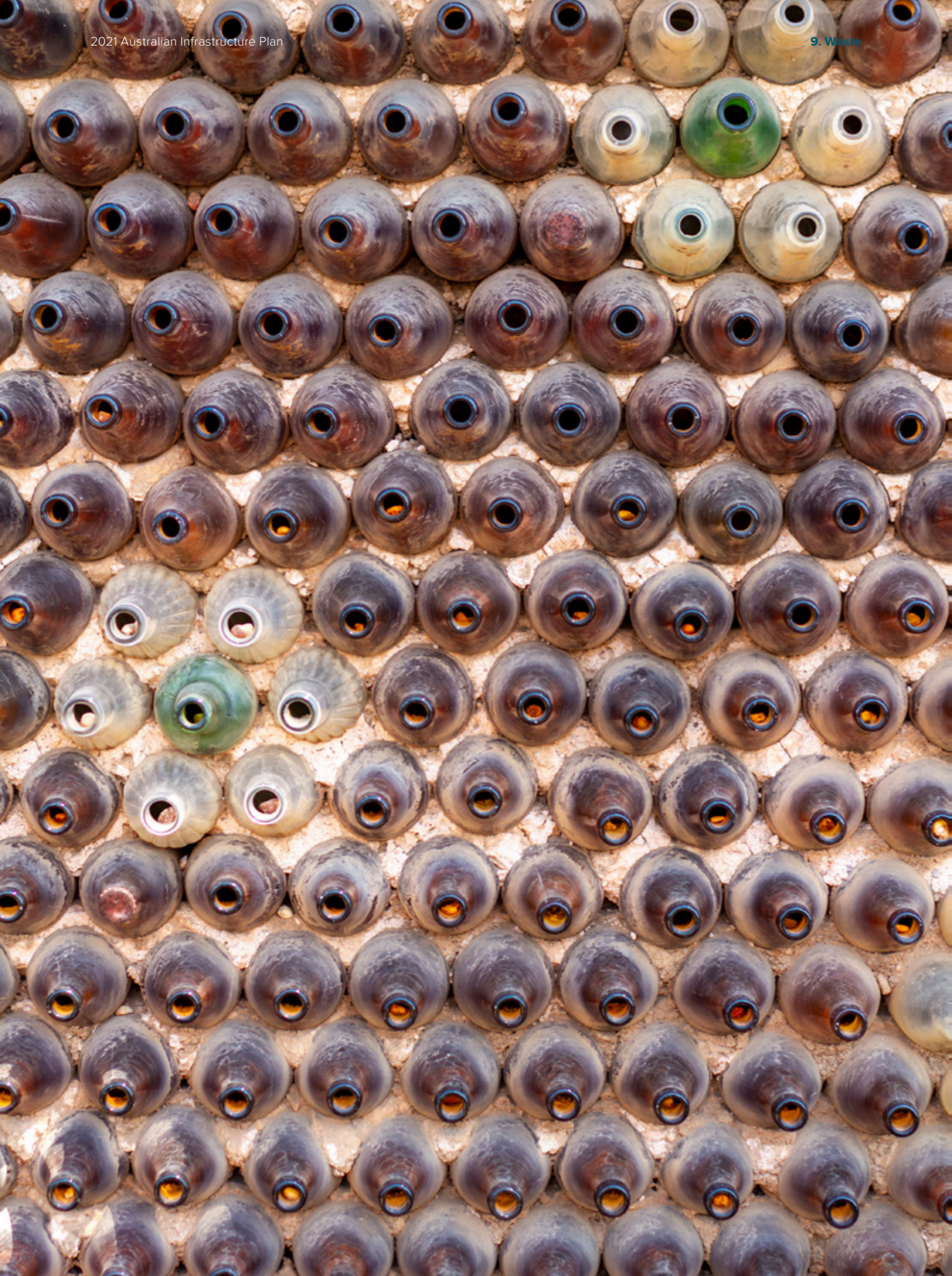
Dealing with interstate waste is a particular challenge in New South Wales and Western Australia because their levy rates for solid, liquid and hazardous wastes are more variable than in other states.⁹⁵

The Australian Government should demonstrate best practice levy structures, pricing and administration to accommodate harmonisation. To support reform, it will need to collect information about which waste streams are levied, the definitions applied, where the levy liability is charged and how the levies are administered.⁹⁶

Introducing a consistent, harmonised levy pricing strategy would remove interstate levy differences and address the inappropriate movement and disposal of waste between states.⁹⁷ The result would be enhanced environmental protection and increased resource recovery.⁹⁸

The pricing strategy should be supported by national protocols that define:

- which wastes should be levied (solid, liquid, hazardous)
- time limits for recycling before a landfill levy is charged
- levy liabilities (for example, at generation point)
- distances that waste can be moved
- how the levy is administered.⁹⁹



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IV. Methodology

At a glance

- Infrastructure Australia has used a set of **best-practice methodologies to develop and assess reforms** for the *2021 Australian Infrastructure Plan* and the *2021 Reform Priority List*. This approach incorporates practices developed with infrastructure sector and government policy implementation units and considers social impact and behavioural insights as well as economic factors.
- By applying a **theory of change** framework, each reform comprises a hierarchy of related **actions** that contribute to an ultimate outcome:
 - a **recommendation** that aligns with the proposed reform for the sector or policy area and identifies the ultimate outcome that the reform targets
 - intermediate outcomes** that align a series of related activities with a desired outcome that is a precondition for the ultimate outcome
 - activities** that describe a change in behaviour and its direct output(s), which will help to unlock the preconditions for change and contribute to an intermediate outcome, which in turn will contribute to the ultimate outcome.
- Infrastructure Australia has proposed a **change agent to sponsor, lead or support each action**. Australian Government departments have been identified to sponsor recommendations where national coordination is appropriate, although they may not implement all of the actions in the recommendation themselves. Proposed leads implement outcomes and actions, in partnership with supporting change agents.
- The **2021 Implementation Pathway** organises the different actions for each identified change agent over the 15-year horizon of the *2021 Plan*, comprising recommendations, intermediate outcomes and activities.
- The **2021 Reform Priority List** outlines how we have applied multi-criteria analysis to qualitatively assess the impacts of the 29 recommendations. Each recommendation is assessed against 13 impact categories, including 33 criteria that determine its impacts on services for users, community sustainability, ease of implementation and risks.
- Multi-criteria analysis has identified Place, Industry, and Water reforms as having the largest positive impact on outcomes that matter to the community.



How the 2021 Plan has been developed

Our analysis applies innovative policy methodologies

Across Australia, the infrastructure sector engages thousands of experienced specialists to support the delivery of high-quality infrastructure and services. The *2021 Australian Infrastructure Plan* complements the work of these experts by applying contemporary policy approaches that support social impact.

Infrastructure Australia's ambition is to identify, incubate and advocate for reform by identifying the best practice of others within the infrastructure sector and endorsing these behaviours where they are delivering value.

To support this ambition, our policy analysis commenced with a wide-ranging review of the state of the infrastructure industry. The *2019 Australian Infrastructure Audit* provided a comprehensive evidence base on which to build recommendations.

Our interim report on the impacts of the recent global pandemic, *Infrastructure beyond COVID-19*,¹ and our assessment of progress against the *2016 Australian Infrastructure Plan*² recommendations, supplemented the information in the *2019 Audit*.

In refining our observations, Infrastructure Australia engaged more than 6,000 individuals, including domestic and global policy leaders, to test our conclusions and identify reform opportunities. This included establishing formal and informal partnerships with technical experts to support the development of more detailed plans, which provide further detail on how the pragmatic and actionable reforms in the *2021 Plan* work towards long-term outcomes.

The *2021 Plan* identifies the reforms that contribute to a community-centred vision while reducing trade-offs and implementation challenges. We have prioritised outcomes that improve services for users and unlock quadruple-bottom-line benefits for the community across economic, social, environmental and governance outcomes.

We considered reforms proposed by the community, industry and governments as part of identifying best practice, including those made through the submissions process for the *2019 Audit*. Examining contemporary opportunities for reform has helped us to identify where recommendations can be most impactful. This is expressed in both the activities and the outcomes they unlock.

It is critical to acknowledge that the maturity of change agents varies. This is often due to local conditions as well as organisational capacity and capability. The *2021 Plan* aims to lift capability and alignment between those change agents who need to work together by defining a common purpose and identifying the outcomes to which activities contribute. We have identified specific, targeted activities to ensure this advice is clear, pragmatic and practical.

Infrastructure Australia's role is to work with reform owners across the maturity spectrum to support implementation of the *2021 Plan*. As well as varying in maturity, some change agents may have to respond to shifting external conditions, in which case the activities may need to be adapted to revised local circumstances.

A pathway to reform that is pragmatic and practical

Infrastructure Australia has developed the *2021 Plan* using a user-centred design process, as shown in **Figure IV.1**.

The *2021 Plan* is founded on the discovery and definition of issues and evidence set out in the *2019 Audit*, which describes Australia's infrastructure challenges and opportunities.

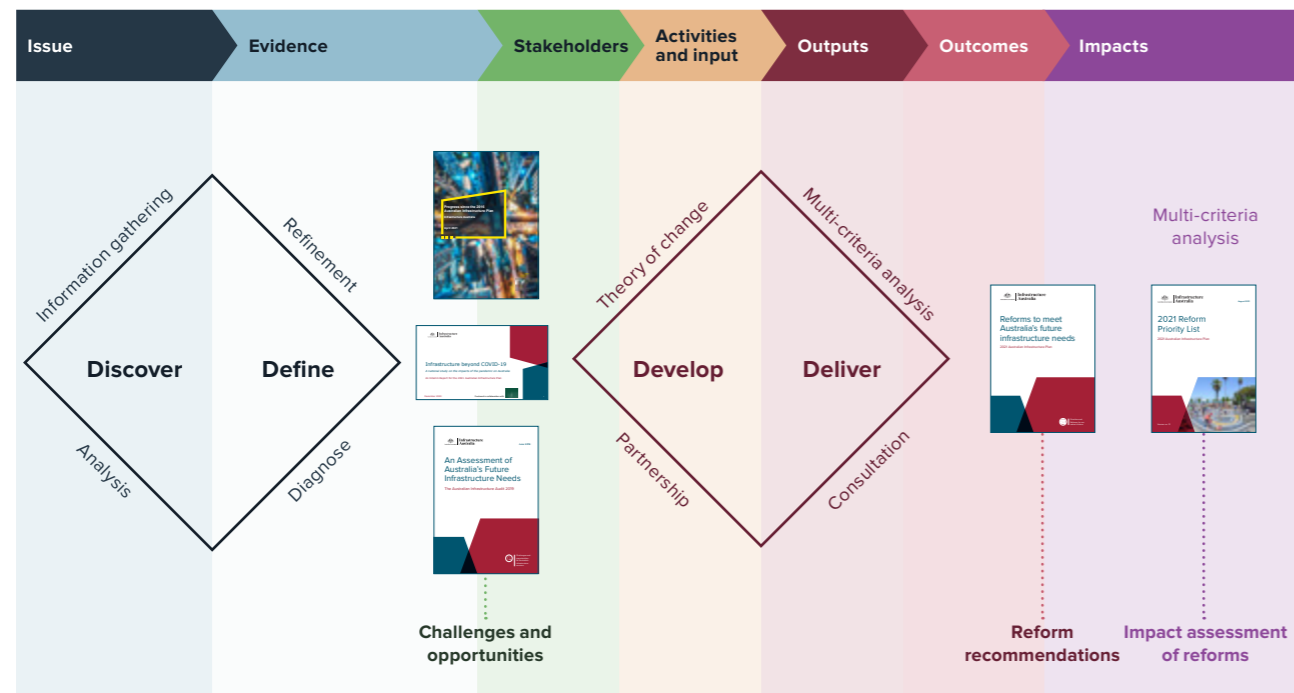
The first phase of the *2021 Plan* developed a vision for Australia in response to these challenges and opportunities by engaging and partnering with stakeholders with deep knowledge of the required changes.

