

Australian Infrastructure Plan

Priorities and reforms for
our nation's future

Report

February 2016



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

It leads reform on key issues including means of financing, delivering and operating infrastructure and how to better plan and utilise infrastructure networks.

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

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Chairman's Introduction

Priorities and reforms for our nation's future

We live in a great country. Australia has an impressive natural and built environment, a highly educated population and a diverse and dynamic culture. Infrastructure has been fundamental to this national success story, underpinning a standard of living that is the envy of the world.

But our nation is undergoing a process of generational change, bringing real opportunities and challenges. Our population growth now exceeds that of our peers, outstripping countries like the UK, Canada and the United States. By 2031, more than 30 million people will call Australia home, and most of them will live in our four largest cities – Sydney, Melbourne, Brisbane and Perth.

Australia's proximity to a rapidly growing Asia-Pacific will unlock new economic opportunities. By 2031, Asia will represent around two-thirds of the world's middle-class population, creating huge demand for Australian produce and skills.

Unless we transform our infrastructure base and invest in new nation-shaping projects and policies, we risk failing to capitalise on these historic opportunities. We need infrastructure that:

- *Strengthens our global role* as an exporter of resources, services and products, with improved networks and gateways that boost connectivity;
- *Meets our needs as a highly urbanised nation*, enhancing the liveability of our cities and fostering the skilled jobs and innovative businesses that cities create; and
- *Underpins our prospects for sustainable growth*, by focusing on resilience and whole-of-life asset management.

Equal effort must be spent to ensure existing infrastructure is used more efficiently, with a focus on maintenance and the use of new technology to secure service improvements for individuals and businesses.

Across the nation, we must encourage strategic and integrated planning. We can show that we have learned the lessons of the past, pursuing best practice procurement and delivery that sees new infrastructure constructed for the right reasons at the right price.

Taking a strategic and ambitious approach to the infrastructure that Australia needs will directly improve living standards and productivity.

For our nation to grasp its full potential, we therefore need a long-term focus and a shared strategy. The *Australian Infrastructure Plan* is the first building block of that approach.

This Plan is a reform document based on substantial research and input from a broad spectrum of stakeholders. It provides a vision and roadmap to address today's infrastructure gaps, and set us up to meet the challenges of tomorrow.

Particular focus is placed on solutions that would improve the public funding of infrastructure and enable increased private sector investment. Market-based policy changes and evidence-based decision making are key recommendations. In the accompanying *Infrastructure Priority List*, significant project initiatives in each state and territory are featured, addressing national and sectoral needs.



Taking a strategic and ambitious approach to the infrastructure that Australia needs will directly improve living standards and productivity.

In developing this Plan, Infrastructure Australia has prioritised the user: the commuter waiting for a train, the family paying their electricity bill and the business looking to access new markets. If we get our infrastructure right, these customers will experience energy, telecommunications, water and transport services that are modern, effective and affordable.

But the Plan will only be as good as the commitments and leadership that follow. This strategic document must be followed by a carefully articulated and broad-based action agenda.

Australia has tackled the challenge of reform before. In the 1950s and 1960s, our population growth was even faster than we face today. Because we planned, we prospered – and emerged a richer nation for it.

In the 1980s and 1990s, we embarked on an unprecedented microeconomic reform agenda to open up a closed economy. This brought greater productivity, jobs and trade growth, and a more competitive nation. It was fundamental in creating the successful Australia we live in today. These reforms happened because governments and business were committed, working together to bring the rest of the community along and willing to collectively implement a bold reform vision.

As a nation, we need to re-establish our reform credentials and act comprehensively. If we don't, Australia faces a future of congestion and constraint. Increasing bottlenecks and costly delays will mean it takes longer for Australians to get to work or home, our goods will take longer to reach ports and shops, and the many services we rely on from infrastructure will decline.

This Plan provides the foundation on which all levels of government can act over the coming decades. The reforms and projects it recommends will, once delivered, drive our nation's competitiveness and prosperity.

Infrastructure Australia is setting our own goals to support the implementation of the Plan's key ideas and investments. We will lead this process through research, engagement and advocacy. It will all be part of an ongoing public dialogue about the infrastructure people want, the outcomes it should deliver and the best ways to plan and pay for it.

Together we can enhance Australian's quality of life and secure the social and economic benefits that come from good infrastructure.

On behalf of the Board of Infrastructure Australia, I would like to thank everyone who has made a submission, offered advice and contributed to this Plan. We look forward to working with all levels of government and the wider community to progress these initiatives.

Mark Birrell

Chairman, Infrastructure Australia

Executive Summary

Australia needs a long-term plan for infrastructure reform and investment

The need for a national infrastructure plan has never been greater.

Australians currently enjoy access to many world-class infrastructure services, which have supported two decades of uninterrupted growth and underpin our world-renowned quality of life. But Australia is undergoing a period of profound change and in 15 years' time will be a very different country from the one it is today.

Our population is expected to grow to over 30 million by 2031. A growing population is a source of economic dynamism. Growth provides a larger domestic market for businesses, increases the size of the labour force and facilitates the injection of new ideas. But it also places additional demands on cities and regions – and ultimately government budgets.

Growing demand for Australia's resources and services from a vibrant Asia-Pacific will also trigger substantial shifts in our economy. Rising incomes in the region present immense economic and social opportunities.

Emerging technologies are stimulating innovation. The increasing automation of infrastructure services

will fundamentally change our built environment. Data is providing us with real-time information on the movement of people and goods. These evolving technologies are rapidly changing how consumers interact with businesses and have the potential to profoundly change how we live and work.

We are facing new and emerging environmental challenges, with greater risks of extreme weather. The impacts of climate change are going to become more apparent and the need for emission reductions will persist.

Adapting to these changes means we have to rethink our economic infrastructure to deliver networks and services which strengthen our role in the global economy, enhance the liveability and productivity of our cities and regions, and supports a transition to a more sustainable and resilient economy.

The purpose of this Plan is to identify the infrastructure reforms and investments that will deliver these aspirations.

Building an evidence base for the Plan

Infrastructure Australia was established in July 2008 to provide advice to the Australian Government under the *Infrastructure Australia Act 2008*. In 2014, our Act was amended to enhance the organisation's independence



and to task Infrastructure Australia with responsibility to develop 15-year rolling infrastructure plans.

This Plan has been developed through a collaborative 18-month process of research and consultation. In May 2015, Infrastructure Australia released the *Northern Australia Audit*, which identified a program of investments and reforms to transform the north of Australia. This was followed by the release of the *Australian Infrastructure Audit* – the nation’s first comprehensive examination of infrastructure across the energy, telecommunications, water and transport sectors.

Together, the two Audits provide the primary evidence base for the Plan. They set out the case for substantially enhancing the quality, capacity and efficiency of infrastructure and overhauling the way our infrastructure is planned, funded, constructed, operated and maintained.

Since releasing these Audits, we have received more than 100 formal submissions from jurisdictions, a wide range of industry associations, public interest groups, local government bodies and individuals. We have consulted with more than 500 stakeholders in every state and territory, and worked closely with representatives from all levels of government, as well as businesses, industry, peak bodies and the wider community.

A list of submissions can be found in **Appendix C**. The full submissions are available on Infrastructure Australia’s website and a selection of submissions and feedback is quoted throughout the document.

Reform is at the centre of the Australian Infrastructure Plan

The Plan lays out a comprehensive package of reforms focused on improving the way we invest in, deliver and use our nation’s infrastructure.

The formulation of the Plan is predicated on the view that, as a nation, we must recapture the reform spirit of the 1980s and 1990s, and initiate a new wave of policy and legislative reforms. We should focus on extracting the greatest value from existing infrastructure, while sustainably funding new investments to deliver better services for all Australians.

