Introducction

Australia’s largest cities are facing a watershed moment in their growth and development. In the coming 30 years the size of the Australian population will grow substantially. Between 2017 and 2046, Australia’s population is projected to increase by 11.8 million people. That’s equivalent to adding a new city, roughly the size of Canberra, each year for the next 30 years.

About 75% of this growth will occur in Sydney, Melbourne, Brisbane and Perth. Growth on this scale will transform these cities. A growing population is an exciting opportunity to increase our national economic prosperity and liveability. The potential benefits are immense.

Growth alone is not the only challenge and opportunity faced by Australia’s cities. The convergence of fundamental shifts across several sectors has an as-yet-unknown but potentially significant impact on the structure and operation of our cities in coming decades, and particularly on the infrastructure required to support them. These include the ageing population, rapid technological transformation, increasing urban freight task, climate change, the shifting structure of national and global economies and changing nature and location of work.

Australians face a complex set of choices regarding the future of our cities and what they will look like. Should our cities grow out or up? How do we align the location of jobs with the needs of our changing economy? How do our infrastructure networks need to change to accommodate more demand? How can we ensure the world-class liveability of our cities is maintained and enhanced?

These are difficult decisions, with each requiring trade-offs and compromise. But inaction is not an option, nor is business as usual. If we fail to effectively anticipate and respond to growth, the likely results will be declining economic productivity, increasing environmental pressures and a marked reduction in each city’s quality of life.

We must act now to preserve and enhance the elements of each city that make them such attractive places to live and work.

For more detail, view the full Future Cities report and a supplementary mapping tool at www.infrastructureaustralia.gov.au
How we approached the research

The 2016 *Australian Infrastructure Plan* explored some of the key challenges facing Australian cities in the context of population growth:

“Population growth will transform our cities. Our four largest cities are set to undergo a higher density urban transformation. Our aim for these cities should be to deliver high-quality, higher density living, connected by world-class infrastructure services.”

This paper builds on the direction set in the Plan, by testing the impact of different scenarios in Melbourne and Sydney to provide governments and the community with an accessible evidence base and reform agenda.

What this paper aims to achieve

The purpose of this paper is to test and better understand the trade-offs between potential long-term growth pathways for Australia’s largest cities. Melbourne and Sydney are used as examples and each of the scenarios for these cities are deliberately hypothetical and strategic in focus. They do not reflect their respective state governments’ current planning policies.

Specifically, this paper aims to:

1. Improve community engagement

Providing the community with accessible information on the potential outcomes of growth and change in their cities will help inform public discussion. The three hypothetical scenarios for Melbourne and Sydney provide the community with a set of examples against which they can compare their current experiences and better engage with the long-term planning strategies for their city.

2. Provide independent advice to governments

The analysis of the three 30-year scenarios for Melbourne and Sydney and supporting recommendations provide governments with an insight into how Australia’s largest cities might grow, and the outcomes delivered by different land-use, employment, and infrastructure decisions.

3. Demonstrate value of scenario planning

The paper advocates for more sophisticated and transparent planning practices such as scenario planning, to meet the challenges and opportunities of the coming decades.
Infrastructure Australia has developed six hypothetical growth scenarios, three each for Melbourne and Sydney in the year 2046. The scenarios seek to test commonly posed questions about how Australian cities could grow and change, including:

- Should our cities expand outwards, at a low density, or consolidate inwards at a higher density?
- Should we seek to locate jobs in a small number of large centres or distribute them more evenly across the metropolitan area?
- What mix of modes and network structure is best suited to meet the needs of a larger city?

The scenarios assume common population and employment growth totals within consistent metropolitan boundaries, but differ by the location of this growth, and by the future structure of the transport network.

**Scenario analysis for Melbourne and Sydney**

**Melbourne’s scenarios**

- **The Expanded Low Density scenario**
  - 40% of population growth in greenfield areas.
  - Maintain current economic geography.
  - Expand transport to better connect increased population in outer suburbs.