The potential reforms were then refined and prioritised by applying a theory of change approach. This resulted in the 29 recommendations in the *2021 Plan*. Reforms have been defined by recommendations, outcome and activities, with each assigned a time period, a geographic impact and a change agent. Change agents are categorised into:

- proposed sponsor:** facilitate, coordinate and champion the recommendation
- proposed lead:** deliver specific activities or lead related outcomes
- support:** share ownership, contributions or knowledge to enable the reform process.

Multi-criteria analysis has been used to assess the impact of reforms. These assessments are included in the *2021 Reform Priority List*.

Figure IV.1: User-centred design makes the reforms in the 2021 Plan relevant and pragmatic



The right tools for policy development

The 2021 Plan draws on established policy development frameworks to identify deliverable reforms that support quality of life for all Australians.

Theory of change has been used to identify reform pathways and articulate the activities that build towards this change. Theory of change describes activities that enable change to happen by bridging the gap between the status quo and the desired long-term outcomes. It applies critical systems thinking to the design, implementation and evaluation of policy initiatives.

The application of theory of change has been pioneered in the social impact sector, but is increasingly applied to supporting change management in other sectors with complex issues and changes that impact users and communities.

It is used by leading policy and research agencies, such as the CSIRO in their *Impact Framework*³ and the United Kingdom's Nesta Innovation Foundation.⁴

Multi-criteria analysis is a tool for assessing and comparing options in both policy and project prioritisation processes. It is often used to complement and target quantitative analyses such as cost-benefit analysis and regulatory impact statements, which should be undertaken by agencies implementing a recommendation.

For the 2021 Plan, Infrastructure Australia has used multi-criteria analysis to assess:

- the trade-offs between beneficial impacts for community sustainability and services for users against the ease and risks of implementation
- the impact of reforms against a set of criteria designed to identify these benefits, risks and challenges
- alignment of recommendations with a set of government policy priorities
- the recommendations that are likely to be resilient to a set of future scenarios.

Together, theory of change and multi-criteria analysis provide a holistic framework for policy design and impact assessment.

Theory of change articulates how the activities in each recommendation will lead to the intended outcomes by linking the logical steps together over the 2021 Plan's 15-year timeline. It underpins the 2021 *Implementation Pathway*, which shows the actions for change agents that have been identified to lead and support reforms. Multi-criteria analysis identifies the expected impacts of each recommendation.

In addition to using multi-criteria analysis to assess the recommendations in the 2021 Plan, Infrastructure Australia has recently included multi-criteria analysis guidance in the 2021 refresh of the *Infrastructure Australia Assessment Framework*.⁵

The Reform Priority List is designed to help guide decision-makers

The 2021 Plan, supported by the 2021 *Reform Priority List* and 2021 *Implementation Pathway*, provides a detailed evidence-based plan for governments to implement reforms that will create meaningful outcomes for all Australians.

The 2021 *Reform Priority List* assesses the relative impact of proposed reforms. It is intended to help policymakers understand the positive impacts, trade-offs and implementation challenges through a wide-ranging set of criteria and is supported by analysis in the detailed plans.

To help inform government prioritisation and planning, the 2021 *Reform Priority List* also:

- identifies where reforms align with stated Australian Government policy priorities
- indicates where reforms would be expected to have greater impact under different future scenarios.

Reforms are broken down to ensure they are actionable

Each of the 28 reforms covered by the 2021 Plan consists of a series of actions, either **recommendations**, **intermediate outcomes** or **activities**. This structure is derived from the theory of change. Each reform consists of one or two **recommendations** providing a vision for the ultimate outcome of reform. Each recommendation is reliant on achieving

change a cross a series of supporting **intermediate outcomes**. These intermediate outcomes are enabled through a series of more granular **activities**.

The Implementation Pathway puts all the actions in one place

The 2021 *Implementation Pathway* is designed to give the change agents identified in the 2021 Plan a concise understanding of the actions relevant to them. It identifies the activities, intermediate outcomes and recommendations that each change agent has been proposed to lead or support across five-year time segments over 15 years.

Subsequent detailed work should inform implementation

Together, the 2021 Plan, 2021 *Reform Priority List* and 2021 *Implementation Pathway* present an evidence-based plan for achieving better outcomes for all Australians. These documents should inform subsequent detailed assessments of the activities and options required to implement the recommendations.

These assessments will then be the basis for policy assessment processes such as regulatory impact statements and cost-benefit analyses, and should be used to drive the subsequent design and implementation of reforms.



How we assessed reform impacts

Key messages

- We have used multi-criteria analysis to qualitatively assess the expected impacts of each recommendation in the *2021 Plan*.
- The **2021 Reform Priority List** shows the impact of each recommendation across 13 impact categories. These are aggregated from evidence-based assessments across 33 criteria that are also weighted into an overall assessment. The weightings were informed by our detailed engagement with 2,000 community members and businesses to determine community priorities.
- As well as assessing the recommendations against community priorities, we also assessed recommendations against the Australian Government's **infrastructure policy priorities**. These are outlined in Infrastructure Australia's **Statement of Expectations**.⁶ We also assessed recommendations against **future development scenarios** informed by *2019 Audit* future trends and findings in *Infrastructure beyond COVID-19*.⁷
- Each recommendation's **detailed assessment, and its supporting evidence base**, will be included in detailed plans that will be released for each of the six infrastructure sectors and three cross-sector themes.



Assessing the impact of policy recommendations

Multi-criteria analysis is often used in policy and project prioritisation processes to complement and target quantitative analyses (for example, cost–benefit analyses) that should be undertaken before implementing significant reform.

Infrastructure Australia has used multi-criteria analysis as a framework for qualitatively identifying the impacts and trade-offs for the recommendations in the *2021 Plan*. We have also recently included best-practice guidance on its use in the *Infrastructure Australia Assessment Framework*.⁸

This multi-criteria analysis framework identifies the impacts of the recommendations across benefits for service users and community sustainability, risk and ease of implementation.

It provides a strategic framework for qualitatively assessing the potential impact and implementation challenges of each reform. Our aim is to help inform, rather than replace, a quantitative assessment such as a business case or regulatory impact statement before a decision is made.

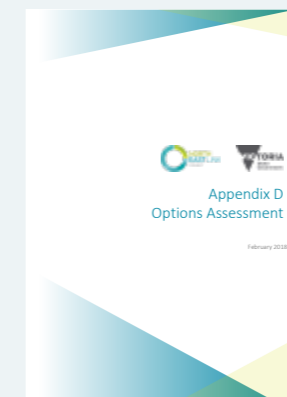
This qualitative analysis is particularly important in the context of policy recommendations, where it is essential to consider impacts that are difficult or costly to monetise. These include:

- impacts related to governance or social equity issues, such as service availability across different places
- challenges, such as governance capacity
- risks, such as community acceptance, that could not be captured in a quantitative analysis.

Where else is multi-criteria analysis used?

Multi-criteria analysis is used frequently by government agencies to assess projects and policies. Examples include:

- Transport for NSW's *Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives*, which describes multi-criteria analysis as an evaluation tool used for decision-making between a range of projects or options that are not easily quantifiable.⁹
- The *North East Link Business Case Options Assessment*, which used multi-criteria analysis to test the strategic merit of options before quantitative cost–benefit analysis was undertaken.¹⁰
- The *Victorian Guide to Regulation*, which identifies multi-criteria analysis as an appropriate tool for assessing policy effects that cannot easily be monetised, such as social equity outcomes.¹¹
- The *Queensland Government's Smarter Solutions: Multi-criteria Analysis Tool*, which provides decision-makers with a framework for undertaking multi-criteria analysis, ensuring that a consistent approach is applied and that the structure of decision problems effectively captures the benefits and impacts of low-cost and non-infrastructure solutions.¹²



Source: Transport for NSW (2016), Victorian Government (2016, 2018), Queensland Government (2019)



Impact criteria focus on what matters to the community

The multi-criteria analysis framework contains 33 criteria in 13 impact categories, against which each recommendation has been assessed.

The criteria were selected through specialist input and by empowering 1,800 people and 200 businesses in a focused engagement process to prioritise criteria that are most meaningful to the community.

As shown in **Table IV.1**, these criteria provide a framework for qualitatively assessing impacts across:

- **Service users**, categorised into impacts on **quality, access and affordability** of services, which was the framework applied by the *2019 Audit*.
- **Community sustainability**, assessed through a quadruple-bottom-line approach to **economic, environmental, social and governance** impacts for community sustainability, as outlined in *Infrastructure Australia's Sustainability Principles*.¹³

- **Ease of implementation**, which helps governments understand the potential delivery challenges and trade-offs across the **costliness** and **complexity** of the reform, and the capacity of government and industry to deliver it.
- **Risks to success**, which indicate risks for the implementation of policy recommendations across community and stakeholder **acceptance**, the level of **confidence** in the analysis of impacts, and the extent of government **control** over the success of the reform.