The reforms in this Plan are guided by four headline aspirations, which serve as the basis for the forthcoming chapters:

- Productive cities, productive regions;
- Efficient infrastructure markets;
- Sustainable and equitable infrastructure; and
- Better decisions and better delivery.

The result is a long-term strategy that lays the foundation for a more productive Australia over the coming 15 years and beyond.

Productive cities, productive regions

For Australia's economy to continue to support our quality of life, our cities and regions need to evolve as productive sources of growth, jobs and opportunity.

While Australia's prosperity over recent decades has been built on the strength of our manufacturing and resources industries, changing global markets mean we need to create new sources of growth and productivity to provide opportunities for all Australians. Across our cities and regions, we need to specialise in what we as a nation do best – as a knowledge-based economy of highly-skilled thinkers, innovators and producers.

Our cities will need to be vibrant, liveable and efficient centres of growth and prosperity. The most important resource in these cities is our people. And getting the best from our people means providing them with high-quality infrastructure to support their lives.

Between 2011 and 2031, almost three-quarters of our population growth will occur in Sydney, Melbourne, Brisbane and Perth. This means our biggest four cities will collectively need to accommodate 5.9 million more people. This growth presents challenges and opportunities. Growing communities need places to live, work and enjoy our great Australian way of life, placing pressure on existing infrastructure networks.

But if we plan for this growth now, we can further develop our cities as thriving, world-class centres of growth and prosperity.

The pace of growth in our four largest cities will require a rethink of the built environment and connecting infrastructure. Medium to high-density development within established urban areas provides a viable mechanism to meet the needs of rapidly-growing urban populations.

But densification alone is not enough. Part of making our cities world-class is creating dynamic communities where people want to live. We should ensure that higher density housing offers high-quality design, is well-connected by infrastructure to jobs and education, and provides access to high-quality public spaces, including parks, community facilities and cultural precincts.

Workers need high-frequency, interconnected public transport systems to move them efficiently and comfortably. We will need to change the structure, operation and use of our passenger transport to deliver services required by a 21st century population. Australia's largest cities should start planning for integrated, timetable-free, 'turn up and go' train and bus services – similar to that of New York, Singapore, London and Paris.

Our smaller cities offer many advantages. They are renowned for their liveability with more affordable housing, accessible green spaces, less congestion, and a strong sense of community. In some cases, their



close proximity to the big four cities means these cities can ease the pressure on our larger cities. We should capitalise on the character and appeal of these cities to grow their populations.

Getting the governance right in all our cities will be central to their success. The Australian Government needs to play a more active role in the development and governance of cities than ever before. Planning for population growth is too great a task to leave to chance. That is why we need a *National Population Policy* to guide decisions on how to best manage and capitalise on our growing population over coming decades.

Technology will transform our cities and how we interact with our infrastructure. Disruptive devices and applications can make a positive change to how, when and where we work. We need to anticipate and plan for the impact of these changes on the operation and use of infrastructure. Regulators will need to be responsive to emerging technologies and new service delivery models that may challenge existing practices, ensuring users' long-term interests are put first.

Maximising the productivity of our cities means making better use of existing infrastructure through technologies and integrated systems that drive greater efficiency across networks. For example, intelligent transport systems can triple the utilisation of an asset – through better management of the road network and the vehicles using it.

Investing in the right infrastructure is also critical. We should target those elements of a network that deliver the highest productivity gains and quality services to customers. New ways of generating, collecting, sharing and analysing data will help us determine where investment is most required, while connecting users with operators and ensuring the customer is at the centre of every decision on infrastructure.

The story in our regions is similar – we need to better plan and prioritise infrastructure to support greater productivity. The booming economies of south-east Asia and China will boost demand for our resources, services, produce and tourism. Efficient and reliable regional infrastructure will help us take advantage of this opportunity for growth.

Our regions are often characterised by vast distances and unique environments. Outside our east coast, Australia is one of the most sparsely populated countries in the world. In northern Australia, seasonal weather also contributes to the high cost of delivering infrastructure in the regions. This means our regions face unique challenges that need careful planning to build their productive capacity. A 'one size fits all' approach will not work.

Many regional industries rely upon freight supply chains to transport their goods to market. Clearance of containers can be delayed through some regional ports, while many regional roads cannot handle heavier, more productive vehicles. This is worsened by the fragmented oversight of Australia's freight network. The planning, delivery and operation of infrastructure occurs largely in isolation and lacks a wider network perspective.

If not addressed, these issues will prevent our regions from reaching their potential in the long term.

Governments, businesses and communities should develop long-term infrastructure plans for higher growth regions. These plans should identify the types of infrastructure and service delivery levels that will be needed to support growing populations and business in coming decades.

This should be supported by the delivery of a *National Freight and Supply Chain Strategy* which would map nationally significant supply chains and their access to supporting infrastructure, and recommend a series of reforms and investments to enable the more efficient movement of freight.

Technology will also play a key role in the regions. High-speed broadband will improve access to domestic and global markets, opening up new possibilities for regional producers. Emerging technologies will help identify the most efficient route from farm to market, meaning investments can be targeted to these routes. Meanwhile, developments in the energy sector could create new ways to power our regions. Governments should also look to improve the quality and financial sustainability of regional infrastructure services by encouraging efficient scale and co-sharing of assets.



Efficient infrastructure markets

Infrastructure provides best outcomes when it is delivered within robust, well-regulated market structures and funded through an efficient and equitable balance of user and taxpayer dollars.

Building and enhancing our infrastructure to meet the challenges of growth over the next 15 years will require more funding, from both taxpayers and users. The balance between what users and taxpayers pay will also need to be fairer, recognising that those who benefit the most – the users of infrastructure – should make a greater contribution.

In most cases, users should fund the greatest possible proportion of costs, freeing up taxpayer dollars to invest in other priorities like social services, health and education. However, governments should carefully consider the implications of increased user charges on individuals and families on lower incomes. Where governments consider this burden unreasonable, they should utilise the tax and welfare systems to redress disadvantage, as they will be significantly more effective and efficient than individual adjustments at the infrastructure service level.

With the right incentive and regulatory structures, infrastructure markets can deliver a better deal for customers. In some infrastructure sectors, Australia has established a good balance and developed the right structures to deliver efficient and responsive services. In others, there is work to be done to achieve the right funding mix and market structure.

In the energy sector, we have a world-leading market structure, where the costs of provision are typically met by users. Public sector monopolies have been separated into corporatised generation, network and retail components, a number of which are now in private ownership. Despite this success, reform of the energy sector is incomplete. Substantial sections remain in public ownership and regulatory frameworks need to be refined to meet emerging challenges. Electricity generation, network and retail businesses still in public ownership should be transferred to private ownership as soon as practicable. Similarly, regulators and governments should deregulate retail energy prices where this has not already occurred.

In telecommunications, reforms over the past few decades have moved the sector away from a government-owned

fixed-line monopoly structure, allowing Australians to enjoy access to competitive and well-regulated telecommunications infrastructure. The next challenge for the Australian Government will be to ensure the efficient rollout of an open-access, wholesale-only fixed-line and fixed wireless broadband network; with capabilities that will cater for ever-increasing demand.

Over the medium term, the National Broadband Network Company should be transferred to private ownership. To achieve this, the Australian Government should commission a scoping study to define a pathway to privatise an appropriately-structured National Broadband Network into an efficiently-regulated market.

In the water sector, the pace of reform is broadly divided between metropolitan and regional markets. For water services in metropolitan areas, reforms over the past 30 years have enhanced service quality and reduced cost. Costs are generally recovered from users, but there is scope for even greater efficiency and improvements in service quality. Subject to efficient economic, safety and environmental regulation, there is no continuing case for public ownership of Australia's metropolitan water utilities. Private ownership and operation of water utilities can deliver substantial benefits for users through higher quality water, more reliable supply and lower bills.

