Australian Government | Infrastructure Australia

Infrastructure Market Capacity 2024 Report

December 2024

Acknowledgement of Country

Infrastructure Australia proudly acknowledges the Traditional Owners and Custodians of Australia, and their continuing connections to the land, waters, and communities. We pay our respects to them and to their Elders past and present. 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 peoples' unique history of land management and settlement, art, culture, and society that began over 65,000 years ago.

As part of Infrastructure Australia's commitment to reconciliation, we will continue to develop strong, mutually beneficial relationships with Aboriginal and Torres Strait Islander partners who can help us to innovate and deliver better outcomes for Aboriginal and Torres Strait Islander communities, recognising their expertise in improving quality of life in their communities.

A note from the artist:

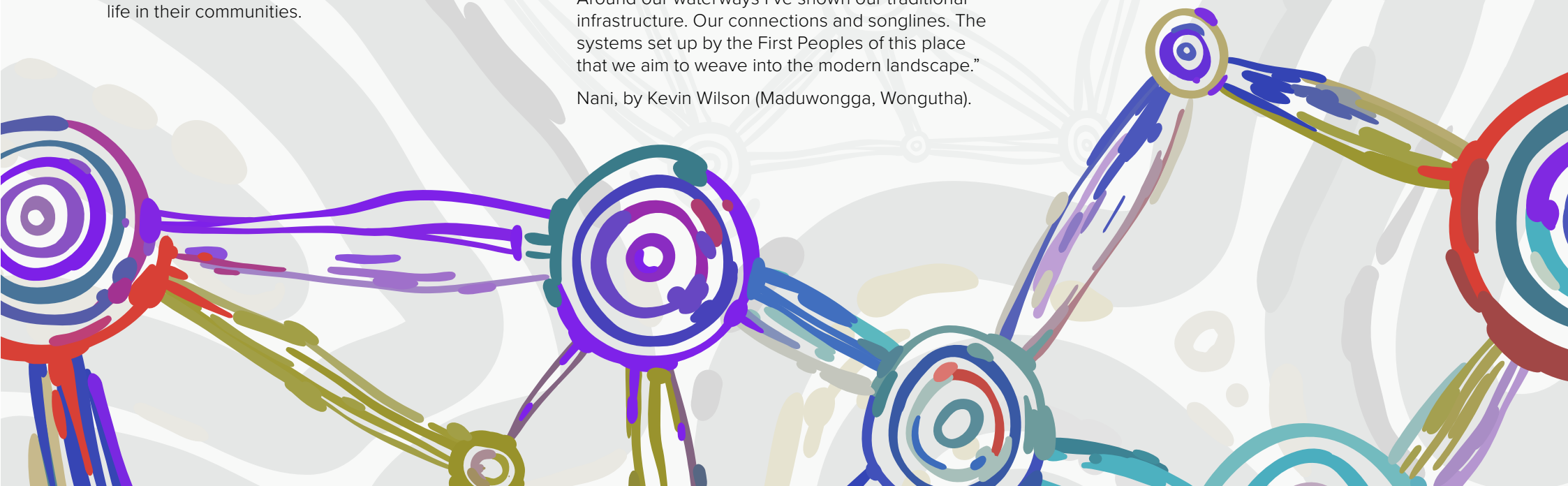
"Through sharing culture, we can create a sense of belonging, by connecting to the land we stand on. This connection of people and our communities is shown through connecting campfires. These being places we sit, yarn, and share knowledge.

The Infrastructure Australia values - expressed by the colours blue, green, orange, purple and teal - weave through the artwork to represent the opportunities and benefits for our communities. Under this sits our rivers, lakes, oceans, and waterways.

Water being the giver and supporter of life and flows through us all. I see the reconciliation journey as the water along the path to benefiting our people.

Around our waterways I've shown our traditional infrastructure. Our connections and songlines. The systems set up by the First Peoples of this place that we aim to weave into the modern landscape."

Nani, by Kevin Wilson (Maduwongga, Wongutha).



Contents

Chief Commissioner's Foreword

With Australia's infrastructure boom far from over, our Infrastructure Market Capacity research will be more important than ever in supporting governments and the infrastructure industry to navigate supply and demand as they deliver our nation's pipeline.

For years, demand has been far outweighing supply leading to cost increases and project timelines being delayed.

While this year we find demand to be easing, it's clear there is more work to do, with skills shortages and cost escalations persisting.

These challenges are not unique to Australia. You only need to look at the skills shortages Europe is grappling with in delivering its renewable energy transition, or the challenges Canada is facing to deliver more housing as proof points that we are not alone.

Now in its fourth year, our Infrastructure Market Capacity research has grown into a trusted and reliable source of information that captures the $1.08 trillion of construction activity happening right across the country. The report also continues to detail and explore the plant, labour, equipment and materials needed to deliver on the nation's five-year Major Public Infrastructure Pipeline, which now stands at $213 billion.

The strength of this research lies in the collaborative relationships Infrastructure Australia has formed across industry and government. We acknowledge and thank all participants for the part they played in developing this year's report, through data sharing and close collaboration.

Infrastructure underpins the growth of our economy – it supports the productivity and liveability of our nation.

The successful planning and delivery of infrastructure is critical in supporting our nation's growing cities and regions, particularly as we navigate the growth in investment across renewable energy and social infrastructure projects, while continuing to deliver record levels of investment in major transport projects.

As governments grapple with these critical decisions, Infrastructure Australia is committed to supporting the Australian Government with the independent advice it needs to drive a thriving, efficient and productive construction sector for the economic and social prosperity of all Australians.

Tim Reardon

Infrastructure Australia

Chief Commissioner

Executive summary

Australia's Major Public Infrastructure Pipeline is $213 billion across the 5 years from financial years 2023–24 to 2027–28 ('five-year outlook'), down 8% compared with the projection of 12 months earlier for the corresponding outlook period 2022–23 to 2026–27. This outcome represents a significant management of demand by governments across Australia to reduce the gap between supply and demand, however demand continues to outstrip supply overall.

Transport continues to dominate demand with growth in buildings and utilities, while investment gradually shifts north across all three sectors

Infrastructure Australia has updated its Market Capacity database with relevant major public infrastructure project pipeline information provided by state and territory governments. A comparative analysis of the national Major Public Infrastructure Pipeline outlook versus the previous outlook period from 12 months earlier reveals:

- There is a significant geographical shift in investment to the north, with Queensland and Northern Territory major public infrastructure pipelines growing by $16 billion, while New South Wales and Victoria have reduced by $39 billion versus the previous outlook period.
- The projected increase in demand for these northern areas would intensify local supply constraints, especially in regional areas where attracting skilled workers is challenging. It is also difficult to source construction materials, plant and equipment due to their geographical distance, adding risk to on-time, on-budget project delivery.

- A jump in labour demand from the private infrastructure sector is observed over the next five years. This is driven by the renewable energy transition. Workforce preparedness is needed to deliver private-funded infrastructure demand.

Key changes in the Major Public Infrastructure Pipeline across the past 12 months include:

- Transport infrastructure investment is projected at $126 billion and remains the largest expenditure category, accounting for 59% of the Major Public Infrastructure Pipeline. This is a $32 billion reduction on the previous year's outlook, driven by:
  - Completions of megaprojects in 2023–24.
  - Fewer new projects to commence in coming years versus the previous outlook period.
  - Cost and schedule changes in the total investment estimates for some megaprojects due to commence construction in the outlook period.
- Buildings infrastructure investment is projected at $71 billion, which accounts for 34% of the Major Public Infrastructure Pipeline and is expected to peak in late 2026. This is up $8 billion on the previous year's outlook. Buildings infrastructure is driven by health ($24 billion) and residential buildings ($17 billion), followed by other building types ($12 billion), such as convention centres, offices, art facilities and laboratories.
- Utilities infrastructure investment is projected at $16 billion, which accounts for 7% of the Major Public Infrastructure Pipeline and is made up predominantly of renewable energy and transmission line projects. This is up $6 billion on the previous year's outlook.

Growth of the building and utilities sectors reflect governments' ambitions to boost housing stock and transition our energy sources towards a net zero future.

The workforce shortfall has reduced, however shortages persist

Projected shortages for infrastructure workers have decreased (-32,000 compared to the 2023 forecast) as demand softens and supply grows, reflecting the impact of governments actively managing ambitious pipelines to align demand more closely with market capacity. Accounting for the impact of cost escalations, and coupled with the softening of demand, the volume of workers required on the Major Public Infrastructure Pipeline alone has reduced by 20% across 2023–24 to 2027–28 compared to the previous five-year outlook period, helping to close the gap between supply and demand.

However, shortages continue across each of the three occupational groupings (Engineers, Scientists and Architects; Trades and Labour; and Project Management Professionals).

This year, demand has shifted across certain occupation groups compared with the previous year's forecasts, due to the natural progression of projects and adjustment of forward pipelines. For example, peak demand for engineers has now passed, as more projects move out of planning and design and into the construction phase. Notwithstanding, engineers remain in shortage.

Nationally, shortages appear to have peaked in capital cities but are expected to rise in regional areas, due to significant new renewable energy projects announced in the regions alongside modest projected increases in supply.

The majority (64%) of new entrant workers will come from Vocational Education and Training, with a quarter from higher education and the rest from migration (10%).

Changes to the size of the infrastructure workforce appear to be largely attributable to workers moving in and out of the construction industry, rather than shifting within construction sectors (examples include movements from infrastructure to housing, housing to infrastructure, or commercial/industrial construction to infrastructure).

Project cost escalations have largely been driven by rising materials cost pressures

We have seen extraordinary escalation in costs trends over the past three years since the establishment of the Market Capacity Intelligence System in 2021, especially in non-labour resources. Recent data has indicated that the volatility of the past three years has, however, reached a point of relative stability, with average price growth for construction materials easing from 11% in 2021–22 and 12% in 2022–23 to 4.3% in 2023–24 (see **Section 2: Non-labour Supply** for details). It, therefore, was the right time for Infrastructure Australia to revisit the cost assumptions that underpin the Market Capacity database. This involved an analysis of cost escalations in the past three years compared with trends over the previous decade.

Key findings from Infrastructure Australia's analysis include:

- Cost increases: the costs of land transport infrastructure construction have increased by 51–53% since 2010–11, with as much growth in the past 3 years as there was in the preceding

10 years. Heavy civil-engineering construction costs, including road and rail, have seen significant increases, particularly in 2020–21.

- Labour sensitivity: labour accounts for roughly two-thirds of costs in land-transport infrastructure construction, making this sector more sensitive to labour cost changes than others, such as housing, where labour costs constitute less than 40% of the average house construction expenses.
- Materials cost pressures: the extraordinary rise in output costs over the past three years has been driven by pressures on material costs.

The cost of construction materials continues to remain high, with most materials experiencing year-on-year growth for three straight years. However, the rate of growth appears to have eased over the past twelve months, driven largely by drops in the price for some steel products. Industry sentiment suggests a reported price escalation of non-labour inputs over the last 12 months of about 10–20%, and that prices are yet to peak.

Concrete and steel, the construction materials most in demand, are vulnerable to cross-sector competition in the event of supply shortages. An analysis of Australia's steel fabrication capacity shows that over two-thirds of domestic capacity is located across New South Wales, Queensland and Victoria. The Northern Territory has least access to local supply despite having the largest demand growth rate of the jurisdictions for steel fabrication products within the Major Public Infrastructure Pipeline.

Construction industry productivity growth remains elusive, more detailed investigation on the supply chain is needed

Construction industry insolvencies are disproportionately high compared to other sectors, accounting for almost 27% of total insolvencies in 2023–24. Small business insolvencies account for 82% of total insolvencies in construction and their profits are in decline. Within the sector, residential construction businesses account for a significant share of total construction insolvencies (24%), compared to non-residential construction businesses (5%) and heavy and civil engineering businesses (3%).

Tier-1 construction companies (that have delivered projects or been awarded contracts valued at over $1 billion) are taking a greater share of public infrastructure contracts, with the top 5 companies estimated to be holding over 40% of the infrastructure market's current contract value in 2024.

While construction productivity growth remains stagnant, economic and financial indicators for the industry are up, with earnings up by 11.6% and contribution to national gross domestic product (Industry Value Added) up by 14.8% in 2022–23.

At an industry level, construction productivity is driven by sustainable construction output growth supported by growth in labour and capital productivity. Almost 47 cents in every dollar spent by a construction company goes to outsourcing services, such as labour hire for skilled trades workers, design and engineering consultants, and capital rentals such as hiring a crane (defined by the Australian Bureau of Statistics as 'intermediate services inputs'). This has gradually grown from 40 cents in every dollar in 1995–96.

The high reliance on outsourced services reflects a structural characteristic of the construction industry, where work is delivered by larger businesses subcontracting further down the chain to smaller or specialist businesses. Further work to understand the impact of contracting arrangements between stakeholders (client, constructor, subcontractor, supplier) and outsourced services on construction supply-chain resilience would enable governments and industry to better identify project performance drivers that could drive sectoral productivity growth.

Despite stagnant levels of industry multifactor productivity growth, individual companies surveyed as part of Infrastructure Australia's 2024 Industry Confidence Survey rate their current productivity levels as 'good'. However, industry continues to call for a more balanced approach to risk allocation in contracts, citing issues such as overly complex and litigious contract models, governments' low tolerance for risk and the threat of extreme weather events on project delivery. Parties need to continue working together to find the best balance of risk to minimise unnecessary costs and deliver best value for money.

Progress to mitigate market capacity constraints over the past 12 months

59% of the Major Public Infrastructure Pipeline is made up of land transport infrastructure projects, and since the previous *Infrastructure Market Capacity Report*, there have been significant enhancements to the Australian Government's approach to priority setting, risk management, and the planning and delivery of land transport projects. This includes enhancements achieved through the new Federation Funding Agreement Schedule on Land Transport Infrastructure Projects (2024–2029), developed in partnership with the states and territories. The new Federation Funding Agreement Schedule replaces the preceding 5-year National Partnership on the Land Transport Infrastructure Projects (2019–2024).

Active demand management

Impactful reforms include:

- Articulation of the Australian Government's key policy objectives, its role, and expectations for its investment via the *Infrastructure Policy Statement* (the 'Statement'), which includes the preference to fund nationally significant land transport infrastructure projects on a 50:50 basis with state and territory delivery partners (with the possibility of a greater contribution in jurisdictions on a case-by-case basis).
- Changes to the investment profile for several projects as a result of the 2023 *Independent Strategic Review of the Infrastructure Investment Program*.
- Negotiation of the new Federation Funding Agreement Schedule, which defines the partnership between the Australian Government and state and territory governments through which land transport infrastructure will be delivered. It sets out investment objectives, outcomes and outputs; the roles and responsibilities of each of the parties; performance monitoring and reporting obligations; as well as financial and governance arrangements.
- Through the Federation Funding Agreement Schedule, the Australian Government and state and territory governments have committed to achieving their shared objectives, including:
  - Introduction of a 2-pass process for investment, enabling more rigorous planning processes and alignment between governments.
  - Introduction of a risk framework that is linked to the development of adequate due diligence for a project, using a confidence index throughout the project lifecycle that is central to the risk framework, and positive obligation reporting.
  - Provision of Annual Infrastructure Plans by states and territories, which will inform the Australian Government's investment funding decisions and ensure their alignment with a more strategic, long-term view (10 years).
  - A commitment by governments to optimise their procurement practices to enable a range of agreed socio-economic outcomes that correspond with key recommendations provided in the *2023 Infrastructure Market Capacity Report*, including:
    - a reduction in embodied carbon in transport infrastructure in line with Australia's Net Zero commitments
    - an increase in women's participation at all levels of the construction industry
    - optimising recycled content in transport infrastructure to support Australia's transition to a circular economy by 2030
    - supporting opportunities for Australian and local businesses and industry
    - optimising opportunities for trainees and apprentices, including Australian Skills Guarantee targets, to ensure a pipeline of skilled workers
    - optimising opportunities to enhance construction sector culture and participation, including flexibility, wellbeing and diversity.
- Establishment of performance indicators and reporting arrangements to measure performance.

These reforms demonstrate governments' intentions to actively manage their transport infrastructure pipelines and reduce the gap between the supply and demand for resources in infrastructure delivery. We are starting to see the impacts this year, with a more manageable public infrastructure pipeline coming off the exponential growth trajectory of the past few years. However, demand still significantly outweighs supply, and construction productivity growth remains stagnant compared to other industries (such as transport or telecommunications).

Adherence to the renegotiated Federation Funding Agreement Schedule processes will support active demand management of the transport infrastructure pipeline. Governments will need to remain vigilant and discerning in their infrastructure spend, including closely managing cross-sector demand in the face of budget and inflationary pressures over the short-to-medium term.

Long-term approaches to boosting supply

The Australian Government 2024–25 Budget aimed at helping built environment organisations acquire a larger share of the available workforce and boost workforce productivity. Under the Australian Universities Accord (released February 2024) and the National Skills Agreement (commenced January 2024), funding was committed in the 2024–25 Budget that would boost construction workforce supply. BuildSkills Australia, the Jobs and Skills Council for the building, construction, property and water sectors (launched in February 2024), has also released its 2024 Workforce Plan that aims to identify the most important strategic challenges facing the construction, property and water industries, and provides a framework for tackling these challenges in collaboration with industry, unions and government.[1] Key challenges identified in the Workforce Plan include attracting and retaining highly skilled workers and improving productivity in the construction sectors.

The Australian Government 2024–25 Budget invests $22.7 billion over the next decade to secure Australia's place in the net-zero global economy, through the Future Made in Australia plan. A key component of the Future Made in Australia plan is the National Interest Framework, designed to guide the Australian Government's decision-making process for identifying and supporting priority industries.[2] The Framework identifies green metals as a priority industry under the net-zero transformation stream, along with renewable hydrogen and low carbon liquid fuels. Two other priority industries, critical metals processing and clean energy manufacturing, are also included under a second economic resilience and security stream.

Steel is a key material used in construction and conventional means of steel production are carbon intensive. Australia can develop a long-term comparative advantage in green metals by drawing on our abundant metal and renewable energy resources. The Future Made in Australia plan may relieve pressure on supply chains and boost local workforce capability.

Create measures and take actions to enable an uplift in construction industry productivity

Another key area of progress is the development of a National Construction Strategy to improve construction productivity. Through the Infrastructure and Transport Senior Officials' Committee (ITSOC), governments are working with industry on national approaches across four areas:

- **Data collection and benchmarking**: to establish measures to assess and track productivity performance.
- **Workforce**: to increase retention and attraction of diverse workers (including women's participation).
- **Procurement and contracting**: for the use of procurement methods to deliver project outcomes.
- **New technology and modern methods of construction**: to explore ways to increase uptake of digital methods and modern methods of construction.

Looking ahead

In keeping with the recommendations made in the *2023 Infrastructure Market Capacity Report*, this year's edition refreshes existing demand and supply insights, while adding new evidence, all of which is oriented towards demonstrating progress against the recommendations.

For each recommendation area — managing demand, boosting labour supply, boosting non-labour supply and increasing productivity — we propose the future directions for the Australian Government to continue the momentum gained this year. Collectively, these recommendations present national priorities for monitoring and mitigating infrastructure market capacity constraints, across all infrastructure sectors. **Table 1** sets this out in detail.

Table 1: Update on progress made against 2023 recommendations and future directions

Active demand management			
2023 recommendation		**Progress over last 12 months**	**Current state**
1	Active pipeline management	• **Federation Funding Agreement Schedule on Land Transport Infrastructure Projects (2024–2029)** (August 2024): – Requirement for state and territories to submit Annual Infrastructure Plans to inform longer term (10 years) and continued strategic decision making by the Australian Government. – Two-pass process for investment decision making, ensuring necessary due diligence to be taken before funding approval and announcement. • Infrastructure Australia has partnered with the Department of Social Services to undertake research to quantify the housing workforce, leveraging the methodology used in this report for quantifying the infrastructure workforce.	• Transport infrastructure demand has reduced in accordance with implementation of the 2023 *Independent Strategic Review of the Infrastructure Investment Program*. The balance between supply and demand for major public infrastructure has improved to be in the best position since reporting commenced in 2021. • A more realistic and achievable pipeline provides greater certainty and increases industry confidence to deliver, however, in the short term, industry is adjusting to change. • The ambition for more renewable energy and more housing is clear, however, delivery is yet to pick up in line with the ambition. **Future directions** • **Adoption and adherence to the new Federation Funding Agreement Schedule Land Transport Infrastructure Projects (2024–2029)** processes to support active pipeline management. • Building on the analysis from this *2024 Infrastructure Market Capacity Report*, **quantify the construction workforce** engaged in sectors outside infrastructure, such as housing and energy, to identify adjacencies and potential worker mobility between sectors to fill labour gaps.
2	Consider cross-sector whole-of-market capacity		

Boost materials supply			
2023 recommendation		**Progress over last 12 months**	**Current state**
3	Quarry supply	• **Federation Funding Agreement Schedule on Land Transport Infrastructure Projects (2024–2029)** (August 2024): – Optimising recycled content in transport infrastructure as part of investment decision making. • Domestic steel fabrication capacity analysis, through Infrastructure Australia collaboration with the Australian Steel Institute. • Future Made in Australia plan announced, identifying green metals as one of five priority industries.	• Import prices and materials and prices more stable than last year. • Steel and timber supply reported by industry as most critical to project delivery. • Domestic capacity to produce specialist components needed for energy projects unknown. Road infrastructure, project planning and coordination will be needed to transport large products (for example, wind turbine blades) from source to site. **Future directions** • Improve **monitoring local production capacity** of key construction materials. This could include industry collaborations, such as the work done with Australian Steel Institute for this report. • Explore opportunities to **coordinate national demands for specific materials or equipment** that face strong global competition and long lead times in light of the energy transition and the enabling infrastructure needed to deliver it.
4	Steel supply		
5	Local materials production data		
6	Recycled materials		

Boost workforce supply

2023 recommendations		Progress over last 12 months	Current state
7	Develop a National Infrastructure Workforce Strategy	• **National Skills Agreement** (commenced January 2024) provides states and territories with access to additional Commonwealth funds of up to $3.7 billion over 5 years. This takes total Commonwealth investment in state and territory training systems to up to $12.6 billion over 5 years. • Funding committed in **Australian Government 2024–25 Budget** for: – 20,000 additional Fee-Free TAFE training places (including 5,000 pre-apprenticeship places) in construction-related training – streamlining around 1,900 migrant skills assessments streamlined to boost supply of the construction industry – the Australian Apprenticeship Incentive System, to support apprenticeship training in priority qualifications which include many construction occupations in shortage (such as civil engineering and the trades). • **Australian Universities Accord** (released February 2024) funding committed in Australian Government 2024–25 Budget to achieve a tertiary-education attainment target of at least 80%, improving pathways between higher education and Vocational Education and Training and developing standard approaches to credibility recognition to make it cheaper and more efficient for students to become qualified. • **BuildSkills Australia** Jobs and Skills Council published its workforce plan for the built environment, which aims to address construction-sector workforce challenges in collaboration with industry, unions and government. • **Federation Funding Agreement Schedule on Land Transport Infrastructure Projects (2024–2029)** (August 2024) providing opportunities for apprentices and trainees to be a consideration as part of funding decisions.	• There is a shortfall of 197,000 public infrastructure workers, dropping from the projected shortage of 229,000 workers last year. • All occupational groups remain in shortage. Engineer and scientist shortages have peaked this year while trades shortages will continue to grow. • The Northern Territory will experience the most acute workforce shortage as a ratio to its current supply, driven by a 40% rise in demand compared to last year's forecast. • Shortages are set to increase in regional areas, driven by new renewable energy projects announced in the regions with only modest increase in supply projected. **Future directions** • Continue to **strengthen the long-term pipeline of new graduate entrants** from the tertiary sector (Vocational Education and Training and higher education), supplemented by **skilled migrants intakes to fill immediate** skills and worker shortages. • Progress actions under the BuildSkills Australia **2024 Workforce Plan**.
8	Boost the higher education pipeline		
9	Place more qualified onshore migrant engineers in engineering jobs		
10	Boost the supply of apprentices and trainees		

Improve construction productivity

2023 recommendations		Progress over last 12 months	Current state
11	A productivity study and national baseline	• **National Construction Strategy** – four workstreams: data collection and benchmarking, workforce, new technologies and modern methods of manufacturing, procurement and contracting. • **Federation Funding Agreement Schedule on Land Transport Infrastructure Projects (2024-2029)** (August 2024): women's participation uptake to be a consideration as part of funding decisions. • **Culture in Construction Pilot:** Interim Report released (May 2024) on findings from five pilot infrastructure projects trialing a draft Culture Standard. • **National Productivity Fund:** an Australian Government $900 million productivity fund to support state-level reforms aimed at reducing regulatory barriers and boosting competition. Streamlining commercial planning and zoning and removing barriers to the uptake of modern methods of construction are some of the fund's focus areas.[3]	• Construction industry productivity continues to decline, dropping from 0.3 to -0.8 over the last 12 months. • Construction industry accounts for 27% of total insolvencies across the market. • Large tier-1 construction companies are taking up an increasingly greater share of public infrastructure contracts. • Small-sized construction business profits are in decline, with their insolvencies accounting for 82% of the industry total in 2023. • Outsourced service costs account for almost 47% of all input costs and has grown steadily over the last 10 years. • Industry continues to voice the need for a better balance of risk allocation in contracts.
12	Participation and workplace culture		
13	New technologies and modern methods of manufacturing		
14	Risk allocation between parties		

Future directions

- Completion of **the National Construction Strategy** and commencement of associated actions.
- Investigate the impact of **contractual arrangements and outsourced services** (including labour hire and capital rental) to construction supply-chain resilience, thereby identifying drivers to lift performance and productivity.

Introduction

The annual *Infrastructure Market Capacity* reports respond to a request made by the Prime Minister and First Ministers in 2020: that Infrastructure Australia work with jurisdictions and industry bodies to monitor the infrastructure sector.

> ***"Leaders considered analysis on the market's capacity to deliver Australia's record pipeline of infrastructure investment to support the country's growing population. This analysis highlighted the importance of monitoring infrastructure market conditions and capacity at regular intervals to inform government policies and project pipeline development. Leaders agreed that Infrastructure Australia will work with jurisdictions and relevant industry peak bodies to monitor this sector."***
>
> *Source: Council of Australian Government Communiqué, 20 March 2020*

The fourth publication on infrastructure demand and supply from Infrastructure Australia

Like the previous three editions of the *Infrastructure Market Capacity Report*, this report examines public infrastructure demand and market supply capacity over five years - in this case, 2023—24 to 2027—28. It provides an updated health check and analysis of our national construction market's capacity to deliver public infrastructure works.

The report is structured as follows:

- **Understanding demand:** a quantification of total infrastructure demand across five years by sector, by project type, and detailed analysis of the Major Public Infrastructure Pipeline including year-on-year changes and escalation costs.
- **Non-labour supply:** an appraisal of the main supply-side risks to market capacity today, including industry views gleaned from interviews and surveys conducted for this report. The focus is on materials supply, which is the largest non-labour supply category by cost shares.
- **Labour and skills supply:** projections of infrastructure construction labour supply and shortage by jurisdiction and occupation groups. Plus, summary of emerging skills and an assessment of boarder construction workforce trends.
- **Industry productivity:** analysis of the current state of the construction industry, including productivity and insolvency trends, supplemented with industry perception obtained from our 2024 Industry Confidence Survey.

New for 2024: Expansion of demand-side coverage, updated demand-side resource cost assumptions, and steel fabrication capacity analysis

This edition of the *Infrastructure Market Capacity Report* advances the analysis on current and emerging influences on market capacity from previous reports, including:

- **Demand-side coverage:** we have expanded our demand-side database by capturing investment in defence infrastructure works, private investment in mining and resources, and smaller scale residential buildings which have not previously been captured in earlier editions.
- **Demand-side resource costs:** recent data has indicated that the cost-escalation volatility of the past three years has reached a point of relative stability, while analysis of the project cost estimates in our database verifies that cost pressures have been incorporated in estimates. To maintain accuracy of our modelled resource requirements, Infrastructure Australia updated its cost assumptions for resources demanded by applying appropriate increases (based on the Australian Bureau of Statistics Producer Price Index and Wage Price Index) to cost rates per resource.
- **Steel fabrication capacity analysis:** The Australian Steel Institute initiated a collaboration with Infrastructure Australia to compare steel fabrication supply-side capacity by geography with nearby project-level demand. Similar supply-and-demand analysis on other materials could be included in future editions of this report if useful supply-side data is willingly shared following the positive example set by the Australian Steel Institute.

Continued emphasis on policy implications with acknowledgement of progress and looking ahead at future directions

Significant work has been undertaken against all four categories of recommendations from the *2023 Infrastructure Market Capacity Report* to actively manage demand, boost materials supply, boost labour supply, and turn around construction productivity. This edition provides an update of market capacity conditions with respect to demand and points to future directions for the Australian Government to maintain the momentum for work in progress against each of the existing recommendation areas.

A brief explanation of our Market Capacity Program

The Market Capacity Program is an assumptions-based methodology for identifying market capacity risks. It was developed in collaboration with state and territory governments, industry, advisory bodies and other subject matter experts. These partnerships are integral to the ongoing evolution of the Market Capacity Program.

The Market Capacity Program is underpinned by two system components:

The National Infrastructure Project Database

The National Infrastructure Project Database aggregates and organises infrastructure project data supplied by the Australian Government (including defence), state and territory governments (public investments), the Australian Bureau of Statistics (housing building activity) and GlobalData (private investments).

The following infrastructure sectors are included in the Market Capacity Program:

- **Buildings:** non-residential buildings for health, education, sport, justice, transport buildings (such as parking facility and warehouse), other buildings (such as art facilities, civic/convention centres and offices), detached, semi-detached and multi-detached residential, apartments and renovation activities (using all residential building activities captured in the Australian Bureau of Statistics Building Approvals).
- **Transport:** roads, railways, level crossings, and other transport projects such as airport runways.
- **Utilities:** water and sewerage, energy and fuels, gas and water pipelines, and telecommunications.
- **Resources:** base metals, precious metals, critical minerals, hydrogen and ammonia, chemical & pharmaceutical plants, oil and gas, and ports.

Market Capacity Intelligence System

The Market Capacity Intelligence System is a set of analytical tools that interrogates and visualises project demand sector, project type and resource inputs, for the following infrastructure pipelines:

- **Major Public Infrastructure Pipeline:** Publicly funded infrastructure projects valued over $100 million in New South Wales, Victoria, Queensland and Western Australia, and over $50 million in South Australia, the Australian Capital Territory, the Northern Territory and Tasmania.
- **Small Capital Public Infrastructure Pipeline:** Publicly funded infrastructure projects valued $100 million and under in New South Wales, Victoria, Queensland and Western Australia, and $50 million and under in South Australia, the Australian Capital Territory, the Northern Territory and Tasmania.
- **Private Infrastructure Pipeline:** Privately funded public infrastructure, such as a wind farms, that is funded, delivered and operated by the private sector.
- **Private Buildings:** Residential and non-residential buildings projects.
- **Road Maintenance:** Resource demands for road-maintenance projects.

Enhancements to the Market Capacity Program in 2024: accounting for cost escalations

We have comprehensively reviewed and updated our Market Capacity Program assumptions this year to ensure our cost estimates and assumptions reflect current economic conditions.

Step 1 involved a comparative analysis of 2024 data collection from jurisdictions to compare the average investment by infrastructure asset class across all jurisdictions, compared with 2022 project estimates before inflation accelerated. We found that those estimates had increased in line with cost pressures. Because this revision to estimates occurred across the pipelines of states and territories, it meant Infrastructure Australia's modelling assumptions needed to be updated to reflect inflation, such that we are forecasting the right number of workers needed or material tonnages needed.

Step 2 involved work to integrate relevant price indices, including the Australian Bureau of Statistics's Producer Price Index and Wage Price Index, to ensure differential escalation rates of construction inputs are factored into our cost estimates and assumptions.