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  - Maintain current economic geography.
  - Expand transport to better connect increased population in outer suburbs.
Melbourne’s scenarios (continued)

The Centralised High Density scenario

- 20% of population growth in greenfield areas.
- Expanded CBD to take in inner suburbs.
- Better use of existing transport infrastructure by developing around existing nodes and tram lines in inner and middle suburbs.

The Rebalanced Medium Density scenario

- 30% of population growth in greenfield areas, with a focus on medium density in the west of the city.
- Growth of employment centres in the west.
- Upgraded transport infrastructure to support rebalancing to the west.
Sydney’s scenarios

The Expanded Low Density scenario

- 30% of population growth in greenfield areas.
- Maintain current economic geography.
- Expand transport to better connect increased population in outer suburbs.
Sydney’s scenarios (continued)

The Centralised High Density scenario
- 10% of population growth in greenfield areas.
- Dual CBD model.
- Better use of existing transport infrastructure by developing around existing nodes in inner and middle suburbs.

The Rebalanced Medium Density scenario
- 20% of population growth in greenfield areas, with a focus on medium density spread more evenly across the city.
- Decentralised employment to eight economic clusters.
- Upgraded transport infrastructure to support new economic geography.
What the scenario analysis found

Infrastructure Australia compared the performance of the three hypothetical scenarios by modelling their respective impact on the city’s infrastructure, using a range of economic, social and environmental indicators. The metropolitan-level results are summarised in the following tables. The full Future Cities report analyses the spatial impacts of these results. These can also be viewed in detail using the supplementary mapping tool at www.infrastructureaustralia.gov.au

**Melbourne**

<table>
<thead>
<tr>
<th>Key statistics</th>
<th>Reference Case (2015/2016)</th>
<th>Expanded Low Density</th>
<th>Centralised High Density</th>
<th>Rebalanced Medium Density</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transport performance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road congestion(^{4})</td>
<td>5%</td>
<td>7%</td>
<td>9%</td>
<td>6%</td>
</tr>
<tr>
<td>Public transport mode share(^{4})</td>
<td>14%</td>
<td>21%</td>
<td>22%</td>
<td>21%</td>
</tr>
<tr>
<td><strong>Access to jobs in 30 minutes(^{4})</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td>22%</td>
<td>18%</td>
<td>17%</td>
<td>18%</td>
</tr>
<tr>
<td>Public transport</td>
<td>2%</td>
<td>3%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Access to jobs in 60 minutes(^{5})</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td>64%</td>
<td>53%</td>
<td>53%</td>
<td>54%</td>
</tr>
<tr>
<td>Public transport</td>
<td>24%</td>
<td>25%</td>
<td>29%</td>
<td>26%</td>
</tr>
<tr>
<td><strong>Access to hospitals(^{5})</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of population with access</td>
<td>87%</td>
<td>78%</td>
<td>82%</td>
<td>80%</td>
</tr>
<tr>
<td><strong>Access to schools(^{5})</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of population with access</td>
<td>95%</td>
<td>86%</td>
<td>90%</td>
<td>87%</td>
</tr>
<tr>
<td><strong>Access to green space(^{5})</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of population with access</td>
<td>38%</td>
<td>31%</td>
<td>33%</td>
<td>32%</td>
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</table>
### Sydney

#### Key statistics

<table>
<thead>
<tr>
<th></th>
<th>Reference Case (2016)</th>
<th>Expanded Low Density</th>
<th>Centralised High Density</th>
<th>Rebalanced Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transport performance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road congestion(^{(a)})</td>
<td>15%</td>
<td>28%</td>
<td>30%</td>
<td>28%</td>
</tr>
<tr>
<td>Public transport mode share(^{(c)})</td>
<td>26%</td>
<td>32%</td>
<td>35%</td>
<td>35%</td>
</tr>
<tr>
<td><strong>Access to jobs in 30 minutes(^{(d)})</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td>13%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Public transport</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Access to jobs in 60 minutes(^{(e)})</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td>43%</td>
<td>35%</td>
<td>36%</td>
<td>36%</td>
</tr>
<tr>
<td>Public transport</td>
<td>13%</td>
<td>18%</td>
<td>23%</td>
<td>22%</td>
</tr>
<tr>
<td><strong>Access to hospitals(^{(f)})</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of population with access</td>
<td>80%</td>
<td>71%</td>
<td>76%</td>
<td>74%</td>
</tr>
<tr>
<td><strong>Access to schools(^{(g)})</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of population with access</td>
<td>97%</td>
<td>92%</td>
<td>95%</td>
<td>94%</td>
</tr>
<tr>
<td><strong>Access to green space(^{(h)})</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of population with access</td>
<td>62%</td>
<td>54%</td>
<td>58%</td>
<td>56%</td>
</tr>
</tbody>
</table>

Note: Best performance is bolded.