In many regional towns and surrounding areas, the costs of potable water services are not recovered from users, and instead rely on allocations from local council rates and other taxpayer top-ups. In these areas, governments should focus on achieving the appropriate scale to deliver efficient, safe and customer-focused regional water services.

Australia's rural productive water markets have been largely a success story. But barriers to efficient trading still exist, or are creeping back, where markets are in place. Large parts of Australia, particularly in the north, are still without secure, tradeable water rights. A new national body and water reform plan is needed to energise governments and communities to complete water reforms, building on the success of the National Water Initiative.

Funding and market reform of the transport sector represents the most significant infrastructure challenge for Australia's governments. In the case of road networks, the *Australian Infrastructure Audit* revealed that there is a shortage of funding available to meet current and future needs. Access and usage charges are opaque and blunt, bearing a very limited relationship to actual use and costs of the road network. For public transport, the

gap between what users pay and the cost of provision is even more acute. Public transport operators in Australia typically recover a small fraction of costs from users, with taxpayers contributing the difference.

On road networks, the transition to a more user pays approach would allow charging to be linked to funding and supply to be linked to demand. This will be fundamental to securing the required funding and sustainably improving the level of service.

That is why the introduction of direct heavy vehicle charging within five years, and direct user charging for all vehicles within 10 years, alongside the removal of existing taxes and charges, should be a priority for Australia's governments to provide greater fairness and equity in how we pay for roads.

Reform in transport should not be isolated to roads. Efficient and effective public transport is crucial to our productivity and quality of life. Where public transport has been franchised through a competitive process, such as Sydney's ferries and Melbourne's trams, consumers have benefitted from increased investment and higher quality services. All public transport operators in Australia should be routinely and periodically exposed to a competitive process, to ensure that users are provided with the best possible service at the most efficient price.

Maintaining and renewing existing infrastructure will also be crucial. Infrastructure is generally characterised by long-dated assets for which the operational costs are often many multiples of the funding required in the planning and building phase. The majority of infrastructure Australians will use in the next 15 years has already been built, but this infrastructure will require substantial additional funding for maintenance, renewal and upgrade as our population grows.

Across all sectors, we should diversify the pool of funding we apply to infrastructure to meet the needs of a growing economy. Public finances cannot support substantial subsidies in perpetuity, while also providing the services our growing population requires. That is why we need to use broader options such as value capture, increased cost recovery in public transport and better use of governments' borrowing capacity.

Achieving the right balance of user pays, reforming our infrastructure markets and continually refining our approach will not be easy. The existing structures are familiar and the reforms are complex, but the rewards are substantial and the imperative for change is clear.

Sustainable and equitable infrastructure

Infrastructure can do more than just get us from A to B or provide power, telecommunications or water when we need it. It can also provide broader social and environmental benefits and help to create a more sustainable and fairer Australia.

Infrastructure decisions should anticipate the long-term implications of decisions for our economy, society and environment, and provide solutions that meet our needs today without compromising our future. Our infrastructure should promote and incentivise behaviours that are in our best interests over the long term.

We therefore need to improve the sustainability of our infrastructure. The electricity and transport sectors account for half of all our greenhouse gas emissions. While we have made strong progress in improving the efficiency of our infrastructure, further work is required if our electricity and transport sectors are to help us meet our 2030 target of reducing national emissions by 26 to 28 per cent below 2005 levels. Governments should set long-term reduction targets and maintain consistent regulatory frameworks to encourage industries to innovate and plan for a reduction in emissions.

Making infrastructure more sustainable often means using networks more efficiently. When planned and operated well, infrastructure minimises the resources required by people and businesses, reducing emissions, waste and costs. For instance, shifting people from cars to public or active transport, or freight from trucks to trains, can reduce emissions, improve air quality, and lift the broader efficiencies of road and rail networks.



We should also encourage growth in renewable energy. Technologies such as smart meters and battery storage systems will alter patterns of energy supply. When combined with solar photovoltaic systems, battery storage will increase the economic viability of renewable generation for households.

Our infrastructure must be robust in the face of dynamic risks. Enhancing the resilience of infrastructure networks requires planners, owners and operators of infrastructure to prepare for the threats and opportunities of a changing world. The capacity of our infrastructure to continue operating through minor disruptions, and recover quickly from major disruptions, will be critical to supporting people and businesses over coming decades. Regulators should ensure that responses to threats are proportionate and efficient. The costs of managing risks should reflect consumer preferences, balancing pricing and reliability considerations.

Infrastructure should provide a strong foundation for all Australians, just as it can and should promote inclusion through accessible and affordable services. This is particularly relevant in remote areas, where affordable, reliable and sustainable infrastructure services can unlock opportunities, reduce disadvantage and promote independence.

Remote and very remote Australia makes up close to 90 per cent of our land mass but is home to only three per cent of Australians. Remote areas are particularly

important for Indigenous Australians. Approximately 143,000 Indigenous people – or one in five – live in these areas, compared to one in 50 non-Indigenous people. Many of these communities lack adequate road access, a reliable energy supply, telecommunications access, and clean water and wastewater services. This can be due to extreme weather, low population densities and long distances driving up costs.

Governments should continue to work with remote communities to develop, implement and maintain their infrastructure. This includes better coordination of funding across governments and businesses, and by tendering out the provision of infrastructure to attract more private sector innovation.

Finding ways to integrate new technology into infrastructure delivery, particularly energy and telecommunications, will deliver more reliable and affordable infrastructure that supports new opportunities for remote communities.

Infrastructure investments should also be tailored to support broader reforms that increase economic opportunities for communities. For example, targeted infrastructure investments should support recent Council of Australian Governments and *White Paper on Developing Northern Australia* actions that aim to improve land administration and use, support Indigenous-led economic development and create greater certainty for private investment in remote areas.



Better decisions and better delivery

Australia has a strong record of delivering high-quality infrastructure projects. But incidents of poor planning, project selection and delivery continue to occur.

The inconsistent delivery of long-term infrastructure planning has impacted the quality and reliability of Australia's project pipeline. Instances of publicly committing to a project before detailed analysis has been completed and published can undercut public confidence in government decision making. The failure to undertake post-completion reviews and collect and benchmark valuable data means we are missing out on an important opportunity to learn from past experiences. The failure to select the best solution can inflict a considerable cost on taxpayers and users.

We need to establish a consistent culture of robust and transparent decision making and delivery across infrastructure sectors. Ahead of project selection, we need to improve the evidence base for decision making by increasing the delivery and quality of integrated long-term infrastructure and land-use planning, stakeholder engagement and project development studies. At the same time, we should preserve corridors and strategic lands for future investments.

We should also modernise the processes and institutions that underpin Australia's infrastructure investment decisions by providing a tool for governments to assess their current governance arrangements against best practice. The development and implementation of *National Governance Principles* will improve the quality and transparency of infrastructure decision making. The Australian Government will have an important role to play by making federal funding for infrastructure contingent on complying with the Principles and allocating funding for planning and project development studies.

Beyond project planning and selection, we should improve the delivery and operation of infrastructure.

We need to establish frameworks and use data to identify and drive improvements throughout the project lifecycle. The development of a national *Infrastructure Performance Measurement Framework* will enable the Australian infrastructure sector to identify which infrastructure projects, practices and reforms work well and why. Sharing these good practices, and exposing areas in need of additional scrutiny, will inform policy makers and drive more informed decision making.

Developing and retaining skills, and facilitating innovation across the infrastructure sector, should also be a focus. An infrastructure skills plan will help to ensure Australia develops and retains the right people with the right skills to deliver infrastructure over coming decades.