Step 3 involved the application of resource-specific escalation rates. Different resource categories were found to have unique escalation rates. For example, the cost of materials like steel or concrete have increased at a different rate compared to labour costs or equipment rental fees. This variation is due to factors such as supply-chain dynamics, market demand, and industry-specific constraints. By incorporating differential escalation rates, the updated assumptions provide a more accurate and realistic representation of the current cost environment, ensuring that the project estimates are aligned with the latest economic conditions.

Industry confidence research

Supporting the quantitative analysis research each year, Infrastructure Australia also undertakes industry research to gauge industry confidence levels and better understand their perspectives on current market conditions.

This year, three surveys were undertaken of Australian businesses in the building and construction industry, supplemented with in-depth interviews:

- **The 2024 Industry Confidence Survey** (n=200) captured views across the infrastructure life cycle, across identification/planning, design, construction, operations and management. The survey sample were actively delivering contracts that ranged in value from less than $10 million to more than $1 billion over the last 12 months.
- **The 2024 Civil Contractors Federation Survey** of its members (n=122) captured views of civil-construction businesses, comprised of majority (63%) smaller Tier-3 and Tier-4 businesses with annual turnover of less than $100 million.
- **The 2024 Infrastructure Australia Labour Shortage Survey** (n=40), as one of various inputs into the workforce analysis, supplements quantitative data and provides additional nuanced insights into projected shortages. Surveyed businesses had operations covering all jurisdictions and all construction sectors (transport, residential, commercial and social infrastructure).
- **In-depth interviews** (n=20) with randomly selected building and construction businesses, with each tier represented, to get a more detailed understanding of the key issues for the year.

All state and territories were represented in this year's industry surveys and were roughly representative of construction industry geographical spread across the country – most in New South Wales and Victoria, followed by Queensland, Western Australia and South Australia, and the smaller jurisdictions Australian Capital Territory, Tasmania and the Northern Territory.

For more details on the survey methodology, see **Appendix F: Industry Confidence surveys**.

Detailed methodologies in Appendices

See the Supporting Appendices for detailed explanations of the Market Capacity methodology:

- Appendix A: Demand-side analysis methodology
- Appendix B: Supply-side analysis methodology
- Appendix C: Infrastructure typecasts
- Appendix D: Resource classifications
- Appendix E: Workforce and skills methodology
- Appendix F: Industry confidence surveys
- Appendix G: Revision of cost escalation assumptions.

1. Understanding demand

This section presents Infrastructure Australia's 2024 demand projections for major public infrastructure works over the five-year outlook (2023–24 to 2027–28), within the context of the wider construction market. It includes analysis of changes over the last 12 months compared to projections last year, covering views of the demand profile by construction sectors, geographies, workforce and materials.

The demand analysis is supplemented with industry assessments of current delivery capacity, including changes over the last 12 months and confidence to scale up over the forward estimates, collected from our 2024 industry surveys and interviews.

Key points

- A reduction of 8% in major public infrastructure demand, compared with the projection of 12 months earlier, represents a significant management of demand by governments across Australia.
- Transport infrastructure investment remains the largest expenditure category, accounting for 59% of the Major Public Infrastructure Pipeline, but has dropped by $32 billion from the previous year's projections.
- Building and Utilities infrastructure investment continues to grow this year, accounting for 34% and 7% of the Major Public Infrastructure Pipeline respectively. Growth of these sectors reflects governments' ambitions to boost housing stock and advance the energy transition towards net zero.
- The Major Public Infrastructure Pipeline sees a geographical shift in investment to the north, with Queensland and the Northern Territory growing by $16 billion, while New South Wales and Victoria have reduced by $39 billion versus the previous outlook period.
- The demand for workers on major public infrastructure has reduced by 20% (average monthly FTE) versus the previous outlook period, reducing the gap between supply and demand compared to what Infrastructure Australia had previously reported (further detailed analysis on workforce supply is provided in **Section 3: Workforce and Skills**).
- The industry reports moderate confidence in its ability to scale up, with over half expressing confidence in scaling up operations by 25% in the future. The residential sector is the least confident about scaling up, while the transport sector shows the highest confidence to scale up in response to changes in public investment in future project pipelines.

Active demand management – future directions

The Australian Government, in partnership with state and territory governments, should continue to actively manage public infrastructure demand through:

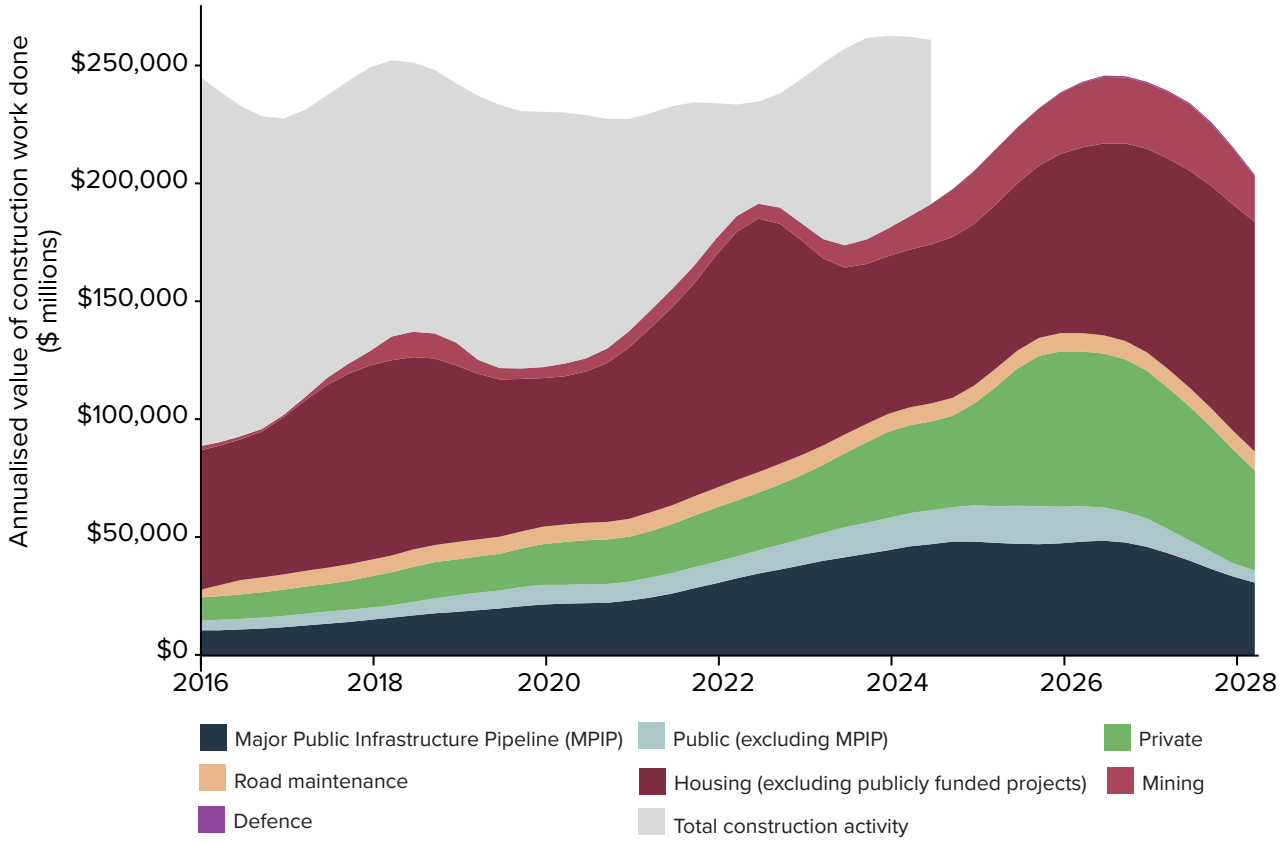
- adoption and adherence to the new **Federation Funding Agreement Schedule** on Land Transport Infrastructure Projects (2024-2029) processes to support active pipeline management.
- building on the analysis from this *2024 Infrastructure Market Capacity Report*, **quantifying the construction workforce** engaged in sectors outside infrastructure (such as housing and energy) to identify adjacencies and potential worker mobility between sectors to fill labour gaps.

The market capacity analysis now captures more construction activity than ever before

Figure 1 shows the Infrastructure Australia pipeline of forecast construction activity based on cost estimates against the backdrop of total construction activity as reported by the Australian Bureau of Statistics. The main difference between the two measures is that the Australian Bureau of Statistics incorporates the impact of cost escalations, while the Infrastructure Australia database shows cost estimates with far less certainty about the value of future escalations. This key difference makes it difficult to assert how much of total construction activity is captured in our database. However, by expanding our database this year to include more residential activity, mining projects and defence capital projects, our database now forecasts a volume of construction activity that peaks in 2026 almost in line with current levels of construction work done as reported by the Australian Bureau of Statistics.

Even though we do not expect all projects to proceed as announced, this approach provides valuable insight into market ambition in the coming years. It also provides the added benefit of enabling a more comprehensive analysis of market demand than was possible in previous editions.

Figure 1: Forecast construction spend, as captured in the Infrastructure Australia database, in the context of istoric total construction activity (2016 to 2028)



Note: Infrastructure Australia no longer displays a projection for future total construction activity as exists in previous editions of the Infrastructure Market Capacity Report.

Source (for total construction activity): Australian Bureau of Statistics (2024)[4]

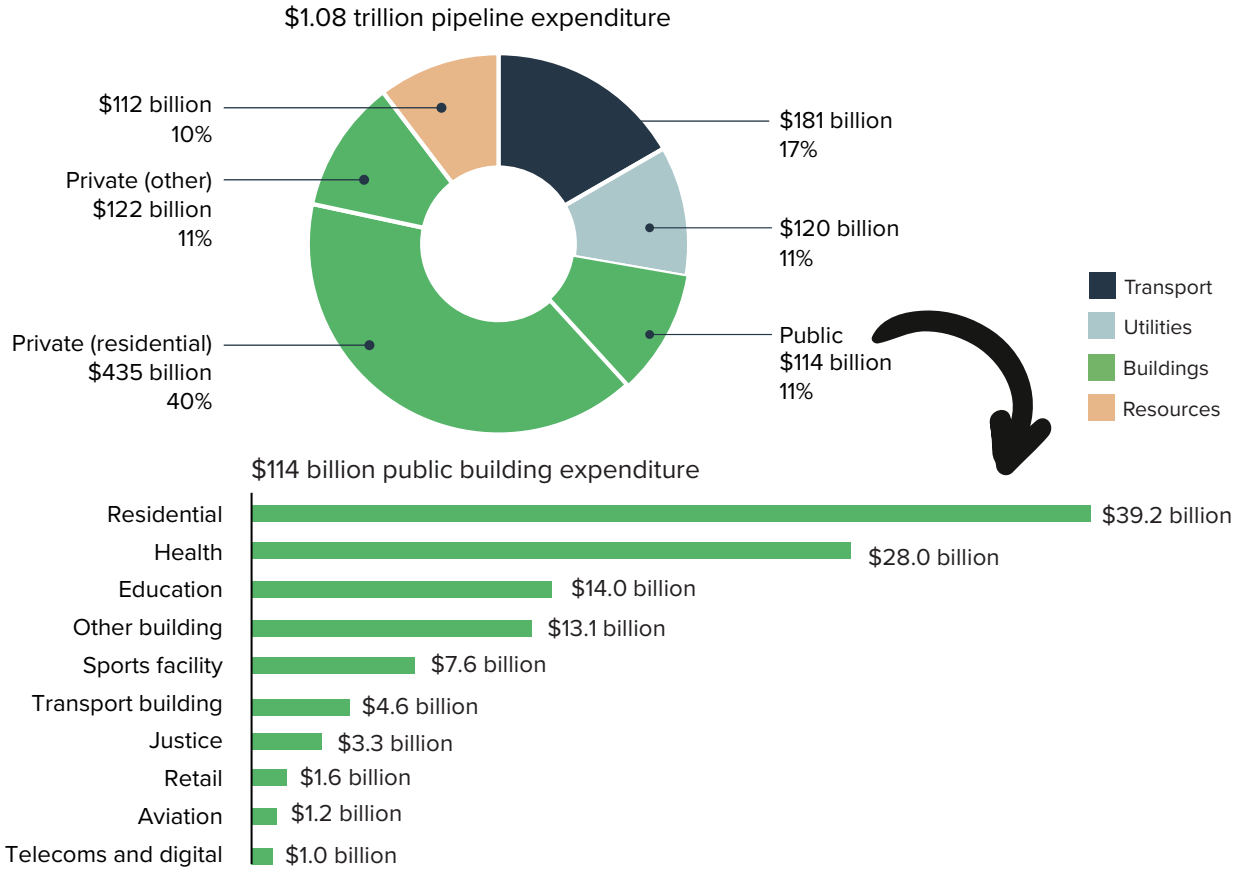
Total construction demand captured in our database covers $1.08 trillion in the five years from 2023–24 to 2027–28. This level of forecast activity is almost in line with current run rates where the total construction activity reported by Australian Bureau of Statistics in the five years from to 2019–20 to 2023–24 was $1.2 trillion.

Figure 2 shows the total infrastructure pipeline, as captured in our database, broken down by sector. Buildings account for most of the expected expenditure (62%), followed by transport (17%), utilities (11%) and resources (10%).

Of the $671 billion in buildings, $71 billion is from the Major Public Infrastructure Pipeline, with another $43 billion invested in buildings by governments, totalling $114 billion of public investment. **Figure 2** includes a breakdown of this public investment in buildings, which is dominated by residential and health projects.

For the period 2023–24 to 2027–28, public spending accounts for 25% of the $1.08 trillion construction market, of which the Major Public Infrastructure Pipeline totals $213 billion and $58 billion is planned on Small Capital Projects. The rest of this section provides an analysis of the Major Public Infrastructure Pipeline.

Figure 2: Combined construction pipeline, as captured in the Infrastructure Australia database, by sector (2023–24 to 2027–28)



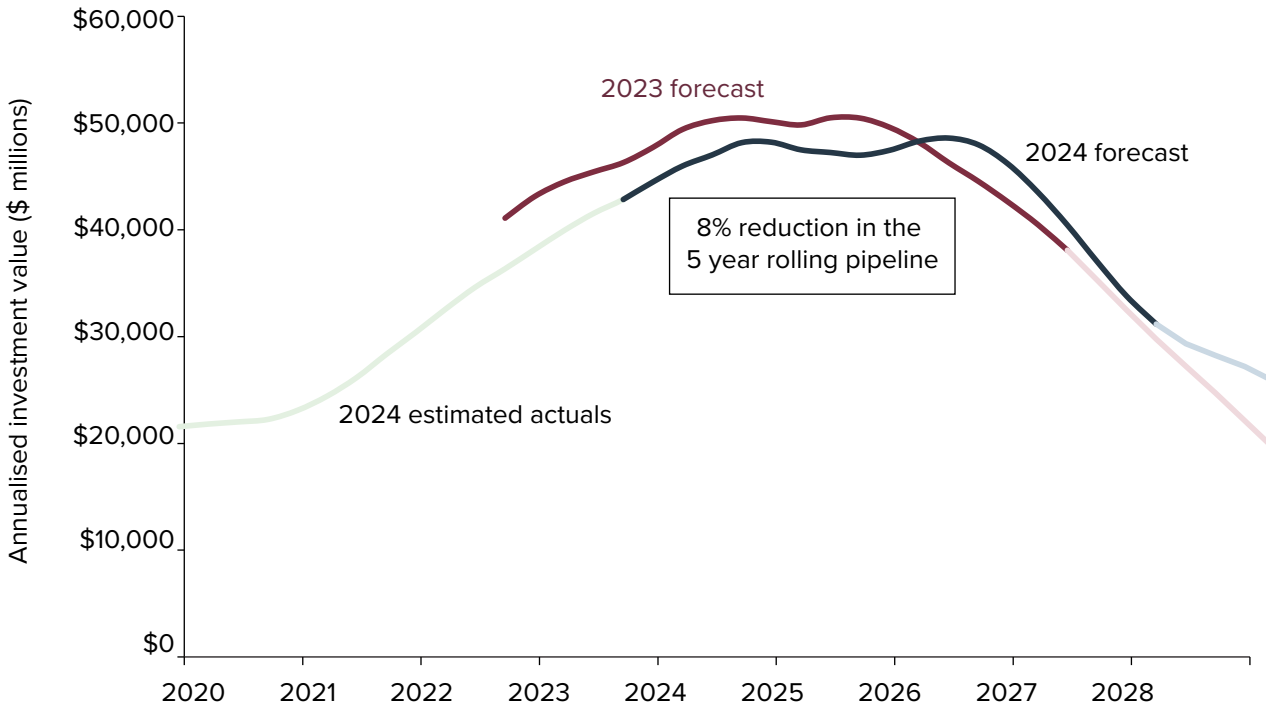
The 5-year Major Public Infrastructure Pipeline has dropped by 8% to $213 billion, with a flatter peak demand moving out one year to mid-2026

As shown in **Figure 3**, the 5-year rolling Major Public Infrastructure Pipeline has dropped from $230 billion projected last year (2022–23 to 2026–27) to $213 billion this year (2023–24 to 2027–28).

Peak investment has moved one year out to 2026 compared to the projection last year. These changes are consistent with a continuing trend each year observed by Infrastructure Australia of projected investment peak shifting into outer years, suggesting that the market struggled to deliver on an overly ambitious pipeline.

The peak demand is also flatter compared to previous years projections (2022, 2023) when demand rose exponentially to a high peak before dropping over outer years. The shape of the demand curve this year suggests a more realistic and achievable pipeline for a constrained market to deliver.

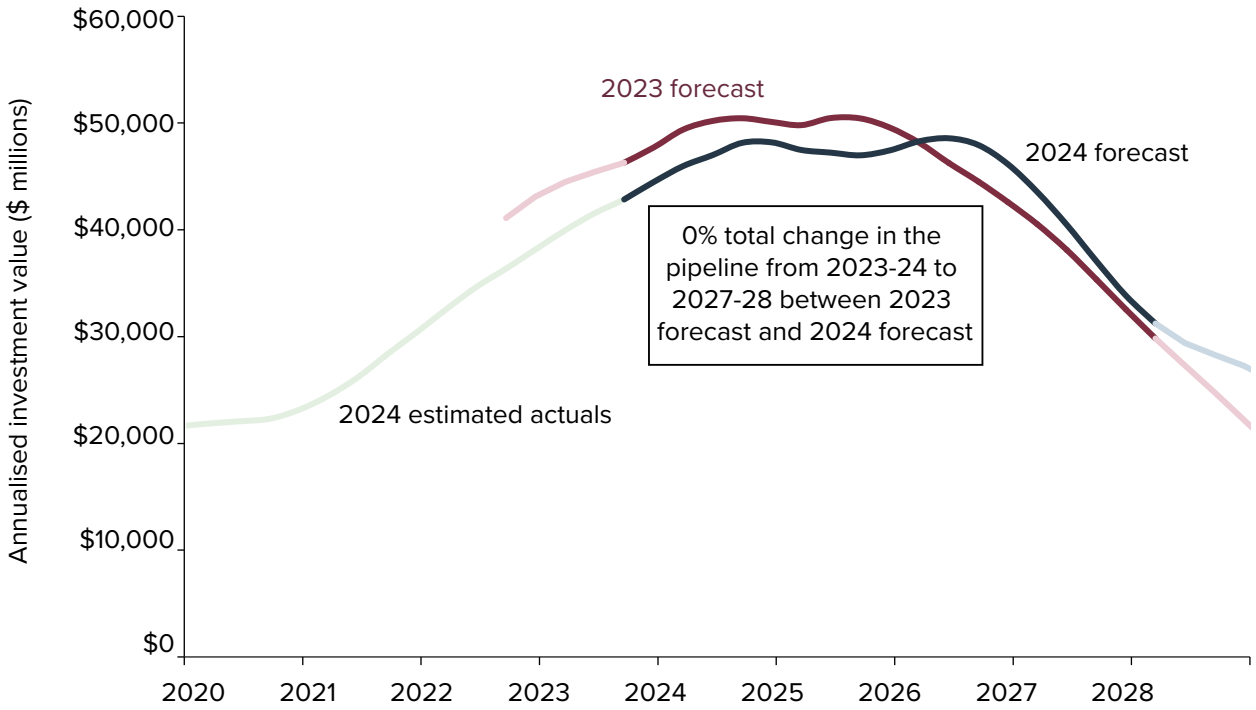
Figure 3: Comparison of 2023 and 2024 rolling forecasts of Major Public Infrastructure Pipeline activity (2022–23 to 2026–27 versus 2023–24 to 2027–28)



Like-for-like analysis of how project estimates have changed in the past 12 months reveals the drop in demand is primarily driven by projects recently completed or removed from the pipeline

Infrastructure Australia conducted an in-depth year-on-year analysis, comparing estimates of the Major Public Infrastructure Pipeline from 2023 and from 2024 for the same 5-year period (2023–24 to 2027–28, as shown in **Figure 4**). Unlike last year when we reported that the pipeline had increased by 13% for this exercise, this year the 2024 forecast is the same as the 2023 forecast for the specified time period.

Figure 4: Comparison of 2023 and 2024 forecasts of Major Public Infrastructure Pipeline activity (2023–24 to 2027–28)



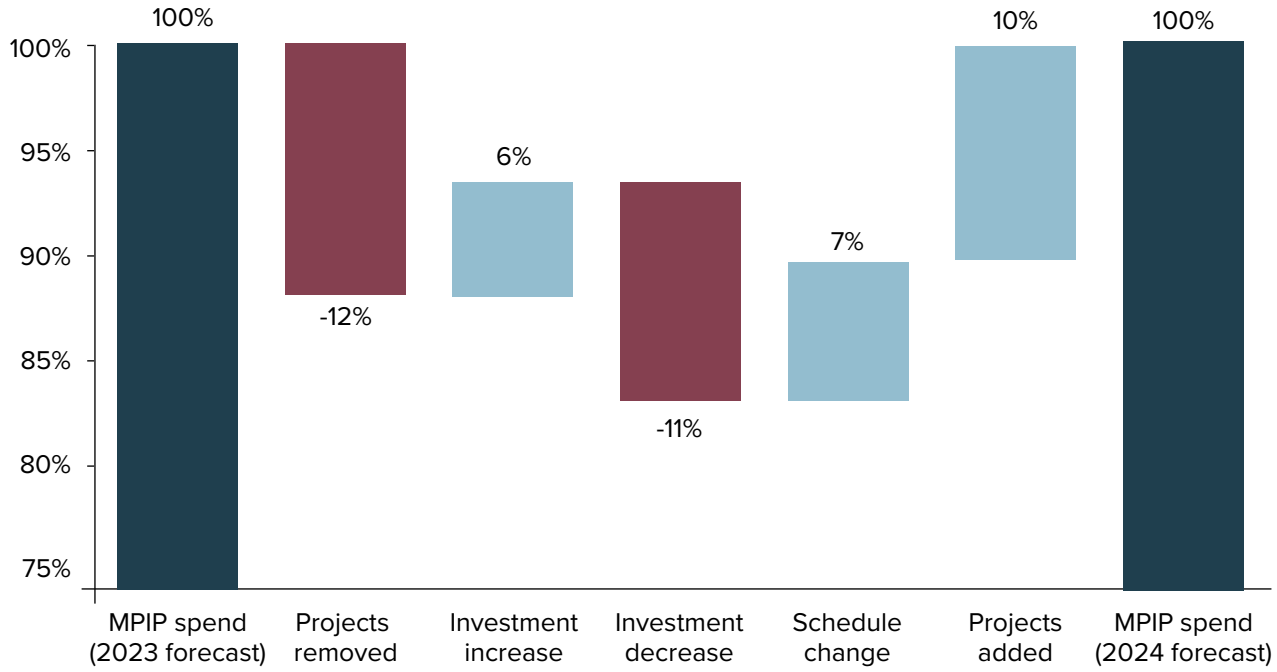
By studying a sample of over 600 on-going major public infrastructure projects in the 2023–24 to 2027–28 pipeline using data from both the 2023 and 2024 pipeline estimates, we identified changes in the pipeline, as visualised in **Figure 5**.

The pipeline decreased by 12% due to projects being removed or recently completed, with a further 11% drop from investment cuts in continuing projects.

The magnitude of 23% in reductions has not quite been netted out by new projects coming into the pipeline (10%, predominantly in the buildings sector) and increases to investment estimates (6%), leaving another 7% in increases still to be explained.

The remaining 7% increase year on year is explained by delays to project schedules. Schedule changes to several projects where construction has been delayed versus the estimates of one year earlier, had the effect of shifting project investment from 2022–23 out to later years. Where this shift occurred, we quantified the 2024 estimate as being 7% higher than the 2023 estimate for 2023–24 to 2027–28.

Figure 5: Major Public Infrastructure Pipeline spend from 2023–24 to 2027–28, changes from 2023 forecast to 2024 forecast



Transport remains the largest public infrastructure expenditure category but has declined this year, while building and energy investment continue to grow

Figure 6 shows investment in the Major Public Infrastructure Pipeline over the 2023–24 to 2027–28 outlook period, as broken down by sector.

Transport infrastructure investment is projected at $126 billion and remains the largest expenditure category, accounting for 59% of the Major Public Infrastructure Pipeline. This is a $32 billion reduction on the previous year's outlook, driven by:

- Completions of megaprojects in 2023–24.
- Fewer new projects to commence in coming years versus the previous outlook period.
- Cost and schedule changes in the total investment estimates, for some megaprojects due to commence construction in the outlook period.

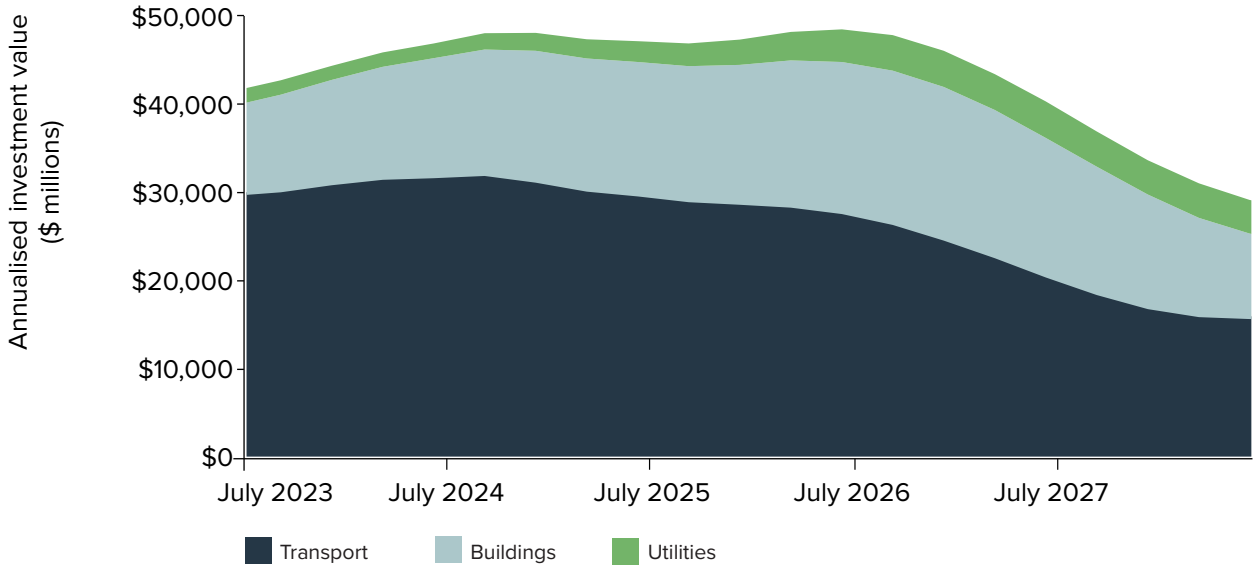
Buildings infrastructure investment is projected at $71 billion, which accounts for 34% of the Major Public Infrastructure Pipeline. This is up $8 billion on the previous year's outlook. Buildings infrastructure is driven by health ($24 billion) and residential buildings ($17 billion), followed by other building types such as convention centres, offices, art facilities and laboratories ($12 billion).

Utilities infrastructure investment is projected at $16 billion, which accounts for 7% of the Major Public Infrastructure Pipeline. This is up $6 billion on the previous year's outlook. While investment in energy projects is mainly driven by the private sector, significant public investment can be seen in large transmission projects.

Analysis of projected demand peaks by sector over the five-year outlook shows that while transport investment is expected to continue to decline, buildings infrastructure is expected to peak in 2026, while energy investment is expected grow steadily. The staggered demand peaks by sectors have an effect of maintaining a steadier level of overall investment across infrastructure.

When interpreting these projections, it should be noted that the Major Public Infrastructure Pipeline accounts for only a quarter of the total construction market and there is significant private investment in buildings and particularly in energy infrastructure.

Figure 6: Major Public Infrastructure Pipeline spend by sector (2023–24 to 2027–28)



Analysis of regional demand sees growth across northern Australia

Regional analysis of the pipeline has been made possible for the first time this year, through the development of analytical tools created in 2023 by Infrastructure Australia in collaboration with state and territory governments. These tools are designed to help government decision makers diagnose labour-supply bottlenecks, spot growth opportunities and build strong evidence bases for investment decisions.

Two analytical tools are fundamental to this regional analysis: a national heat map of construction demand and supply, and a demand pipeline simulator – both of which analyse investment demand, material demand, and labour demand and supply.

In the five years from 2023–24 to 2027–28, when compared with the corresponding period in the 2023 forecast, there is a significant geographical shift in public investment to the north, with the Major Public Infrastructure Pipeline in Queensland and Northern Territory growing by $16 billion, while New South Wales and Victoria have reduced by $39 billion.

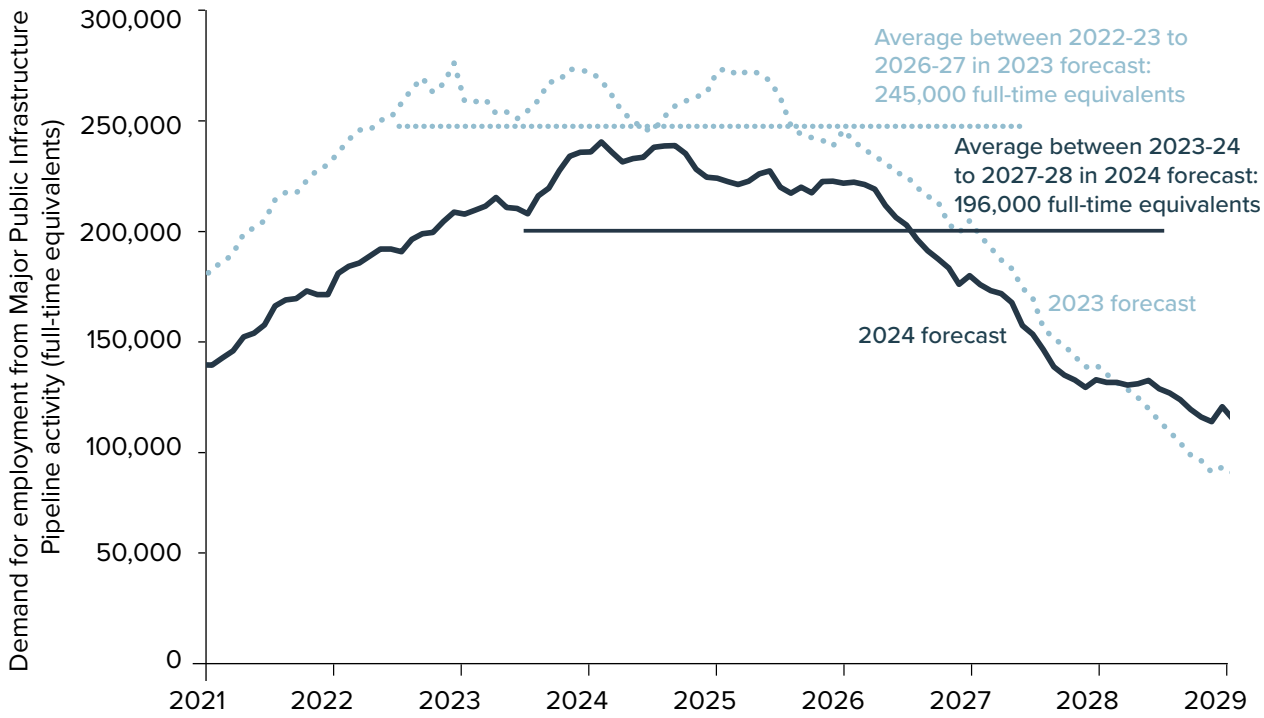
Deep dive: contribution of cost pressures by resource type

In 2024, Infrastructure Australia undertook a deep dive of the contributions to cost escalation on the Major Public Infrastructure Pipeline by PLEM (Plant, Labour, Equipment, Materials) resource types. This analysis breaks down the total project cost escalation into its constituent parts, allowing us to identify the contribution of each resource type to the overall escalation.