Table IV.1: Each recommendation is assessed against 33 impact criteria

Impact themes	Impact categories	Impact criteria
Service users	Quality	1. Provides a fast service that is easy to use
		2. Services available with minimal disruption and variance in quality
		3. Enhanced safety and security for users
	Access	4. Comparable services across all places
		5. Services on demand when users need them
		6. Improved access for disadvantaged groups
	Affordability	7. Pricing reflects usage and costs to deliver the service
		8. Affordability for an average Australian household
		9. Costs distributed fairly based on users' ability to pay
Community sustainability	Economic	10. Improved efficiency
		11. Improved access to a higher-quality workforce
		12. Increases national employment or Gross Domestic Product (GDP)
	Environmental	13. Supports waste reduction and circular economy
		14. Reduced harmful air and water pollution
		15. Reduced greenhouse gas emissions
	Social	16. Opportunities for education and employment
		17. Reduced anti-social behaviour and crime
		18. Improved health outcomes
	Governance	19. Improved planning and decision-making within government
		20. Transparency of decision-making
		21. Consideration of the needs of local communities and businesses
Ease of implementation	Costliness	22. Minimises upfront and ongoing costs
		23. Minimises financial burden on the taxpayer
	Complexity	24. Minimises time to implement
		25. Minimises complexity of implementation
	Capacity	26. Capability of government to implement
		27. Capacity of industry to deliver
Risks to success	Acceptance	28. Community acceptance
	Confidence	29. Expected impacts are clear
		30. Confidence that benefits will be achieved
		31. Confidence that reform will be successful during COVID-19 recovery
		32. Quality and availability of supporting evidence
	Control	33. Extent of government control over success of reform

Impacts assessed on a five-point scale

Each recommendation is scored against the 33 criteria as having a high negative, low negative, neutral, low positive or high positive impact, as shown in **Table IV.2**.

Scoring is a qualitative assessment of the impact, based on available evidence and supported by specialist judgement.

As an example of how the five-point scale is applied, the table includes the intended qualitative meaning of each score for an example criterion.

It shows the extent to which the suggested recommendation minimises the upfront and ongoing costs of implementation.

The scoring and evidence for each of the 33 criteria will be included in the detailed plans for each sector or cross-sectoral issues.

Infrastructure Australia will also be releasing a guidance note on how impacts have been assessed against the five-point scale in each criterion. This will be available on the Infrastructure Australia website.

Table IV.2: Each criterion is graded on a five-point scale

Qualitative rating	Score	Description	Example criterion: 'minimises upfront and ongoing costs'
High	5	High positive support for meeting the criteria	Large reduction in the total costs from what would otherwise be spent
Low	4	Low positive support for meeting the criteria	Small, or potential, reduction in financial cost, compared to business as usual
No impact	3	No support for meeting the criteria (N/A)	No net change to financial cost, compared to business as usual
Low negative	2	Low negative support for meeting the criteria	Requires some further investment, above business as usual
High negative	1	High negative support for meeting the criteria	Requires substantially more financial resources than would otherwise be spent



Evidence-based qualitative assessment

While the impact assessment scores are qualitative, they are evidence-based.

Our analysis is complemented by examining detailed studies, pilots and deployments of the proposed reforms domestically and in other jurisdictions. This evidence is set out in the forthcoming detailed plans for each sector and cross-sector, which will be released after the *2021 Plan* to provide further evidence to support our case for reform.

Evidence for long-term reforms is often qualitative or circumstantial, but we encourage and support change agents to undertake more detailed and quantitative assessments as part of implementing the reforms.

Table IV.3 shows how the scoring and use of evidence will be presented in the detailed plans.

Table IV.3: Criteria are supported by justifications and evidence

Impact criteria	Score	Justification	Evidence
'Minimises upfront and ongoing costs'	Qualitative scale, as per Table IV.2	Provides a qualitative justification for the impact assessment score that draws on relevant evidence where appropriate	References as evidence that supports the assessment of the criterion

Making impact assessment work for policymakers

To help inform policy decision-making, we have used multi-criteria analysis to be able to compare the reforms. We prioritised reforms in 13 different ways, in order to indicate how they deliver on the Australian community's priorities, align well with Australian Government policy priorities, and impact under potential future scenarios.

Identifying which reforms best deliver on community priorities

To understand how the Australian community prioritise costs, risks and benefits of infrastructure, we conducted a 2,000-member community survey conducted in June 2020.¹⁴ We asked individuals and businesses to rank and rate the importance of four impact themes (service user impacts, community sustainability impacts, ease of implementation and risk), as well as a long list of impact criteria that were relevant to them (service user and community sustainability impacts). We used these results to inform which criteria were most important to the community, resulting in the 33 impact criteria shown in **Table IV.1**.

These survey results also helped us to understand the relative importance of each criterion relative to each other. We used the average of the importance ratings (out of 5) to produce weightings for each criterion, adding to a total of 100%. By using this to produce aggregate scores for each reform, we were able to determine which reforms have the greatest impact on the balance of community priorities.

We found that the community placed high importance on most criteria, which meant that most criteria contributed equally to the total. In summary, for assessing reforms against community priorities, we used these **community priorities weightings**:

- service user impacts: 25.6%
- community sustainability impacts: 25.6%
- ease of implementation: 23.8%
- risks to success: 25.0%

The 6 ease of implementation and 6 risk criteria were equally weighted within their impact theme, while we used the survey results to set the weightings of the 21 service user and community sustainability criteria.



Reforms can align with different policy priorities

As the successful implementation of these recommendations depends on government action over a long time, recommendations have been assessed for their alignment to the explicit policy priorities of the Australian Government.

Infrastructure Australia's *Statement of Expectations* provides a useful reference point for understanding these priorities.¹⁵

As well as the community-weighted baseline assessment, we assessed recommendations against the stated Australian Government objectives that infrastructure:

- provides or underpins services that deliver economic and social benefits to Australians
- has an important role in shaping cities that are productive and liveable
- provides connectivity to regional and remote parts of Australia.

These have been translated into five policy priorities against which to assess the impact of recommendations, as shown in **Table IV.4**.

Table IV.4: How policy priorities translate from the *Statement of Expectations*

Policy priority	Description
 Economic benefits	Recommendations most likely to provide economic benefits to Australians, including increased national employment or GDP
 Social benefits	Recommendations most likely to increase quality of life to Australians, including improved access for disadvantaged groups, health outcomes, affordability, and opportunities for education and employment
 Productive cities	Recommendations most likely to make cities more productive, through efficiency benefits, higher-quality workforce or greater services on demand Only recommendations relevant to Fast-growing Cities or Smaller Cities and Regional Centres are considered
 Liveable cities	Recommendations most likely to make cities more liveable, through addressing social, environmental and governance outcomes Only recommendations relevant to Fast-growing Cities or Smaller Cities and Regional Centres are considered
 Connected regions	Recommendations most likely to increase connectivity and equality of outcomes between regions Recommendations that only impact Fast-growing Cities are not considered

A multi-criteria analysis framework allows weighting adjustments to reflect different priorities. This has been applied to the five policy priorities. Adjusting weightings for priorities maintains the evidence-based impact assessments in the 33 criteria while increasing or decreasing the weighting of the impact according to what aligns with each policy priority.

We assessed the impact against each policy priority by re-weighting the 33 criteria to either:

- increase the weighting of criteria that support the priority (for example, 'improved access for disadvantaged groups' is strongly weighted under the 'social benefits' policy priority weighting profile); or

- de-weight or ignore criteria that are not relevant to it (for example, 'increases national employment or Gross Domestic Product' is ignored in the 'social benefits' policy priority weighting profile).

Changing the weightings still draws on the same evidence-based impact assessment scoring as the community-weighted baseline.

To determine performance against the policy priorities, the reforms were assessed against the same criteria with new weightings. This is explained in further detail in the *2021 Reform Priority List*, and the results are reported in the **Results and prioritisation chapter**.

Table IV.5 explains how criteria have been re-weighted under each policy priority.

Executive summary

Introduction

1. Place

2. Sustainability

3. Industry

4. Transport

5. Energy

6. Water

7. Telecommunications and digital






8. Social infrastructure






9. Waste

Methodology and results

Next steps

Table IV.5: Each policy priority emphasises specific criteria through weightings

Impact themes	Impact category	Impact criteria					
			Economic benefits	Social benefits	Productive cities	Liveable cities	Connected regions
Service users	Quality	1. Provides a fast service that is easy to use				High	Low
		2. Services available with minimal disruption and variance in quality				High	High
		3. Enhanced safety and security for users		Low		High	
	Access	4. Comparable services across all places		Low			Max
		5. Services on demand when users need them			High	High	Low
		6. Improved access for disadvantaged groups		Max			
	Affordability	7. Pricing reflects usage and costs to deliver the service	Low		High		
		8. Affordability for an average Australian household	Low	High		Low	
		9. Costs distributed fairly based on users' ability to pay		High			
Community sustainability	Economic	10. Improved efficiency	Low		Max		
		11. Improved access to a higher-quality workforce	Low		High		
		12. Increases national employment or GDP	Max		Low		
	Environmental	13. Supports waste reduction and circular economy				Low	
		14. Reduced harmful air and water pollution				High	
		15. Reduced greenhouse gas emissions				Low	
	Social	16. Opportunities for education and employment		High		High	
		17. Reduced anti-social behaviour and crime		Low		High	
		18. Improved health outcomes		High		High	
	Governance	19. Improved planning and decision-making			Low		
		20. Transparency of decision-making					
		21. Consideration of the needs of local communities and businesses		High		Low	High

Impact themes	Impact category	Impact criteria					
			Economic benefits	Social benefits	Productive cities	Liveable cities	Connected regions
Ease of implementation	Costliness	22. Minimises upfront and ongoing costs	High				
		23. Minimises financial burden on the taxpayer	Low				
	Complexity	24. Minimises time to implement					
		25. Minimises complexity of implementation					
	Capacity	26. Capability of government to implement	Low				
		27. Capacity of industry to deliver	Low				
Risks to success	Acceptance	28. Community acceptance		Low			
		29. Expected impacts are clear	Low				
	Confidence	30. Confidence that benefits will be achieved	Low				
		31. Confidence that reform will be successful during COVID-19 recovery	High	High			
		32. Quality and availability of supporting evidence					
	Control	33. Extent of government control over success of reform					

Note: Only the criteria that are most relevant for addressing the policy priority retains a weighting. The relevant weightings are then redistributed from the **community priorities weightings**, according to a tiered hierarchy of their relevance. In order of importance, the tiers are Max, High and Low, and the weightings by policy priority sum to 100%.

Some reforms may be easier to implement

The risks and ease of implementation impacts were included in the multi-criteria analysis to allow for consideration of the challenges and trade-offs of implementing the recommendations.

It is also useful to consider the deliverability of recommendations. This helps policy-makers consider which reforms are likely to face the lowest barriers to implementation, and those reforms that could be accelerated.

The reforms assessed through the multi-criteria analysis as having a relatively high-ease, low-risk implementation are identified as 'low-hanging fruit'.

This assessment only considers the 12 criteria within the impact themes of 'risks' and 'ease of implementation'.

Different future developments could affect these impacts

Infrastructure Australia's *Statement of Expectations* also asked Infrastructure Australia to consider a range of possible future developments.¹⁶

We developed five scenarios depicting possible futures to consider their potential effects on recommendation impacts (see **Table IV.6**).