Greater use of technology in planning and designing infrastructure has the potential to deliver substantial benefits throughout asset lifecycles.

An Infrastructure Priority List to guide investment decisions

Released alongside the Plan, the *Infrastructure Priority List* reinforces the reforms outlined in this Plan. It presents a number of recommended investments to address nationally significant challenges, support Australia's productivity and unlock new economic and social opportunities. It states where Infrastructure Australia believes governments, the community and the private sector can best focus their investments.

The *Infrastructure Priority List* used the Australian Infrastructure Audit as the primary evidence base, working in close collaboration with state and territory governments, industry and other stakeholders to establish priorities for investment in two categories:

- **Initiatives:** priorities that have been identified to address a nationally significant need, but require further development and rigorous assessment to determine and evaluate the most appropriate option for delivery; and
- **Projects:** priorities that have undergone a full business case assessment by Infrastructure Australia, will address a nationally significant problem, and deliver robust economic, social or environmental outcomes.

It also provides a basis for investing in studies, business cases and corridor preservation.

These priorities include a combination of city-shaping projects and smaller scale investments, focused on extracting the greatest value from our existing infrastructure.

The *Infrastructure Priority List* will help governments and business invest in initiatives and projects that represent the most productive use of our infrastructure funding, while solving our most pressing infrastructure problems first.

Putting the Plan into action

The scale and complexity of the actions identified in the Plan are substantial. For this reason, the Plan goes beyond simply identifying what needs to change, and outlines a practical approach to turning the package of reforms into an actionable agenda for change.

National leadership is required. While the benefits of reform will be experienced by all Australians, most changes will be required at the state, territory and local government levels. The Australian Government should show the way by leveraging its investment in infrastructure to drive the delivery of the reforms and priorities in the *Australian Infrastructure Plan*.

The Australian Government already makes payments to state, territory and local governments through funding for nationally significant infrastructure. These payments are tied to projects but requirements to meet wider policy outcomes or deliver reforms are generally limited. The *Australian Infrastructure Plan* outlines a three-tiered approach to better use existing and additional infrastructure investment to drive reform:

- **National Governance Principles:** Infrastructure Australia will develop *National Governance Principles*, which will articulate best practice planning and project decision making processes for infrastructure. The Australian Government should ensure compliance with these principles and improve the quality of infrastructure decision making and delivery by, over time, making project funding contingent on adherence to the Principles.
- **Project-specific conditions:** To ensure the public benefits of a project are maximised, the Australian Government should make project funding conditional

on meeting specified outcomes throughout the project lifecycle. Examples of these conditions may include the application of user charging mechanisms, the delivery of wider land-use outcomes, such as increased housing or new public spaces, or meeting sustainability and resilience outcomes.

- **Infrastructure Reform Incentives:** The Australian Government can and should use its funding position to drive the implementation of wider reforms not specifically related to a project. Through *Infrastructure Reform Incentives*, the Australian Government would incentivise reforms by providing additional infrastructure investment – above existing projected allocations – in return for delivery of agreed reforms, as outlined in the Plan.

To be successful, communities will need to be engaged meaningfully throughout the reform process. For too long, community engagement around infrastructure reform and projects has been inconsistent and – at times – superficial. Governments should work hard to engage with communities on the logic of their decisions – about what needs to change and why – well in advance, and take the public along as change occurs.

Infrastructure Australia will also play an active role in implementing reform. In partnership with governments, businesses and the community, it will support the implementation of the Plan's reform agenda through its ongoing work program.

The Plan will be updated at least every five years, in order to respond to the nation's changing infrastructure needs. Between these updates, Infrastructure Australia will regularly update the *Infrastructure Priority List*, while continually advocating and leading the reforms outlined in the Plan.

Productive Cities, Productive Regions



Productivity

Better utilise infrastructure networks and emerging technologies to improve productivity

More efficient infrastructure will support a more productive economy and help to create a more prosperous and equitable Australia.

In simple terms, productivity is the rate at which an economy transforms inputs – including its people and natural resources – into outputs that can be sold to domestic users or exported to people and businesses overseas.

Making our infrastructure more efficient boosts productivity by reducing costs to both users and taxpayers. This gives people and businesses more time and money for the things that matter. Reducing how much we pay for infrastructure frees up capital for investments that create jobs and promote sustainable growth.

Efficient infrastructure also unlocks opportunities for economic development. It enables Australians to generate more from our vast natural resources and highly skilled workforce by providing the means to connect and compete across domestic and global markets. World-class infrastructure can also create dynamic centres of productivity and development within communities, bringing economic, social and environmental benefits.

Extracting greater value from our infrastructure can be achieved through reform and investment.

To ensure the best outcomes for customers, governments need to reform their role in infrastructure delivery. Governments should drive greater efficiency from our infrastructure in the way they regulate the private sector, in order to promote innovation and build confidence in markets.

This is no simple task. The Australian Government should take the lead on implementing these reforms, and should provide incentives for others to play their part in creating a stronger, more productive economy with efficient infrastructure. Focusing on the experience of the customer and engaging businesses and the community in the process of reforms will be critical to their success.

Smarter investment in our infrastructure will also be required to enhance opportunities for productivity growth. Our infrastructure investments can unlock greater productivity – but these should be on the right projects, at the right time. Governments should focus on providing a stable, transparent environment to facilitate greater private investment in our infrastructure.



A key element of extracting the greatest productivity from our infrastructure investments is the establishment of an integrated Australian Government *Infrastructure Fund*. This will encourage better decision making and ensure the Australian Government's finite infrastructure dollars are directed where they are needed most.

Technology will be essential to making better use of our infrastructure. It boosts productivity growth by providing the means to extract more value from existing resources

and future investments. Cultural change is required in governments to better understand and utilise emerging – sometimes disruptive – technologies to improve the efficiency of infrastructure and provide flexible, customer-focused solutions. In particular, embedding technology in infrastructure provides operators with rich data on network performance and use, enabling major efficiency and reliability improvements, and better decisions on the infrastructure that can best drive productivity growth.

What the Audit found

- Australia's multifactor productivity growth – the rate at which the economy turns labour and capital inputs into outputs – has slowed considerably since 2000. More efficient infrastructure can play a key role in improving this trend.
- The value-add of infrastructure services was 13 per cent of GDP in 2011, of which over 70 per cent was attributable to transport. Infrastructure planners should place a high priority on productivity growth. This can be achieved through better decision making across project lifecycles, from planning to delivery, operation and maintenance.
- Infrastructure decision making must place a high priority on productivity growth. This can be achieved through efficient management of existing infrastructure, rigorous and disciplined evaluation of investment initiatives, and efficient delivery of new assets.
- Infrastructure exists to provide services. The focus of governments and the private sector must be on the quality of infrastructure services, and their cost to users and the community at large.

Boosting productivity through reform

The past decade has seen a structural change in the Australian economy. Shifts in the workforce caused by increasingly competitive and globalised labour markets, a slowing in demand for our mineral resources, and financial instability overseas have hollowed out traditional sources of growth. Our productivity growth has stalled.

Australia has the right ingredients for sustainable growth and development: vast natural resources, a highly educated workforce and a dynamic and innovative culture.

But to make the most of these, we need to adapt. Our large, sprawling cities must become world-class centres of knowledge-driven economic activity. Our regions, increasingly exposed to the challenges and opportunities of overseas markets, should specialise in producing those goods and services for which Australians hold a comparative advantage.

We need to reform our infrastructure to support the transition of the Australian economy.

Productivity-enhancing reforms are, by their nature, difficult. They often require considerable changes to the way a number of entities function, the disruption of familiar structures may conflict with vested interests, and the delivery of benefits may not be tangible at first, increasing the likelihood of public anxiety about change.