We have comprehensively reviewed and updated our Market Capacity Program cost assumptions this year (based on the Australian Bureau of Statistics Producer Price Index and Wage Price Index) to ensure our cost estimates and assumptions reflect current economic conditions.

As shown in **Figure 7**, applying the updated cost assumptions to the Major Public Infrastructure Pipeline this year, average labour demand dropped by 20% in full-time equivalents per month compared to last year's projection.

Figure 7: Comparison of 2023 and 2024 forecasts of demand for labour from the Major Public Infrastructure Pipeline (2020–21 to 2027–28)

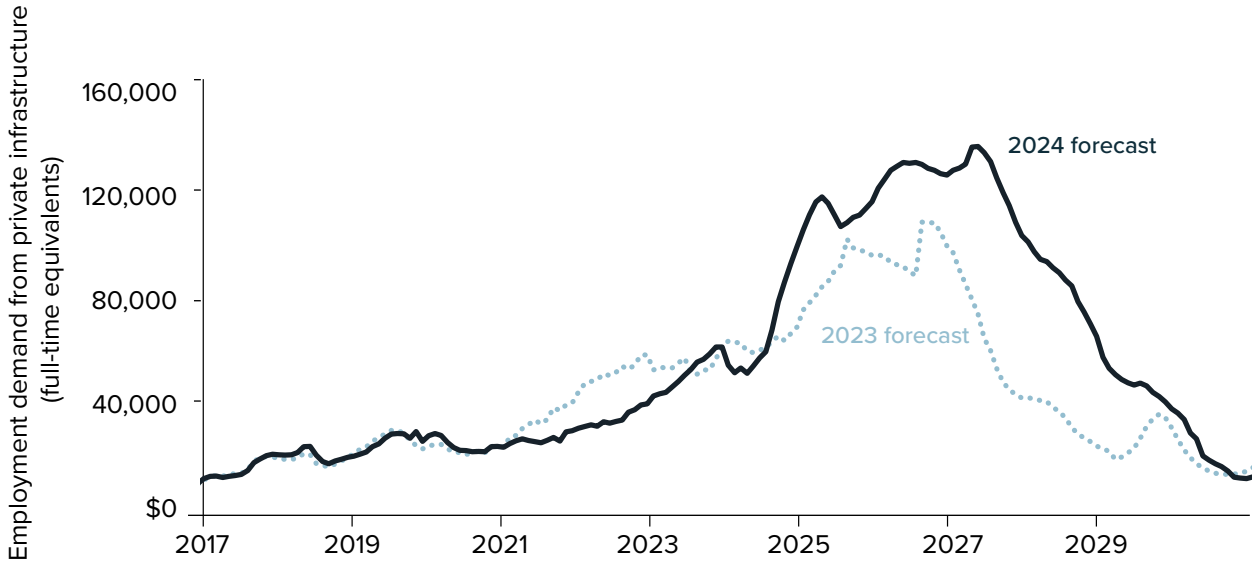


Preparedness is needed for the workforce to deliver private-funded infrastructure demand

In terms of private investment (that is, separate to the Major Public Infrastructure Pipeline), we observed a jump in labour demand from the private infrastructure sector in the near future. This is driven by the renewable energy transition. As shown in **Figure 8**, from early 2027, labour demand from private infrastructure will almost double when compared with the forecast from 2023.

The top 5 occupations needed to deliver energy projects over the five-year outlook are Other Professional Engineers (those not classified as civil, electrical, industrial, mechanical or production engineers), General Construction Labourers, Electricians, Plant Operators and Project Managers.

Figure 8: Comparison of 2023 and 2024 forecasts of demand for labour from private infrastructure (2020–21 to 2027–28)



Demand for concrete and steel cuts across all construction sectors, while demand for other materials varies by sector

By cost shares, materials accounts for the largest proportion (73%) of total non-labour spend on the Major Public Infrastructure Pipeline, followed by plant (15%) and equipment (11%).

As shown in **Table 2**, concrete is the top construction material needed by volume to complete major infrastructure works over the five-year outlook (137 million tonnes), followed by rock/bluestone (31 million tonnes), asphalt (18 million tonnes) and steel (8 million tonnes).

Table 2: Demand for materials from the Major Public Infrastructure Pipeline (2023–24 to 2027–28)

Material	Demand (million tonnes)
Concrete	**136.8**
Aggregate	80.0
Cement	22.4
Sand	34.4
Rock/Bluestone	**30.6**
Asphalt	**18.0**
Steel	**8.1**
Steel – Structural Elements	3.8
Steel Reinforcement	3.6
Girders	0.6
Rail Track	0.1
Bitumen Binders	**1.5**
Walls	**0.7**
Timber	0.3
Plasterboard	0.3
Bricks	0.1
Electrical Bulk	**0.2**
Aluminium	0.1
Copper	0.04
Plastics and Polymeric Materials	0.03
Electric Bulk	0.01
Fibreglass	0.01
PV Panels	**0.003**

As shown in **Figure 9**, across major public infrastructure works, materials demand is mostly driven by transport, due to its dominant position on the Major Public Infrastructure Pipeline, followed by buildings and utilities. As all sectors will be consuming concrete (aggregate/sand/cement) in bulk, it may be subject to cross-sector competition in the event of supply shortages.

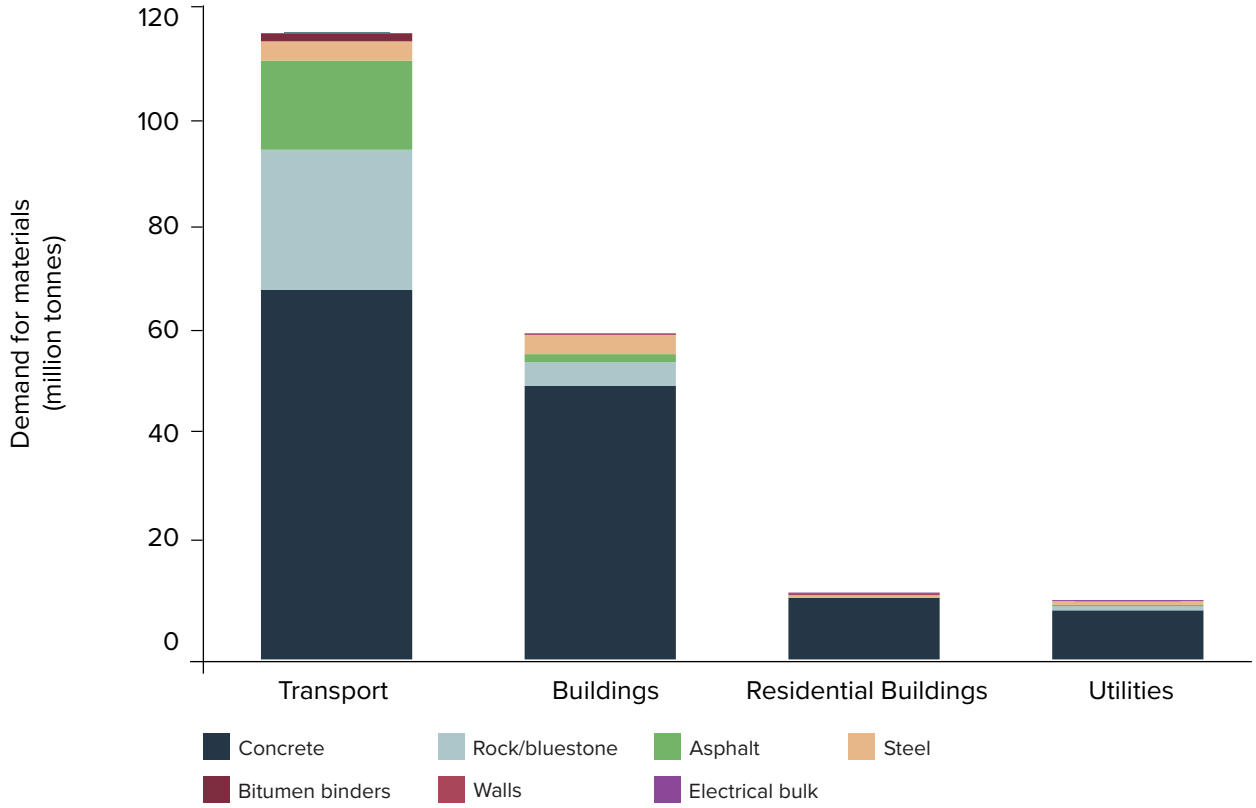
To remove the impact of pipeline size, we analysed materials required per $ million to normalise data and understand material requirement per sector. In doing so, we observe that steel is another material that is critical to delivery shared cross all sectors.

To deliver $100 million of investment, we need:

- 64 tonnes of steel for other buildings
- 44 tonnes for utilities
- 28 tonnes for transport
- 23 tonnes for residential buildings.

Asphalt and rock/bluestone are materials heavily needed for transport projects and non-residential building types. Wall materials (bricks, plasterboard, timber) on the other hand are unique to residential buildings.

Figure 9: Demand for materials from the Major Public Infrastructure Pipeline by sector (2023–24 to 2027–28)



Most businesses report capacity as being the same or worse than last year, and a third expect work will increase in the next two years

When it comes to industry's assessment of current market capacity compared to the previous year, 64% of surveyed building and construction businesses felt it was the same, 26% believed it was worse and 6% felt it is 'not as challenging' as last year. There were no significant variations in responses across industry subsectors or size of contracts delivered.

When looking two years ahead, approximately 40% of surveyed businesses expect capital project activity to stay about the same as current levels, with almost a third (32%) believing it will increase and a fifth (22%) believing it will decrease.

By sector, more businesses in the utilities and transport sectors (over 40%) anticipate an increase in activity levels over the next two years than other sectors (housing, mining and commercial). A smaller proportion (32%) of residential-construction businesses expect activity levels to increase compared to 42% expecting activity to stay the same. These responses are slightly at odds with the pipeline-demand data that shows growth in residential buildings investment and a decrease in transport investment over the forward estimates compared to the previous years' projections.

The market observes a 'two speed' economy with demand driven by Queensland and falling in the New South Wales and Victoria

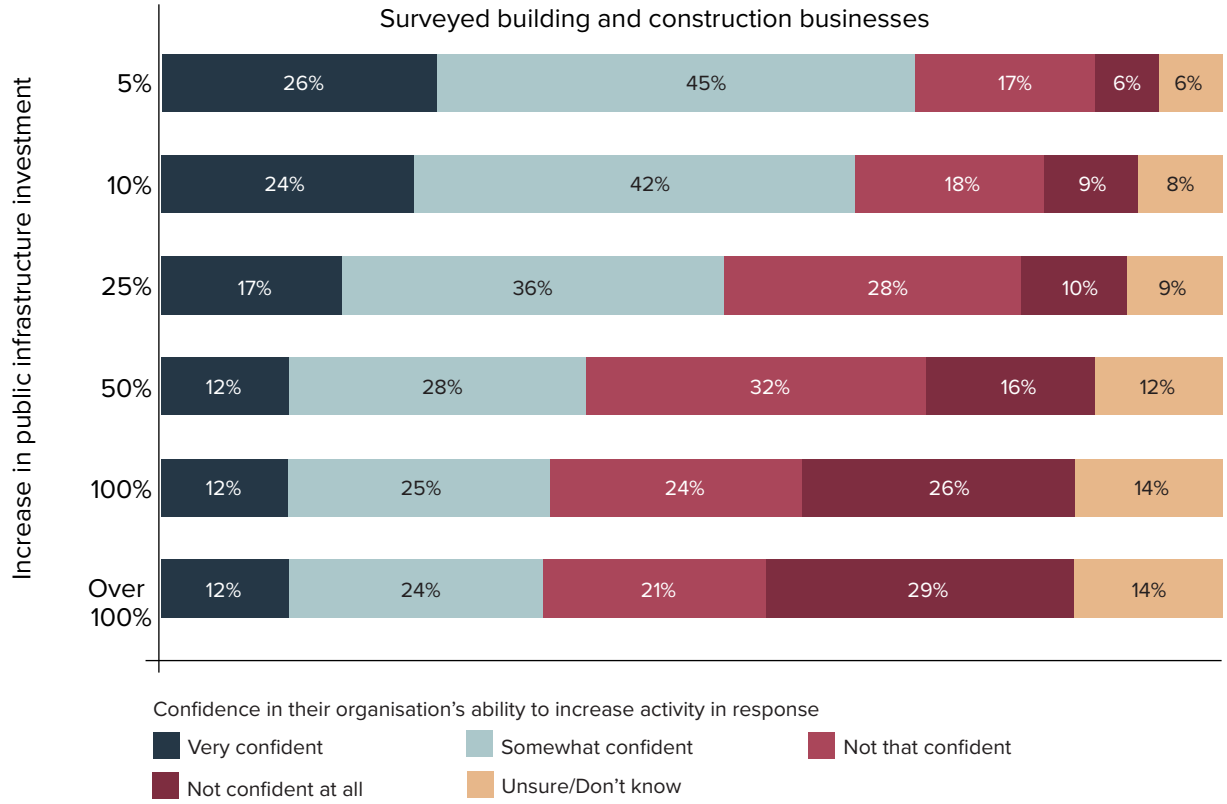
Industry notes diverging pipeline pressures in different states, observing many active or large infrastructure projects planned in some states such as Queensland, while in New South Wales and Victoria, government spending has reduced, and pipelines are lengthening.

These views align with Infrastructure Australia's analysis of the Major Public Infrastructure Pipeline over the forward estimates, with more subdued overall demand compared to previous projections characterised by weaker investment in east-coast states and growth up north.

Industry is confident to scale up operations moderately, with residential sector least confident to scale up

As shown in **Figure 10**, when asked to rate their confidence to scale up in response to increased investment in public infrastructure across a few growth scenarios (scale up by 5%, 10%, 25%, 50%, 100% or over 100%), most businesses believe they have the capacity to scale up to meet increased activity to a degree. Over half (53%) were very or somewhat confident in their ability to scale up their activity by 25%. However, confidence to push beyond this then starts to drop with 40% of businesses confident to scale up their activity by 50%, and 37% confident to scale up by 100%.

Figure 10: Confidence of building and construction businesses in their ability to increase activity to meet increased public infrastructure investment



Source: Infrastructure Australia Industry Confidence Survey (2024)

Consistently, businesses in the mining sector reported highest confidence to scale up, followed in order by the utilities, transport and commercial sectors. Businesses in the residential construction sector reported the lowest confidence levels to scale up. This suggests the residential construction sector is experiencing more significant capacity constraints of all construction sub-sectors.

Businesses delivering larger contracts have greater confidence to scale up. Across all growth scenarios, companies delivering contracts over $100 million are more confident to scale that those delivering contracts between $10 million and $100 million. Companies delivering contracts less than $10 million in value have consistently less confidence to scale up than the two prior-mentioned groups.

Of those surveyed among the Civil Contractors Federation's member base, representing a majority smaller Tier-3 businesses, nearly a third (31%) reported that if there was an increase in the number of projects tendered in their respective state, they could take on between 10–25% extra work. This is compared with a little over a fifth (21%) who said they could take on between 25–50% more work. Where these members suggest they have extra capacity to take on additional projects, nearly 80% said they could take on the most work in rural and regional areas, compared to 64% who reported capacity to take this extra work within metropolitan areas.

During interviews, businesses also noted the current economic environment, including inflation, rising costs and interest rates, as a challenge affecting project viability and profitability, which in turn is impacting on overall capacity.

2. Non-labour supply

This section provides an assessment of non-labour demand and supply. It includes an overview of supply risks for key construction materials, as viewed by industry, and a snapshot on the status of key materials, plant and equipment supply this year.

Following from the recommendation made in the *2023 Infrastructure Market Capacity Report to "undertake analysis of domestic steel production and fabrication capacity...to strengthen and support sovereign supply chain capability and grow new capacity for future industries"*, we provide a deep dive on domestic steel fabrication capacity using data provided by the Australian Steel Institute.

The section concludes with industry views of non-labour supply issues, collected from our 2024 industry surveys and interviews.

Key points

- The cost of construction materials continues to remain high with most materials experiencing year-on-year growth for three straight years. However, the rate of growth appears to have eased over the past twelve months, driven largely by drops in the price for some steel products.
- Industry reports price escalation of non-labour inputs over the last 12 months of about 10–20%, and believe prices are yet to peak.
- Concrete and steel, the construction materials most in demand, are vulnerable to cross-sector competition in the event of supply shortages.
- An analysis of Australia's steel fabrication capacity shows that over two thirds of domestic capacity is located across New South Wales, Queensland and Victoria. The Northern Territory, with less than 1% of national steel-fabrication capacity while requiring 7% of demand, will be the most challenged to source local supplies and rely heavily on imports.
- Less is known about domestic capacity to supply steel fabrication needed for renewable energy projects, which requires specialised components that are typically imported, nor the roads infrastructure needed to transport large equipment, such as wind turbines, from supply source (domestic or imports) to project site.
- Improved visibility of demand against local supply of key construction materials gives the market a clearer understanding of gaps and opportunities. This enables industry to expand capacity to support planned infrastructure delivery and achieve net-zero targets via new growth areas such as green steel and recycled materials.

Boost non labour supply – future directions

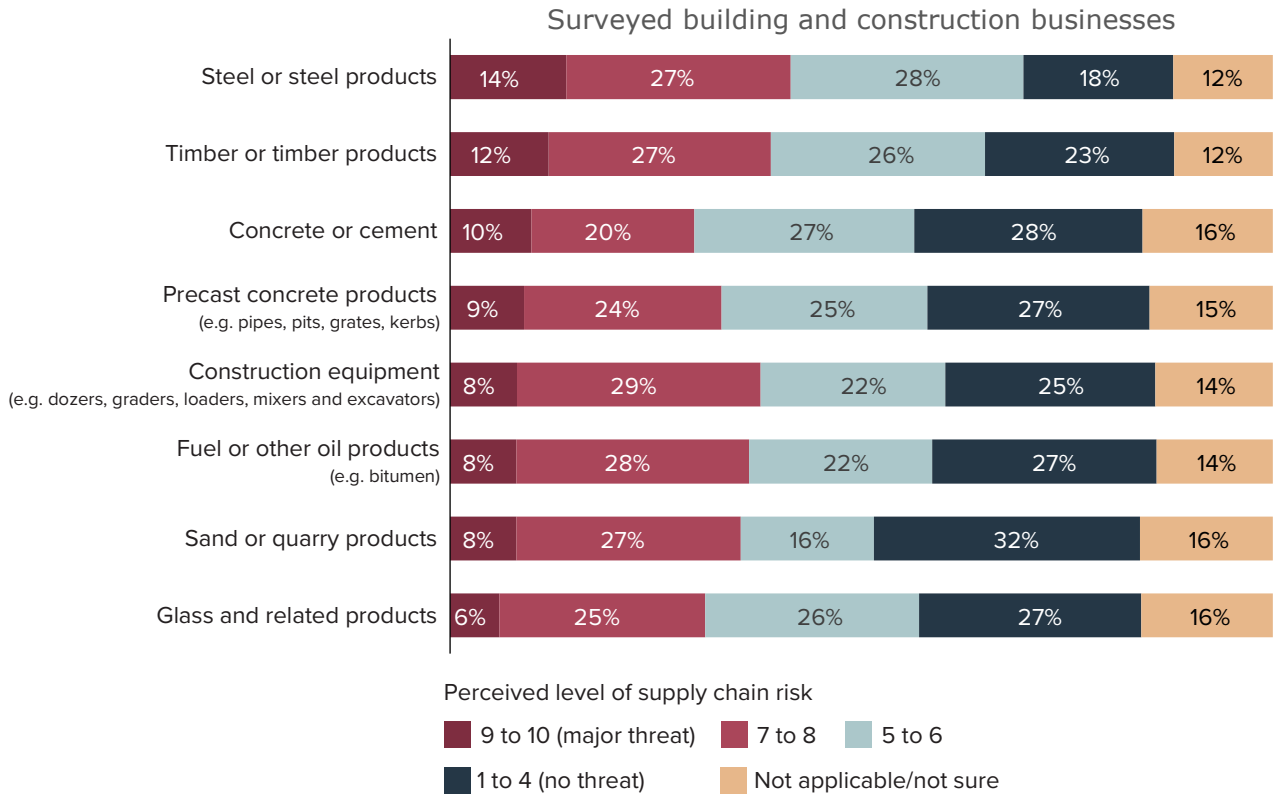
The Australian Government, in partnership with state and territory governments, should continue to expand construction non-labour supply through:

- improving **monitoring local production capacity** of key construction materials. This could include industry collaborations such as the work done with the Australian Steel Institute for this report.
- exploring opportunities to **coordinate national demands** for specific materials or equipment facing strong global competition and long lead times in light of the energy transition and the enabling infrastructure needed to deliver it.

Supply of steel and timber cited by industry as being a critical delivery risk this year

Businesses surveyed as part of the 2024 Industry Confidence Survey regarded most materials as posing some level of supply-chain risk. As shown in **Figure 11**, steel and timber supply were most often cited (rated as 9-out-of-10 or 10-out-of-10 risk by 14% and 12% of surveyed businesses, respectively), followed by concrete/cement and construction equipment as posting a threat to project delivery.

Figure 11: Views of building and construction businesses on materials supply threats to infrastructure projects delivery



Source: Infrastructure Australia Industry Confidence Survey (2024)

Table 3 provides a snapshot of key construction material, plant and equipment supplies in 2024.

Table 3: Key construction non-labour supply – 2024 insights

Construction material/ plant and equipment	2024 insights and implications
Steel and steel fabrication	Steel product prices have dropped this year, driven by a combination of factors, including weakening global demand, increased production capacity, and fluctuations in raw material costs (such as for iron ore).[5] Imports of steel products, particularly specialised ones like stainless steel and tool steel, remain significant (see **Figure 16**). A majority of surveyed local steel fabricators and manufacturers (86%) report reduced profit margins due to cheap imported fabricated steel, which is priced between 15% and 50% lower than locally produced steel (as reported by the Australian Steel Institute survey conducted in in July 2024). Reliance on imported steel exposes construction projects to risks related to fluctuating prices, transport costs, and potential supply disruptions.
Quarry products	Some governments have taken measures to address quarry supply risks. The Victorian Government has ramped up approvals for new quarries to meet growing infrastructure demands and aims to stabilise supply and reduce costs, with 300 million tonnes of new quarry resources approved for development.[6] Queensland quarry demand and supply risks report indicates that demand for hard rock and sand can be met by reserves in existing quarries.[7]
Concrete	Concrete production depends heavily on quarry product availability. Stricter sustainability standards and environmental regulations could lead to higher concrete production costs and potential supply delays.[8] Precast concrete continues to experience long lead times due to high demand, particularly in infrastructure projects.[9] These factors are putting pressure on the availability of concrete for large-scale projects.
Plant and equipment	The construction industry continues to experience delays in securing plant and equipment, driven by high global demand and geopolitical issues. Ongoing supply-chain bottlenecks are expected to extend lead times for essential equipment, affecting project timelines. The Australia construction machinery market size is expected to reach USD 3.29 billion by 2029, growing at a compound annual growth rate of 3.35% during 2024–2029, indicating supply responses to demand pressures driven by increased infrastructure investment.[10]

Construction material/ plant and equipment	2024 insights and implications
Timber	Australia's timber supply is facing significant challenges due to the combined effects of regulatory changes and environmental risks. Logging in native forests is set to be banned in Victoria and Western Australia in 2024, and a court action to halt logging is currently underway in Tasmania and New South Wales.[11] This is further reducing the availability of hardwood timber, pushing Australia to rely more on imports.[12] Hardwood from Australia's native forests is typically made into flooring, decking, window frames, beams and joists.[13] Hardwood can be replaced with more expensive composite wood alternatives.[14]
Cement	Cement production remains under pressure due to rising energy costs and stricter environmental regulations, which have forced some local cement plants to scale back operations or shut down.[15] This has led to an increased dependence on imported clinker and other materials necessary for cement production. The global cement market is also experiencing disruptions due to geopolitical tensions and trade restrictions, which are affecting the availability and cost of imports. Price of cement products increased 2.4%, driven by fibrous cement products (3.3%), linked to increase in costs in labour, energy and freight inputs.[16]
Plasterboard	The plasterboard industry faces rising energy costs, which are increasing production costs. No significant supply issues are currently reported, but higher energy expenses are expected to impact the price of plasterboard.[17] The industry is also beginning to face increased demand for sustainable products, which may require additional investment in innovative technologies and processes.
Bitumen	The global bitumen market is expected to grow from $53.66 billion in 2023 to $56.23 billion in 2024 at a compound annual growth rate of 4.8%.[18] Australia's reliance on imported bitumen continues to pose risks, especially as global oil markets face volatility due to geopolitical tensions and environmental regulations.

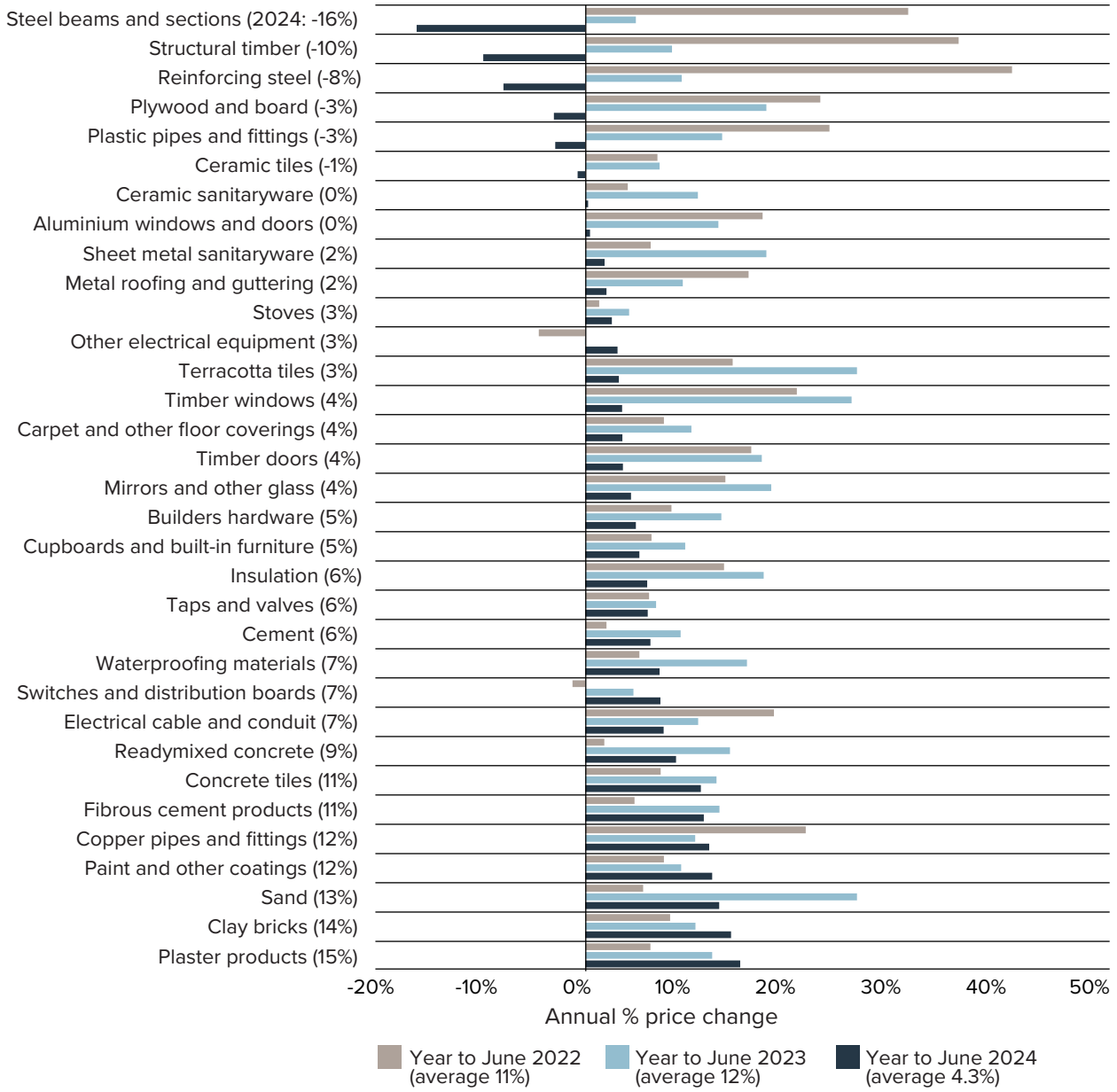
Cost of materials still increasing but at lower rate

The cost of construction materials continues to remain high, with the majority of materials experiencing year-on-year growth for three straight years. However, the rate in which these materials have grown has largely eased over the past twelve months, with average annual price growth for all materials being 8% lower than in 2023 (average growth of 4.3% in 2024 versus 12% in 2023).

As shown in **Figure 12**, while this slow down in price escalation was felt across the board, it was largely driven by large drops in the price for steel beams and sections, and reinforcing steel, which decreased over the year by 16% and 8%, respectively. For these materials, this is a notable shift in the annual changes in the prices Infrastructure Australia observed in 2022, when the prices for these materials had increased beyond 30%. There were, however, some outliers to the broader trend for this year, with clay bricks, coating, and electrical products experiencing significant increases.

Some of these material cost escalations are being driven by conflicts in Ukraine and the Middle East, which are disrupting international supply chains. The conflict in the Middle East, for example, has seen disruptions to shipping routes, which are adding substantial costs to the transportation of materials. However, overall the increases in costs are stabilising and becoming more predictable, especially as Australia continues to move past the post-COVID-19 period.