In line with the qualitative nature of multi-criteria analysis, scenarios describe how the world could be qualitatively different to our current baseline assumptions.

The assumptions used in the baseline assessment were drawn from the Australian Government 2021–2022 Budget Paper No. 1.¹⁷ The scenarios were qualitatively defined using the seven future trends identified in the *2019 Audit*, as well as COVID-19 recovery scenarios, as identified in *Infrastructure Beyond COVID-19* (see **Table IV.7**).

Table IV.6: Five future Australian scenarios that could affect the impacts of recommendations











Future state	Description
Baseline	Budget 2021–22 Outlook. ¹⁸ Recent record rates of economic growth are expected to moderate but remain higher than global averages, and COVID-19 vaccines are fully available by the end of 2021.
 Bounce back to rapid recovery	Faster global and local recovery from the COVID-19 pandemic. Fast population growth, greater centralisation in cities, trend economic growth and greater return to cities and offices.
 Slow recovery from a sustained pandemic	Longer-lasting global pandemic and additional domestic outbreaks. Slower population growth, below trend economic growth for the medium-term, significantly less international movement of people and some trade effects.
 Regionalised Australia	Faster population growth in regions. Lower demand for inner city business and residential locations and significantly more working from home.
 Digital Australia	Faster adoption of digital technologies by consumers and society. A higher rate of digital transformation, faster-closing digital divide, greater digital and technological literacy.
 Destabilised world	Increased risk and impacts of disaster. Greater incidence of natural disasters, increased political instability, increased cyberwarfare and cybercrime.

Table IV.7: The five future scenarios are qualitatively defined

Future trend	Baseline	Future scenario				
		 Bounce back to rapid recovery	 Slow recovery from a sustained pandemic	 Regionalised Australia	 Digital Australia	 Destabilised world
Quality of life and equity	Household consumption returns to trend in 2022. Greater impacts on young and female Australians. ¹⁹	Faster rising quality of life	Greater inequality; lower quality of life			Shocks reduce quality of life
Cost of living and incomes	Wage growth remains low until at least 2022. CPI moderate. Unemployment 5.5% 2021 to 4.5% 2024. ²⁰	Higher income growth	Lower income growth	Lower cost of living pressure in cities, but higher in regional areas		
Community preferences and expectations	Trust in government highest in 13 years at 55%. ²¹	Higher trust in government due to successful response	Lower trust in government due to ongoing issues		Greater participation and transparency through technology	Lower trust in government due to ongoing crises
Economy and productivity	GDP expected to grow by 4.25% in 2021–22 then moderate to 2.5%. Slow productivity growth. ²²	Faster growth; higher productivity growth	Slower growth; lower productivity growth		Higher productivity growth due to technology adoption	Shocks reduce productivity and GDP growth
Population and participation	Population growth is expected to fall to 0.1% in 2020–21 and 0.2% in 2021–22, the slowest growth in over a century. ²³	Faster population growth and net overseas migration	Slower population growth and net overseas migration	Population growth centred in regions rather than cities		
Technology and data	No unexpected step changes in adoption. Technology changes with trends over time, with Australia behind global best practice.				Faster change and adoption; higher literacy	
Environment and resilience	Some increased recurrence of natural disasters, environmental degradation continuing.	Faster consumption growth increases degradation	Slower consumption growth reduces degradation	Greater exposure of population to natural disasters	Faster change and adoption of low-emissions technologies	Faster climate change; bigger disasters; more frequent shocks
COVID-19	Localised outbreaks occur but are largely contained. A population-wide Australian vaccination program fully in place by end 2021. ²⁴	Faster return to international mobility; faster global economic recovery	Slower return to international mobility; slower global economic recovery			

Different future developments may alter the assumptions that underpin scoring in a multi-criteria analysis, so have not been re-weighted in the baseline scorings to account for future developments. Our analysis therefore reconsiders individual scoring.

We indicatively scored each recommendation against the 33 criteria to determine whether its impact would be better, worse, or unchanged if each scenario eventuated.

Using the baseline weightings, the more criteria that were assessed as better or worse for a recommendation under a scenario, then the better or worse that recommendation ranked under the future scenario.

We undertook this process separately from re-weighting the evidence-based baseline assessment and based it on the judgement of sector specialists.

It would not be feasible to compile a full evidence base like the community-weighted baseline assessment for another five future scenarios, within the *2021 Plan*. It is therefore important that further evidence is gathered to guide final decision-making and implementation.

This analysis is only intended as an indicative exploration of how the evidence-based assessment could change under different potential future developments, and can be used to inform more detailed analysis during implementation.

Some reforms maintain their impact across all different versions of the future

These five scenarios represent different versions of the future, which may or may not come to fruition. In light of this uncertainty, recommendations that remain impactful regardless of what manifests have also been identified.

This 'no regrets' assessment has been made where a recommendation's impact is only better, or unchanged, across all five scenarios. The overall impact of the recommendation is considered for this assessment. This means that while a recommendation's impact may be reduced for one or two criteria, it can still be considered no regrets if this is outweighed by more improvements in impacts for other criteria.



Identifying pathways to change

Key messages

- Theory of change applies critical thinking to **link outcomes with enabling activities**. It supports the design, implementation and evaluation of initiatives and programs that are intended to support changes within their contexts.
- Infrastructure Australia developed a theory of change for **each recommendation** to articulate the critical steps on **each pathway to a vision for change**.
- The theory of change can also identify **indicators to help measure** whether the desired outcomes of a reform are being realised. Where appropriate, we have identified these indicators.



Theory of change — bridging the gap between actions and outcomes

To develop the *2021 Plan*, Infrastructure Australia used the theory of change approach to identify:

- the pathway to achieving outcomes for service users and community sustainability
- interdependencies between the actions required to deliver these outcomes.

An outcomes-focused approach helps to guide decision-making and coordinate alignment between change agents and jurisdictions. It also identifies both a reform pathway and indicators for monitoring performance. This approach has set out a reform framework that can be tested, challenged and refined regularly to support the implementation of reforms and report on progress.

Theory of change describes how and why a desired change is expected to happen in a particular context. It focuses on mapping (filling in) the ‘missing middle’ between what a change initiative does (its activities) and how these lead to the desired outcomes.

It identifies the long-term goals (ultimate outcomes), then works back from them to identify all the conditions (intermediate outcomes) that must be in place for the goals to be reached, including how they relate to each another.

Why is it important for infrastructure planning?

Infrastructure Australia identifies and assesses challenges, opportunities and reforms for enhancing quality of life for Australians. Our *2019 Audit* identified quality, affordability and access as critical outcomes for service users. Our *Sustainability Principles* provide a holistic framework for community sustainability across economic, environmental, social and governance outcomes (quadruple bottom line).²⁵

Using theory of change enables Infrastructure Australia to apply a structured approach to advising governments on policy that enhances Australia’s infrastructure. As a systematic way to understand and document complex changes, it informs and complements other assessment tools we use, such as multi-criteria analysis and cost–benefit analysis.

Infrastructure Australia has used strategic analysis frameworks that are suitable for defining and prioritising reform. This approach draws on the experience of the social impact sector. The application of these methodologies recognises the complex set of factors that can contribute to our vision of improving quality of life and increasing national productivity.

Theory of change has been adopted because it:

- **Leads to greater impact:** An outcomes-focused approach encourages clarity about the desired impact and enables testing, learning and iterating to make sure reforms are effective. This process can improve design and delivery, foster collaboration to achieve shared goals, and drive innovation that ultimately leads to better outcomes.
- **Prioritises infrastructure users and the community:** An outcomes-focused approach puts the needs of infrastructure users and communities at the centre of policy development. With this focus, Infrastructure Australia can work with stakeholders to empower them to be agents of change and underpin improved outcomes for individuals and their communities.
- **Supports innovation:** By building evidence about what works and why, theory of change supports finding new ways of addressing challenging problems and being more responsive to dynamic conditions. Accounting for other interdependencies helps to identify implementable reform pathways.
- **Engages and focuses work:** By providing a conceptual backbone that links issues with strategic thinking, it makes the intended outcomes clearer. This facilitates collaboration when dealing with the complex challenges of infrastructure policy reform.
- **Provides greater transparency:** Reforms that demonstrate an evidence-based pathway to how outcomes would be achieved are more likely to be adopted. An outcomes-focused approach provides greater clarity to all change agents involved in implementing a reform.
- **Supports collaboration:** Individual and community needs often span a mix of economic, social, environmental and governance objectives. Understanding interdependencies by applying theory of change helps the different change agents to agree on the pathway to reform.
- **Informs next steps:** Identifying interdependencies and preconditions to change at a strategic level provides informed input to subsequent implementation work, such as regulatory impact statements and investment prioritisation.

How it supports each recommendation

Infrastructure Australia has applied a theory of change framework to bridge the gap between the opportunities and challenges identified in the *2019 Audit and Infrastructure beyond COVID-19* and outcomes that would improve quality of life for Australians.

Figure IV.2 illustrates the *2021 Plan's* theory of change framework. This sets out how the recommendations will be supported by the activities and intermediate outcomes that contribute to that change.