Note: Indicators are rounded to the nearest whole percent. This means some scenarios appear to show the same result even though there are differences in performance. More detail is provided in the full *Future Cities* report.

Note: Care should be taken when comparing the reference case to the scenarios. This is particularly the case with green space, school and hospital access indicators, where no new infrastructure was added in addition to the reference year.

(a) For Melbourne only, the population and employment reference case year is 2015 for transport modelling. Reference case year is 2016 for social infrastructure and green space modelling

(b) Measured as the percentage of vehicle kilometres travelled where volume of traffic exceeds road capacity in the AM peak

(c) The percentage of trips by public transport in the AM peak

(d) The percentage of jobs accessible in 30 minutes during the AM peak

(e) The percentage of jobs accessible in 60 minutes during the AM peak

(f) Within a 20-minute drive or 30 minutes by public transport of a major hospital in the AM peak

(g) Within a five-minute drive or 20 minutes by public transport or a 40-minute walk of a primary or secondary school in the AM peak

(h) Within a five-minute walk of any green space.
Nine key findings have emerged from the scenario analysis of Melbourne and Sydney. These provide valuable insights for all Australian cities experiencing rapid population growth and change, regardless of the future growth scenario that is followed.

Infrastructure Australia has combined this evidence base with analysis from the Australian Infrastructure Plan to develop 15 recommendations for Australian governments at all levels. The findings and recommendations are summarised in this paper, more detail can be found in the full Future Cities report.

1. Unplanned growth delivers the worst outcomes for Australia’s fastest growing cities

The scenario analysis shows that well-planned cities, where the location of jobs, homes and their supporting infrastructure networks are coordinated to maximise accessibility and liveability, will deliver the best outcomes for Australian communities. For both Melbourne and Sydney, the scenario which delivers the greatest proportion of greenfield development, the lowest population densities, and the lowest integration between land use and infrastructure has poorer job and infrastructure access outcomes for future residents. This makes clear that if our largest cities are going to successfully respond to growth, changes to their structure and operation, and the processes used to deliver these, will be needed.

Recommendation

The Australian Government should establish a consistent framework of incentives to drive the delivery of national benefits within our cities at the project, place and reform level, such as National Partnership and Project Agreements, City Deals and Infrastructure Reform Incentives.

Recommendation

Australia’s largest cities should establish institutions and processes which enable the delivery of metropolitan-scale governance.

Recommendation

Australian governments should improve the flexibility, transparency and sophistication of current strategic planning tools and practices to improve decision-making and deliver better planning outcomes for the long-term growth of our cities.
Recommendation
Australian governments should improve the quality and accessibility of community engagement at the strategic planning stage of a city’s development.

Recommendation
Australian governments should focus on outcomes rather than outputs when developing the policy and regulatory frameworks that respond to changing technologies and services.

Recommendation
In the context of climate change, Australian governments should prepare metropolitan resilience strategies that establish clear policy, regulation and guidelines for strengthening the resilience of the planning, coordination and construction of our cities as they grow.

2. Public transport is crucial to improving accessibility in Australia’s largest cities

Under all scenarios, the use and performance of public transport services across the cities improves. Even as our largest cities grow by over 2 million people, both the public transport mode share, and the proportion of the cities’ jobs that can be accessed by public transport, increase. This shows that public transport is well suited to moving large volumes of people, particularly in higher density environments.

Recommendation
Australian governments should increase investment in public transport infrastructure in cities experiencing significant population growth. Investment in mass transit is crucial to reducing congestion, increasing accessibility and reducing the rate of emissions growth.