Figure 12: Annual % input price changes for house construction materials (2021–22 to 2023–24)



Source: Australian Bureau of Statistics (2024)[19]

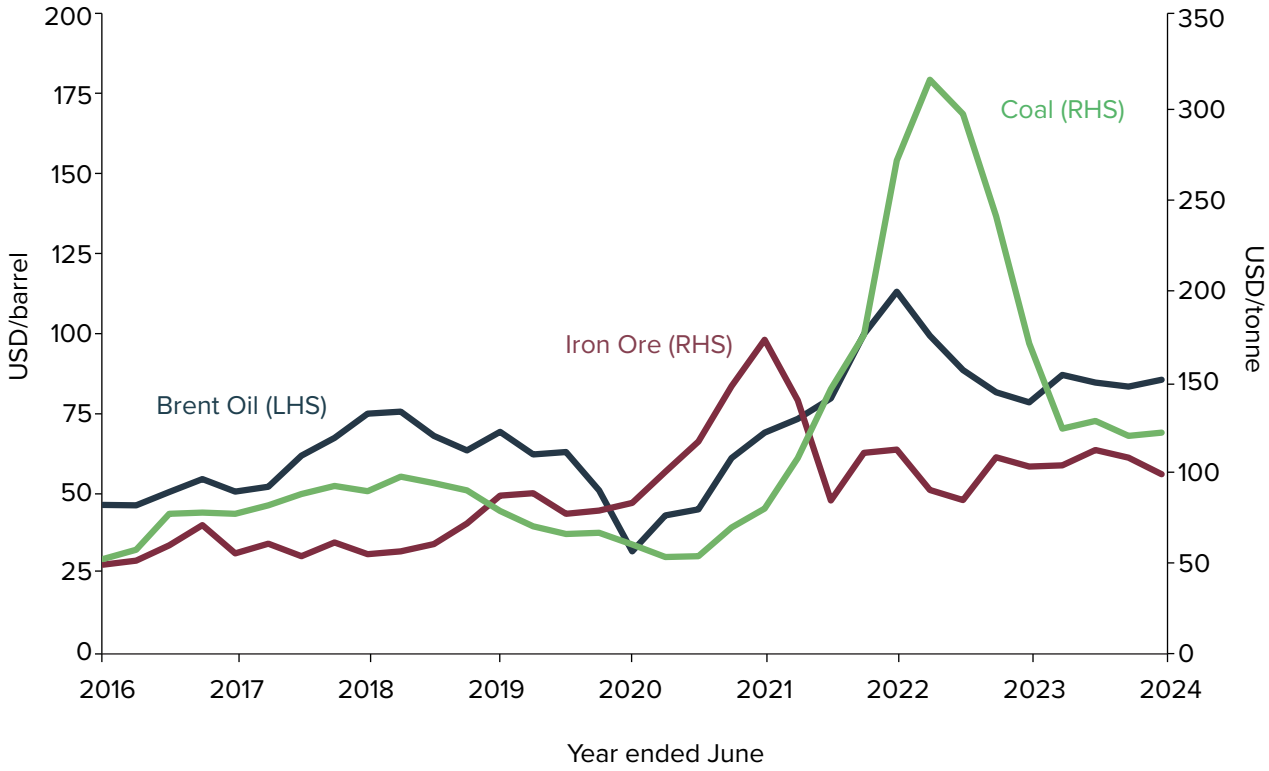
Prices of imported materials have been stable over the last 12 months

Over the past 12 months, the prices of oil, coal and iron ore have continued to fluctuate. While these prices are expected and not unusual, these fluctuations were not as extensive as they were in previous years.

When compared with the nature of the price fluctuations in 2021, 2022 and 2023, the prices for these materials throughout 2024 can be described as being much more stable. That is, they did not experience such wild swings in price points, which were caused by the COVID-19 pandemic, the start of the conflict in Ukraine, and renewed geopolitical tensions and conflicts within the Middle East. These events saw significant disruptions to supply chains and demand. For instance, conflict in the Middle East, especially disruptions to shipping routes in the Red Sea, has driven up shipping costs as companies are forced to reroute, resulting in longer and more expensive journeys.

Additionally, there is strong demand for materials such as iron ore from China, driven by the country's significant infrastructure boom. As conflicts in Ukraine and the Middle East persist, along with global demand for materials, these factors will continue to influence material prices. However, this impact is likely to be more predictable than what has been experienced in the past. **Figure 13** shows minimal change in the price of imported oil, iron ore and coal over last 12 months, following periods of greater variability.

Figure 13: Changes in oil, coal and iron ore prices (2016 to 2024)

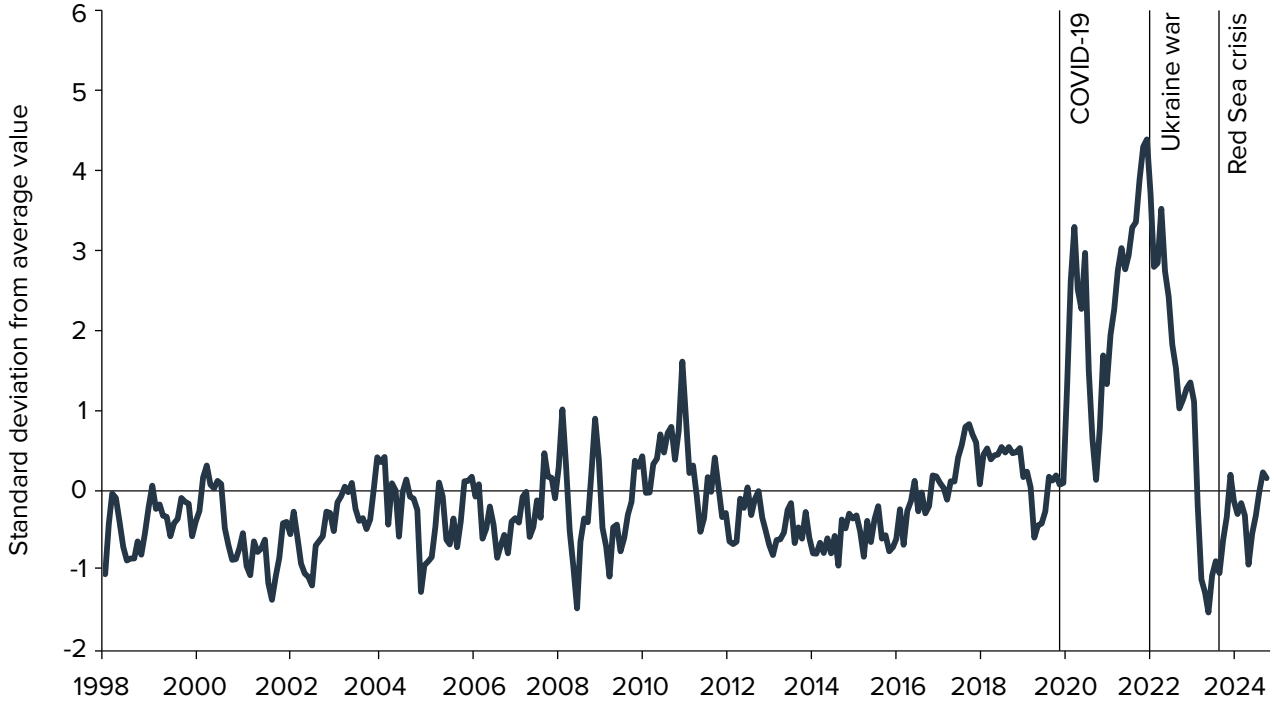


Source: Department of Industry, Science and Resources (2024)[20]

Freight schedules and costs were impacted by global supply chain disruptions

Events such as conflicts in Ukraine and the Middle East continued to disrupt global supply chains earlier in 2024. **Figure 14** shows their impact on the Federal Reserve Bank of New York's Global Supply Chain Pressure Index.

Figure 14: Global Supply Chain Pressure Index including key events (1998 to 2024)



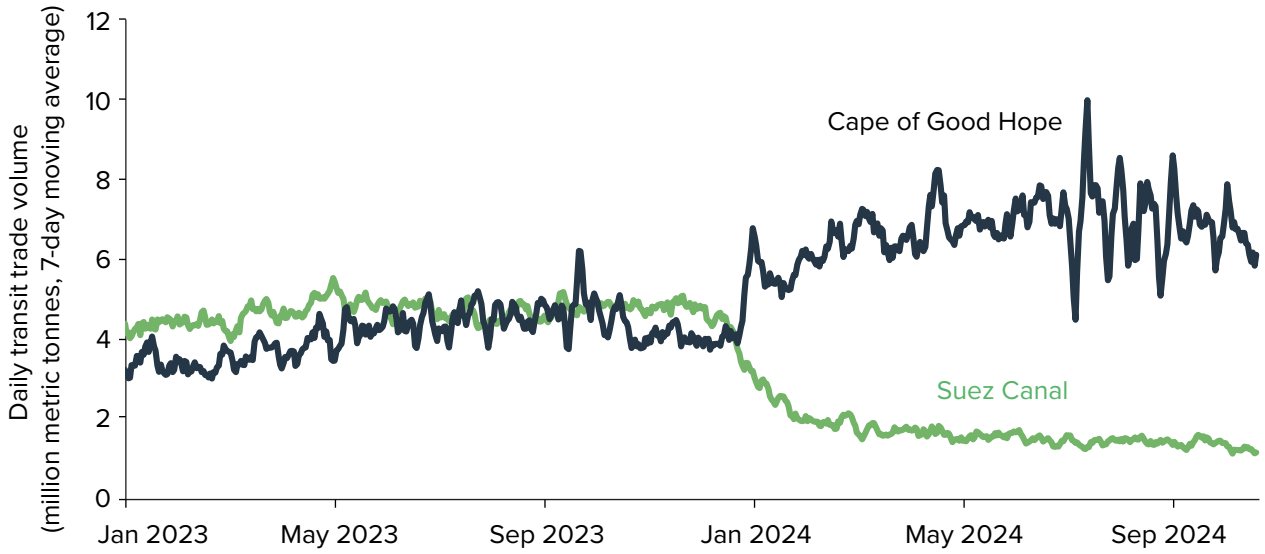
Source: Federal Reserve Bank of New York (2024)[21]

In January and February, conflict in the Red Sea had a major impact on key global trade routes. As shown in **Figure 15**, trade volumes through the Suez Canal – the crux of Europe and Australasia's shortest maritime route – were 50% lower than in 2023. As a result, trade levels surged around South Africa's Cape of Good Hope due to re-routed freight.

Cost impact: The Australian Bureau of Statistics links a 1.2% rise in water freight (shipping) prices to the Red Sea conflict, while noting the increase followed six consecutive quarters of price drops.[22]

Schedule impact: The average journey time of rerouted freight was 26 days, which is 19 days (55%) longer than average equivalent freight trips through the Suez Canal.[23]

Figure 15: Daily transit trade volumes for Suez Canal and Cape of Good Hope (January 2023 to October 2024)

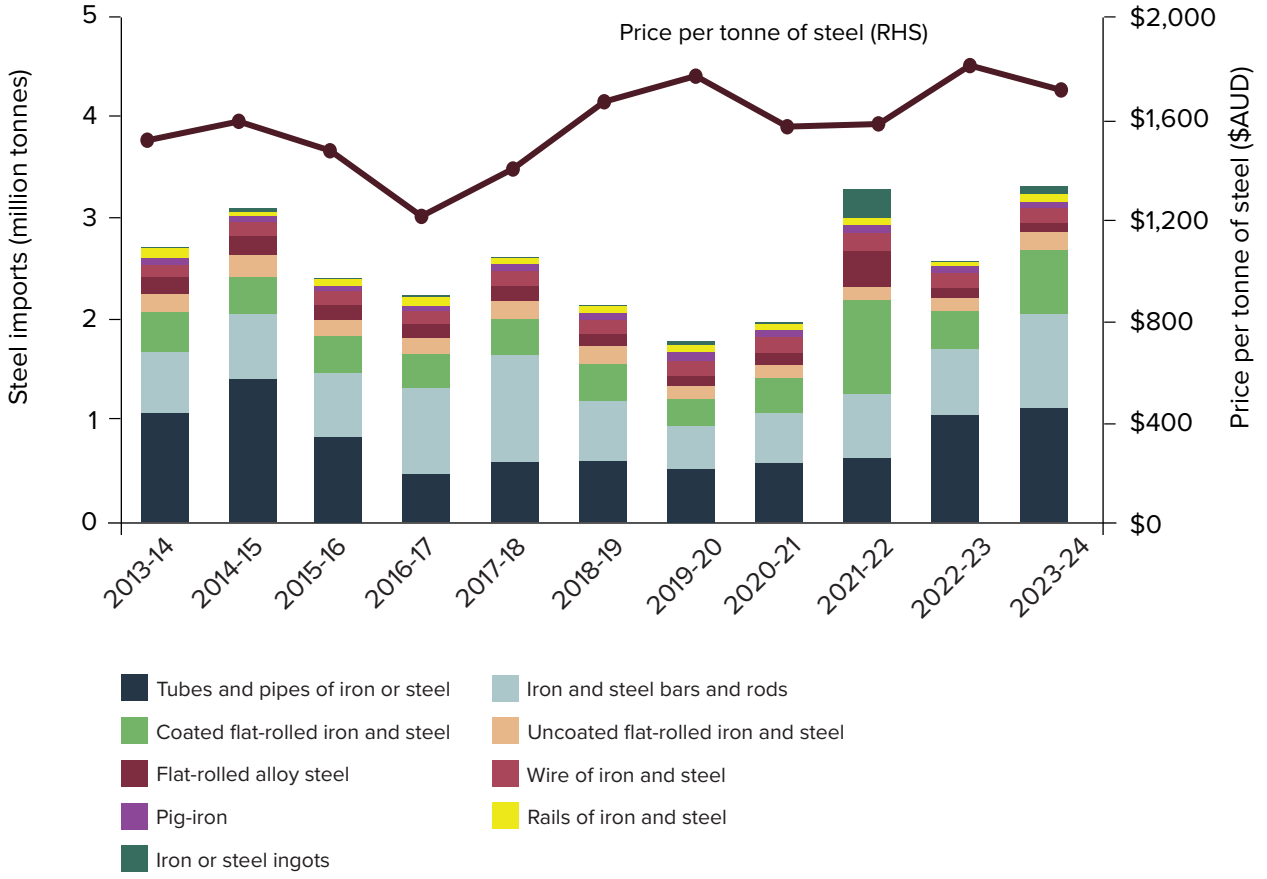


Source: International Monetary Fund Port Watch (2024)[24]

Imported steel is fulfilling local demand for products that are not manufactured anywhere in Australia

In Infrastructure Australia's *2023 Infrastructure Market Capacity Report*, we noted a 20% increase in steel imports over the previous two years compared with the past two decades. It is evident that this reliance on imports has continued with specialised products such as stainless steel and tool steel,[25] and **Figure 16** shows an increase in overall steel imports in 2023–24. Over the same period, steel prices have decreased due to a combination of factors such as lower global demand, greater global production capacity and changing raw material costs, such as for iron ore.[26]

Figure 16: Steel imports by type compared to price of steel (2013–14 to 2023–24)



Source: Australian Bureau of Statistics (2024)[27]

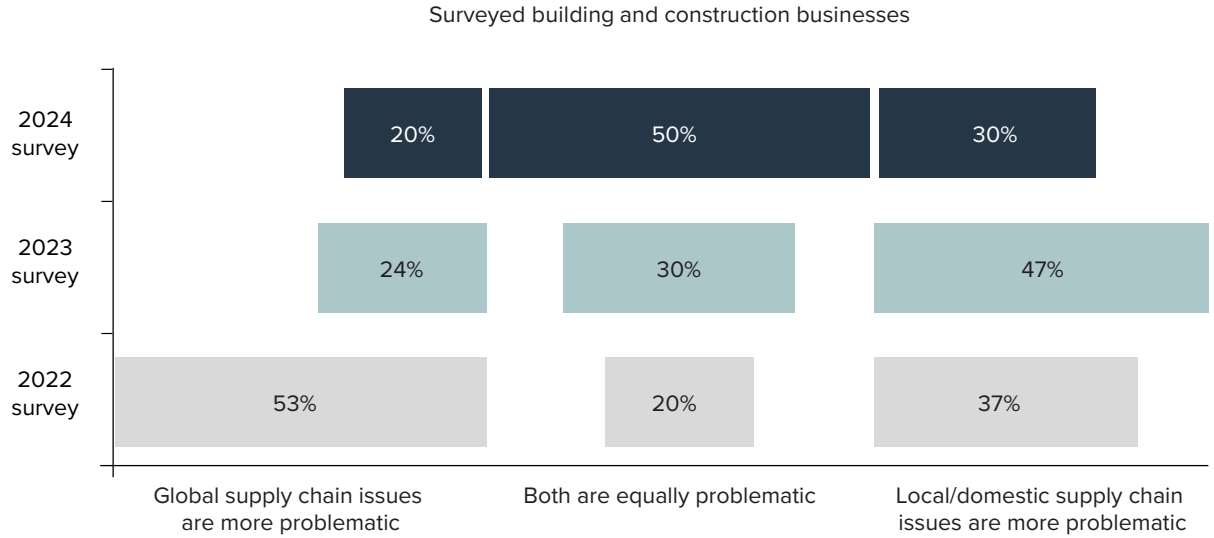
Industry is cognisant of both global and domestic risks to supply

Infrastructure Australia has been tracking industry's sentiments, through the Industry Confidence Survey, for four years. As shown in **Figure 17**, there have been shifts in how industry assesses domestic versus global supply risks over that time.

In 2022, just over half (53%) of building and construction businesses surveyed thought global issues alone were responsible for supply-side risks, while 37% thought it was domestic issues and 11% thought it was due to both. In 2023, industry's opinion switched to viewing domestic factors being the predominant source. This year, half of respondents regarded both global and domestic supply chain issues being equally problematic, compared to 30% who viewed domestic and 20% who viewed global supply-chain risks as being more problematic.

The Russian invasion of Ukraine and the impacts of the COVID-19 pandemic on global supply chains in the preceding years may have elevated industry's assessment of global risks in 2022. This year, industry is aware of the impacts of both global and domestic supply risks to their business. This aligns with our observations on the need to balance reliance on imports with domestic production capability to mitigate supply risks of key construction materials.

Figure 17: Views of building and construction businesses on whether global or domestic supply chain issues are more problematic, changes over 2022 to 2024



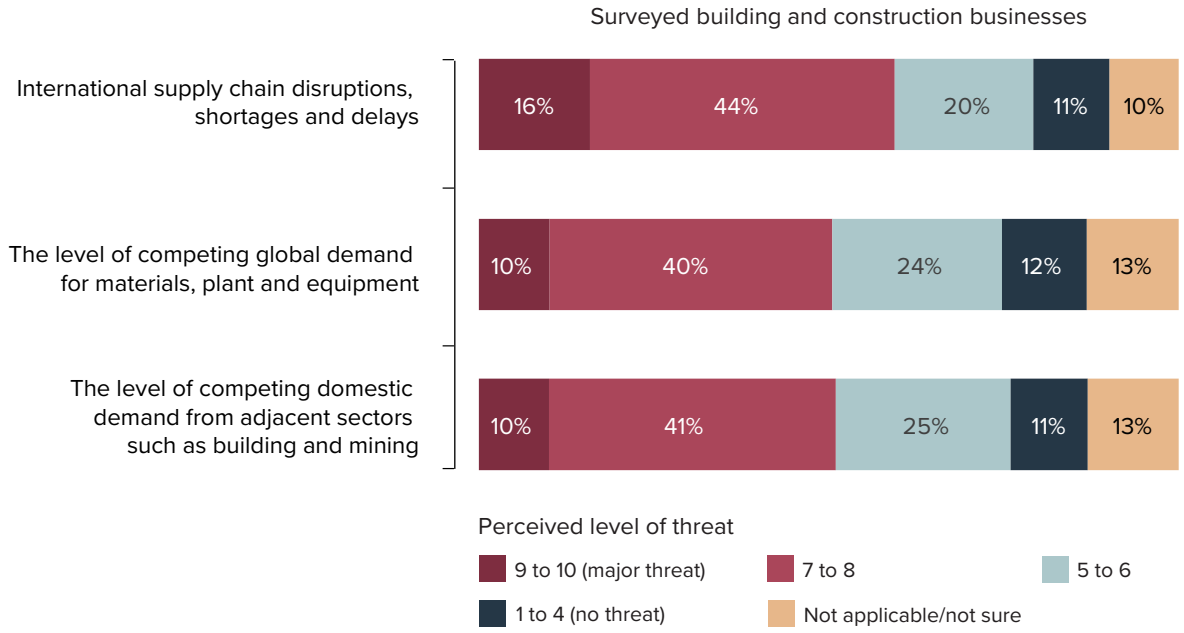
Note: These figures exclude 'not sure' responses.

Source: Infrastructure Australia Industry Confidence Survey (2022, 2023, 2024)

Figure 18 presents industry views on the main risks in sourcing global supplies for infrastructure project delivery. Industry regarded international supply-chain disruptions, delays and shortages as the highest threat (60% ranked as a threat, including 16% as a major threat).

Competing domestic demand from adjacent sectors (such as building and mining) and competing global demand were both regarded by industry as relatively similar levels of threat to the global supply chain (50–51% ranked both as a threat, including 10% as a major threat).

Figure 18: Views of building and construction businesses on the threat level of global supply-chain risk factors to successful delivery of infrastructure projects in Australia



Source: Infrastructure Australia Industry Confidence Survey (2024)

Businesses have noticed a 10–20% price escalation of non-labour costs over the last 12 months and believe prices are yet to peak

62% of surveyed businesses noted an increase in price escalation in terms of non-labour costs over the last 12 months. The vast majority (62%) of industry surveyed noted the increase in price for non-labour resources this year. Of those that noticed this increase in costs, 64% reported a 10–20% increase.

Many believe a peak in non-labour costs is still yet to come. In fact, 43% say that prices are increasing at an accelerating rate, whereas 36% believe they have been doing so at a steady rate.

Looking specifically to those surveyed within the Civil Contractors Federation membership, the largest group (45%) said they had noticed an increase of between 10–25% in the cost of project inputs. Only 18% noted an increase of more than 25%. However, these figures reflect respondents' views of both labour and non-labour inputs combined, not solely materials.

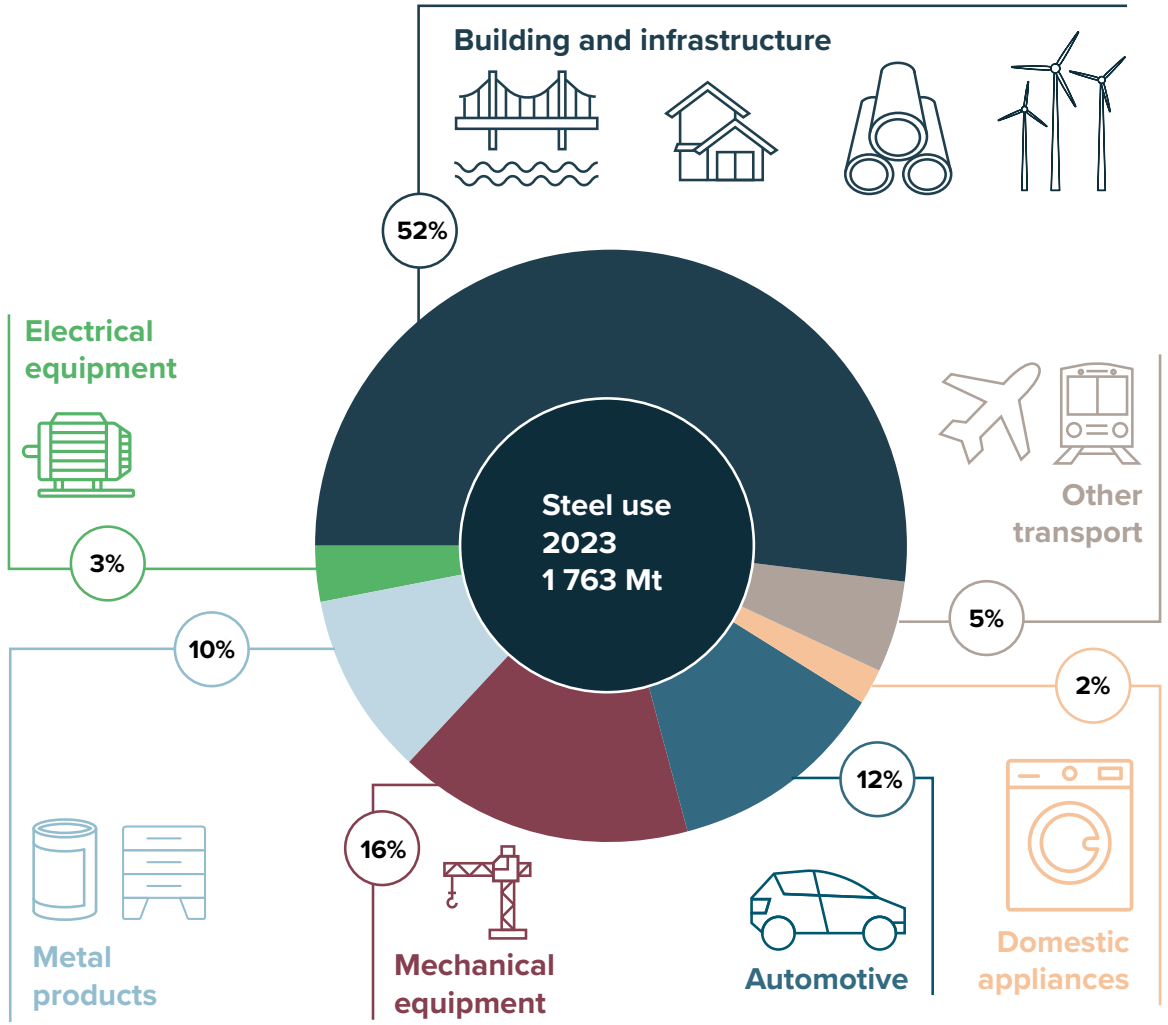
These industry perceptions on cost increases are largely consistent with Infrastructure Australia's analysis of the Australian Bureau of Statistic's price index data,[28] which shows that non-labour inputs are 80% higher now than in 2010–11.

Spotlight: Steel and steel products

Australia needs 8 million tonnes of steel to deliver the pipeline of public and private sector construction projects over the next five years.

Steel is a critical input of transport, energy and other infrastructure projects, and a critical construction input overall. As shown in **Figure 19**, over half the world's annual steel output (52%) was used within buildings and infrastructure.

Figure 19: Global steel use by sector



Source: World Steel Association (2024)[29]

Imported steel and global supplies

The global steel industry, producing over 1.8 billion metric tonnes of steel annually, is dominated by a few major producers: China (the largest), India, Japan, the United States and Russia.[30] Australia plays an important role in the global steel supply chain, by mining and exporting iron ore and coking coal for steel production.

Local Australian steel output is supplemented by imported steel, some of which is critical for project success, particularly finished-steel products that are not manufactured in Australia, such as stainless steel and tool steel. Over 2013–14 to 2023–24, Australia imported approximately 2.5 million tonnes of steel a year.

Using imported steel in local construction can expose projects to risks inherent to global resourcing, such as price fluctuations, greater competition, supply-chain disruptions, product quality variances and local compliance modifications.

Additionally, embodied carbon emissions of imported steel can create uncertainty, add complexity and compromise Australia's measures and efforts in decarbonising the infrastructure sector.

Domestic steel production

With an estimated output of 5.3 million tonnes annually, Australia's steel industry is substantial. There are four major manufacturers of steel in Australia, supported by over 300 distribution outlets and numerous manufacturing, fabrication and engineering companies.[31]

The capabilities of the Australian steel industry include: steel manufacturing, roll-forming, distribution, fabrication, construction modelling, hot dip galvanizing, protective coatings and grating and handrails.

Steel fabrication

Analysis undertaken with the Australian Steel Institute reveals Australia has an estimated steel fabrication capacity of 1.4 million tonnes per year. The domestic steel-fabrication sector is comprised of majority small and medium-size enterprises, many of which are multi-generational family-owned businesses.

Whilst some businesses continue to operate as traditional 'jobbing' shops, many have developed specific areas of specialisation and associated capabilities. These include: bridge work, architectural steelwork, refurbishment and maintenance of mining equipment, sheet metal fabrication, chemical-industry infrastructure, civil construction, wind tower fabrication, and portal-frame structures.

Green steel

The Australian Government has identified green metals (including green steel) as a priority industry under its Future Made in Australia National Interest Framework. While Australia is in the early stages of developing facilities with the capacity to produce green steel, it has the potential to reduce carbon emissions from the steel-production process and maximise the economic and industrial benefits of our move to net zero.

The Australian Government 2024–25 Budget commits funding for Green Metals Foundational Initiatives that will explore ways government can stimulate demand, including industry participation frameworks at federal and state levels, which will help define opportunities for the inclusion of green metals in energy, defence, infrastructure and housing projects.[32]

Domestic steel fabrication supply capacity analysis

Australia needs 3.8 million tonnes of fabricated steel structure elements over 2023–24 to 2027–28.. By sector, buildings will require 55% of total demand for fabricated steel, transport 29% and utilities 16%.

Based on data provided by the Australian Steel Institute, we analysed the capacity and location of 296 domestic steel fabricators, representing an estimated 70% of total domestic capacity. As shown in **Table 4**, we estimate these producers have a capacity to produce approximately 939,500 tonnes annually, with over two-thirds (69%) capacity located across New South Wales, Queensland and Victoria.

We note that based on the Australian Steel Institute dataset, there is currently very little capacity in the Northern Territory, at less than 1% of total domestic capacity. However, the Territory will require 7% of national demand.

Table 4: Steel fabrication capacity versus demand, by state and territories

State/territory	Estimated annual capacity (tonnes)	% of total capacity	% of demand
New South Wales	255,000	27%	34%
Queensland	199,000	21%	17%
Victoria	195,000	21%	20%
Western Australia	152,000	16%	9%
South Australia	114,500	11%	6%
Tasmania	14,500	2%	2%
Australian Capital Territory	7,000	1%	2%
Northern Territory	2,000	0%	7%
Australia	**939,500**	**100%**	**100%**

Note: Percentages do not add to 100% due to rounding.

Source: Infrastructure Australia analysis of Australian Steel Institute data (2024)

Delivery of fabricated steel to project sites will be critical for our energy transition

Energy projects will drive the nation's energy and economic transition. As our demand analysis indicates, industry is gearing up to deliver a wave of energy projects over the next five years. Through the Rewiring the Nation program, the Australian Government has committed $20 billion to build and upgrade transmission infrastructure needed to transform the generated energy from renewable sources into electricity and move it across the network to end users.

However, there is a lack of data about Australia's fabrication capacity for specialist components needed in energy projects. Energy projects often need specialist steel components that are imported. For example, components such as lines, transformers and cables are manufactured near bigger markets in Europe and the United States, while transmission towers are imported from overseas and assembled in Australia.[33]

The majority (89%) of planned government-funded solar and wind farms will be built in regional areas. Transportation of supply from source, whether from a local producer or overseas via a port, to the project site will require adequate road infrastructure, co-ordination and careful project staging, especially as equipment such as wind turbine blades can measure up to 70 meters in length and 7 meters in diameter.[34]

Opportunities for industry to work together with Government

One of the 14 recommendations put forward in Infrastructure Australia's *2023 Infrastructure Market Capacity Report* was for an analysis of domestic steel production and fabrication capacity. From a supply-chain-resilience perspective, this could inform broader Australian Government directions to strengthen sovereign capability and identify opportunities to grow future industries where warranted, including green steel.

More information on domestic production capacity of key construction materials could help strengthen the early stages of project planning and design. That is, projects could be planned with local businesses in mind. It could also help foster earlier engagement with the industry, providing more visibility of future demand and encourage businesses to increase capacity accordingly.

Improved visibility of demand against local supply gives the market a clearer understanding of gaps and opportunities to grow. It might also encourage small businesses within close proximity of a proposed project to collaborate and join forces to meet specific project requirements.

One such example of local business collaboration was the construction of Western Sydney Stadium in Parramatta, New South Wales. This was a $360 million project that used 4,500 tonnes of Australian steel sourced by a local supplier, with the exposed local steel fabricated and painted by several Western Sydney businesses. The structure was designed and specified to ensure local steel mills could competitively produce steel, which was then sent to a large group of existing suppliers and fabricators within a 10-kilometre radius of the stadium. The scale of the project and early engagement with these businesses gave them confidence to invest in new equipment and expand their capability to deliver.

Our collaboration with the Australian Steel Institute this year on the analysis of domestic steel fabrication capacity is a starting point to improving awareness of domestic supply capacity of a key construction material. Industry and governments can continue to work together to improve knowledge of demand, mapped against supply capacity, for key construction materials, particularly in national priority areas such as renewable energy.