But we should remind ourselves that we have faced – and overcome – these challenges before. During the 1980s and 1990s, Australia underwent a series of major microeconomic reforms. These included the floating of the dollar, deregulation and privatisation of iconic industries and a package of tax reforms centred on the Goods and Services Tax (GST). The result was a transformation of the economy, with the strongest period of productivity growth in this nation's history.

The time is right for us to renew this spirit of reform. This Plan outlines a 15-year reform agenda to enhance the way our infrastructure is delivered, operated, maintained and used.

Undertaking the reforms proposed in this Plan can inject fresh confidence in the economy, providing people and businesses with greater opportunities to prosper over coming decades. But this Plan is only as good as the actions which follow it.

The Australian Government should play a stronger role in driving reform

The Australian Government will need to lead the reform process. While the benefits of reforms will be realised by all, the majority of complex change will be required at the state, territory and local government levels. One lever available to the Australian Government to drive nationally-coordinated reforms is to provide direct incentives to jurisdictions in return for agreed reform outcomes.

The National Competition Policy (NCP) payments structure provided a powerful incentive for jurisdictions to enact the reform pathways articulated by the 1993 *National Competition Policy Review* led by Professor Frederick Hilmer (*Hilmer Review*). Broadly, payments were made by the Australian Government to jurisdictions according to progress against agreed reform priorities. This provided rewards to those states and territories that contributed to meeting national microeconomic reform priorities.¹

More recently, the Australian Government allocated \$5 billion to establish the Asset Recycling Initiative, which provides incentive payments to state and territory governments that sell assets and reinvest the proceeds in productive infrastructure. Mirroring NCP payments, these can also be considered as a reward for meeting a national reform objective – but one where the reward is tied to infrastructure reinvestment by the jurisdiction.

The broad spectrum success of the NCP payments structure and the targeted success of the Asset Recycling Initiative together provide a sound blueprint for a new incentive framework to drive the implementation of the reforms outlined in this Plan.

“Australia must reform its economy, not only to deal with the productivity challenge at home but also to take advantage of global developments, to sustain Australia’s capacity to secure rising levels of prosperity.”

Harper Review, 2015

Our proposal for *Infrastructure Reform Incentives* would see additional Australian Government investment in state and territory infrastructure – over and above existing and projected allocations – in return for delivery of agreed infrastructure reforms consistent with those outlined in this Plan.

The Australian Government already makes a series of payments to state, territory and local governments in the form of grant funding to contribute to the delivery of nationally significant infrastructure projects. These payments are tied to projects, but not contingent on reforms or policy outcomes, effectively creating a structure where the Australian Government allocates infrastructure ‘gifts’ to jurisdictions with limited conditionality.

Through *Infrastructure Reform Incentives*, additional payments would be tied to the delivery of reforms, including those identified in this document, that are the responsibility of individual state, territory and local governments but contribute to national productivity objectives.

These reforms are focused in two chapters of the Plan:

- Improving the governance and operation of our cities as discussed in **Population**; and
- Microeconomic reforms across the energy, telecommunications, water and transport sectors as discussed in **Competitive Markets**.

For the new framework to be effective, the Australian Government would need to make supplementary funding available for infrastructure (beyond routine allocations) to those jurisdictions prepared to deliver agreed reforms. In addition to establishing a reform fund, an administrative architecture will also need to be developed in order to fully define the reforms, outline reform timelines and establish a process to monitor progress. Consideration would also need to be given to the appropriate level of incentive, a structure to encourage first-mover advantage and the form and function of the reciprocal agreements between the Australian Government and jurisdictions.

In response to the *Competition Policy Review* led by Professor Ian Harper (*Harper Review*),² the Australian Government will negotiate a new competition principles and reform agreement for the Council of Australian Governments’ (COAG) consideration by the end of 2016. Australia’s governments, through COAG, will be responsible for agreeing on the details of the reform agenda and implementing it.

The COAG agreement could provide a national framework for governments to commit to relevant reforms outlined in this Plan, with a suitable incentive package. This is particularly the case for those actions we have identified that require strong collaboration between the federal and state and territory governments to make our cities more productive and our energy, telecommunications, water and transport infrastructure sectors more efficient.

In turn, this will help improve national productivity and competition, and deliver substantial benefits to the Australian community.

Recommendation 1.1:

The Australian Government should establish *Infrastructure Reform Incentives*, which link additional infrastructure funding to the delivery of reform outcomes. This mechanism would encourage state, territory and local governments to deliver productivity enhancing reforms to the planning, construction, operation, ownership and governance of Australia’s infrastructure. *Infrastructure Reform Incentives* should be aligned to key reforms recommended in this Plan including: improving the governance and operation of our cities and microeconomic reform across the energy, telecommunications, water and transport sectors.

“Fixing infrastructure is complex, because it needs national reforms to be implemented across sovereign states. This points to a very clear case for federal funding to be directly linked to state reforms that meet the national interest.”

Infrastructure Partnerships Australia submission, 2015

Moving to a more productive delivery model

Getting the most out of our infrastructure means finding how to deliver services at lowest cost and highest benefits to customers. Maximising productivity means finding the most efficient way of owning and operating infrastructure in each sector.

In Australia, governments have delivered services through public entities that today are wholly privately-owned and operated. From banks to insurance companies and gas producers to airlines, governments have transferred responsibility for service delivery to the private sector as the case for public ownership has diminished. Instead of direct provision, governments now regulate and oversee these services – putting customers’ interests first.

Infrastructure services are no different. Governments have historically done the heavy lifting on infrastructure funding, operation and maintenance. While many networks generate widespread public benefits, it should not be assumed that customers will get the best deal if government owns and operates these services.

Experience across local and global markets has shown that greater private sector involvement, when properly regulated and incentivised, can make infrastructure services more efficient, lower cost and more flexible, providing better outcomes for users and taxpayers alike. This facilitates a more productive economy that can better support the needs of Australians.

Responding to the changing needs of Australia’s economy over coming decades will require innovation and flexibility. In most cases, the private sector has been shown to be better at predicting and providing for shifting patterns of demand and risks, guided by commercial opportunities and consumer needs.

Over recent decades, governments have initiated the ongoing process of transferring responsibility for direct provision of infrastructure services to the private sector. Socially-desirable outcomes are being realised through effective regulation of many of our airports, airlines, ports, electricity utilities and freight providers.

In particular, this process is well-underway across Australia’s energy and telecommunications sectors. Reforms over recent decades have created significant benefits for users. Recent price rises in retail electricity highlight the need for effective and responsive regulatory frameworks.

Governments and regulators should focus on providing the best outcomes for customers, with services matching the standards we expect and are prepared to pay for. Greater private sector involvement in the delivery of services means operators can be more efficient, innovative and flexible in catering to the changing needs of people and businesses.

The role for governments in reforming markets is discussed further in the **Competitive Markets** chapter.



Regulation should focus on customer outcomes

Getting the regulation of our infrastructure right is fundamental to supporting productivity growth. Governments can best support productivity growth by ensuring our infrastructure services efficiently meet customer demand through high-quality, low-cost services.

Community concerns over greater private involvement in the delivery of assets have often focused on the costs and quality of services when they are not provided by government. These risks can be managed through regulation. Done well, shifting from direct ownership and delivery of services provides governments with greater control over service levels. Arms-length control of infrastructure gives governments the power to enforce standards through contracts and incentives that are not possible within a public delivery model.

The most productive role for governments in dynamic and competitive infrastructure markets is one of oversight – ensuring users’ interests are protected as delivery models change. Regulators’ first response to changes in markets should be to ask: “Is this in the long-term interests of customers?”

Where changes in service delivery or regulation impacts on users, regulators should ensure the outcomes of change are fair and reasonable. In some cases, it may be necessary to provide transitional support or compensation to some users who bear an unreasonable burden from service changes. Governments should use the tax and welfare systems to ensure that support is provided efficiently and fairly.