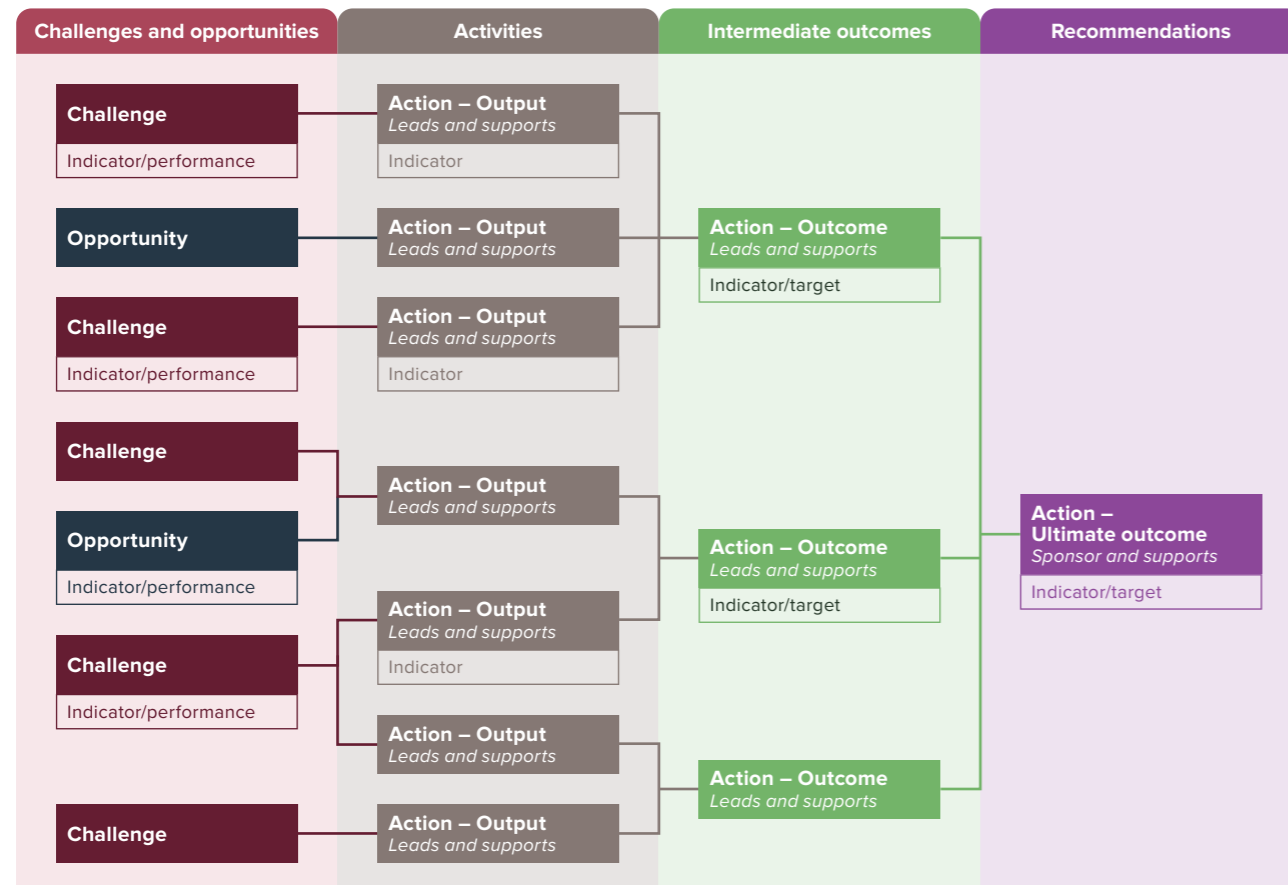
This step-by-step representation of the pathway to realise the vision of the *2021 Plan* of higher quality of life and increase national productivity. The theory

of change provides a narrative for structuring policy reform to improve outcomes in infrastructure service delivery to enable this change.

In addition, the detailed plans for each of the six infrastructure sectors and three cross-sector themes include an illustrated theory of change for each recommendation. These demonstrate the logical flow of activities that respond to current issues and lead to a pathway of outcomes at a level of detail that is useful for making policy decisions.

These plans should be supported by more detailed planning by the proposed change agents working towards implementing the recommendations.

Figure IV.2: The theory of change framework steps out the pathway to change



Indicators show if change is underway

As part of developing the theory of change, Infrastructure Australia has identified indicators that would help measure progress towards outcomes and the desired ultimate outcome, where available.

Where appropriate, we have included indicators that provide a measurable way to understand whether change is happening over the 15-year horizon.

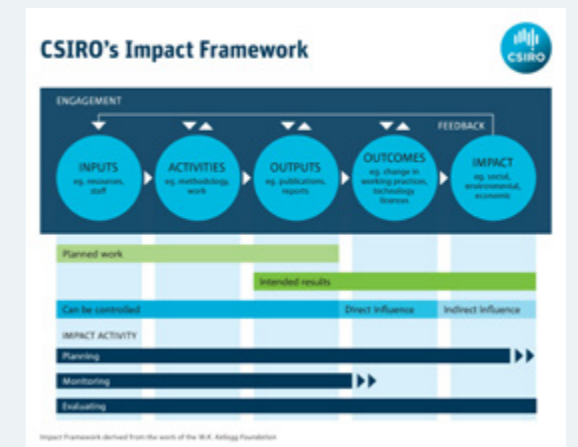
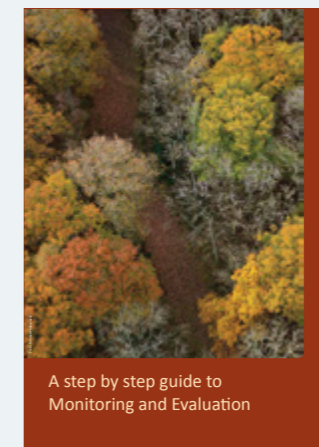
These indicators have been drawn from existing government commitments, including the United Nations Sustainable Development Goals,²⁶ to which Australia is a signatory. This approach can help policy-makers understand how reforms can contribute to their shared goals. Indicators also allow stakeholders to monitor implementation, measure realisation and allow for course correction if required.

Where else is theory of change used?

Theory of change is being used more frequently to inform infrastructure planning and investment decisions across sectors and government agencies.

- Government agencies, such as the CSIRO, have developed impact frameworks using theory of change as the foundation that informs their activities and investments.²⁷

- For disaster recovery, infrastructure and built environment recovery outcomes need to be prioritised using a theory of change approach, as seen in the 2018 guide from the Australian and New Zealand School of Government.²⁸
- Understanding the change pathway can be used to help groups working on innovative community-led approaches to climate change and energy solutions, such as the Transition Network.²⁹



Sources: Australian and New Zealand School of Government (2018), Transition Network (2016), CSIRO (2018, derived from the work of the W.K. Kellogg Foundation)



The path to implementation

Key messages

- The 2021 Implementation Pathway contains the full set of actions recommended in the 2021 Australian Infrastructure Plan, set out for the identified change agents over the 15-year time horizon.
- There are over 151 change agents across the 29 policy recommendations, with more than 96 intermediate outcomes and 360 activities identified in the 2021 Plan.
- While each of the 29 policy recommendations is supported by its own theory of change, the 2021 Implementation Pathway summarises the required actions by change agents across one or more recommendations.

Who should deliver reform?

Infrastructure Australia has designed the Implementation Pathway to help change agents understand the breadth of activities that are recommended for them.

It is presented as a 'placemat', with a summary of activities for each change agent to help with the prioritisation and allocation of resources to implement the reforms and their supporting actions.

How to read the 2021 Implementation Pathway

Change agents are identified above each table, with time represented across the page and actions aligned to the 15-year time horizon of the 2021 Plan, presented by sector and completion horizon (see Figure IV.3).

A total of 485 actions are documented in the 2021 Implementation Pathway. Each is categorised in accordance with the supporting theory of change that was used to derive that set of actions.

The categorisation depicts 29 policy recommendations, as set out in the 2021 Plan and the accompanying 2021 Reform Priority List. They require 96 intermediate outcomes, which in turn require 360 activities.

Once implemented, each activity will create the conditions needed to achieve an intermediate outcome. The combination of each intermediate outcome will create the conditions needed to achieve the goals of the recommendation.

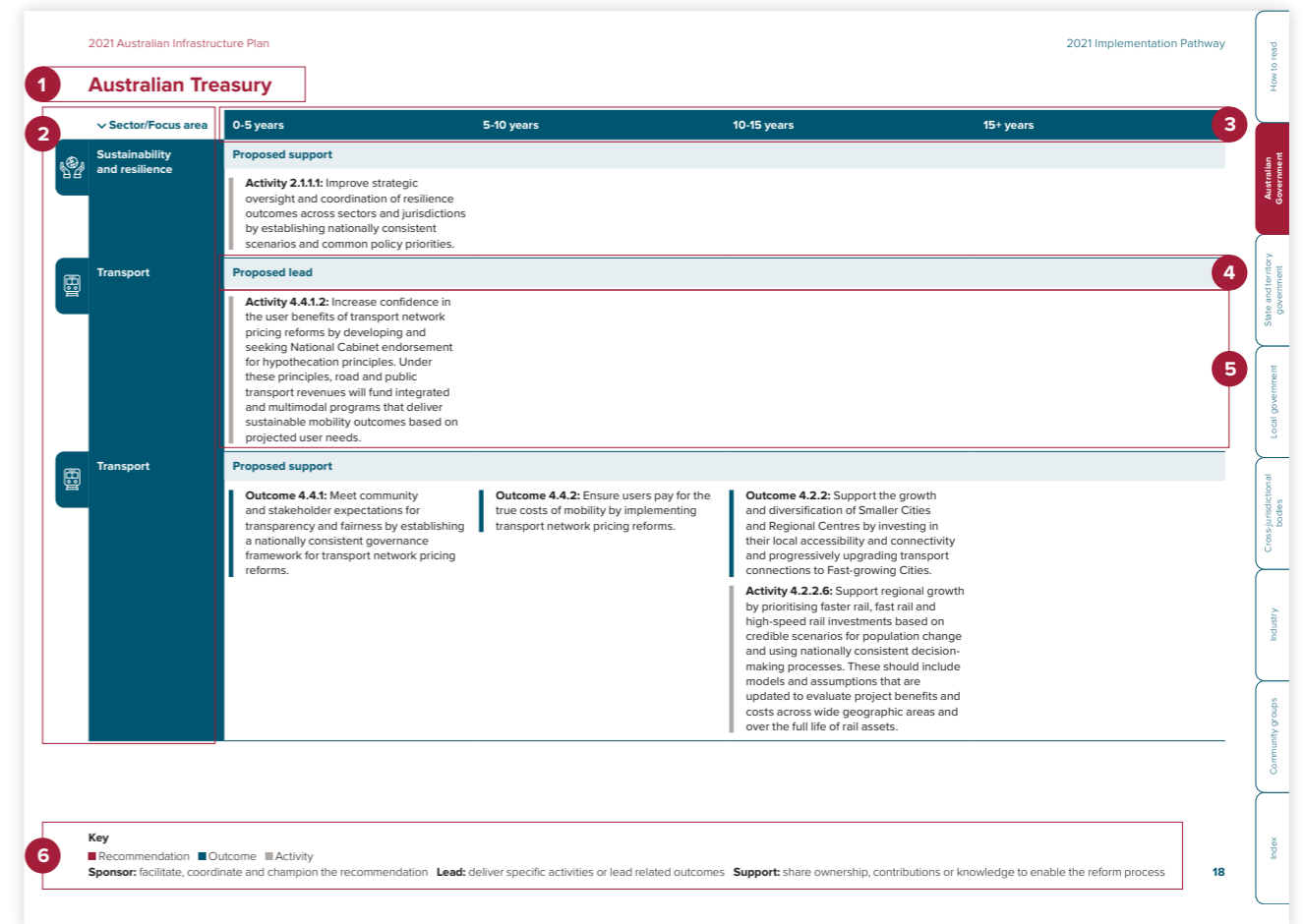
Irrespective of its category, every action articulates the desired effect sought by that action.

The 2021 Implementation Pathway sets out actions by change agent rather than by policy recommendation. A change agent can find collaborators on a particular recommendation by referring to the corresponding recommendation within the 2021 Plan.