National uptake of recycled materials

Over the next 5 years, Australia will need over 192 million tonnes of construction materials to deliver planned infrastructure projects. Key materials used in construction, such as concrete, asphalt and steel, produce significant embodied carbon emissions throughout their lifecycle. Buildings and infrastructure are directly responsible for almost one-third of Australia's total carbon emissions and indirectly responsible for over half of all emissions.[35]

In 2022, Infrastructure Australia estimated that based on current technology and standards, approximately 27% of the conventional material tonnage needed to deliver 998 road projects across Australia between 2015–31 could be replaced with a range of recycled materials.[36]

This year we have estimated the current (2022–2023) national uptake of three recycled materials used in construction to replace conventional materials:

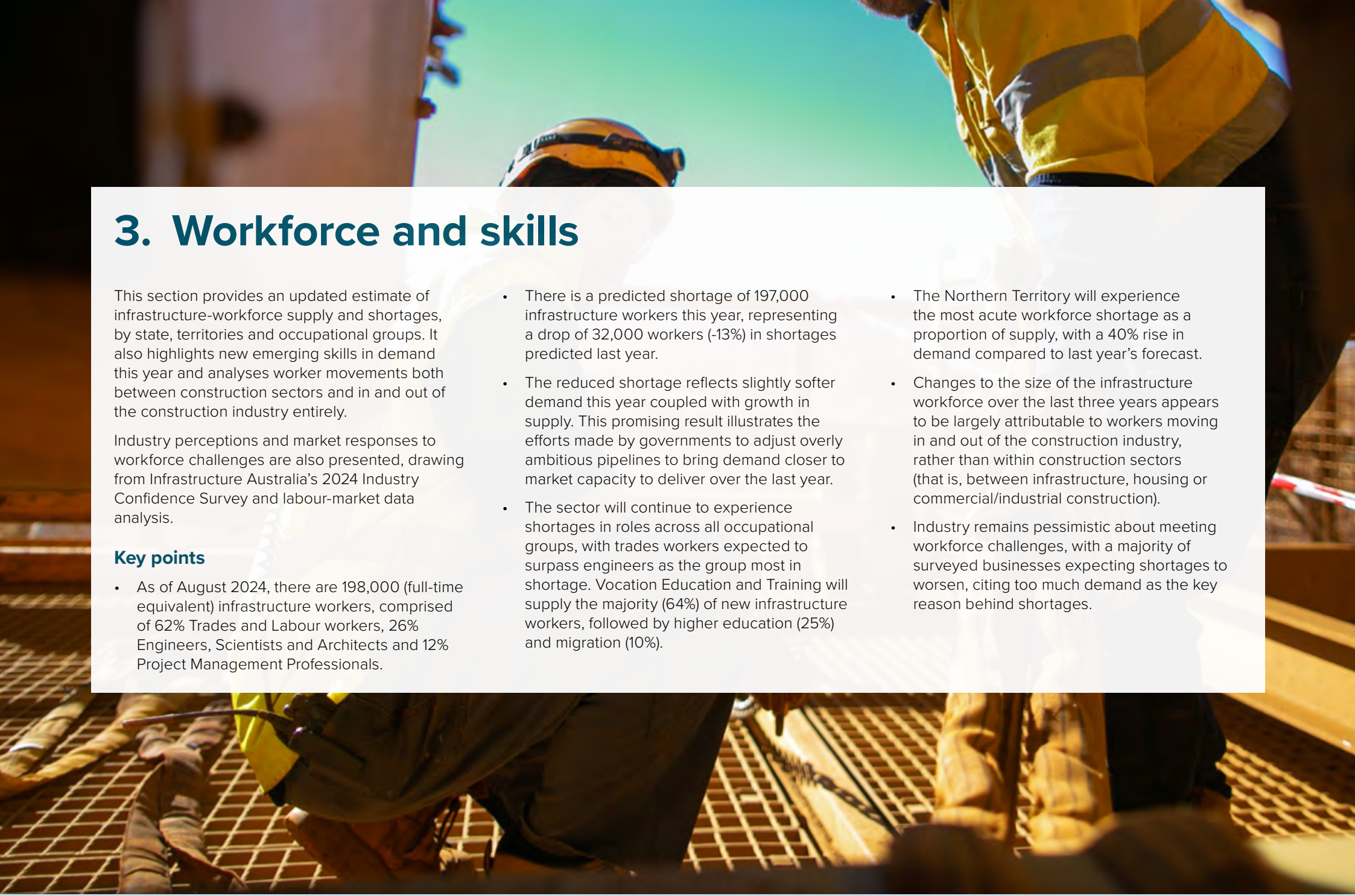
- 13.9% supplementary cementitious materials – used to replace cement in concrete mixes across buildings, transport, water and energy infrastructure.
- 9.3% reclaimed asphalt pavement – used to replace asphalt in pavements for different road classes.
- 1.5% recycled crushed concrete – used to replace aggregate in road pavements.

These estimates were derived from uptake rates captured as part of our *Embodied Carbon Projections for Australian Infrastructure and Buildings* research, released in July 2024.[37] An average uptake rate was calculated for each state and territory by combining rates for each recycled material across different asset classes. These averages were then weighted by demand, using our market-capacity materials demand data for the equivalent conventional material, to generate a weighted uptake rate for each material by jurisdiction. The jurisdiction uptake rates were then aggregated to provide a national uptake rate for each material.

Infrastructure Australia's research highlights the potential of using recycled materials, among other decarbonisation strategies, to lower the embodied carbon produced by the national infrastructure pipeline, but acknowledges that several barriers exist to hinder greater adoption. It is one aspect of a wider range of opportunities to reduce construction emissions to support Australia's net-zero commitments.

Over the last 12 months, we note the Australian Government has taken significant first steps to support industry's continued uptake of recycled construction materials, including:

- Development of the **National Framework for Recycled Content Traceability**, which will give buyers the ability to trace the history, location or source of recycled materials. This initiative aims to boost demand for recycled materials by providing greater awareness of circular economy principles opportunities and increasing buyers' confidence of quality of supplies.
- Agreement with state and territory governments, as part of the renegotiated **Federation Funding Agreement Schedule on Land Transport Infrastructure Projects (2024–2029)**, to optimise their procurement practices to support recycle content uptake on land-transport infrastructure projects.[38]



3. Workforce and skills

This section provides an updated estimate of infrastructure-workforce supply and shortages, by state, territories and occupational groups. It also highlights new emerging skills in demand this year and analyses worker movements both between construction sectors and in and out of the construction industry entirely.

Industry perceptions and market responses to workforce challenges are also presented, drawing from Infrastructure Australia's 2024 Industry Confidence Survey and labour-market data analysis.

Key points

- As of August 2024, there are 198,000 (full-time equivalent) infrastructure workers, comprised of 62% Trades and Labour workers, 26% Engineers, Scientists and Architects and 12% Project Management Professionals.
- There is a predicted shortage of 197,000 infrastructure workers this year, representing a drop of 32,000 workers (-13%) in shortages predicted last year.
- The reduced shortage reflects slightly softer demand this year coupled with growth in supply. This promising result illustrates the efforts made by governments to adjust overly ambitious pipelines to bring demand closer to market capacity to deliver over the last year.
- The sector will continue to experience shortages in roles across all occupational groups, with trades workers expected to surpass engineers as the group most in shortage. Vocation Education and Training will supply the majority (64%) of new infrastructure workers, followed by higher education (25%) and migration (10%).
- The Northern Territory will experience the most acute workforce shortage as a proportion of supply, with a 40% rise in demand compared to last year's forecast.
- Changes to the size of the infrastructure workforce over the last three years appears to be largely attributable to workers moving in and out of the construction industry, rather than within construction sectors (that is, between infrastructure, housing or commercial/industrial construction).
- Industry remains pessimistic about meeting workforce challenges, with a majority of surveyed businesses expecting shortages to worsen, citing too much demand as the key reason behind shortages.

Expand labour supply – future directions

The Australian Government, in partnership with state and territory governments, should continue to expand construction labour supply by:

- continuing to strengthen the **long-term pipeline of new graduate entrants** from the tertiary sector (Vocational Education and Training and higher education), supplemented by **skilled migrant intakes** to fill immediate skills and worker shortages.
- progressing actions under the BuildSkills Australia **2024 Workforce Plan**.

Infrastructure construction workforce update

The infrastructure workforce stands at 198,000 and is expected to grow steadily

As of August 2024, there are 198,000 workers engaged in infrastructure across the nation. Between 2020 and mid-2022, demand and supply both increased rapidly. Since then, we observe a temporary dip in supply while demand has continued to rise, leading to more acute shortages over the last two years.

We estimate historical workforce numbers by analysing the Australian Bureau of Statistic's Labour Force Survey and Census data. Our workforce projections are calculated by adding expected workforce entrants from training and migration, minus exits from retirement modelling and applying a population growth factor to estimate supply to 2030. Based on the long-term historical view of supply, we predict the workforce to grow steadily in the future.

Infrastructure Australia has created three occupational groups, and the current workforce can be broken down as follows:

- 62% (122,000) Trades and Labour workers.
- 26% (52,000) Engineering, Scientists, and Architects.
- 12% (24,000) Project Management Professionals.

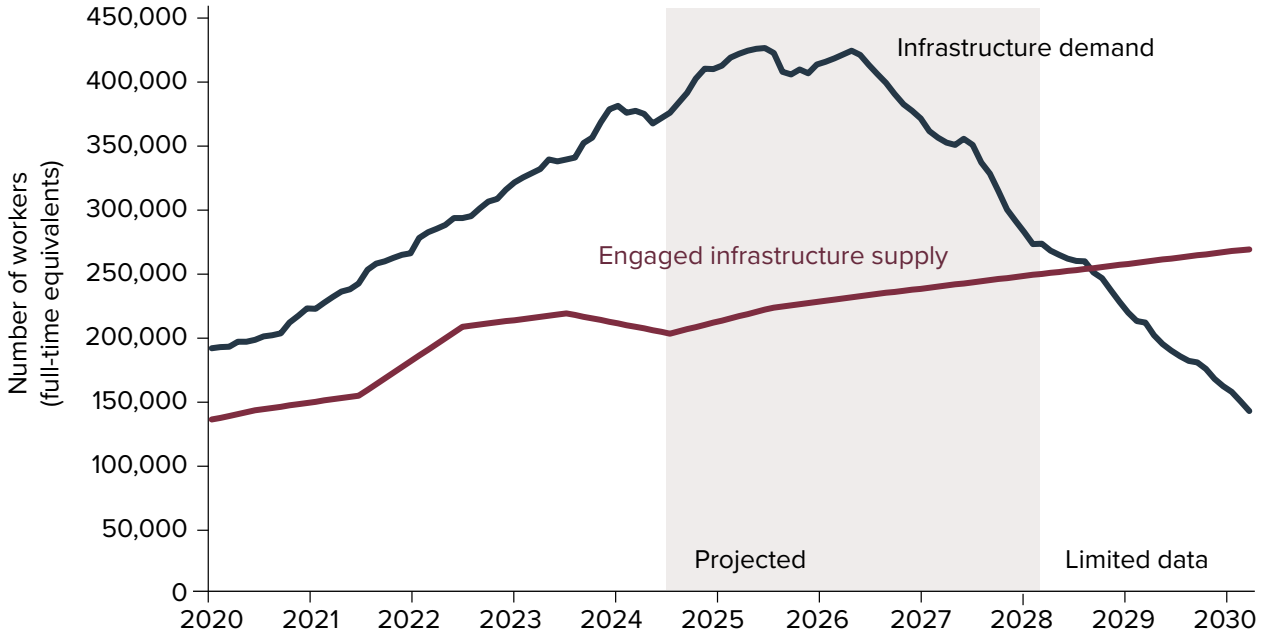
Infrastructure Australia's website hosts the Infrastructure Workforce Skills Supply Dashboard, which presents detailed insights on infrastructure workforce supply, demand and shortages. The dashboard is an interactive tool that allows views of the workforce broken down by state and territory, specific roles, age, and gender. Infrastructure Australia refreshes the Dashboard data annually.

Labour shortages have slightly eased over the next five-year outlook, as governments successfully bring demand closer to market capacity

We estimate a shortage of 197,000 infrastructure workers as of August 2024 – a 13% decrease from the shortage of 229,000 workers predicted last year.

Figure 20 shows the latest projection of demand versus supply over the forthcoming horizon. Compared to last year's projections, peak demand has moved one year out, from mid-2025 to mid-2026. This trend is consistent with observations made in previous years and is likely reflective of planned expenditure being pushed back as the market struggles to deliver on overly ambitious delivery targets.

Figure 20: Demand and supply of infrastructure workers (2020 to 2030)



Source: Nous Group commissioned by Infrastructure Australia (2024)

Shortages are unevenly dispersed across the nation, and are set to increase in regional areas

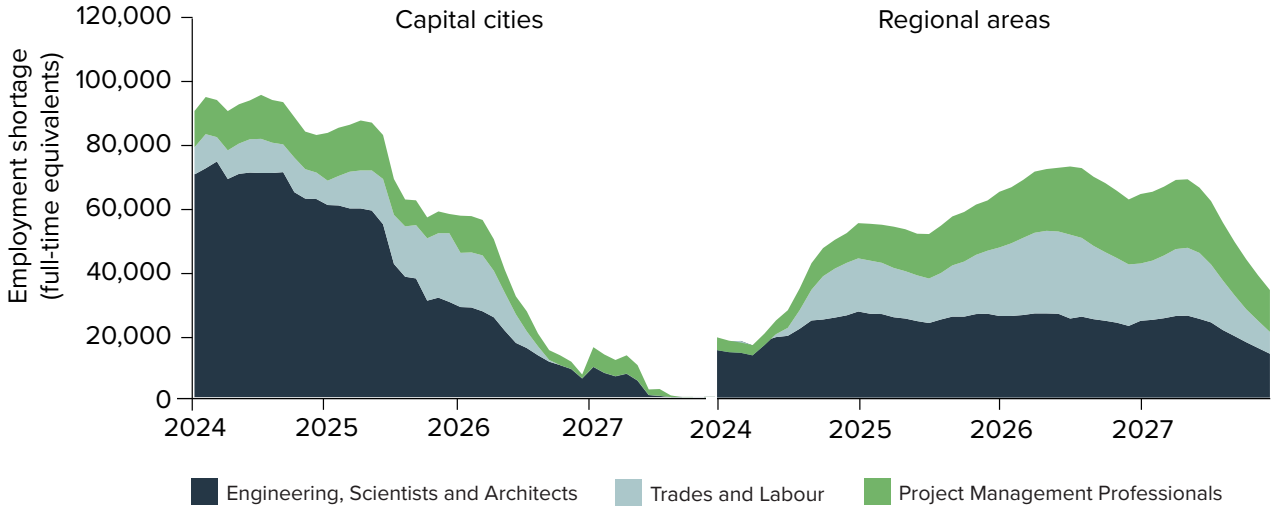
Figure 21 presents a national comparison of shortages across capital cities and in regional areas (outside the Greater Capital City Statistical Areas as defined by the Australian Bureau of Statistics).

Shortages appear to have peaked in capital cities but are projected to rise in regional areas, driven by significant new renewable energy projects announced in the regions with only modest increases in supply projected. It should be noted, however, that the diminishing shortage in capital cities may largely reflect poor pipeline visibility in the years beyond the forward estimates.

While all jurisdictions remain in shortage, these impacts are unevenly felt across the nation:

- Northern Territory, Queensland and Tasmania are experiencing more dispersed demand across cities and regional areas.
- Shortages in New South Wales and South Australia are mostly concentrated in cities.

Figure 21: Labour shortage by occupation group, capital-city areas versus regional areas (2024 to 2027)



Note: This shows shortages only for projects with a known location (those that can be mapped to a specific Statistical Area Level 4 as defined by the Australian Bureau of Statistics) and thus does not equate to total national labour shortage.

Source: Nous Group commissioned by Infrastructure Australia (2024)

As discussed in **Section 2: Understanding Demand**, energy projects are driving the growth in workforce demand over the five-year outlook. The top five occupations needed to deliver energy projects in over the five-year outlook are:

- Other Professional Engineers (those not classified as civil, electrical, industrial, mechanical or production engineers)
- General Construction Labourers
- Electricians
- Plant Operators
- Project Managers.

Chronic shortages will remain across the workforce

Broken down by occupation groups, the 197,000 total workforce shortfall comprises of:

- 111,000 Engineering, Scientists, and Architects in shortage (56% of total shortages). While still the largest group in shortfall, shortages appear to have peaked and will decline from 2025, potentially a reflection of more projects in the pipeline moving past design and planning into the construction phase.
- 29,000 Project Management Professionals in shortage (15% of total shortages). Shortages are expected to increase steadily until mid-2027 to 37,000.
- 57,000 Trades and Labourers in shortage (29% of total shortages). Shortages are expected to climb up quickly and peak in early 2026 to 74,000.

Vocational Education and Training is the biggest source of new entrants into the workforce, followed by higher education and migration

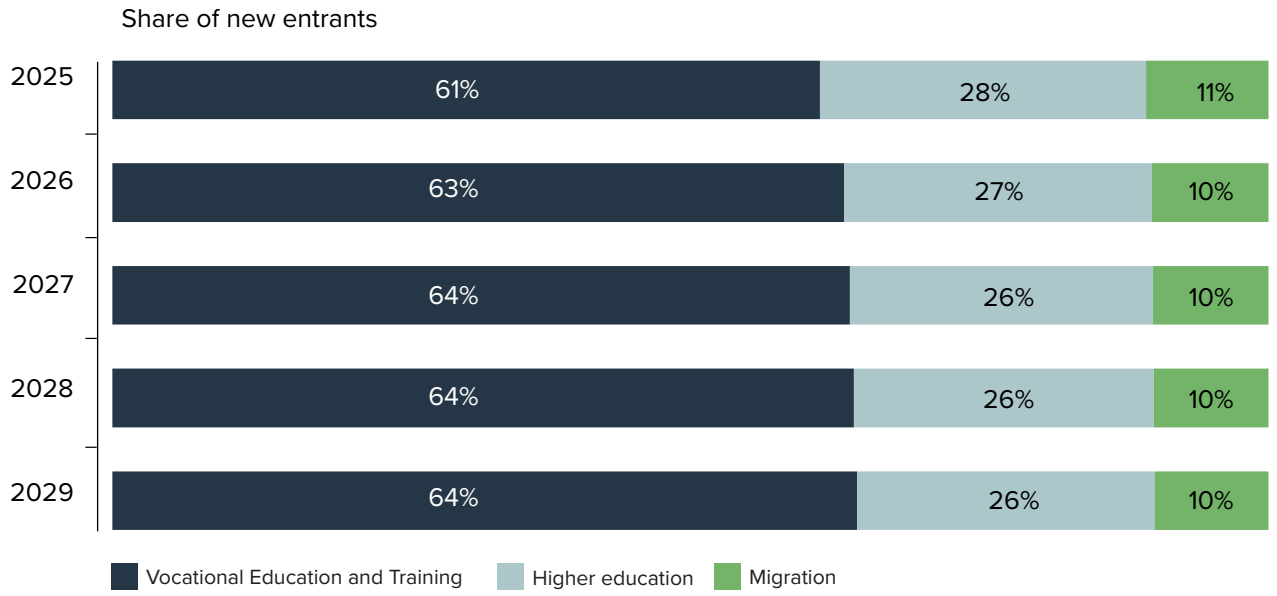
Vocational Education and Training, higher education and migration all play crucial roles to the supply pipeline of workers. **Figure 22** shows a majority (61%) of new entrants in 2025 will come from VET, followed by 28% from higher education and 11% from migration.

Furthermore, the relative share of Vocational Education and Training entrants will grow slightly to 64% in 2029, compared to the share of higher-education graduates which will drop to 26% over the same period. This reflects the evolution of the workforce profile over time as demand for trades workers increase and surpass engineers over the forward estimates.

Looking at skilled migration intake in 2023, Engineers, Scientists and Architects received the largest portion (66%) of visas in the construction industry compared to visas granted to skilled workers in Finishing Trades and Labour (18%), Structure and Civil Trades and Labour (7%) and Project Management (8%).

Given it takes longer to train engineers, scientists and architects than workers in trade and labourers, migration provides a quicker short-term fix to address shortages. However, as noted in the *2023 Infrastructure Market Capacity Report*, many qualified migrant engineers, once on shore, struggle to secure an engineering role due to a range of barriers. Several initiatives are underway by governments working with industry to address this problem, such as Engineers Australia's Global Engineering Talent Program.

Figure 22: Share of new entrant inflows by source (2025 to 2029)



Source: Nous Group commissioned by Infrastructure Australia (2024)

Engineers Australia's Global Engineering Talent Program

The Global Engineering Talent (GET) Program is a program run by Engineers Australia, targeting engineers currently in Australia on a skilled migration visa who are unable to find work or are working in a position not commensurate with their skill and experience level.

It delivers participants with a six-week preparatory course through Engineering Education Australia with engineering standards specific training and a 12-week paid internship at an engineering firm.

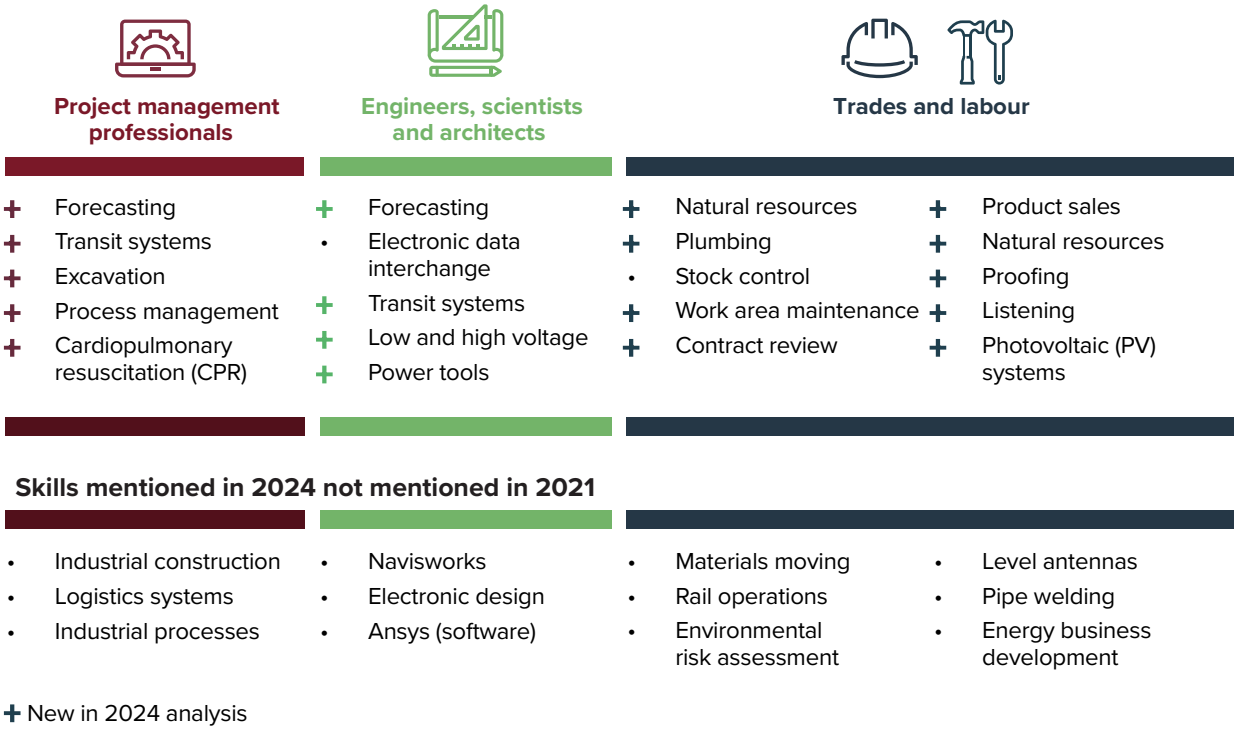
- Throughout 2024, the GET Program saw 21 participants commence across three cohorts from three states (Queensland, Northern Territory and Tasmania). In June 2024, the first cohort completed the program and saw three of the four participants successfully transition into further employment opportunities with their host employers.
- The program has received encouraging and positive feedback, helping Engineers Australia refine the learning component of the program.
- The Queensland Government committed funding for up to 20 participants through its Clean Energy Workforce Roadmap. Similarly, the Northern Territory Government provided funding for 20 participants through their Flexible Workforce Solutions Fund. 17 government and private organisations have successfully been onboarded.
- Engineers Australia continues to work with industry, stakeholders and partners to connect employers with the skills they need now and in the future. Assessment from the pilot shows the initiative could be scaled with further support from the Australian Government.

‘Emerging’ skills continues to vary from year to year

Figure 23 provides a snapshot of the top emerging skills per occupation group with the highest annualised growth in the share of job ads that mention them in 2023–24.

All skills identified, except for two, were not present in the list of top emerging skills last year. As noted in the *2023 Infrastructure Market Capacity Report*, this analysis does not capture the volume of demand, as many of the skills identified would not be in wide circulation or in high demand for some time, if ever. While demand for these newly identified skills is unclear, the speed of their arrival indicate that skill requirements evolve rapidly, and that job designs need time to settle.

Figure 23: Skills with strongest compound annual growth (mid-2021 to mid-2024)



Note: Skills mentioned in 2024 but not in 2021 may not be strictly ‘new’ – they may have appeared in intervening years.

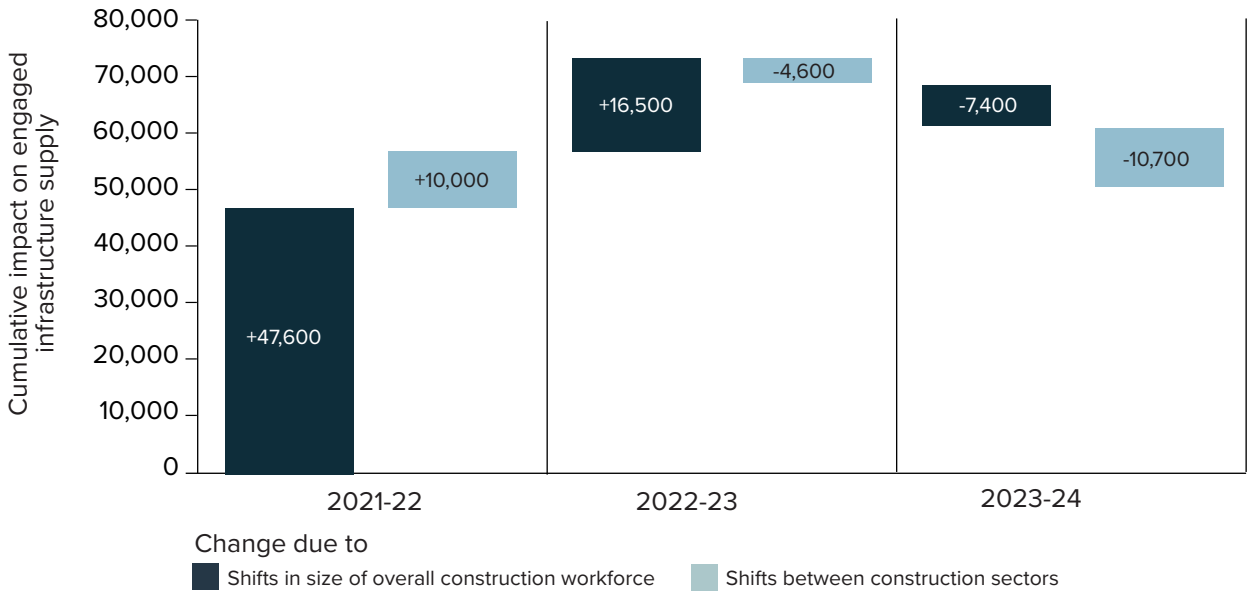
Source: Nous Group commissioned by Infrastructure Australia (2024)

There is scope for greater mobility of construction workers between infrastructure and housing

Infrastructure is a subset of the larger construction labour pool. To better understand the drivers behind worker movements, we conducted an analysis to compare changes that could be attributable to individuals moving between construction sectors (infrastructure, housing and commercial/industrial) and those moving in and out of the construction industry entirely.

Figure 24 suggests changes to the size of the infrastructure workforce appears to be largely attributable to workers moving out in and out of the construction industry, rather than within construction sectors. Over 2021–22 to 2023–24, net gains of 56,700 infrastructure workers entering or leaving construction more broadly overshadowed the net losses of 5,300 workers to adjacent construction sectors. Three in every four of these movements were attributable to 'all of construction' activity, or workers moving in and out of construction, rather than between sectors within construction. As such, all-of-construction trends play a key role in shaping the infrastructure workforce.

Figure 24: Impact of worker shifts within construction sectors and between industries on the infrastructure workforce (2021–22 to 2023–24)



Source: Nous Group commissioned by Infrastructure Australia (2024)

Industry remains pessimistic about how it can address worker shortages

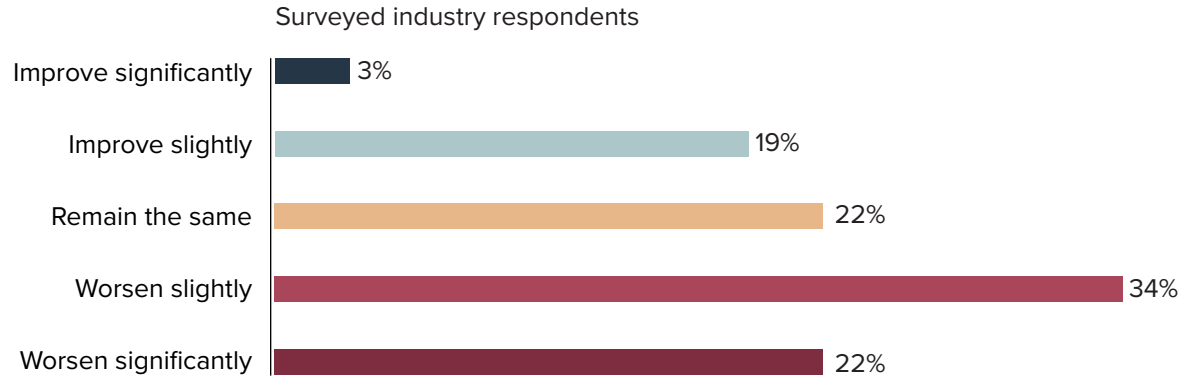
As shown in **Figure 25**, over half (56%) of respondents surveyed in Infrastructure Australia's 2024 Labour Shortage Survey expect the labour market to worsen over the next 1–2 years, while 22% expect shortages to remain the same and another 22% expect an improvement. This supports our analysis that, while workforce shortages have peaked this year due to a flatter demand profile compared to previous years' estimates, industry will continue to struggle to secure the workers as shortages will remain across all occupational groups.

Industry reports that labour shortages have contributed to delays in project timelines, increased workloads for existing employees, and increased costs this year. Fewer respondents, however, noted poor work quality or increased rework as an impact.

76% of surveyed respondents believe that demand growth outstripping supply is the top driver of workforce shortages. Aside from demand growth outstripping supply, industry does not have firm views about other causes for the shortage, with responses shared almost equally across wage, training and retention issues.

These findings reinforce the continued need for a two-pronged approach to alleviating workforce shortages – boosting supply as well as careful demand management.

Figure 25: Industry outlook on how the labour market will change in the next 1–2 years



Source: Infrastructure Australia Labour Shortage Survey (2024)

Businesses can't attract candidates, and may have given up advertising vacancies

Industry reports that the top barriers to hiring the right candidates are poor skills and experience, and difficulty attracting candidates.