Focusing on customer outcomes means governments can regulate to ensure infrastructure provides benefits to the community without restricting the means of delivering those services. Service delivery contracts can establish a framework that leverages private sector innovation to drive efficiency and customer-focused services by setting the outcomes that governments expect from the outset.

For example, the New Zealand Government achieved this in Transmission Gully – a public private partnership (PPP) to design, finance, construct, operate and maintain a 27-kilometre motorway over a 25-year contract. The contract provides incentives for the operator and maintainer to meet availability and travel time outcomes, with penalties for deaths or serious injuries on the road, almost regardless of cause. This approach incentivises the entire consortium, including financiers, designers and constructors, operators and maintainers, to focus on delivering the outcomes sought by the public clients – in this case a high-quality, reliable and, above all, safe road.³

Recommendation 1.2:

Governments should make greater use of well-regulated market-based solutions to improve the efficiency of Australia’s infrastructure and support productivity growth. Governments should focus on improving outcomes for consumers – high-quality services at affordable prices – by seeking greater private sector involvement in infrastructure services. In cases where some users bear an unreasonable burden of service changes, governments should provide transitional support or compensation through tax and welfare systems.

“Infrastructure that is unable to operate at its maximum design capacity, due to operational restrictions should not be considered efficient or sustainable.”

Australian Logistics Council submission, 2015

Removing impediments to productivity growth

Ensuring our existing and new infrastructure is free from needless constraints is essential to supporting a vision of Australia as a world-leading, productive economy. Reconsidering and updating policies and regulations to reflect current needs can unlock growth potential in existing industries, and create opportunities for new approaches.

Some of Australia’s international gateways – ports and airports – operate under regulations that limit how and when services can be provided. It is essential that our gateways facilitate the movement of people and goods to domestic and international markets quickly, safely and at least cost. Moving people and freight to and from these gateways is fundamental to developing Australia as a connected, competitive economy.

For our cities to be world-class and accessible to increasingly dynamic global business, we cannot afford to be limited by curfews or other restrictions that inhibit the flexible use of infrastructure. Any restrictions should appropriately balance local interests with those of the broader community. Our ports and airports should be carefully developed to ensure community concerns are

managed through design and integrated land-use planning, rather than overly prescriptive operational restrictions.

At the other end of the scale, local trucking operators are often regulated by rules that restrict how, when and where they can provide services. Local councils routinely restrict the hours of deliveries to supermarkets and other customers. This restricts goods vehicles to operating in peak periods and imposes significant costs on road users and freight customers.

Caps, curfews and restrictions should be the last resort in achieving an intended outcome, and regularly reviewed to ensure the restriction is still the most appropriate and efficient means of achieving that outcome. For example, restricting the number of trains running along urban lines at night may be less effective than enforcing a maximum noise level. This incentivises operators to minimise their impact on local communities, and may allow more productive use of freight rail infrastructure.

Lowering the costs of delivering infrastructure can also unlock greater productivity, reducing costs to taxpayers and users, while improving the economic viability of prospective projects. Inefficiencies in the management and regulation of the construction industry impact Australia's global competitiveness.

In particular, improving workforce productivity reduces construction costs, freeing up funding for other purposes. Labour accounts for between 23 and 39 per cent of infrastructure project costs, and often more for smaller projects.⁴ Building and retaining skills in the infrastructure workforce, while minimising factors that skew labour markets, is important to improving the competitiveness and maximising the productivity of Australia's construction industry.

Recommendation 1.3:

Caps, curfews and other restrictions on how our infrastructure is operated and used should be avoided where possible. Giving Australia's infrastructure the capacity to freely meet its economic and social purposes will open new opportunities for growth and development. Existing regulatory constraints should be regularly reviewed to ensure they remain relevant and new assets – including new ports and airports – should be planned to ensure curfews and other restrictions are avoided.



Driving greater efficiency through innovation

Innovation drives productivity growth. Ideas for improving the delivery of our infrastructure services should be encouraged, and given an opportunity to be developed and tested.

Enhanced innovation in infrastructure will be most effectively progressed by increased private sector involvement. Motivated by the potential for commercial rewards, the private sector is more likely to find new ways of meeting customer needs and responding to technological developments in increasingly competitive and global markets. By contrast, government providers generally lack the flexibility and commercial motivation to compete.

Sometimes innovation involves incremental change. In other cases, new approaches will cause disruption to existing models of delivery.

Emerging technologies such as battery storage, open-source mobile applications and ride sharing services are disrupting markets, transforming how infrastructure is used and operated. In most cases, disruptions create competition in the provision of services by shifting patterns of demand and supply. Emerging and existing providers are motivated by commercial returns to deliver services in creative ways that make better use of existing networks, leading to lower prices and better services for consumers (see Box 1.1).

Box 1.1: Disruption in public transport delivering better services

New transport systems, which disrupt traditional patterns of infrastructure service delivery and use, are increasing in popularity. By capitalising on advances in smartphone technology, data collection, and the growth of the sharing economy, these new systems are able to provide high-quality, on-demand, point-to-point transport services that more directly and intuitively meet the needs of users. Managed well, the result can be a win for consumers, often with higher quality and lower costs than existing services.

Bridj, a flexible bus service operating in Boston and Washington D.C. is a useful example of this new trend in service delivery. Bridj analyses origin and destination data and land-use patterns in real time to identify optimal pick-up and drop-off times and locations. As a result, Bridj services are more responsive to users' needs than existing buses, which are restricted by timetables and set routes, and more affordable than taxis.

The company also uses technology to offer an enhanced customer experience. The Bridj mobile application enables customers to book their seat, free Wi-Fi is provided to users, and the use of real-time data enables drivers to deliver faster travel times and manage passenger numbers to prevent overcrowding.

The service is particularly well-suited in cities where legacy transport systems are increasingly unable to meet new patterns of demand. In both Boston and Washington D.C., over one-third of residents do not own cars, and fewer than 40 per cent of metropolitan-based jobs can be accessed via existing public transport in less than 90 minutes.⁵

Achieving a balance of regulation is critical. Customer outcomes should be safeguarded and efficiency standards enforced without stifling innovation. Over-regulation raises the hurdles for new ideas and processes, meaning that both regulators and businesses will be playing catch-up to those global markets that drive innovation and embrace change.

Over the past 20 years, there has been significant progress in opening up Australian infrastructure sector to innovation. The benefits of this in the energy and telecommunications sectors are clear. Greater competition has motivated service providers to put customers' interests first, and develop new models of delivery. These developments need to be extended across other sectors to drive greater efficiency from our infrastructure and provide even better outcomes for users and taxpayers alike.

Recommendation 1.4:

Innovation in infrastructure service delivery should be encouraged through positive, flexible regulatory frameworks. Where emerging technologies and delivery models disrupt infrastructure markets, governments should respond quickly to ensure regulatory settings maximise productivity growth and reflect the long-term interests of customers.



Boosting productivity through investment

Whether driven by public or private investment, the guiding principle for decisions affecting Australia's public infrastructure should be to lift productivity.

This should be the focus across project lifecycles, from problem evaluation to solution development, delivery, operation and maintenance. A dollar saved on one project is a dollar that can be invested in another productivity-enhancing project, or allocated to priorities such as health and education.

Investments in the right infrastructure at the right time can reduce costs for people and businesses and unlock significant opportunities for growth.

For example, improved broadband connectivity gives a rural farm access to a worldwide marketplace, potentially increasing demand for its products. Investments to improve heavy vehicle access in the farm's local area improve the efficiency of the regional supply chain, so that goods can get to market sooner and at lower cost. These developments provide businesses with the confidence to expand operations, stimulating further growth.