Infrastructure Australia has proposed a change agent to sponsor, lead or support each action. Australian Government departments have been identified to sponsor recommendations where national coordination is appropriate, although they may not implement all of the actions in the recommendation themselves.

Proposed leads are to implement outcomes and actions, alongside proposed supporting change agents. As states and territories are major owners and regulators of infrastructure, many outcomes and activities are attributed to state and territory governments. Where appropriate, the activities have been phased for deliverability.

Figure IV.3: Each table in the Implementation Pathway comprises of six sections



1. Change agent

The name of the change agent is listed at the top of each table, signifying that it is the sponsor, lead, or support for all of the actions underneath.

2. Sector/Focus area

The left-hand pane of each table shows which sector or focus area of the 2021 Plan actions belong to.

3. When this will impact

The columns of the table relate to the time horizon during which the action is expected to impact.

4. Change agent role

Each row of actions has a heading that identifies the role of the change agent – as either the proposed sponsor, lead or support.

5. Actions

The body of the table contains the actions, tabulated by sector, change agent role and time horizon. Each action is identified as either a recommendation, outcome or activity.

6. Key

The key shows how the types of actions are identified and provides a definition of each change agent role.

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V. Results and prioritisation

What the results mean

Infrastructure Australia has assessed the impact of each recommendation using multi-criteria analysis. We have used the theory of change methodology to ensure the recommended reforms are structured to deliver impact.

The multi-criteria analysis has been applied at the recommendation level, incorporating the recommendation alongside its supporting outcomes and activities.

The results of the multi-criteria analysis highlight which of the 29 recommendations proposed by the *2021 Plan* are most impactful under a range of future developments and against the infrastructure policy priorities of the Australian Government.

We expect the anticipated impact of each reform to vary in response to the changing infrastructure environment, so the resilience of reforms has been considered.

We have not attempted to identify the single strongest performing reform, but rather reforms aligning with the community's priorities and a series of scenarios that warrant further planning.

The results highlight the reform recommendations that do well under certain criteria and scenarios. However, while these assessments highlight relative performance, every reform included in the *2021 Plan* is critical to a particular sector or issue.

Reforms that deliver on the community's priorities



Community priorities

Recommendations with the most beneficial impact on community priorities.

In the Australian Government *2021–2022 Budget Outlook*,¹ recent record rates of economic growth are expected to moderate but remain higher than global averages, and COVID-19 vaccines should become fully available by the end of 2021. Under this outlook, the five recommendations that have the strongest impact against the balance of community priorities share commonalities in meeting the needs of the next generation through infrastructure planning that keeps them in mind (see **Table V.1**).

- The COVID-19 pandemic provides an opportunity to **rethink the role of our Fast-growing Cities**, to embed the positive behaviour changes associated with COVID-19 and to reshape the planning of cities for the future. Collaborative governance aligns investment priorities to improve economic development and support future employment patterns.
- The infrastructure industry is large and globally it does not have endless capacity. **Improved planning, portfolios and pipelines** enable Australia to remain an attractive market for investment. Investing in governance will improve affordability, unlock significant economic productivity gains and lift industry capacity.
- Governments should strive to act as a model client providing a clear and consistent long-term direction on **next generation infrastructure investment**. This reform supports the increased alignment of the various levels of Australian Government to ensure increased capability, alignment and collaboration. This will involve the identification of a common vision for infrastructure and the sector that supports it.
- Driven by water-literate communities, Australia must enter a new phase of water efficiency to adapt to an unpredictable future and to ensure urban, rural, environmental and cultural users have **secure, long-term water supply**. A consistent approach to measuring water security risk enables stronger planning to support better health and environmental outcomes, with reduced frequency and intensity of water shortages.
- In addition to being critical to the health of people, the environment and communities, water is a key driver of economic prosperity. It transforms urban environments into desirable places to live, work and visit. All Australians have a right to **high-quality water for healthy communities**. This is essential to strengthen outcomes for health, wellbeing, economic prosperity and sustainable development.

Table V.1: Community priority reforms

Rec.	Theme	Chapter
1.1	Rethinking our Fast-growing Cities	Place-based outcomes for communities
3.1	Improving planning, portfolios and pipelines	Industry productivity and innovation
3.4	Next generation infrastructure investment	Industry productivity and innovation
6.1	Securing our water future	Water
6.2	Valuing water to create liveable communities	Water



Reforms aligning with the Australian Government’s infrastructure priorities

Infrastructure Australia has assessed reforms against the Australian Government’s three objectives for infrastructure, as defined in our *Statement of Expectations*.² Namely, that infrastructure:

- provides or underpins services that deliver economic and social benefits to Australians

- has an important role in shaping cities that are productive and liveable
- provides connectivity to regional and remote parts of Australia.

We translated these objectives into five policy priorities then assessed the impact of recommendations against them.



Economic benefits

Recommendations most likely to provide economic benefits to Australians, including increased national employment or GDP.

Under the conditions detailed in the Australian Government 2021–2022 *Budget Outlook*, the reforms most likely to strongly increase Australia’s economic performance are reforms to the functioning of the infrastructure sector, as well as the energy and water sectors (see **Table V.2**). The strong focus

on productivity and innovation in the infrastructure sector recognises the strong focus on the sector to supporting recovery and continuing to operate during potential COVID-19 outbreaks. Access to water and clean, affordable and reliable energy is also critical to Australian businesses and households.

Table V.2: Reforms to deliver economic benefits

Rec.	Theme	Chapter
3.2b	Enhancing project outcomes	Industry productivity and innovation
3.3	Digital by default	Industry productivity and innovation
3.4	Next generation infrastructure investment	Industry productivity and innovation
5.3	Powering a cheaper, cleaner future	Energy
6.1	Securing our water future	Water



Social benefits

Recommendations most likely to increase quality of life for Australians, including improved access for disadvantaged groups, health outcomes, affordability, and opportunities for education and employment.

Reforms to support the quality of life of Australians are fundamental to the *2021 Plan*. Reforms in many sectors are impactful against this vision, however hold a common thread of supporting community choice and flexibility in access to infrastructure (see **Table V.3**). Enhanced customer-centricity, both business and household, in telecommunications

and digital, water and transport are seen as central. So too, enhancements to infrastructure resilience and supporting growth in Northern Australia and Developing Regions are priorities. This assessment assumes economic conditions consistent with those detailed in the Australian Government 2021–2022 *Budget Outlook*.

Table V.3: Reforms to deliver social benefits

Rec.	Theme	Chapter
1.4	Unlocking opportunity in Northern Australia and Developing Regions	Place-based outcomes for communities
2.1	Infrastructure planning for an uncertain future	Sustainability and resilience
4.3	Mobility choice made possible	Transport
6.2	Valuing water to create liveable communities	Water
7.2	Putting customers at the heart of digital infrastructure	Telecommunications and digital





Productive cities

Recommendations most likely to make cities more productive, through efficiency benefits, higher-quality workforce, or greater services on demand.

Only recommendations relevant to Fast-growing Cities or Smaller Cities and Regional Centres are considered.

The Australian Government has prioritised supporting the productivity of Australia's cities. The reforms to support the productivity of cities, is closely aligned to enhancing the economic performance of the country as a whole (see **Table V.4**). However, added

emphasis should be given to managing the pipeline of large infrastructure projects, electricity transmission rule changes and supporting the electricity distribution grid to cope with rapid electricity system decentralisation if city productivity is to be prioritised.

Table V.4: Productive cities reforms

Rec.	Theme	Chapter
3.1	Improving planning, portfolios and pipelines	Industry productivity and innovation
3.3	Digital by default	Industry productivity and innovation
3.4	Next generation infrastructure investment	Industry productivity and innovation
5.2	A smart, affordable, reliable grid	Energy
6.1	Securing our water future	Water



Liveable cities

Recommendations most likely to make cities more liveable, through addressing social, environmental and governance outcomes.

Only recommendations relevant to Fast-growing Cities or Smaller Cities and Regional Centres are considered.

In addition to productivity, the Australian Government has asked Infrastructure Australia to emphasise the liveability of cities (see **Table V.5**). Water security is the only reform to perform strongly under both priorities, and is joined by better valuing water. The shift to cleaner and cheaper energy is prioritised for liveability over reforms to support the functioning

of the grid. Building from the experience during the COVID-19 pandemic, supporting the resilience of the community to future shocks and stresses is highly central to urban liveability. The impacts of COVID-19 have also emphasized urban Australia's incumbent congestion challenge so enabling mobility choice will remain critical.

Table V.5: Liveable cities reforms

Rec.	Theme	Chapter
2.1	Infrastructure planning for an uncertain future	Sustainability and resilience
4.3	Mobility choice made possible	Transport
5.3	Powering a cheaper, cleaner future	Energy
6.1	Securing our water future	Water
6.2	Valuing water to create liveable communities	Water





Connected regions

Recommendations most likely to increase connectivity and equality of outcomes between regions.

Recommendations that only impact Fast-growing Cities are not considered.

Reforms to support greater equity in access to infrastructure services for people and businesses in regional Australia are critical (see **Table V.6**). In an increasingly digitalised world, this will include increasing the user centricity of telecommunications

and digital services, and supporting digital adoption in the infrastructure sector. Defining minimum service levels for communities, supporting their resilience and particularly securing water supply will be important.

Table V.6: Connected regions reforms

Rec.	Theme	Chapter
1.3	Lifting access in Small Towns, Rural Communities and Remote Areas	Place-based outcomes for communities
2.1	Infrastructure planning for an uncertain future	Sustainability and resilience
3.3	Digital by default	Industry productivity and innovation
6.2	Valuing water to create liveable communities	Water
7.2	Putting customers at the heart of digital infrastructure	Telecommunications and digital

Reforms that have the lowest barriers to implementation



Low-hanging fruit

Recommendations that are assessed as being the most deliverable, having considered their implementation challenges and risks.

The prioritisation of the *2021 Plan's* proposed reforms varies based on the emphasis given to differing types of benefits. However, it is critical to note all reforms in the *2021 Plan* are critical to their respective sector or cross-sector. The focus on Low-hanging fruit allows governments to identify quick-wins, or areas of reform

that are likely to experience relatively lower barriers to change. (see **Table V.7**). Prioritising the growth of Smaller Cities and Regional Centres, reform to the infrastructure sector to enhance productivity and support innovation as well as building trust in the sector have the lowest barriers to reform.

Table V.7: Low-hanging fruit reforms

Rec.	Theme	Chapter
1.2	Strengthening Smaller Cities and Regional Centres	Place-based outcomes for communities
2.3	Transparency and collaboration build trust in decisions	Sustainability and resilience
3.1	Improving planning, portfolios and pipelines	Industry productivity and innovation
3.2a	Enhancing project outcomes	Industry productivity and innovation
3.4	Next generation infrastructure investment	Industry productivity and innovation



Reforms that strengthen under future outlook scenarios



Bounce back to rapid recovery

Faster global and local recovery from the COVID-19 pandemic. Fast population growth, greater centralisation in cities, trend economic growth and greater return to cities and offices.