Recommendation
The Australian Government should encourage state and territory governments to focus and prioritise efforts toward achieving full accessibility compliance across public transport networks in Australia’s largest cities within defined timeframes.
3. Congestion will increase under all scenarios and adding new roads is only part of the solution

The scenario analysis indicates that private vehicles continue to be used for the majority of trips within our largest cities, and the total number of trips on our roads increases significantly. Construction of new roads alone cannot accommodate this demand and alleviate congestion at the same time. Land-use planning and transport network investment will need to be complemented by other approaches, including demand management mechanisms such as road user charging, and public transport investment.

**Recommendation**

Consistent with the *Australian Infrastructure Plan*, Australian governments should work together to progressively introduce a national heavy and light vehicle road user charging regime within 10 years, as part of a broader demand management strategy.

4. We need to use existing infrastructure in our largest cities more efficiently

The scenario analysis shows that population growth, particularly in established areas, will increase the demand on existing economic and social infrastructure. New infrastructure will be needed to support growth, but governments should also maximise the return on investment from existing assets. ‘Sweating’ assets can be more financially effective and less disruptive to the community than building new infrastructure. This could include ensuring appropriate maintenance, renewal, technology upgrades and demand management strategies are in place.

**Recommendation**

Australian governments should routinely review the capacity of economic and social infrastructure within our cities and develop strategies to ‘sweat’ existing assets to extract greater value for communities.
5. As demand increases, coordinating new and upgraded infrastructure across governments will be a challenge

The scenario analysis shows increases in demand for transport, health services, schools and tertiary education facilities, which will require new and upgraded infrastructure. Governments and the community will face a series of choices about the sequencing, type and location of infrastructure to support growth. Problems arise when new developments and infrastructure are planned and delivered in isolation. A place-based approach that considers interrelated elements and the broader needs of an area can deliver better community outcomes.

**Recommendation**

Australian governments should adopt a place-based approach when translating metropolitan visions into the sequencing and delivery of development with infrastructure.

6. Well-serviced employment centres enhance the job accessibility of our cities and deliver national benefits

The three scenarios present a spectrum of economic geographies ranging from single central business districts to several distributed employment centres. Across the scenarios, the analysis shows that access to jobs improves when cities are serviced by an established set of employment centres, particularly when connected by public transport, rather than a dispersed employment structure, requiring private vehicle access.

**Recommendation**

Australian governments should take an active role in supporting employment centres in our largest cities, serviced by public transport.

7. Land-use and infrastructure planning can help to address inequality of access, but supporting social and economic policies are also required

Spatial inequality, in terms of access to jobs, health services, education and green space, is evident within all scenarios, and particularly stark for those who live on the outskirts of our cities. Across both cities, the scenario which sees housing and jobs distributed more evenly across the city delivers the most equitable level of access in traditionally job-poor areas. However, disparities are still present, indicating that complimentary social and economic policies, alongside land-use and infrastructure changes, are required to effectively address this issue as our cities grow.

**Recommendation**

Australian governments should focus on improving access to jobs, health services, education and green space for the outer areas of our largest cities.
8. Green and public spaces play an increasingly important role in maintaining the city’s liveability

The scenario analysis shows that regardless of the way in which these cities grow, population growth on the scale projected will see access to private space decrease while demand for green and public space increases. This transition will place a much greater emphasis on each city’s public realm. It is critical that these assets are protected and enhanced to ensure that the liveability of Australia’s largest cities is maintained.

**Recommendation**

As our cities grow, Australian governments should focus on maintaining and enhancing green infrastructure and the public realm to ensure they remain liveable.

9. Land-use changes can play some role in addressing the amount of carbon emissions our cities generate

Australian cities are the principal generators of Australia’s carbon emissions and, without significant change, the growth of these cities will only increase this trend further. The scenario analysis shows that different land-use and transport infrastructure choices can improve the environmental performance of our cities’ transport networks. Higher density spatial patterns that encourage mode shift away from private vehicles towards active and public transport generate lower carbon emissions, reducing the city’s impact on the environment.

**Recommendation**

Australian governments should work collaboratively to establish a stable national framework to respond to climate change and reduce emissions in line with our international commitments.