But the government alone cannot provide all the infrastructure solutions Australia needs. As noted in the Audit, the current level of public sector expenditure will be insufficient to support productivity growth over coming decades.

Greater private investment will be required to deliver efficiency gains from our infrastructure, and create new areas of growth and development. Governments should focus on providing a stable, transparent environment to facilitate greater private investment and deliver benefits to the whole community.

Recommendation 1.5:

Given current expenditure levels are unlikely to be sufficient to provide the infrastructure Australia needs over coming decades, a material increase in funding for infrastructure from both public and private sources is required to meet our infrastructure challenges and boost productivity. Governments should use infrastructure investments to support opportunities for productivity growth across the economy. These investments should be made on the basis of rigorous assessments for which projects display clearly positive productivity benefits.

A single Australian Government Infrastructure Fund will drive better decision making and increase transparency

Multiple infrastructure funding programs exist within the Australian Government, often with singular purposes and distinct assessment frameworks for selecting projects.

As a result, the prioritisation of infrastructure funding by the Australian Government is at times unnecessarily disjointed. Infrastructure spending is dispersed according to often overlapping purposes of different funding pools. This means the outcomes of the Australian Government's infrastructure spending can be inconsistent and poorly directed.

This situation reflects the tendency by governments to establish single funds to solve single problems rather than taking an integrated network approach.

There is also a lack of transparency about how much is being spent and what it is being spent on. The community cannot access basic information regarding Australian Government spending on infrastructure.

The consolidation of Australian Government infrastructure funding sources into a single pool would enable decision makers to prioritise investments based on national significance rather than on a project-by-project basis. Infrastructure Australia is a long-time advocate for this reform and has identified it as a priority in previous work.

It would also enable much greater public transparency to be brought to decisions. A single Australian Government *Infrastructure Fund* would inform the public how much is being invested and what it is being spent on. The Australian Government could facilitate this by frequently updating funding information and making it easy to access.

Recommendation 1.6:

The Australian Government should consolidate its existing fragmented funding pools into an integrated and transparent *Infrastructure Fund*. The consolidation of national funding programs for infrastructure would enable the Australian Government to prioritise investments based on national significance and enable greater public transparency around Australian Government infrastructure funding decisions.

Making better use of networks through investment and technology

Investments should target those elements of networks that deliver the highest productivity gains.

Often relatively modest investments can generate relatively large social and productive returns. While these initiatives generally do not alleviate the need for large-scale projects, smaller investments can sometimes delay the need to build expensive new capacity. Planned well, these upgrades can be delivered in less time, involve lower risks and provide better value for money than large-scale investments.

Cost-effective solutions to improve the efficiency of networks exist across the infrastructure sectors. For example:

- Removing on-street parking and extending clearways on road networks to off-peak periods can greatly improve traffic flow. While this may cause some inconvenience to local businesses and shoppers, a transition period allows governments to communicate the benefits of the change, provide greater parking availability on surrounding local roads and minimise social costs.
- Providing higher quality telecommunications services to regional areas often simply requires a better understanding of customer needs. The high cost of providing fixed-line or payphone services to many regional communities are a legacy requirement of past decades. These high costs may be offset by providing more affordable, reliable mobile network access.
- Energy providers and regulators can lower the costs of catering for peak demand by establishing strong price signals to shift consumption patterns. Household devices, such as smart meters, enable providers to use price signals to shift energy use away from peak periods, leading to lower total costs for consumers.
- In the water sector, supply may be readily expanded without constructing new dams. Depending on the local environment, recharging suitable aquifers, making better use of surplus water produced by industry or smarter use of stormwater flows can supplement supply or change patterns of demand.

“Automated and connected vehicles represent perhaps the most significant of the technological changes impacting transport.”

Intelligent Transport Systems (ITS) Australia submission, 2015

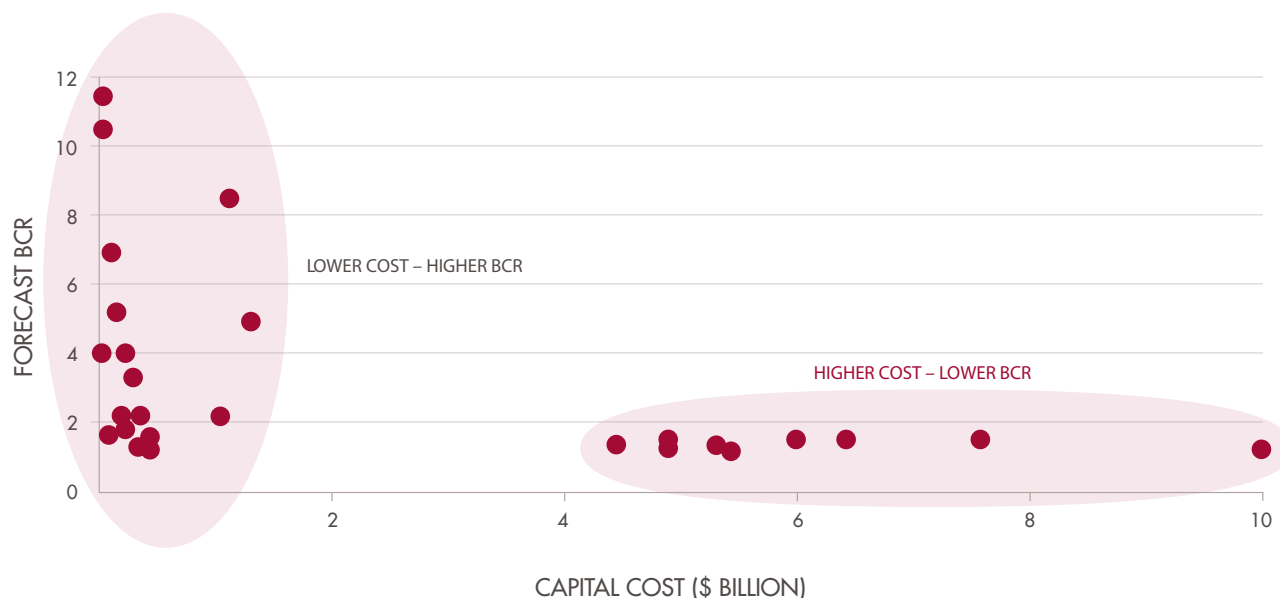
Articulation of the benefits of projects that make better use of existing networks is critical to influencing decision makers. Combining projects into a program of works that make better use of existing assets provides a stronger vehicle for governments to communicate the benefits of these projects to the community and maximise their value.

Figure 1.1 presents the forecast benefit-cost ratio (BCR) and projected capital cost of a selection of Australian infrastructure projects submitted to Infrastructure Australia. While a blend of investment scales is required to meet our infrastructure needs, Figure 1.1 shows that smaller investments yield substantial benefits.

Technology is transforming the way infrastructure is delivered and operated, and offers opportunities for expanding the productivity-enhancing potential of our infrastructure. It can better regulate demand for an asset, reducing costs for users and operators alike, and improving the efficiency of network operation. Similarly, emerging technologies allow existing infrastructure to be upgraded and repurposed, providing customer-focused solutions to better meet the demands of a changing world (for example, see Box 1.2).



Figure 1.1: Lower cost projects often deliver relatively high productivity benefits



Source: Infrastructure Australia analysis, 2015

Box 1.2: Smarter vehicles

Over coming decades, the greater automation of vehicles is likely to require a growing network of devices and sensors in and around roadways. The automation of vehicles is well-underway, with many new vehicles including various technologies to assist drivers or override controls when an accident or loss of traction is detected.

The potential benefits of more autonomous vehicles are clear. The technology can enable drivers to use their time more productively, prevent accidents, save fuel, reduce emissions, raise average speeds and expand the capacity of roads and parking facilities through assisted driving and self-parking.