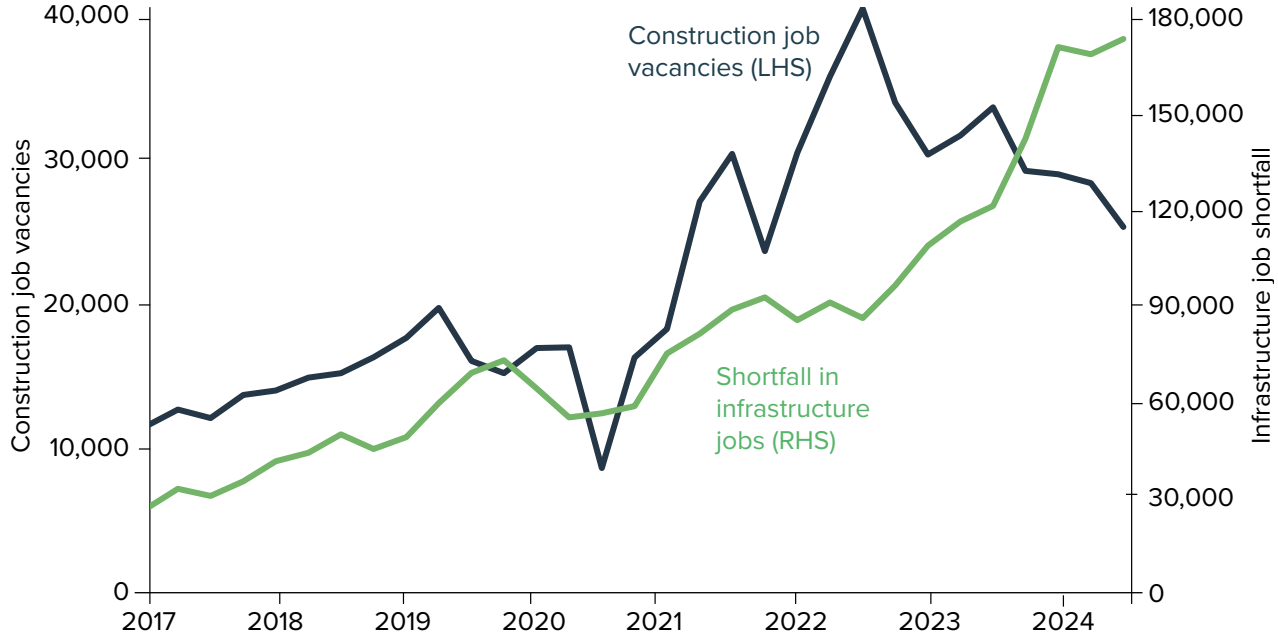
- 81% of businesses report candidates do not have the appropriate skills or experience.
- 42% of businesses couldn't get enough candidates to apply.
- 40% of businesses report candidates did not want the type of work they need filled.
- 40% of businesses report that project locations are not appealing to candidates.

There may be a range of reasons candidates do not have the skills or experience companies are looking for. This includes existing workers needing to be upskilled, learners requiring more on the job training before graduation, or applicants not meeting prequalification requirements set by the government.

Despite ongoing workforce shortages, construction job vacancies have continued to decline

As shown in **Figure 26**, construction job vacancies have dropped from the peak in 2022, despite rising labour shortages from 2021. Within the context of low unemployment and a tight labour market, it may be that industry has given up attempting to recruit workers for what is seen to be less desirable work or locations considering chronic shortages.

Figure 26: Construction job vacancies and shortfall in infrastructure jobs (2017 to 2025)



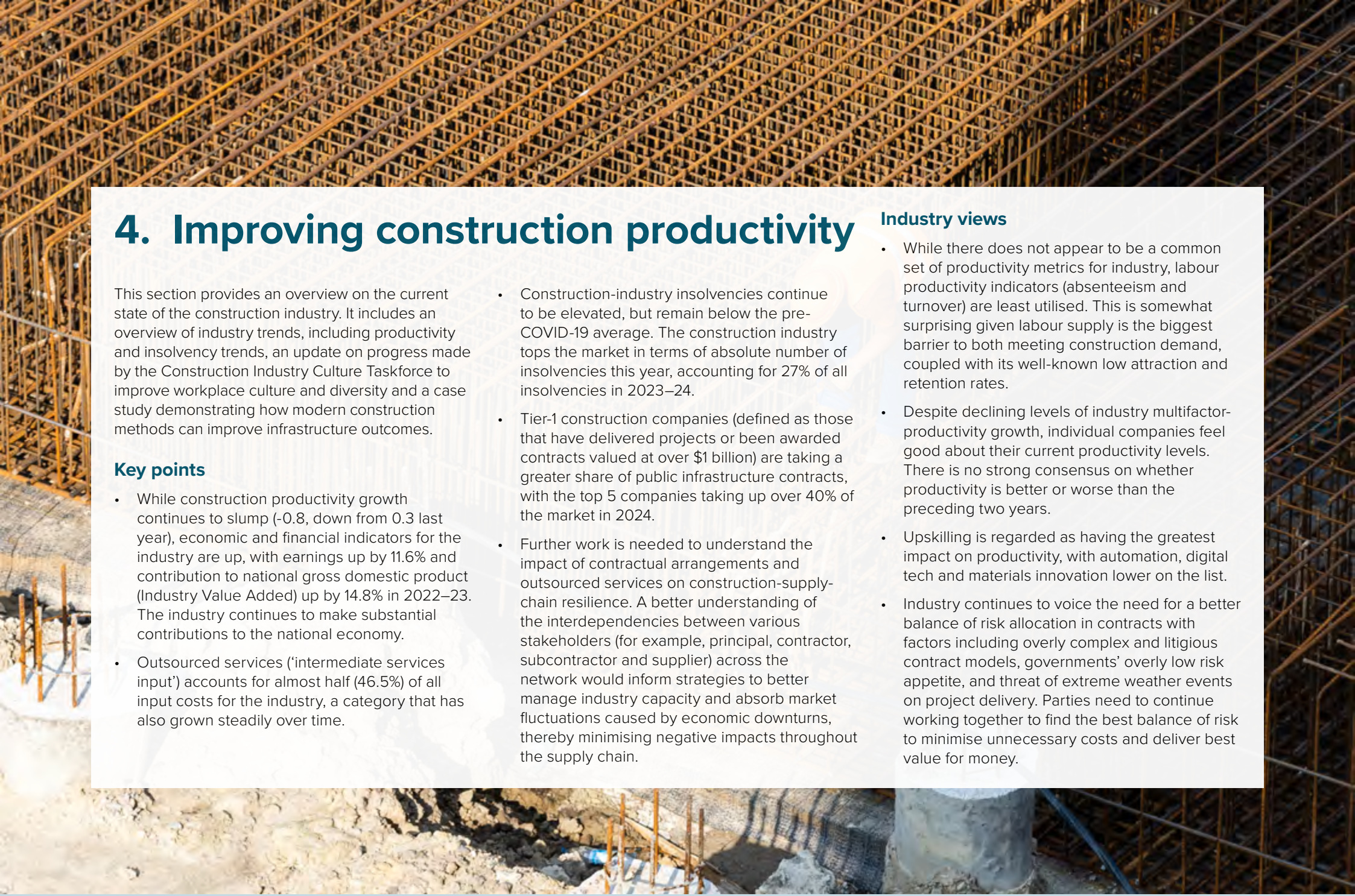
Source: Nous Group commissioned by Infrastructure Australia (2024)

Increasing pipeline certainty enables industry to plan and invest in building capacity

The mix of skilled labour needed on a construction project varies as it progresses from planning to delivery and commissioning. Careful workforce planning and scheduling is necessary to ensure a company hires and retains the workers needed at each right stage of the project life cycle to deliver on schedule. Improving visibility and certainty of the pipeline enables businesses to more efficiently plan labour resources and invest in building capacity.

Consult Australia's 2024 survey of design, advisory and engineering businesses found that in the last 12 months, almost half (46%) of respondents have made resource cuts and more (57%) have redeployed staff to alternative projects due to changes to the government infrastructure pipeline.[39]

Infrastructure Australia's 2024 Industry Confidence Survey found that businesses continue to report pipeline uncertainty as one of the biggest risks to project delivery. Notwithstanding the widespread construction workforce shortages at the national aggregate level, delays or uncertainty at the project level may disincentivise businesses from investing in longer-term workforce capacity building.



4. Improving construction productivity

This section provides an overview on the current state of the construction industry. It includes an overview of industry trends, including productivity and insolvency trends, an update on progress made by the Construction Industry Culture Taskforce to improve workplace culture and diversity and a case study demonstrating how modern construction methods can improve infrastructure outcomes.

Key points

- While construction productivity growth continues to slump (-0.8, down from 0.3 last year), economic and financial indicators for the industry are up, with earnings up by 11.6% and contribution to national gross domestic product (Industry Value Added) up by 14.8% in 2022–23. The industry continues to make substantial contributions to the national economy.
- Outsourced services ('intermediate services input') accounts for almost half (46.5%) of all input costs for the industry, a category that has also grown steadily over time.
- Construction-industry insolvencies continue to be elevated, but remain below the pre-COVID-19 average. The construction industry tops the market in terms of absolute number of insolvencies this year, accounting for 27% of all insolvencies in 2023–24.
- Tier-1 construction companies (defined as those that have delivered projects or been awarded contracts valued at over $1 billion) are taking a greater share of public infrastructure contracts, with the top 5 companies taking up over 40% of the market in 2024.
- Further work is needed to understand the impact of contractual arrangements and outsourced services on construction-supply-chain resilience. A better understanding of the interdependencies between various stakeholders (for example, principal, contractor, subcontractor and supplier) across the network would inform strategies to better manage industry capacity and absorb market fluctuations caused by economic downturns, thereby minimising negative impacts throughout the supply chain.

Industry views

- While there does not appear to be a common set of productivity metrics for industry, labour productivity indicators (absenteeism and turnover) are least utilised. This is somewhat surprising given labour supply is the biggest barrier to both meeting construction demand, coupled with its well-known low attraction and retention rates.
- Despite declining levels of industry multifactor-productivity growth, individual companies feel good about their current productivity levels. There is no strong consensus on whether productivity is better or worse than the preceding two years.
- Upskilling is regarded as having the greatest impact on productivity, with automation, digital tech and materials innovation lower on the list.
- Industry continues to voice the need for a better balance of risk allocation in contracts with factors including overly complex and litigious contract models, governments' overly low risk appetite, and threat of extreme weather events on project delivery. Parties need to continue working together to find the best balance of risk to minimise unnecessary costs and deliver best value for money.

Prioritise productivity – future directions

The Australian Government, in partnership with state and territory governments, should continue to progress national efforts to uplift construction industry productivity through:

- completion of the **National Construction Strategy** and commencement of associated actions.
- investigating the impact of **contractual arrangements and outsourced services** (including labour hire and capital rental) to construction supply chain resilience, thereby identifying drivers to lift performance and productivity.

Key industry trends

Construction industry growth lags the market average this year

As of June 2024, there were 452,820 businesses in operation in the Construction industry across Australia. This is far more than any other industry sector, outnumbering the next largest industry (Professional, Scientific and Technical Services) by over 100,000 businesses.

Over the previous 12 months, the number of construction businesses grew by 2.0%, with 8,900 new entrants. As shown in **Figure 27**, this is 0.8% below the all-industries average, behind comparable sectors such as Transport, Postal and Warehousing (8.5%), Professional, Scientific and Technical services (2.6%), and Electricity, Gas, Water and Waste Services (2.5%), but slightly above Mining (1.5%).

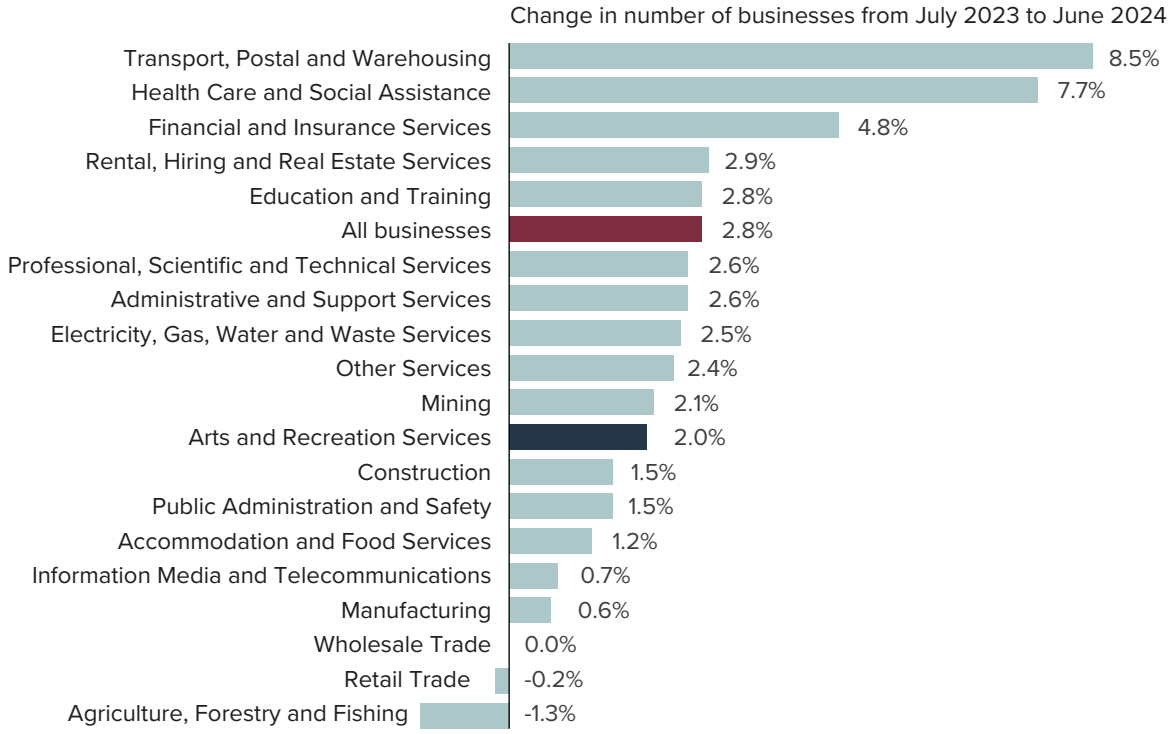
As of June 2023, almost all (98%) construction businesses are small in size, with less than 20 employees.[40]

By employment-share size:

- 44% of the workforce is employed by a micro business (less than 4 employees).
- 21% are employed by a small business (5 to 19 employees).
- 22% are employed by a medium business (20 to 199 employees).
- Only 14% are employed by a large business (over 200 employees).

Over half (55%) of construction businesses turn over less than $200,000 per year.

Figure 27: Change in number of businesses by industry (2023–24)



Source: Australian Bureau of Statistics (2024)[41]

Tier-1 construction companies are increasing their share of public infrastructure contracts

Based on project contract data from Infrastructure Australia's Market Capacity database, we analysed construction companies that have delivered infrastructure projects that are funded publicly or via public-private-partnerships over the last three years.

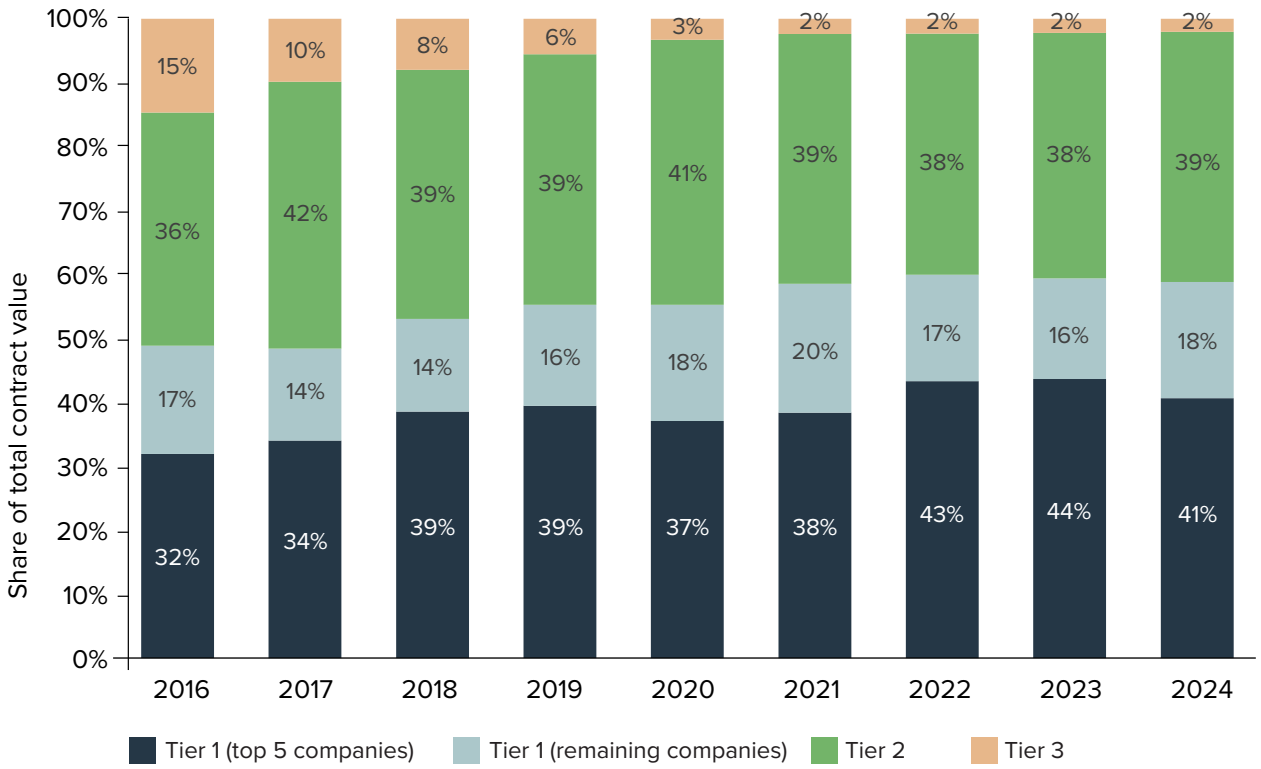
We have segmented the infrastructure construction market by capacity size, as follows:

- **Tier-1 companies:** have delivered or won megaprojects valued over $1 billion.
- **Tier-2 companies:** have delivered on at least one project valued at over $100 million.
- **Tier-3 companies:** representing rest of the market.

Our analysis shows that the value of the infrastructure market has increased substantially in this time and, although lower-tier companies are being awarded more contracts of smaller work, tier-1 companies are undertaking more work of higher-value projects, with increased complexity.

In 2024, there are 25 tier-1 construction companies that meet the above definition. Collectively, as shown in **Figure 28**, the share of the public infrastructure construction market contracts held by tier-1 firms has grown from 49% to 59% since 2016.

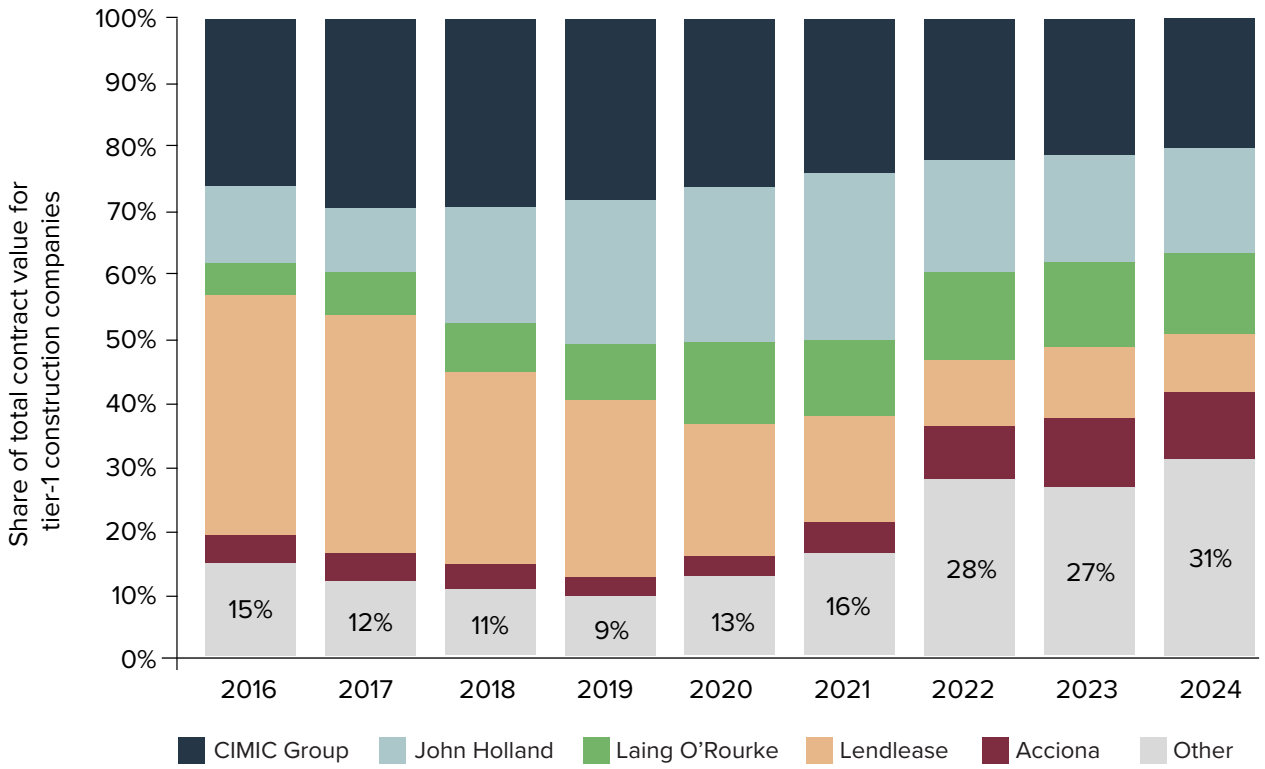
Figure 28: Market share of public infrastructure construction contracts by tier of construction company (2016 to 2024)



Source: Infrastructure Australia analysis of GlobalData (2024)

The top five companies have taken most of the share gains, growing 9% compared to the remaining tier-1 companies, which only grew 1%. As shown in **Figure 29**, the total value of contracts held by the top 5 companies amounts to 69% among tier 1s.

Figure 29: Market share of public-infrastructure contract value by Tier-1 construction companies (2016 to 2024)

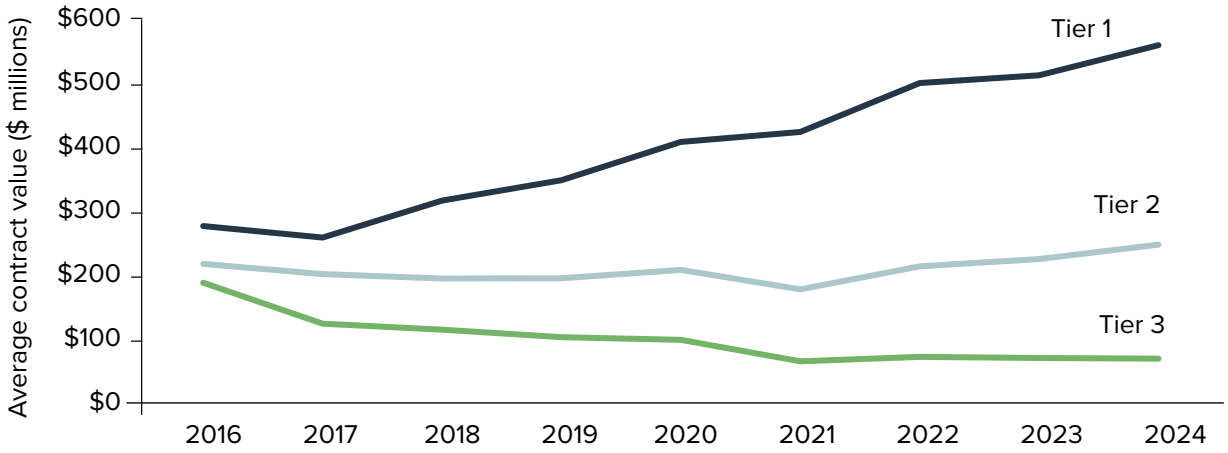


Source: Infrastructure Australia analysis of GlobalData (2024)

While the value of the infrastructure market has increased substantially over time, and lower-tier companies are being awarded more contracts of smaller work, tier-1 companies are undertaking more work of higher value projects, with increased complexity. As shown in **Figure 30**, over the past 8 years, the average value of contracted works undertaken by tier-1 companies have nearly doubled to roughly $600 million in 2024.

Australia finds itself facing a situation where our largest and most important infrastructure projects are increasingly being allocated to large, offshore companies. Australia is therefore competing with other international infrastructure markets for their services. However, if one of these large foreign-owned contracting companies were to exit the Australian market, the impacts would include further concentration of the market, a loss of capability in terms of project delivery expertise and skills, and a loss of capability in terms of fiscal capacity.

Figure 30: Average contract value by tier of construction company (2016 to 2014)



Source: Infrastructure Australia analysis of GlobalData (2024)

Construction industry insolvency rate remains below pre-pandemic levels, but leads the market in the number of insolvencies each year

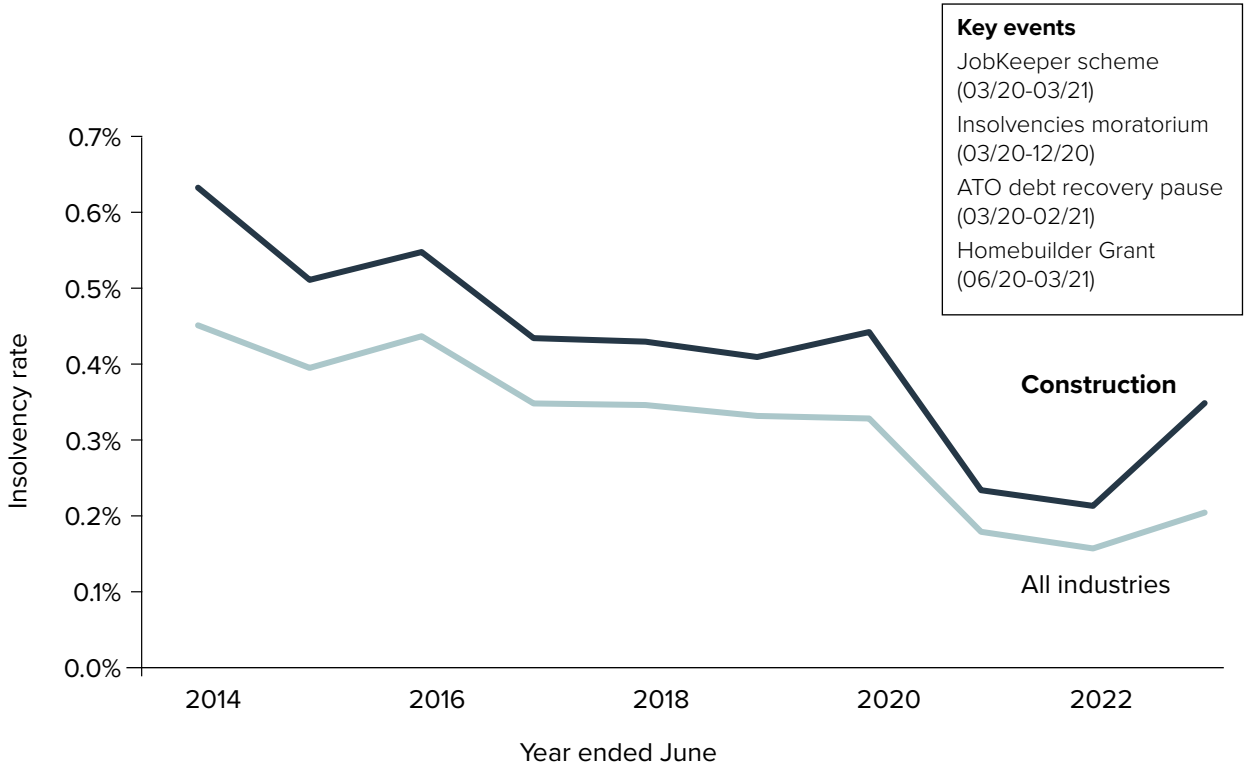
The media has reported on the insolvency of several large construction companies this year, as the economy experiences an uptick of insolvencies across all industries during 2022–23.

This comes off the back of extraordinarily low insolvency rates in the preceding two years (2020–21 and 2021–22). This coincided with key financial relief responses from the Australian Government to the COVID-19 pandemic, including the JobKeeper Payment, the HomeBuilder Grant and the Australian Taxation Office debt recovery pause. These efforts had the effect of artificially suppressing insolvency rates during the pandemic years.

During those years, as shown in **Figure 31**, the construction-industry insolvency rate dropped to a low of 0.21% in 2021–22, less than half the average rate of the previous 7 years (0.48%).

Research indicates that for the construction industry, a substantial portion of corporate insolvencies tend to follow economic downturns.[42] The current rate of construction insolvencies can also be linked to the unintended consequences of monetary policies and government stimulus designed to counteract the effects of the COVID-19 pandemic.[43]

Figure 31: Comparison of insolvency rates for construction against all industries (2013–14 to 2022–23)

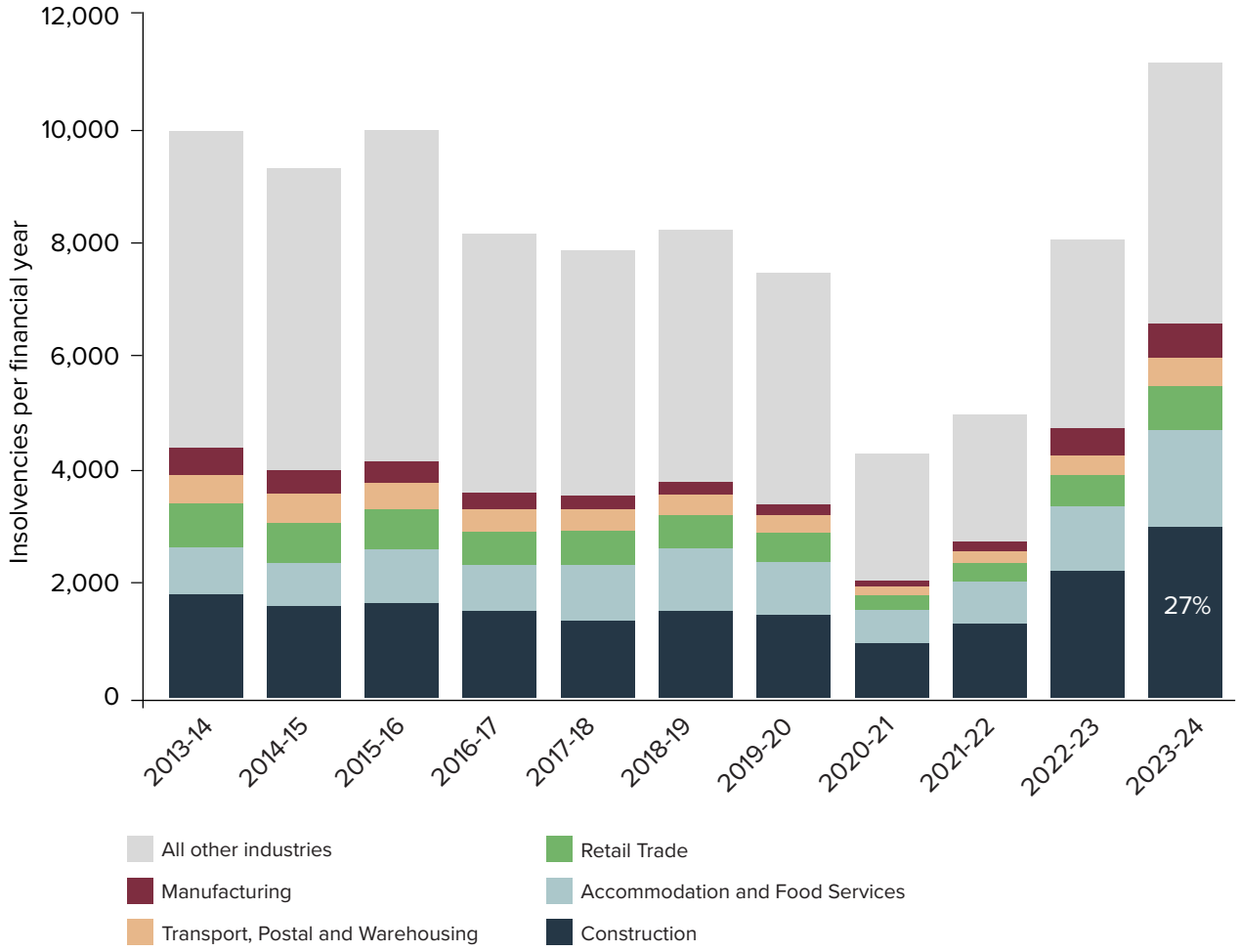


Note: These figures are based on external administrators' and receivers' reports, and on counts of businesses operating at end of each financial year.
Source: Infrastructure Australia analysis of Australian Bureau of Statistics (2024) and Australian Securities and Investments Commission (2023)[44]

Construction industry insolvency rates have always been slightly higher than the all-industry average. On a cumulative basis, the insolvency rate for construction (0.35%) in 2022–23 is still lower than the pre-COVID-19 historical average and aligns with the broader market trend.