A more rapid recovery from the COVID-19 pandemic than anticipated in the Australian Government’s *2021–2022 Budget Outlook* is likely to require increased focus on supporting the adjustments in Australia’s cities that were catalysed during the COVID-19 pandemic (see **Table V.8**).

This will require a greater accommodation of the rapid digitalisation of workplaces and working from home. Improvements in the recognition of the value of social infrastructure, the cost of transport infrastructure and the benefits of sustainable infrastructure should guide future investment.

Table V.8: Bounce back to rapid recovery reforms

Rec.	Theme	Chapter
1.1	Rethinking our Fast-growing Cities	Place-based outcomes for communities
2.2	Technology-led sustainability	Sustainability and resilience
4.4	A fairer price for every journey	Transport
7.3	Enabling Australia’s digital future	Telecommunications and digital
8.3	Social infrastructure is economic infrastructure too	Social infrastructure



Slow recovery from a sustained pandemic

Longer-lasting global pandemic and additional domestic outbreaks. Slower population growth, below trend economic growth for the medium-term, significantly less international movement of people and some trade effects.

A slower recovery from the COVID-19 pandemic than anticipated in the Australian Government’s *2021–2022 Budget Outlook* will require the efficient functioning of our supply chains and transport

infrastructure. Both the efficient operation of existing transport networks and investment in enhancements to the network will have additional emphasis (see **Table V.9**).

Table V.9: Slow recovery from a sustained pandemic reforms

Rec.	Theme	Chapter
4.1	Getting the most out of our transport investments	Transport
4.2	Connecting regional and remote Australia	Transport





Regionalised Australia

Faster population growth in regions. Lower demand for inner city business and residential locations and significantly more working from home.

The COVID-19 pandemic has seen a strengthening of regional growth as people extend existing connections with regional Australia or decide to call it home for the first time. If this growth outpaces the expectations of the Australian Government’s 2021–2022 Budget Outlook the introduction of place-based

planning strategies to support population and jobs growth will be critical (see **Table V.10**). Access to secure, quality water must be understood and supported, alongside improved transport connections to link to Fast-growing Cities.

Table V.10: Regionalised Australia reforms

Rec.	Theme	Chapter
1.2	Strengthening Smaller Cities and Regional Centres	Place-based outcomes for communities
1.3	Lifting access in Small Towns, Rural Communities and Remote Areas	Place-based outcomes for communities
4.2	Connecting regional and remote Australia	Transport
6.1	Securing our water future	Water
6.2	Valuing water to create liveable communities	Water



Digital Australia

Faster adoption of digital technologies by consumers and society. A higher rate of digital transformation, faster-closing digital divide and greater digital and technological literacy.

The pace of digital and technological change is occurring increasingly rapidly, with increasing processing capability, big data, machine learning, automation and connectivity (see **Table V.11**). Under this technology-led model, smart enablement by the telecommunications and digital sectors will

be critical. These reforms will allow step changes in transport services for urban, regional and remote communities to be unlocked. The availability of better data and customer information in energy and waste sectors unlocks behaviour change.

Table V.11: Digital Australia reforms

Rec.	Theme	Chapter
4.2	Connecting regional and remote Australia	Transport
4.3	Mobility choice made possible	Transport
5.2	A smart, affordable, reliable grid	Energy
7.3	Enabling Australia’s digital future	Telecommunications and digital
9.2	Waste data to drive innovation	Waste





Destabilised world

Increased risk and impacts of disaster. Greater incidence of natural disasters, increased political instability, increased cyberwarfare and cybercrime.

An increasingly destabilised world will place added importance on the need to enhance resilience and sustainability. All three sustainability and resilience reforms perform well under this scenario (see **Table V.12**). Increasing the resilience of the telecommunications sector, which has proven

vital in both the COVID-19 pandemic and the 2019–2020 bushfire season will also be critical. Finally, improving the independence of our waste system through a circular economy will enhance supply chain sovereignty and reduce exposure to foreign disruption.

Table V.12: Destabilised world reforms

Rec.	Theme	Chapter
2.1	Infrastructure planning for an uncertain future	Sustainability and resilience
2.2	Technology-led sustainability	Sustainability and resilience
2.3	Transparency and collaboration builds trust in decisions	Sustainability and resilience
7.1	Improving the resilience of Australia's telecommunications	Telecommunications and digital
9.1	Valuing resources to enable a circular economy	Waste

Reforms that are resilient to all of our future scenarios



No regrets

Recommendations that maintain their impact under all five possible future scenarios.

In order to ensure reforms are robust against a rapidly changing and uncertain future, we have examined the *2021 Plan* reforms to understand which are most robust to a changing and uncertain future (see **Table 21**). Our No regrets reforms perform

strongly in all futures, including pursuing reforms to support transformational change in the energy sector, enhancements to social infrastructure and improvements to data and digital capability in the infrastructure sector, including particularly waste.

Table V.13: No regrets reforms

Rec.	Theme	Chapter
3.3	Digital by default	Industry productivity and innovation
5.1	Putting customers first	Energy
5.2	A smart, affordable, reliable grid	Energy
5.3	Powering a cheaper, cleaner future	Energy
8.1	Transforming social infrastructure to enhance quality of life	Social infrastructure
8.2	Partnerships to build communities	Social infrastructure
8.3	Social infrastructure is economic infrastructure too	Social infrastructure
9.2	Waste data to drive innovation	Waste



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VI. Conclusion and next steps

- Executive summary
- Introduction
- 1. Place
- 2. Sustainability
- 3. Industry
- 4. Transport
- 5. Energy
- 6. Water
- 7. Telecommunications and digital
- 8. Social infrastructure
- 9. Waste
- Methodology and results
- Next steps

We will support implementation

Infrastructure Australia is committed to supporting and promoting implementation of the reforms outlined in the *2021 Australian Infrastructure Plan* through our *2021–25 Strategic Plan*.¹

As its independent advisor, Infrastructure Australia will work alongside the Australian Government to plan for and adopt reform and facilitate adoption opportunities.

The *2021 Plan* covers the transport, energy, water, and telecommunications and digital sectors and — for the first time — social infrastructure and waste. In each of these industries, a discrete set of stakeholders are working to progress common reforms.

Infrastructure Australia is uniquely placed to support national collaboration, including partnering within and between the Australian Government, state and territory governments, industry and local government.

As a priority, we will support collaboration in the three strategic focus areas that cut across all infrastructure sectors: Place-based outcomes for communities; Industry productivity and innovation; and Sustainability and resilience.

To ensure reform is embedded in future decision-making, our recommended reform areas must be supported by clear governance frameworks, processes and systems.

We will work with the Australian Government to advise on how to make this happen.

Detailed analysis will guide implementation

Over the next few months, Infrastructure Australia will release several documents to support the *2021 Plan* (see **Figure VI.1**).

The supporting material will include detailed examination of the reforms in each sector and cross-sectoral focus areas. These focused plans will expand on the analysis in this Master Plan document to support implementation and reform.

Infrastructure Australia has also developed a series of advisory documents to support and guide change agents as they advance and implement the reform agenda proposed by the *2021 Plan*.

- **A Pathway to Infrastructure Resilience:** This introduces a systemic approach to infrastructure resilience.
- **Deliverability:** A roadmap for collaboration to drive productivity and embed innovation into infrastructure delivery.
- **Regional Strengths and Infrastructure Gaps:** Working with the local Regional Development Australia (RDA) network to partner with industry and the community to identify regional infrastructure gaps for future planning.

Infrastructure reform is a continuous process

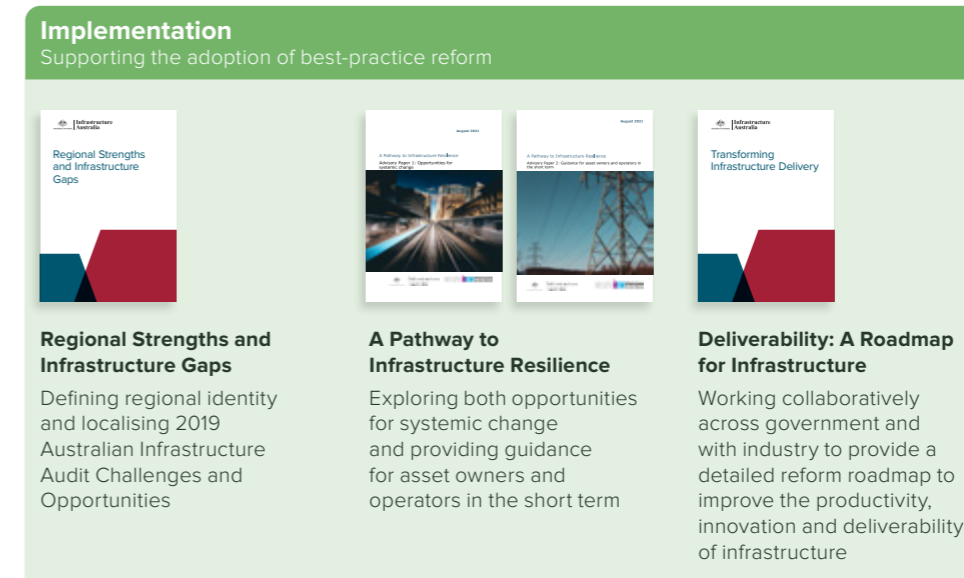
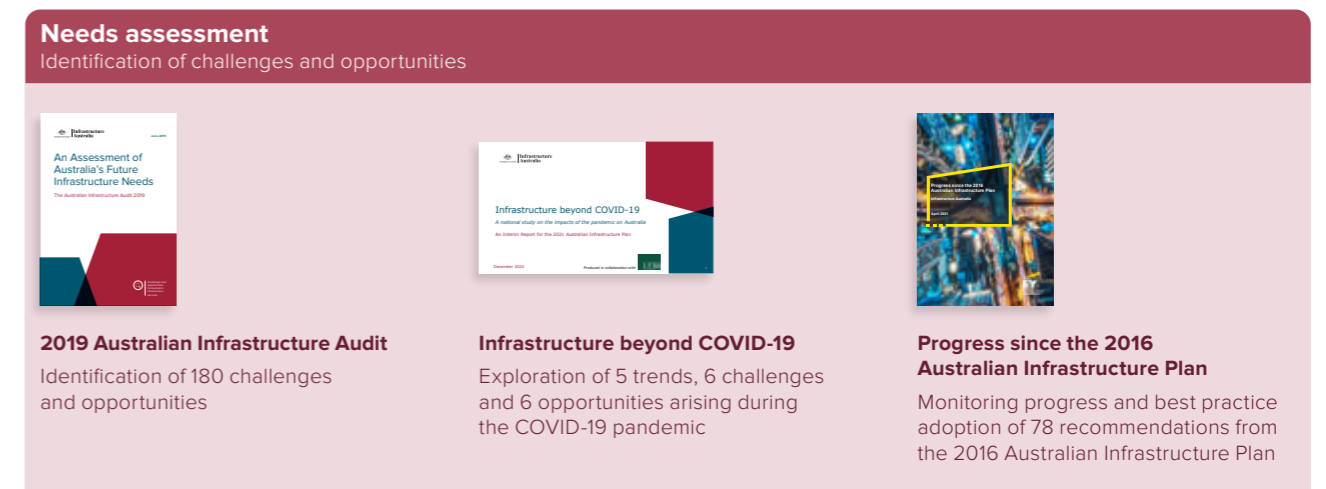
The *2021 Plan* provides a long-term vision supported by a clear roadmap to address the nation's infrastructure challenges and embrace the opportunities of tomorrow. However, it is only one part of the infrastructure reform journey.