In relative numbers, more construction businesses face insolvency each year than those in any other industry. As shown in **Figure 32**, 3,000 construction business entered insolvency during 2023–24, representing 27% of all insolvencies.

Figure 32: Number of insolvencies by industry – top 5 versus all other industries (2013–14 to 2023–24)



Note: These figures represent companies entering external administration or having a controller appointed.

Source: Australian Securities and Investments Commission (2024)[45]

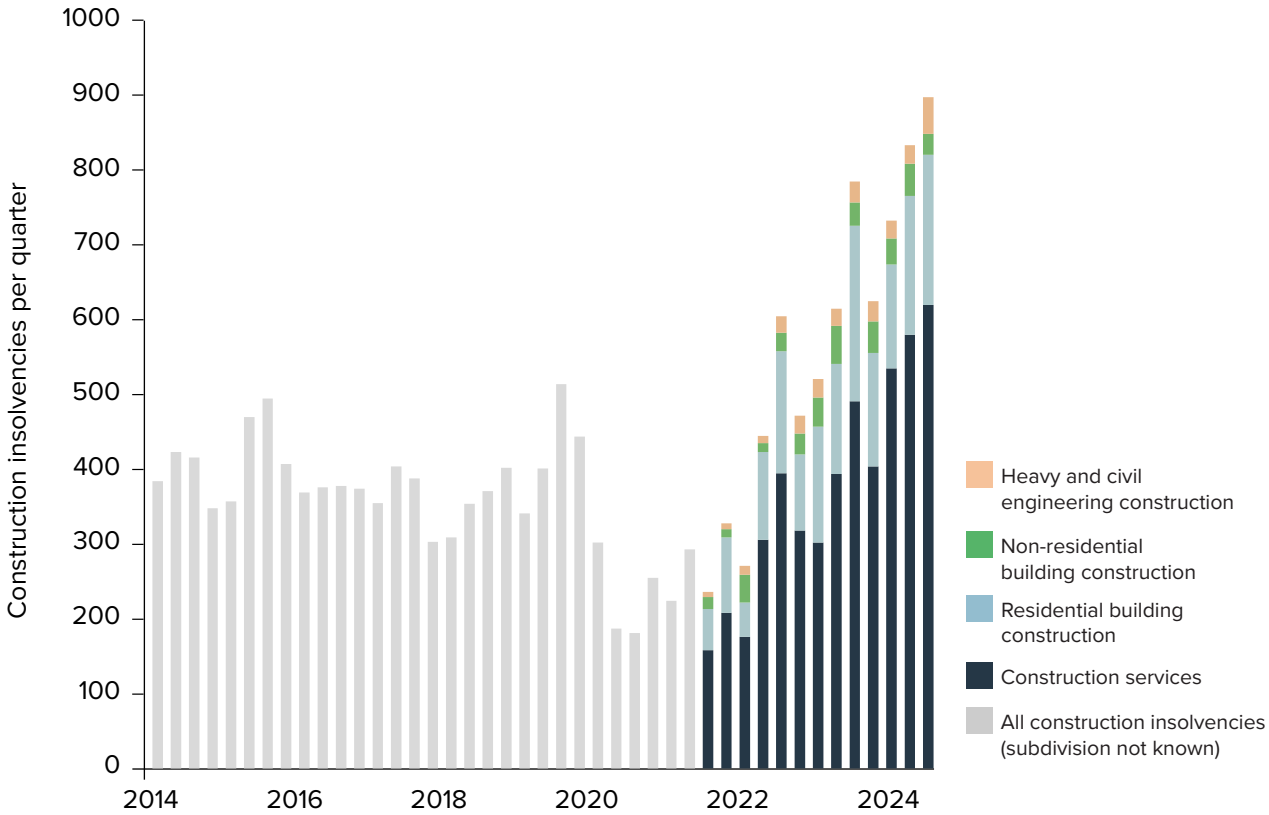
Businesses in residential construction are at higher risk of insolvency than those delivering heavy and civil engineering works, but construction-services businesses are at most risk

The Australian Securities and Investments Commission's Insolvency Statistics show that construction businesses involved in residential construction carry a high risk of insolvency. As shown in **Figure 33**, residential building insolvencies accounted for 24% of total industry insolvencies in 2023–24, much higher than those in non-residential buildings (5%) and heavy and civil engineering (3%) that year.

The category of businesses delivering 'construction services' is the only group collectively exhibiting higher insolvency numbers than residential building businesses, representing 68% of total industry insolvencies in 2023–24.

An estimated 15% of construction services were for residential construction in 2022–23, which accounted for almost 40% of total intermediate inputs into residential building construction in that same year.[46]

Figure 33: Insolvencies in construction by industry subdivision (Q1 2014 to Q3 2024)



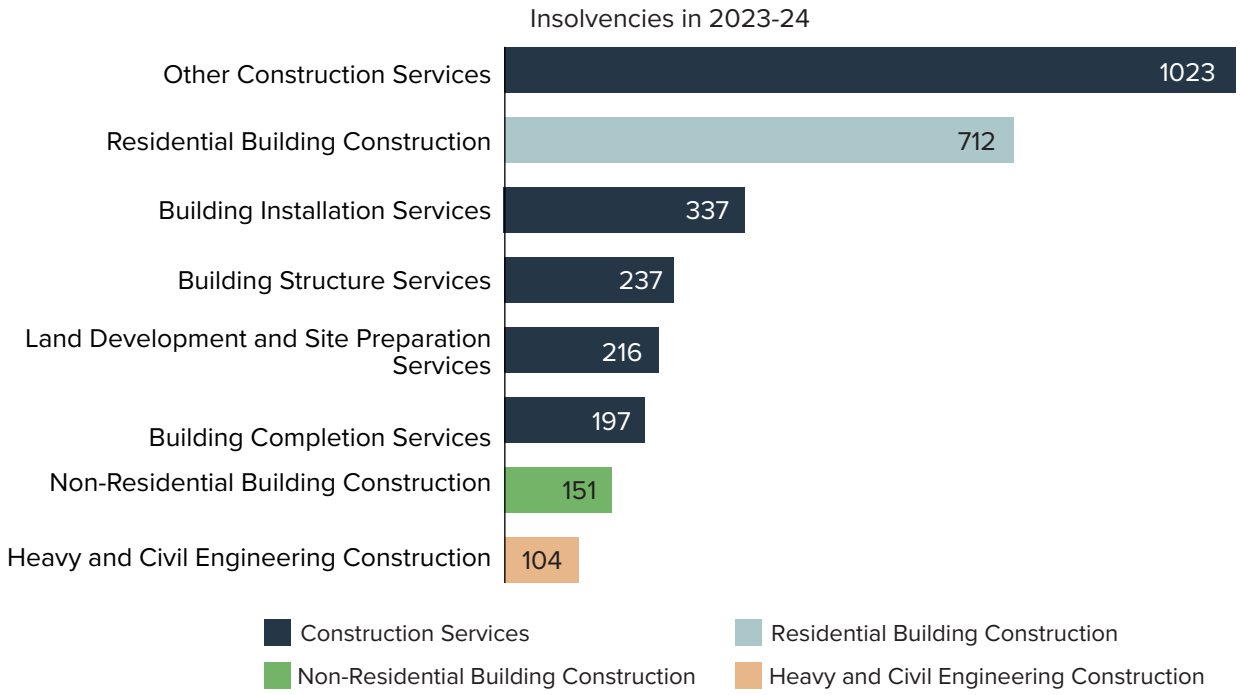
Note: These figures are based on the notification of appointment lodged with ASIC when a company enters external administration or has a controller appointed. ASIC started collecting industry subdivision from 29 April 2021, and therefore this detail is not available prior to 2021.

Source: Australian Securities and Investments Commission (2024)[47]

These construction services businesses deliver a range of trade services that can be further broken down into: residential building construction, building completion, building installation, building structure, land development and site preparation, and other services. As shown in **Figure 34**, most insolvencies have been in the 'other construction services' category.

Continued insolvency of these construction services businesses, which has been increasing since 2022, would further exacerbate the number of insolvencies directly affecting residential building construction.

Figure 34: Insolvencies in construction by detailed industry group (2023–24)



Note: These figures are based on notification of appointment lodged with ASIC when a company enters external administration or has a controller appointed.

Source: Australian Securities and Investments Commission (2024)[48]

Small and micro businesses make up the majority of construction industry insolvencies

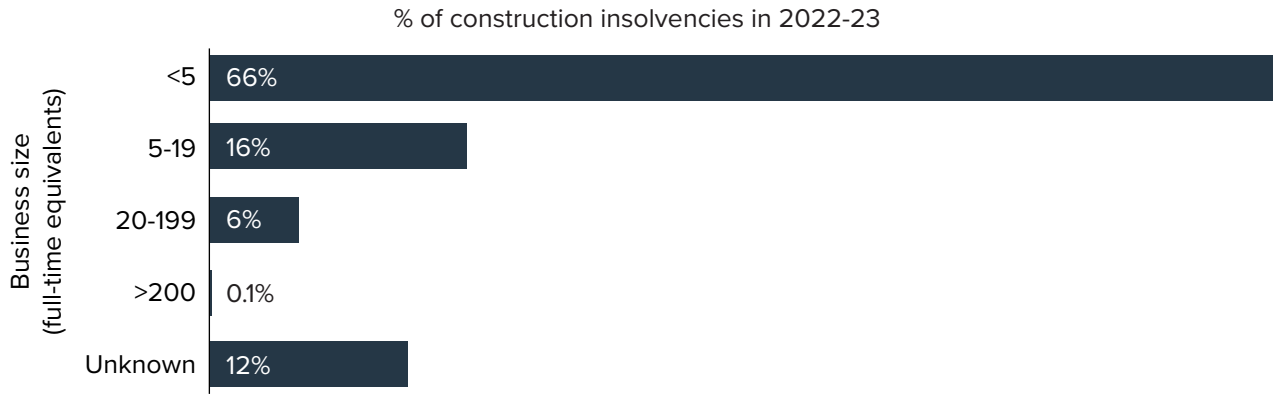
As shown in **Figure 35**, micro construction businesses with less than 5 employees represent over two-thirds of insolvencies during 2022–23. Small businesses with less than 19 employees make up 82% of total construction insolvencies.

Governments tend to focus on the head contractors with whom they enter into contracts. These head constructors then typically rely on a network of subcontractors to deliver much of the work. Subcontractors don't have a direct contractual relationship with the principals who fund the project and are vulnerable to risks passed onto them from higher up the chain.

The steep upward trend in the number of construction insolvencies over the last two years has added to the supply risk factors to successful infrastructure delivery. Insolvency in the construction sector can trigger a domino effect due to its reliance on a complex network of subcontractors and suppliers to deliver the work. For example, the flow-on effect of construction insolvencies in the supply chain can lead to subcontractors leaving behind projects due to chain bankruptcies.

This occurs when the profit of the main contractor is compromised, causing a ripple effect of financial uncertainty throughout the construction chain. A 2008 study conducted in Japan found that nearly 20% of bankruptcies are attributed to this link effect, which is more pronounced in larger bankruptcies, indicating the ripple effect grows with the size of the initial insolvency.[49]

Figure 35: Construction insolvencies by business size (2022–23)



Note: These figures are based on external administrators' and receivers' reports.

Source: Australian Securities and Investments Commission (2023)[50]

A better understanding of the impact of contracting arrangements on construction supply-chain resilience would allow the industry to better manage capacity and absorb market fluctuations caused by economic downturns, thereby minimising negative impacts throughout the supply chain.

Aside from a 2016 study of tier-one subcontractors, much of the research to date has focused on head contractors. The 2016 survey identified key factors central to subcontractor productivity,[51] such as:

- **quality of trust and relationships** on a project. When tendering, subcontractors price the project team as well as the project specification, and a good team makes a difference of up to 30% of productivity.
- **poor tender practices**, including bid-shopping, whereby head contractors share subcontractors' intellectual property during the tender process to secure a lower price, thereby disincentivising subcontractors from putting forward productivity uplifting ideas.
- **poor project documentation and document control**, which can result in up to 40% of subcontractor staff on site being tied up with non-productive administration.
- **poor scheduling and planning**, as subcontractors are involved later in the tendering process, leaving them less time to plan in advance and identify solutions.

Further research to understand the network impact of subcontracting arrangements on construction supply-chain resilience would provide a useful lens on how to improve construction industry performance and productivity.

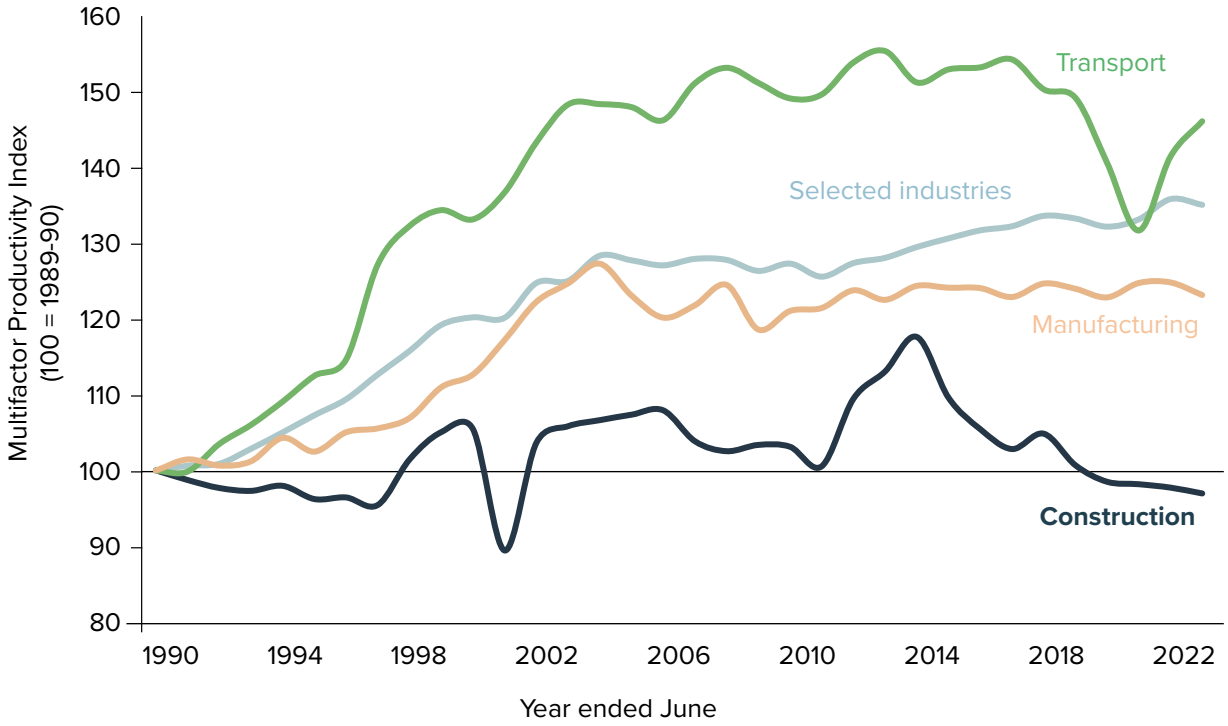
Construction multifactor productivity drops for another year, however other key economic and financial performance indicators for the sectors are up

As shown in **Figure 36**, construction-industry gross-value-added multifactor productivity growth dropped to -0.8 in 2023, a decrease from 0.3 in 2022.[52] This continues a 30-year trend of construction productivity consistently tracking flat and underperforming other comparable industries, such as transport and manufacturing, since the Australian Bureau of Statistics commenced its estimates in the late 1980s.

Construction was one of the eight sectors that showed productivity decline over the preceding year. This is an opposite trend to 2022 when only three sectors presented a negative multifactor productivity growth.

The calculation of Australian Bureau of Statistics multifactor productivity is complex and decreases in growth can be attributed to several factors. Most recently, decreases in construction multifactor productivity and construction labour productivity resulted from growth in hours worked and capital services outpacing growth in construction output. Despite showing signs of recovery, the construction industry is still challenged by lingering effects of the economic downturn following the COVID-19 pandemic, including increases in the number of insolvencies, labour and skills shortages, material supply constraints, and high construction costs.

Figure 36: Gross-value-added multifactor productivity – comparison of construction and comparable industries (1989–90 to 2022–23)



Note: Selected industries include: agriculture, forestry and fishing; mining; manufacturing; electricity, gas, water and waste services; construction; wholesale trade; retail trade; accommodation and food services; transport, postal and warehousing; information, media and telecommunications; financial and insurance services; arts and recreation services.

Source: Australian Bureau of Statistics (2023)[53]

In 2022–23, the construction industry grew across a range of other key economic and financial performance metrics:

- Earnings grew 11.6% ($6.8 billion), driven by 14.1% ($69.3 billion) in sales and service income and strong demand, reflecting the rising costs of construction being passed to customers.
- Industry value added grew by 14.8% ($21.0 billion), driven by the 17.3% ($14.4 billion) growth in Construction Services, which predominately provides the trade services for building and civil construction projects. By industry subdivision, Construction Services accounts for 60% of industry value added, compared to 23% by building construction and 16% by heavy and civil engineering construction.[54]

2023–24 estimates of quarterly gross output increased by 0.5%, bolstered by a 0.5% rise in Construction Services (driven by trades for housing construction) and a 0.9% rise in Heavy and Civil Engineering (driven by public investment), offset by a 0.2% fall in Building Construction, driven by non-residential construction.[55]

Notwithstanding declines in both dwelling commencements and approvals caused by higher borrowing and construction costs, the volume of dwellings under construction in 2022–23 contributed to an increase in the value of construction work done for the period.[56]

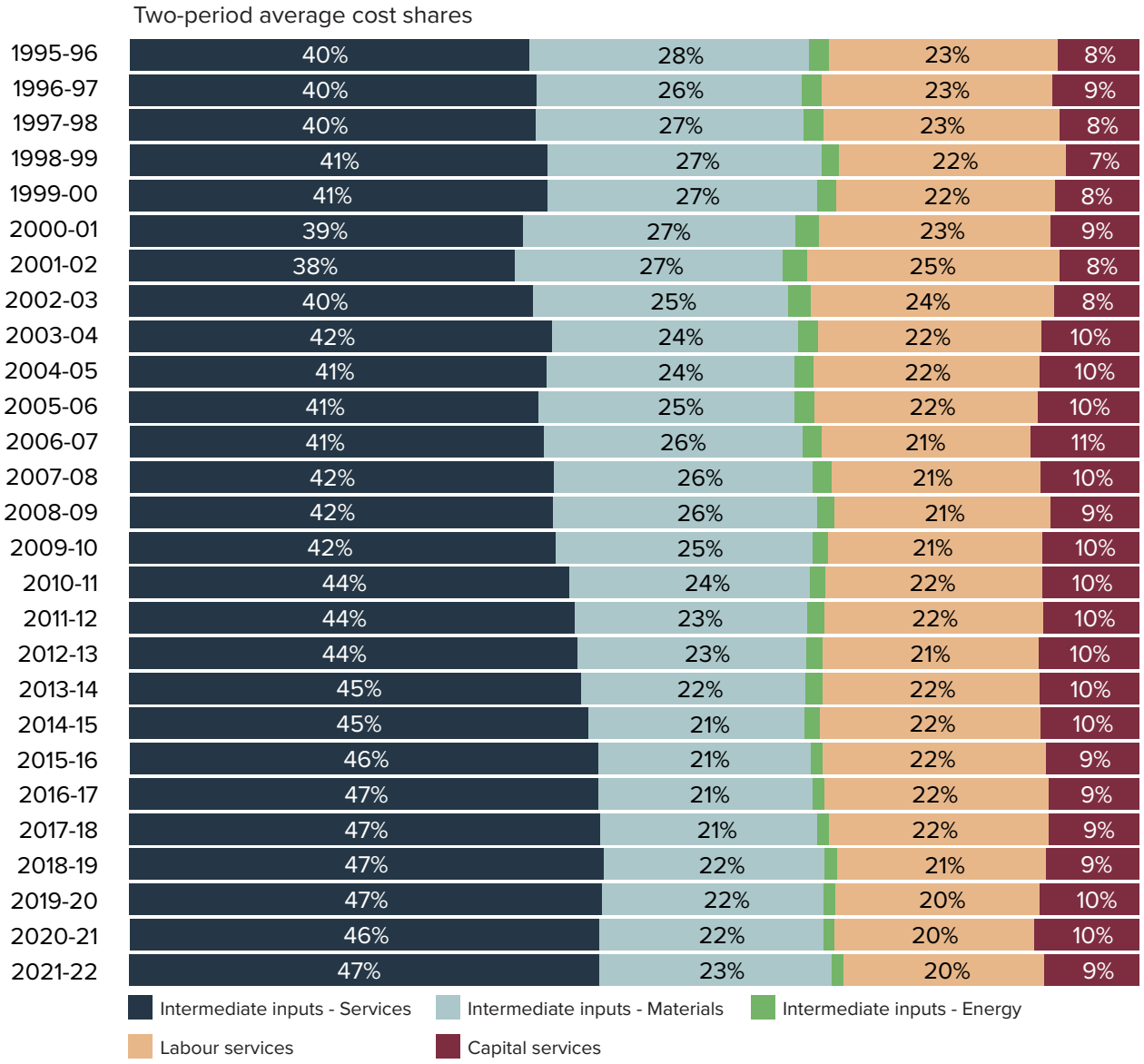
Approximately 47 cents in every dollar spent by construction companies goes to outsourcing services

At an industry level, construction productivity will be driven by sustainable construction output growth supported by growth in labour and capital productivity. Understanding the breakdown of outputs and inputs to the lowest level can help mapping of project-level effectiveness measures of cost, schedule, safety and asset performances. These linkages will provide necessary evidence to support measuring, monitoring and reporting of construction productivity on a project and portfolio level basis.

Gross-value-added multifactor productivity growth is broadly defined as a ratio of a measure of output to a combined input of labour and capital. To get a more complete picture of total inputs that go into construction, we examined the Australian Bureau of Statistics alternative gross-output-based multifactor productivity measure, which captures intermediate inputs – materials, energy and services – in addition to labour and capital. The gross-output-based multifactor productivity trend over time exhibits similar movement with the gross-value-added-based approach.

When broken down into intermediate inputs, as shown in **Figure 37**, services comprised a majority share of total input costs and has been slowly growing, from 40% in 1995–96 to 47% in 2021–22. In comparison, materials accounted for 23%, labour 20% and capital 9% of total input costs in 2021–22. In relative dollar terms, the cost of services grew by $14.5 billion in 2021–22.

Figure 37: Construction-industry cost shares (1995–96 to 2021–22)



Source: Australian Bureau of Statistics (2023)[57]

The intermediate services input category covers any outsourced services by a construction company that is used up in the process of production within one year.

The high reliance on outsourced services reflects a structural characteristic of the construction industry, where work is delivered by larger businesses subcontracting further down the chain to smaller or specialist businesses.

Growth in this input cost also potentially reflects the growing scale and complexity of projects in recent years.

Industry views on productivity and risk

Infrastructure Australia surveyed 200 businesses this year on their perceptions and claimed practices for improving productivity. The findings provide an indication of current practices and a basis for future work to develop evidence-based productivity metrics and activity drivers that could improve productivity at the project or program level.

Industry rates their productivity as 'good', and about the same as two years ago

Despite poor productivity rates at the industry level, results from our 2024 Industry Confidence Survey shows that individual companies are reportedly content with their current productivity. Of companies surveyed that operate in the construction phase of the infrastructure life cycle, almost half (49%) believe that productivity is 'good' (with a rating of at least 8 out of 10), and a further 9% say productivity is 'extremely good' (with a rating of 10 out of 10). This is comparable to the average of companies across the infrastructure life-cycle, with 46% noting productivity is good and 8% extremely good.

Construction companies appear to be unclear about which direction productivity has shifted over the previous two years, with 40% rating it as 'about the same' and the rest split between higher (28%) or lower (31%). Similarly, across all infrastructure, 44% rate productivity as about the same, with the remainder split between 28% higher and 25% lower. Only a small percentage of respondents (2%) were unsure, answering 'can't say' to how their productivity compares to two years ago.

Upskilling is regarded by businesses as having the greatest impact on productivity, and investment in digital and innovation as having the least impact

When asked to rate a range of factors impacting productivity on their business, surveyed businesses ranked upskilling as the most effective lever to increase productivity (as shown in **Figure 38**). With workforce consistently rising to the top of issues impacting both capacity and productivity, construction businesses should prioritise investment in workforce attraction, retention and upskilling first.

A range of perceived barriers to workforce upskilling however were noted during interviews:

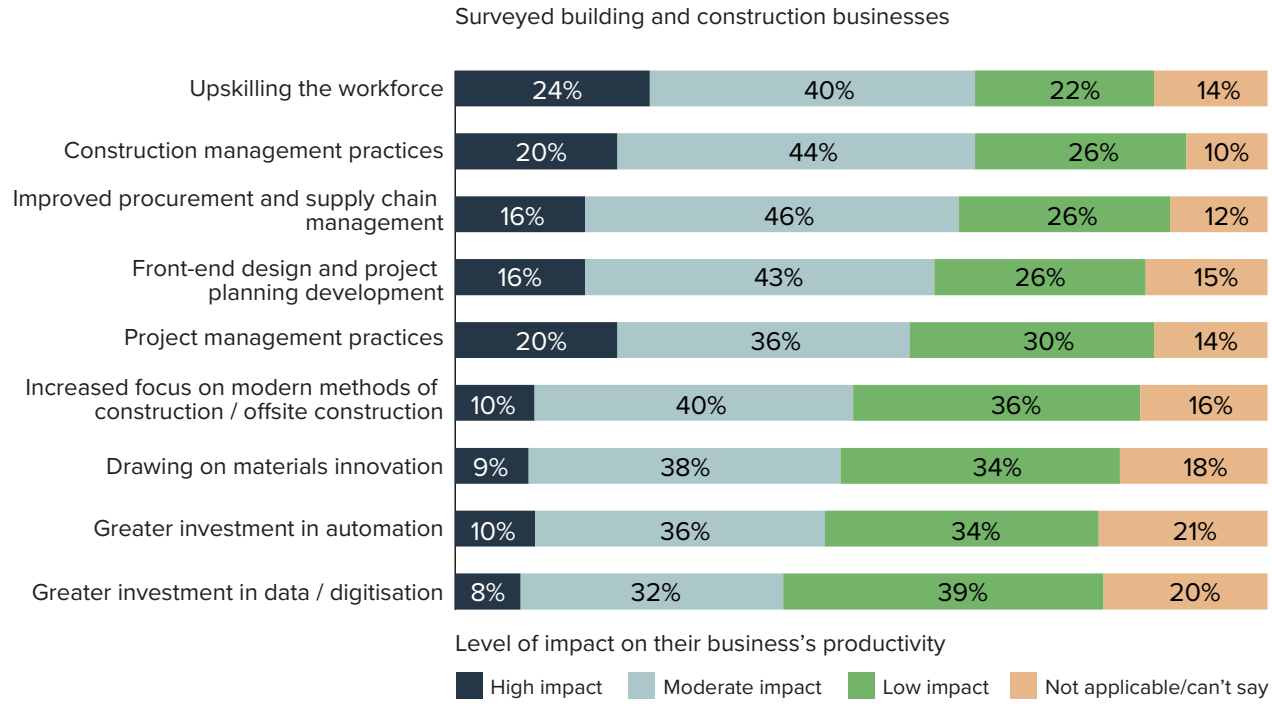
- Some pockets of the industry, particularly in the trades, are resistant to change.
- Smaller sub-contractors are key players in infrastructure delivery, but they lack the time and resources necessary for ongoing upskilling.
- Wider labour shortages and poor workforce diversity, including female participation rates continue to hinder both capacity building and productivity.

> ***"The construction industry also has quite a significant reliance on subcontractors. And, fair to say that subcontractors by nature of their business, unless they're a very highly skilled organisation, probably struggle to maintain the levels of training necessary."***
> ***(Company)***

After workforce upskilling, construction-focused companies ranked the following productivity factors:

- Over 60% regard improvements to procurement and supply-chain management and improvements to construction management as having the highest impact.
- Approximately half believe modern methods of construction, project management, front-end design and project planning development will have a high or moderate impact.
- Digital and innovation (automation, data digitalisation and materials innovation) are regarded has having less impact compared to the other categories.

Figure 38: Views of surveyed building and construction businesses about factors that affect their productivity



Source: Infrastructure Australia Industry Confidence Survey (2024)

While there is no common set of productivity metrics, labour and rework measures are the least popular

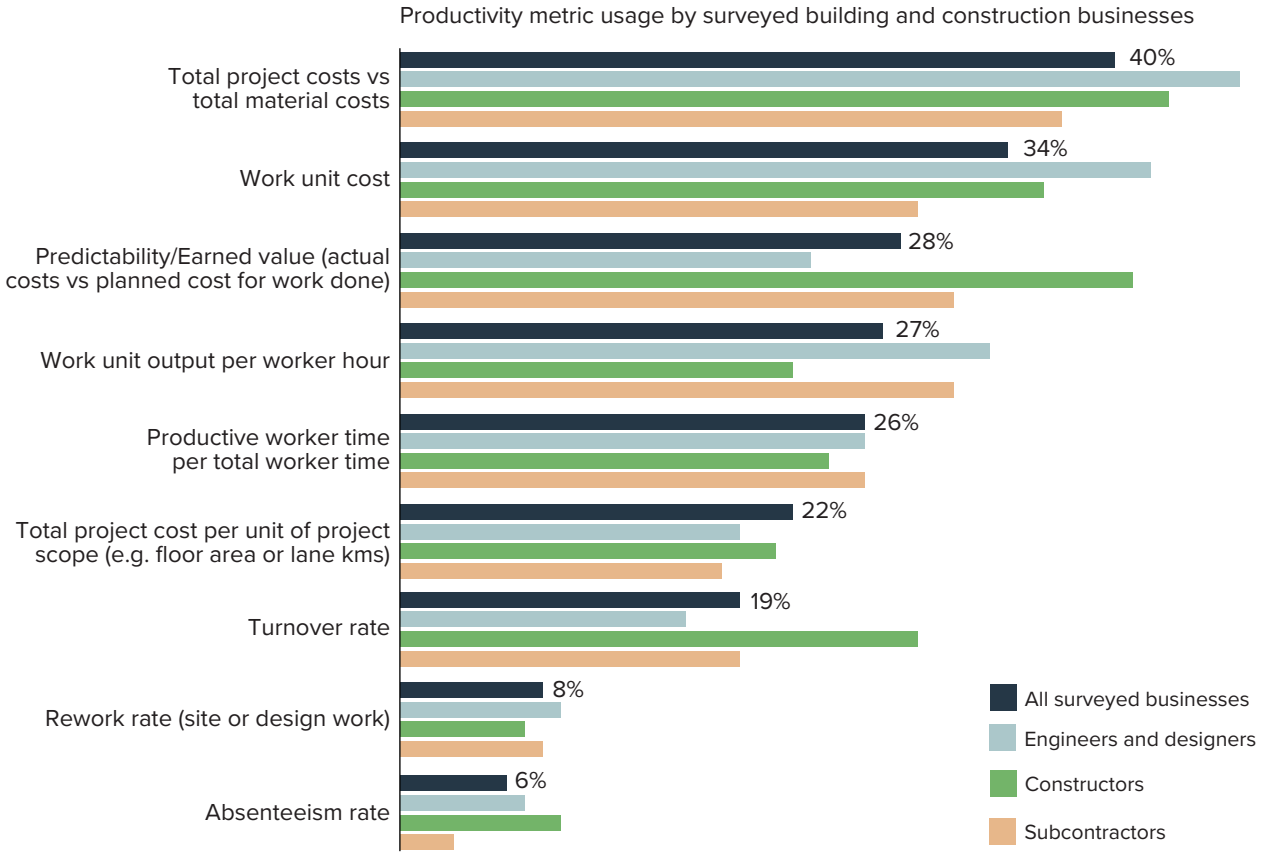
As shown in **Figure 39**, when it came to measuring how these industry members measured the productivity of their operations, they use a wide range of work-level and project-level metrics. For instance, members said they measured their productivity by work unit cost; work unit output per worker; absenteeism; total project cost verses total material costs and the earned value of a project against the planned costs for work done.

The wide range of metrics used by the industry to measure productivity shows there is no universal way in which productivity is measured and reiterates the need for work to be undertaken to develop a set of productivity metrics and indicators to better measure infrastructure productivity, as was recommended by Infrastructure Australia in the *2023 Infrastructure Market Capacity Report*.

Less than 10% of respondents measure labour metrics at the company level (turnover and absenteeism rates), which is somewhat surprising given workforce shortages are a top market constraint.

Another surprising result is that very few companies (8%) measure rework done. Given the tight profit margins for construction businesses, rework done could have a significant impact on the final bottom line, particularly for smaller businesses who are more likely to be undercapitalised and thus less resilient to unexpected setbacks. It has been estimated that rework can reduce companies' yearly profit by up to 28%.[58]

Figure 39: Usage of metrics for measuring productivity among surveyed building and construction businesses and selected segments



Source: Infrastructure Australia Industry Confidence Survey (2024)

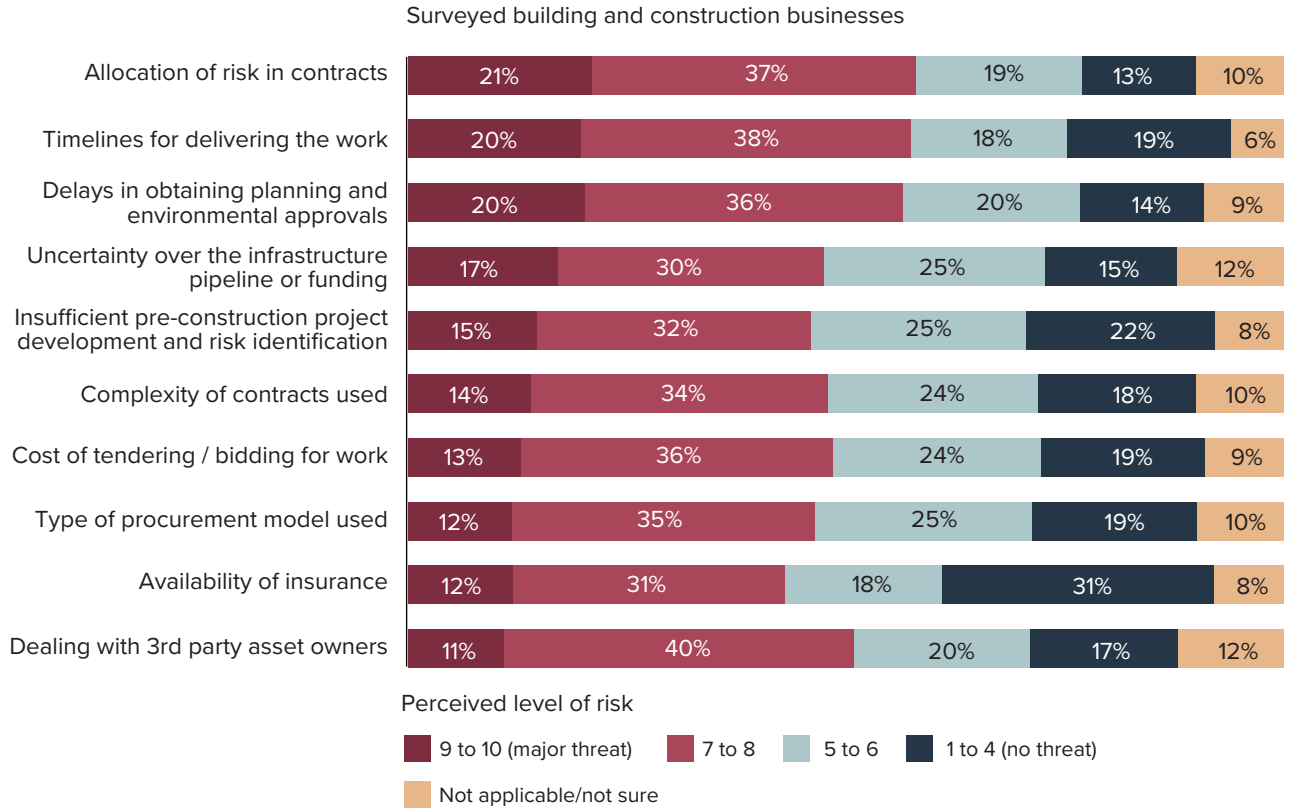
Beyond looking at immediate project costs, industry should take a strategic and longer-term approach to tracking productivity, particularly workforce indicators and other considerations that have the potential to seriously undermine their business sustainably, such as rework done.

Further, given outsourced services account for almost half of construction company costs, companies should also look to capture productivity metrics of their outsourced labour contingent.

Allocation of risk in contracts is the greatest threat to project delivery, particularly for those with larger contracts

Figure 40 below shows that industry surveyed by Infrastructure Australia this year regards risk allocation in contracts, timelines for delivery and delays in obtaining planning and environmental approvals as the highest risks to project delivery.

Figure 40: Views of building and construction businesses on risk factors to their ability to deliver infrastructure projects



Source: Infrastructure Australia Industry Confidence Survey (2024)

From interviews, business outlined key issues seen to be adding to overall costs:

- **Contracts** tend to be complex and bespoke, with built in 'design-construct-litigate' pathways: these require expensive expert lawyers to be engaged and facilitate post-project litigation and insurance claims as a way to recoup lost profits.
- **Excessive prudence hindering acceptable risk**: risk appetite of governments below what should be reasonable levels.
- **Extreme weather events**: which are more frequent and impact on the timely completion of projects (for example, through forcing the closure of work sites). This year, weather conditions was the top-ranked cause of project delays, and is an issue particularly in areas such as Queensland, but also more recently in New South Wales. Risks associated with extreme weather events is reflected in contracts, with the onus falling back to contractors and subcontractors, who in turn add this additional risk into their overall contract costs.

Contract variations are becoming the pre-emptive tool for cost recovery

In light of continued escalation of costs, industry appears to be using cost variations as a pre-emptive tool to mitigate the impact of continued and ongoing cost escalations. 51% of businesses surveyed by Infrastructure Australia have sought a contract variation in the last 12 months. Businesses reported factoring in cost variations of at least 10% into budgets, or omitting the costs from quotes to win projects with the intention of a cost variation future down the track.

Parties need to continue working together to find the best balance of risk to minimise unnecessary costs and deliver the best value for money.

Workplace culture and diversity

Efforts to improve construction workplace culture and increase diversity will have positive flow on effects for attracting and retaining employees in the industry. Aside from wages, employment conditions, workplace culture, working hours and career development opportunities are factors influencing whether people choose to enter or leave construction.

Currently, the industry does not track well on these metrics with the Construction Industry Culture Taskforce finding that:

- 64% of current construction industry workers are working more than 50 hours per week.
- 59% say they are unhappy with their work-life balance.
- Only 26% thought they could combine construction with parenthood.[59]

Further, 63% of construction workers surveyed by the NSW Building Commission are considering leaving and cited the difficulty in achieving work/life balance as the main reason.

Construction Culture Standard

The Construction Industry Culture Taskforce is tackling the three critical challenges of construction industry culture, which cost the Australian economy roughly $8 billion a year, and deter workers from joining and remaining in the industry at this crucial time of low productivity growth and acute skills shortages. These challenges are:

- **excessive working hours**, which cause high rates of burnout, absenteeism, ill-health, and turnover.
- **minimal gender diversity**, with women occupying 12% of jobs, sector wide.
- **double the rate of stress and suicide** among construction workers compared to the national average.[60]

The Taskforce has developed a Culture Standard: a framework for clients and contractors to co-create work cultures that prioritises *time for life, diversity and inclusion*, and *wellbeing*. This is to be used in procurement activities, whereupon clients commit to buying services from compliant constructors. For example, the Culture Standard requires constructors to comply with project programming requirements that ensure *time for life* for workers, including:

- a target of up to 50 hours per week
- a limit of 55 hours per week
- a five-day work week.

Creating a solid evidence base for the Culture Standard has been critical, so a multi-institutional research team, led by RMIT University, has captured and analysed interview and survey responses of construction workers engaged in one of five pilot projects. So far, findings indicate that:

- The majority of workers prefer a five-day work week.
- The majority of workers are happy with their work hours.
- Workers perceive high levels of support for their time for life.
- Workers perceive high levels of positive mental wellbeing.
- Many will not like returning to working a six-day week.

The Culture Standard was adopted by the Brunt Road Level Crossing Removal project, which composed a five-day work week from a 10-hour Monday-Friday schedule, and a 6-hour Saturday schedule on a Rostered Day Off week. The project achieved each of its time and budget milestones, including a 21-day reduction in total workdays per year, while intentionally focusing on workforce mental health and gender diversity. Senior project stakeholders have celebrated and attested to the ability of the Culture Standard to:

- enrich the work-life balance of employees
- foster a more engaged and vibrant work environment
- make strides in gender diversity, both on and off-site
- highlight the link between thoughtful workplace practices and enhanced wellbeing.

The Culture Standard will be finalised and released in early 2025, along with the final research report including an economic analysis.

The Construction Industry Culture Taskforce is a jointly funded initiative of the Australian Constructors Association and the Governments of New South Wales and Victoria that is supported by a multi-institutional research team led by RMIT University. Other jurisdictions have requested and joined the Taskforce since its inception, specifically the Australian Capital Territory, South Australia, Queensland and Western Australia.

Photo source: supplied by Fulton Hogan.

Photo source: supplied by Fulton Hogan.

New technologies and modern methods of construction

There has been much written about the productivity uplifting potential of new technologies and modern methods of construction. However, uptake rates remain low.

Interviewed respondents this year accepted that low uptake of technology hinders Australia's ability as a market, and specifically as a sector, to stay competitive, and that investment in technology currently sits lower on the list priorities.

Results from the Infrastructure Australia's 2024 Industry Confidence Survey shows that industry regards digital and innovation (automation, data digitalisation and materials innovation) as having less impact compared to a range of other categories.

Views did vary slightly depending on the phase of the infrastructure life-cycle a business focused on, with companies placing more value on the factors that are closer to their core business:

- More **engineers and designers** ranked materials innovation, automation and data digitalisation as having high to moderate impact compared to the average for the industry.
- More **transport-sector** companies ranked data digitisation as having high to moderate impact than the average for the industry.

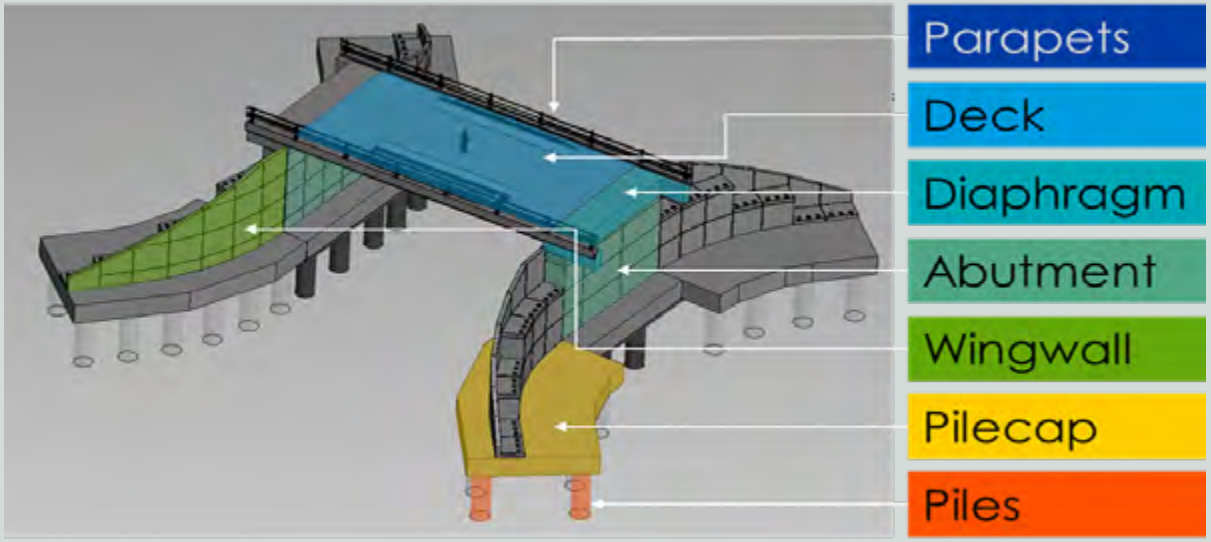
Case study: Laing O'Rourke Kit of Parts

Laing O'Rourke has developed an award-winning bridge delivery system that demonstrates how modern construction methods can measurably improve infrastructure outcomes.

The use of the modular bridge system adopts 'product-led design' where the bridge design takes account of the characteristics of the products, rather than attempting to retrospectively fit a set of precast products to an outline design.

At its highest level, as shown in **Figure 41**, the system comprises a digital bridge configurator and an engineered kit of parts – a range of standard precast products – that can be formed to create modular single-span integral bridges with precast prestressed concrete beams and associated wingwalls.

Figure 41: Features of a modular bridge solution



Source: Laing O'Rourke (2024)[61]

The kit of parts is also readily applicable to steel beam solutions, bridges with bearings, multi-span bridges, standalone elements in larger schemes such as piers, retaining walls and box-structure sections.

The system was co-created with industry and academic partners and has been used to deliver solutions for major clients. These include High Speed 2 – the UK's high-speed rail delivery partner – which has noted considerable improvements in programme, productivity and sustainability measures.

Programme

The construction and assembly of the 35-metre span High Speed 2 trace bridges delivered a programme saving of 18 weeks. This 50% reduction on the original programme (37 weeks using traditional construction methods, versus 19 weeks using the kit of parts) was primarily due to the rapid construction of the abutments and wingwalls.

Productivity of resource

The construction of the modular abutments and wingwalls of the High Speed 2 trace overbridges (each measuring 400 square metres on elevation, approximately) was completed in three weeks by a six-person on-site team. This represents an 84% reduction in on-site labour compared to traditional construction using in-situ reinforced concrete, which was estimated to be completed in 11 weeks (minimum) by a 10-person on-site team.

Sustainability – reducing carbon

A detailed carbon study of the modular bridge system concluded that the modular approach reduced embodied carbon by 8% in the abutments, compared to an equivalent, traditionally designed in-situ reinforced concrete abutment.

The bridge delivery system offers other potential benefits. For example:

- **Modular abutment delivery can accelerate earthworks**, by allowing backfilling to commence without the bridge deck in place. This instantly saves months of time and creates the potential for follow-on activities, such as road surfacing, to start earlier than programmed.
- **Rapid construction of modular bridges can reduce or remove the need for temporary bridges**, while creating the opportunity to utilise the bridges as construction/logistics routes, opening new work fronts earlier than would have been possible.
- **Modular solutions create safer working environments**, since well-defined processes and repeatable assembly are carried out in a warm and dry indoor environment, by smaller teams of multi skilled technicians. This compares to traditional environments where larger teams of specialist trades use multiple interfaces and hand overs in conditions and locations that can be difficult and dangerous due to changing weather conditions and scaffold access systems.
- In recent years, the Australian construction industry has experienced labour shortages and cost escalation at a significant scale. The benefits brought by the digital-bridges approach in improving productivity, sustainability and costs will bring certainty in delivery to Australian projects. However, we need to deliver infrastructure with a programmatic approach that provides economies of scale and harmonise specifications across jurisdictions to truly realise the benefits of repeatable design.

Bridge beam installation on shell abutments on M25 Stratford Brook, United Kingdom

Source: Laing O' Rourke (2024)[62]

Endnotes

1 BuildSkills Australia 2024, 2024 Workforce Plan, BuildSkills Australia, available via: https://buildskills.com.au/workforce-plan

2 The Commonwealth of Australia 2024, Future Made in Australia fact sheet, Australian Government, Canberra, available via: https://budget.gov.au/content/03-future-made.htm

3 Chalmers J, Address to the Australian Business Economists: Building a new economy on 5 pillars of productivity address to the Australian business economists, 13 November 2024, available via: https://ministers.treasury.gov.au/ministers/jim-chalmers-2022/speeches/address-australian-business-economists

4 Australian Bureau of Statistics 2024, Construction Work Done, Australia, Preliminary, "Table 01. Value of Construction Work Done, by Sector, Chain Volume Measures, Australia", time series spreadsheet, Australian Bureau of Statistics, available via: https://www.abs.gov.au/statistics/industry/building-and-construction/construction-work-done-australia-preliminary/jun-2024

5 Office of the Chief Economist 2024, Resources and Energy Quarterly June 2024, Australian Government, Canberra, pp 28-35, available via: https://www.industry.gov.au/publications/resources-and-energy-quarterly-june-2024

6 Resources Victoria 2024, Boost to quarry approvals, Victoria Government, Melbourne, available via: https://resources.vic.gov.au/about-us/news/boost-to-quarry-approvals

7 Department of Natural Resources and Mines, Manufacturing, and Regional and Rural Development 2024, Report into quarry material supplies for 2040, Queensland Government, Brisbane, available via: https://www.resources.qld.gov.au/mining-exploration/initiatives/2040-quarry-material-supplies-report

8 Apel F, Hoyt J, Marques F, Reiter S and Schulze P, 'Cementing your lead: The cement industry in the net-zero transition', McKinsey, 6 October 2023, available via: https://www.mckinsey.com/industries/engineering-construction-and-building-materials/our-insights/cementing-your-lead-the-cement-industry-in-the-net-zero-transition

9 Market Research Future 2024, 'Australia precast concrete market 2024 volume and value, upcoming investments, recent developments, innovations 2032', BizBuildBoom, available via: https://bizbuildboom.com/australia-precast-concrete-market-2024-volume-and-value-upcoming-investments-recent-developments-innovations-2032

10 Mordor Intelligence 2024, Australian construction machinery market report, available via: https://www.mordorintelligence.com/industry-reports/australia-construction-machinery-market

11 Infrastructure Australia 2024, Embodied carbon projections for Australian infrastructure and buildings, Infrastructure Australia, Sydney, available via: https://www.infrastructureaustralia.gov.au/reports/embodied-carbon-projections-australian-infrastructure-and-buildings

12 Lindasy P 2024, 'Timber trends: Navigating Australia's structural supply and demand dynamics', Timber Trader News, 24 April 2024, available via: https://www.timbertradernews.com/2024/04/24/timber-trends-navigating-australias-structural-supply-and-demand-dynamics

13 Infrastructure Australia 2024, Embodied carbon projections for Australian infrastructure and buildings, Infrastructure Australia, Sydney, available via: https://www.infrastructureaustralia.gov.au/reports/embodied-carbon-projections-australian-infrastructure-and-buildings

14 McSweeney N, Bui C and Yap Abidin A, 'Australian construction material price outlook – Q2 2024', Altus Group, 4 September 2024, available via: https://www.altusgroup.com/insights/australian-construction-material-price-outlook

15 Ker P and Macdonald-Smith A, 'Industry hit by faltering energy transition', The Australian Financial Review, 9 October 2023, available via: https://www.afr.com/companies/energy/industry-hit-by-faltering-energy-transition-20231009-p5eas5

16 Australian Bureau of Statistics 2024, Producer Price Indexes, Australia, June Quarter 2024, Australian Bureau of Statistics, available via: https://www.abs.gov.au/statistics/economy/price-indexes-and-inflation/producer-price-indexes-australia/jun-quarter-2024

17 McSweeney N, Bui C and Yap Abidin A, 'Australian construction material price outlook – Q2 2024', Altus Group, 4 September 2024, available via: https://www.altusgroup.com/insights/australian-construction-material-price-outlook

18 The Business Research Company 2024, Bitumen global market report 2024, Research and Markets, available via: https://www.researchandmarkets.com/reports/5939500/bitumen-global-market-report

19 Australian Bureau of Statistics 2024, Australian National Accounts: National Income, Expenditure and Product, June 2024, Australian Bureau of Statistics, available via: https://www.abs.gov.au/statistics/economy/national-accounts/australian-national-accounts-national-income-expenditure-and-product/jun-2024

20 Office of the Chief Economist 2024, Resources and Energy Quarterly June 2024, Australian Government, Canberra, available via: https://www.industry.gov.au/publications/resources-and-energy-quarterly-june-2024

21 Federal Reserve Bank of New York 2024, Global Supply Chain Pressure Index, New York, available via: https://www.newyorkfed.org/research/policy/gscpi

22 Australian Bureau of Statistics 2024, Producer Price Indexes, Australia, June Quarter 2024, available via: https://www.abs.gov.au/statistics/economy/price-indexes-and-inflation/producer-price-indexes-australia/jun-quarter-2024

23 World Trade Organization 2024, Global trade outlook and statistics, April 2024, World Trade Organization, Geneva, p 34, available via: https://www.wto-ilibrary.org/content/books/9789287076335

24 PortWatch 2024, Daily chokepoints transit calls and trade volume estimates, International Monetary Fund, Washington DC, available via: https://portwatch.imf.org/datasets/42132aa4e2fc4d41bdaf9a445f688931_0/explore

25 Office of the Chief Economist 2024, Resources and Energy Quarterly June 2024, Australian Government, Canberra, available via: https://www.industry.gov.au/publications/resources-and-energy-quarterly-june-2024

26 Office of the Chief Economist 2024, Resources and Energy Quarterly June 2024, Australian Government, Canberra, available via: https://www.industry.gov.au/publications/resources-and-energy-quarterly-june-2024

27 Australian Bureau of Statistics 2024, International Trade in Goods, Australia - information consultancy subscription service, unpublished data.

28 Australian Bureau of Statistics 2024, Producer Price Indexes, Australia, June Quarter 2024, available via: https://www.abs.gov.au/statistics/economy/price-indexes-and-inflation/producer-price-indexes-australia/jun-quarter-2024

29 World Steel Association 2024, World steel in figures 2024, World Steel Association, Brussels, available via: https://worldsteel.org/data/world-steel-in-figures-2024

30 World Steel Association 2024, World steel in figures 2024, World Steel Association, Brussels, available via: https://worldsteel.org/data/world-steel-in-figures-2024

31 Australian Steel Institute 2023, Capabilities of the Australian steel industry to supply major projects in Australia, Australian Steel Institute, Sydney, available via: https://www.steel.org.au/resources/elibrary/resources/capability-of-the-australian-steel-industry-to-sup

32 Department of Industry, Science and Resources 2024, Green metals: A future made in Australia: Unlocking Australia's green iron, steel, alumina and aluminium opportunity, Australian Government, Canberra, available via: https://consult.industry.gov.au/unlocking-green-metals

33 Briggs C, 'Australia needs tradies and materials to build the power grid of the future. So where are they?', The Conversation, 3 September 2024, available via: https://theconversation.com/australia-needs-tradies-and-materials-to-build-the-power-grid-of-the-future-so-where-are-they-237858

34 Big Rigs, '$340m bypass needed to truck giant wind turbines to NSW sites', Big Rigs, 12 July 2023, available via: https://bigrigs.com.au/2023/07/12/340m-bypass-needed-to-truck-giant-wind-turbines-to-nsw-sites

35 Infrastructure Australia 2024, Embodied carbon projections for Australian infrastructure and buildings, Infrastructure Australia, Sydney, available via: https://www.infrastructureaustralia.gov.au/reports/embodied-carbon-projections-australian-infrastructure-and-buildings

36 Infrastructure Australia 2022, Replacement materials: understanding the market for replacement materials across major infrastructure road projects, Infrastructure Australia, Sydney, available via: https://www.infrastructureaustralia.gov.au/publications/2022-replacement-materials-report

37 Infrastructure Australia 2024, Embodied carbon projections for Australian infrastructure and buildings, Infrastructure Australia, Sydney, available via: https://www.infrastructureaustralia.gov.au/reports/embodied-carbon-projections-australian-infrastructure-and-buildings

38 Treasury 2024, Federal Funding Agreement Schedule on the Land Transport Infrastructure Projects (2024-2029), Australian Government, Canberra, p 7, available via: https://federalfinancialrelations.gov.au/agreements/land-transport-infrastructure-projects-2024-2029

39 Consult Australia 2024, Consult Australia confidence & continuity report 2024 , Consult Australia, available via: https://www.consultaustralia.com.au/home/advocacy/consulting-matters-may-2024/Consult-Australia-survey

40 Australian Bureau of Statistics 2023, Counts of Australian Businesses, including Entries and Exits July 2019 - June 2023, Australian Bureau of Statistics, available via: https://www.abs.gov.au/statistics/economy/business-indicators/counts-australian-businesses-including-entries-and-exits/jul2019-jun2023

41 Australian Bureau of Statistics 2024, Counts of Australian Businesses, including Entries and Exits, July 2020 - June 2024, Australian Bureau of Statistics, available via: https://www.abs.gov.au/statistics/economy/business-indicators/counts-australian-businesses-including-entries-and-exits/jul2020-jun2024

42 Lowe JG and Moroke E 2010, 'Insolvency in the UK construction sector' in Proceedings 26th Annual ARCOM Conference, Egbu C, 6-8 September 2010, Association of Researchers in Construction Management, Leeds, pp 93-100, viewed at: https://www.arcom.ac.uk/-docs/proceedings/ar2010-0093-0100_Lowe_and_Moroke.pdf

43 Jeffrey D, 'Two Australian construction industry are collapsing every day. This is why – and what you can do about it', 9 News, 30 June 2023, available via: https://www.9news.com.au/national/building-construction-companies-collapse-australia-why-is-it-happening-what-can-you-do-explained/bac174fc-9263-4077-adac-98cd9b10c07c

44 Australian Bureau of Statistics 2024, Counts of Australian Businesses, including Entries and Exits, July 2020 - June 2024, Australian Bureau of Statistics, available via: https://www.abs.gov.au/statistics/economy/business-indicators/counts-australian-businesses-including-entries-and-exits/jul2020-jun2024; Australian Securities and Investments Commission 2023, 'Table 3.3.5 - Initial external administrators' and receivers' reports by industry, Annual', Insolvency statistics, Australian Securities and Investments Commission, available via: https://asic.gov.au/regulatory-resources/find-a-document/statistics/insolvency-statistics

45 Australian Securities and Investments Commission 2023, 'Series 1A – Companies entering external administration and controller appointments by industry (July 2013 – July 2022)', Insolvency statistics (up to 31 July 2022), Australian Securities and Investments Commission, available via: https://asic.gov.au/regulatory-resources/find-a-document/statistics/insolvency-statistics/insolvency-statistics-up-to-31-july-2022; Australian Securities and Investments Commission 2024, 'Series 1 and 2: Insolvency statistics (current)', Insolvency statistics (current), Australian Securities and Investments Commission, available via: https://asic.gov.au/regulatory-resources/find-a-document/statistics/insolvency-statistics

46 Australian Bureau of Statistics 2024, Australian National Accounts: Supply Use Tables, 2022-23 financial year, Australian Bureau of Statistics, available via: https://www.abs.gov.au/statistics/economy/national-accounts/australian-national-accounts-supply-use-tables/2022-23

47 Australian Securities and Investments Commission 2023, 'Series 1A – Companies entering external administration and controller appointments by industry (July 2013 – July 2022)', Insolvency statistics (up to 31 July 2022), Australian Securities and Investments Commission, available via: https://asic.gov.au/regulatory-resources/find-a-document/statistics/insolvency-statistics/insolvency-statistics-up-to-31-july-2022; Australian Securities and Investments Commission 2024, 'Series 1 and 2: Insolvency statistics (current)', Insolvency statistics (current), Australian Securities and Investments Commission, available via: https://asic.gov.au/regulatory-resources/find-a-document/statistics/insolvency-statistics

48 Australian Securities and Investments Commission 2024, 'Series 1 and 2: Insolvency statistics (current)', Insolvency statistics (current), Australian Securities and Investments Commission, available via: https://asic.gov.au/regulatory-resources/find-a-document/statistics/insolvency-statistics

49 Fujiwara Y 2008, 'Chain of firms' bankruptcy: a macroscopic study of link effect in a production network', Advances in Complex Systems, vol. 11, no. 5, pp 703-717, available via: https://doi.org/10.1142/s0219525908001994

50 Australian Securities and Investments Commission 2023, 'Series 3.2 - External administrators' and receivers' reports for selected industries, 1 July 2022–30 June 2023', Insolvency statistics, Australian Securities and Investments Commission, available via: https://asic.gov.au/regulatory-resources/find-a-document/statistics/insolvency-statistics

51 Chalker M and Loosemore M 2016, 'Trust and productivity in Australian construction projects: A subcontractor perspective', Engineering, Construction and Architectural Management, vol. 23, no. 2, pp 192-210, available via: https://doi.org/10.1108/ECAM-06-2015-0090

52 Australian Bureau of Statistics 2023, Estimates of Industry Multifactor Productivity, 2022-23 financial year, Australian Bureau of Statistics, available via: https://www.abs.gov.au/statistics/industry/industry-overview/estimates-industry-multifactor-productivity/2022-23; Australian Bureau of Statistics 2022, Estimates of Industry Multifactor Productivity, 2021-22 financial year, Australian Bureau of Statistics, available via: https://www.abs.gov.au/statistics/industry/industry-overview/estimates-industry-multifactor-productivity/2021-22

53 Australian Bureau of Statistics 2023, Estimates of Industry Multifactor Productivity, 2022-23 financial year, Australian Bureau of Statistics, available via: https://www.abs.gov.au/statistics/industry/industry-overview/estimates-industry-multifactor-productivity/2022-23

54 Australian Bureau of Statistics 2024, Australian Industry, 2022-23 financial year, Australian Bureau of Statistics, available via: https://www.abs.gov.au/statistics/industry/industry-overview/australian-industry/2022-23

55 Australian Bureau of Statistics 2024, Australian National Accounts: National Income, Expenditure and Product, June 2024, Australian Bureau of Statistics, available via: https://www.abs.gov.au/statistics/economy/national-accounts/australian-national-accounts-national-income-expenditure-and-product/jun-2024

56 Australian Bureau of Statistics 2024, Australian Industry, 2022-23 financial year, Australian Bureau of Statistics, available via: https://www.abs.gov.au/statistics/industry/industry-overview/australian-industry/2022-23

57 Australian Bureau of Statistics 2023, Estimates of Industry Level KLEMS Multifactor Productivity, 2021-22 financial year, Australian Bureau of Statistics, https://www.abs.gov.au/statistics/industry/industry-overview/estimates-industry-level-klems-multifactor-productivity/2021-22

58 Love PED, Smith J, Ackermann F, Irani Z and Teo P 2018, 'The costs of rework: insights from construction and opportunities for learning', Production Planning & Control, vol. 29, no. 13, pp 1082–1095, available via: https://doi.org/10.1080/09537287.2018.1513177

59 Construction Industry Culture Taskforce 2023, CICT Newsletter December 2023, Construction Industry Culture Taskforce, available via: https://www.constructionindustryculturetaskforce.com.au/cict-newsletter-december-2023

60 BIS Oxford Economics 2021, The cost of doing nothing report, Construction Industry Culture Taskforce, available via: https://www.constructionindustryculturetaskforce.com.au/publication/culture-standard-research-title

61 Laing O'Rourke, 'Technology and innovation spotlight: building bridges', Laing O'Rourke, 2 November 2022, available via: www.laingorourke.com/thinking/technology-and-innovation-spotlight-building-bridges

62 Laing O'Rourke, 'Technology and innovation spotlight: building bridges', Laing O'Rourke, 2 November 2022, available via: www.laingorourke.com/thinking/technology-and-innovation-spotlight-building-bridges

Online ISBN: 978-1-925352-78-8