The Plan complements Infrastructure Australia's *Infrastructure Priority List*.² This is an authoritative list of nationally significant infrastructure investments Australia needs over the next 15 years. It is a 'live' list that is regularly updated.

Infrastructure Australia is required to produce an updated *Australian Infrastructure Audit* and corresponding *Australian Infrastructure Plan* every five years, within two years of each other.

The next Plan is due by 2026. Until then, we will continue to evaluate progress against infrastructure reform. We will also provide research and policy advice to government, and support the adoption and implementation of reform.

Figure VI.1: 2021 Australian Infrastructure Plan suite of publications



Infrastructure Australia will track progress

As part of our commitment to supporting reform implementation, Infrastructure Australia will track progress against implementation and completion of the reforms proposed in the *2021 Plan*.

We regularly track and report on progress in infrastructure reform. As part of the suite of materials supporting the *2021 Plan*, we delivered *Progress since the 2016 Australian Infrastructure Plan*. This document identifies best practice in adopting reform and identifies where the pace of reform has fallen short.

Infrastructure Australia will continue to measure and publish progress against both the activities outlined in the *2021 Plan* and specific indicators for each infrastructure sector and cross-sector.

Wherever possible, we have included indicators in the *2021 Plan* that align to existing government policy, such as commitments to the United Nations Sustainable Development Goals.³

For other areas, where data is available, we have extrapolated trends and identified targets that best demonstrate positive, achievable progress against reforms.

How we move from advice to implementation

The *2021 Australian Infrastructure Plan* provides a platform for lasting reform in the infrastructure sector. It aims to enable a step change in the quality of life of Australians, improved infrastructure services and a more sustainable nation. The challenge of progressing the reforms outlined in the *2021 Plan* is a shared one.

In developing the *2021 Plan*, we have identified key groups of stakeholders, each with a distinct role to play as we move from policy development to implementation. These are: **Infrastructure Australia, governments, industry, individuals and the community**.

The *2021 Implementation Pathway* identifies the actors from each of these stakeholder groups, who are responsible for implementing reform and the time period over which it should commence.

The *2021 Plan* has been developed principally for the Australian Government. As such, over half of the total reform effort is within its remit. However, as owners of many of the most significant infrastructure networks in the country and the most substantial clients for infrastructure delivery, around a third of reforms require action or ownership from state and territory governments.

Infrastructure Australia has not defined the funding or resource requirements for each of these 151 actors identified to implement the reforms. However, we will enable the success of reforms by facilitating and supporting conversations across government and industry.

The role of Infrastructure Australia

Infrastructure Australia's role, as the Australian Government's independent infrastructure advisor, is to enable action from others to deliver lasting reform.

Infrastructure Australia is committed to working in partnership with reform advocates across government, industry and the community to support the outcomes set out in the *2021 Plan*.

Key activities for Infrastructure Australia include:

- Collaboration and strategic support for the adoption of the reforms proposed in the *2021 Plan*
- Coordination of working groups for individual reforms or across themes, allowing the sharing of best practice
- Linking like-minded jurisdictions, departments, agencies and industry
- Provision or co-development of tools and frameworks – including our newly developed multi-criteria analysis and theory of change guidance
- Advocacy and education on the vision for reform, its benefits and trade-offs, as well as enabling actions
- Regular, ongoing publishing of presentations, reports⁴
- Development and release of data to build the evidence base for decision-making⁵
- Progress reporting, leveraging the indicators and metrics contained within the *2021 Plan*.

The *2021 Plan* also identifies 4 outcomes and 28 activities for which Infrastructure Australia is best placed to steward or support reform. These areas will serve as priorities for the organisation over the years ahead.

Infrastructure Australia's ongoing role in the implementation program will be determined by the Australian Government's response to the *2021 Australian Infrastructure Plan* and the availability of resources to support change. To encourage alignment, Infrastructure Australia will support the development of the Australian Government's response, where required.

Infrastructure Australia will also support change within industry and the community. This will involve continuing to press for awareness of the challenges

and opportunities identified by the *2019 Australian Infrastructure Audit* as well as the *Infrastructure Beyond COVID-19* report and presenting the case for the adoption of the best practice reform identified by the *2021 Plan*.

The role of government

Australian governments, at all levels, will need to take concerted action to deliver the outcomes set out in the *2021 Plan*.

Australian Government

Upon receipt of the *2021 Plan* in August 2021, the Australian Government has flagged its intention to work alongside the Department of Infrastructure, Transport, Regional Development and Communications to formally respond to Infrastructure Australia's reform recommendations. The Australian Government's response to the *2016 Australian Infrastructure Plan* was delivered 12 months after publication of the *2016 Plan*.

For those *2021 Plan* recommendations that are partially or wholly supported by the Australian Government, the next steps would require sponsor and lead departments or agencies to identify implementation plans and associated resource requirements.

The role of sponsor will be critical to ensure national consistency, collaboration across jurisdictions and common measurement of outcomes. The role of the lead agency involves ownership of outcomes and delivery of specific actions.

Although the analysis within the *2021 Plan* provides an important strategic assessment of national reform priorities, agencies should continue to employ best-practice policy and regulation development. The Office of Best Practice Regulation has published a new *Regulatory Impact Analysis Guide for Ministers' Meetings and National Standards Setting Bodies*.⁶

Infrastructure Australia acknowledges that progress towards outcomes, or their associated activities, may not be possible within the existing funding. Progress will therefore be dependent on funding being reallocated within Australian Government agencies.

Key activities for the Australian Government include:

- Delivery of the *Australian Government's Response to the 2021 Australian Infrastructure Plan*.
- Development of policy documents to provide clear statements on government positions, including alignment to the advice of Infrastructure Australia.
- Identification and coordination of reform, including the preparation of Regulatory Impact Statements.

- A plan to drive change in industry and community behaviours, including communication and education campaigns.
- Implementation frameworks to support inter-jurisdiction and industry collaboration.

State and territory governments

Across the breadth of reforms, state and territory governments will be responsible for implementation of many specific reforms, including a substantial proportion of those limited by place, or enabling the more efficient delivery of infrastructure projects.

Furthermore, some jurisdictions may also have existing initiatives to address specific reforms. Infrastructure Australia acknowledge the pre-existing progress in many areas from individual governments and points to the opportunity for those jurisdictions to demonstrate best practice and share this experience with others. This provides an opportunity for communities of practice and centres of excellence to develop around the reforms proposed in the *2021 Plan*.

State and territory infrastructure bodies

Since the development of the *2016 Plan*, the number of independent state and territory infrastructure bodies, or dedicated infrastructure functions, has increased substantially. Each state and territory now has jurisdiction-wide infrastructure plans.

Infrastructure Australia has already commenced engagement with these bodies to support the incorporation of common reform agendas. This has included shared research, methodologies and data.

Infrastructure Australia acknowledge the opportunity to continue to collaborate with state and territory infrastructure bodies and to embed shared reforms in future Australian Infrastructure Plans and State Infrastructure Strategies (or equivalent). This will require enduring collaboration. Infrastructure Australia will maintain our role as an active collaborator through regular engagement.

Local government

Local governments play a critical role in the *2021 Australian Infrastructure Plan* as active owners of transport, water, digital and social infrastructure. Local governments are a vital link to the local community through land use and investment planning.

Specific reforms have been identified for local governments that will require higher levels of collaboration across local government boundaries, and with other levels of government.

The role of industry

Infrastructure Australia has identified a clear role for industry in the *2021 Plan*. This includes the

infrastructure sector committing to reforms that support better project outcomes, as well as an openness to greater collaboration with government.

Thousands of private sector organisations are engaged in the Australian infrastructure sector. The role of these organisations is diverse, covering planning, construction and operations. Many organisations are engaged solely within the infrastructure sector. Others have a wide range of services and priorities in other markets that all compete for resources.

Industry should engage with government to demonstrate best practice in the infrastructure sector, support the value of reform and identify opportunities to implement change.

Outside of the infrastructure sector, business leadership is needed to support Environment, Social and Governance (ESG) practices and reporting. The *2021 Reform Priority List* adopts aspects of the ESG approach through the community sustainability metrics within the multi-criteria analysis

Infrastructure Australia welcome engagement with industry through submissions to the *Infrastructure Priority List*, and the provision of best-practice case studies that would add to our evidence base.

The role of individuals and the community

The health of the Australian infrastructure sector is dependent on the behaviours of individuals and the community. All Australians have a role to play in improving the affordability, quality and access to infrastructure services by engaging and advocating for better outcomes.

The *2021 Plan* has identified reforms to empower consumers and deliver better access to services. This includes improved community engagement throughout infrastructure planning processes, and a step change in ownership over consumption patterns across the transport, energy, water and waste sectors. Key to achieving better outcomes for communities is a culture shift towards limiting waste and promoting efficiency.

Individuals and community groups must also engage actively in the infrastructure planning process. Active engagement in the early stages of planning can improve services for the community, reduce resistance to project delivery and reduce the risk of costly changes later in the process.

We will continue to advocate for reform

As part of our *2021-25 Strategic Plan*, Infrastructure Australia is committed to drive change for sustainable, resilient and productive infrastructure that benefits Australians now and in the future.

We will engage in the reform process, through research, by engaging with governments, industry and the community. This will maintain the public dialogue to improve the quality of life for all Australians.

We stand ready to support the adoption of the reforms outlined in this Plan.

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Infrastructure Australia is an independent statutory body that is the key source of research and advice for governments, industry and the community on nationally significant infrastructure needs.

It leads reform on key issues including the means of financing, delivering and operating infrastructure and how to better plan and utilise infrastructure networks. Infrastructure Australia has responsibility to strategically audit Australia's nationally significant infrastructure, and develop 15-year rolling infrastructure plans that specify national and state-level priorities.

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