In most cases, commercial incentives to further develop vehicle automation, such as improving safety and efficiency, are aligned with common public benefits. However, increasingly complex vehicle and data collection systems increase barriers for consumers to fully understand the benefits and costs of adopting new technologies. Governments should ensure developments provide benefits for all road users, and mandate manufacturers provide objective information on vehicle technologies and their use of consumer-generated data.

Investments in technologies to make better use of our infrastructure can deliver significant productivity gains. For example, McKinsey Global Institute found that intelligent transport systems (ITS) can triple the use of an asset through better management of networks.⁶ The costs of these systems generally decrease over time, and the benefits accumulate, when they are applied across the broader network.

On urban roads, management and monitoring systems can improve traffic flows by collecting, storing and analysing data on traffic counts, travel times, congestion, incidents and faults through sensors at intersections. Many of Australia's road management systems were developed

in the 1970s. Advances in technology are providing opportunities to update these systems to better manage the growing congestion challenges of our modern cities (see Box 1.3).

For example, on a section of the Monash Freeway in Melbourne, the delivery of ITS through the *Managed Motorways Program* – including the installation of electronic signs to improve traffic flow and additional CCTV cameras – allowed 16 to 19 per cent more people to travel in each lane. This is equivalent to another 0.5 to 0.8 lanes on the four-lane carriageway, delivered for considerably less than the construction of a new lane.⁷

Box 1.3: Infrastructure Priority List: Network Optimisation Portfolio

As the Audit found, Australia's urban road networks are projected to come under increasing pressure as the population grows. Unless we take action to address this problem, congestion in our cities could result in substantial economic and social costs. While this will require some large-scale investments over coming decades, finding new and innovative ways to improve the capacity and efficiency of existing networks will be essential to addressing this problem while maximising the value of public and private investments.

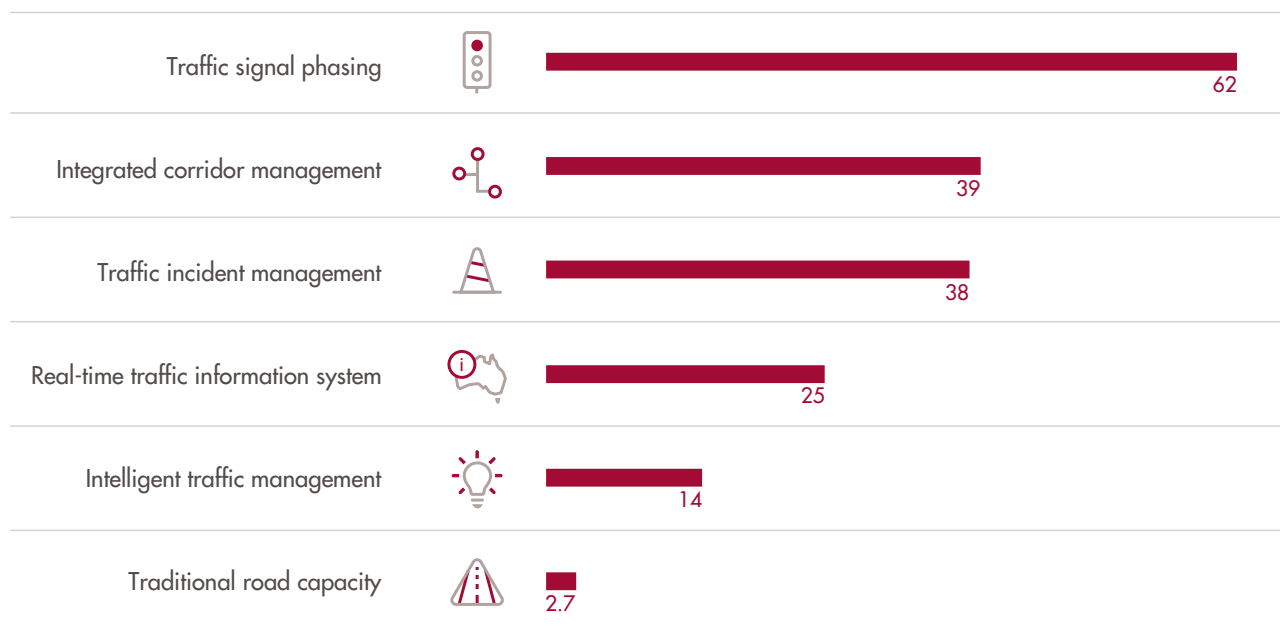
The Network Optimisation Portfolio seeks to address increasing congestion in our cities by targeting investments on urban road networks to where they are most required, and making smarter use of existing infrastructure. Examples of potential investments through this initiative may include:

- **Motorways:** Real-time traffic information systems; variable lane control; traffic management centres; incident detection; variable speed limits;
- **Urban arterials:** Intersection upgrades; high occupancy vehicle lanes; traffic signal reviews; improved pedestrian crossings and integration; bus priority and queue management; on-street parking controls; and
- **Central business districts:** Similar to urban arterials, improvements to maximise the efficiency of networks with short distances between intersections and high bus volumes.

The Audit provides a national perspective for analysing urban road networks across Australia's biggest cities. Using this evidence base as a starting point, the Network Optimisation Portfolio will allow Infrastructure Australia to work with states and territories to further develop an understanding of these networks. The initiative provides the means to collaboratively identify constraints and deliver improvements that will best manage congestion and make better use of existing infrastructure in our cities.



Figure 1.2: Possible benefit-cost ratios of ITS projects compared to building new road capacity



Source: McKinsey Global Institute, 2013 *

Figure 1.2 gives a broader view of the potential benefits of different ITS investments versus traditional road capacity.

Across suburban and intercity rail networks, automatic train control and signalling systems can improve efficiency and safety. By continuously monitoring the movements of trains on lines and at stations, these systems provide real-time data to central management systems. These technologies reduce the scope for human error, automatically detect faults and allow trains to travel at shorter intervals, enabling the safe scheduling of more frequent train services.

Incorporating upgradeable technologies into our networks supports future, potentially transformative applications. New roads and rail lines should include integrated network management systems to reduce the cost of implementing future technologies and ensure Australia leads the world in maximising their productivity benefits.

In the telecommunications sector, there is significant potential for productivity-enhancing initiatives. The National Broadband Network (NBN) represents a major investment by the Australian Government in the future capacity of the nation's telecommunications networks. Governments at all levels should leverage this investment to deliver greater productivity from existing networks and systems.

High-speed broadband offers opportunities that benefit all sectors of the economy. Reliable access to large volumes of real-time information presents public and private operators with opportunities to reduce costs and find new ways of engaging with customers. This can be particularly important in regional areas, where people and businesses have historically had limited direct access to services, international business opportunities and sources of information.

Further discussion of how to leverage the rollout of the NBN to deliver broad economic and social benefits can be found in the **Connectivity, Regional and Remote and Indigenous Communities** chapters.

Recommendation 1.7:

Governments should increase funding for investments in projects and technologies that make better use of existing infrastructure.

Australia can extract more from existing infrastructure networks through smarter operation, maximising their productive capacity and delaying the need for large-scale investments.

Data helps operators to improve network efficiency and save costs

Data is revolutionising the way we see assets and networks. Investing in technologies that allow operators to generate, collect and use data will be fundamental to supporting sustainable improvements in the efficiency of our infrastructure.

In the past, gathering information on how and when infrastructure was used and how well assets responded to demand was a time-consuming, costly exercise.

Embedded technologies use fixed and mobile telecommunications networks to provide operators with detailed, instant feedback on how infrastructure is performing. Various network components are able to communicate with each other, providing data to improve operation of assets, optimise maintenance schedules and provide real-time feedback on disruptions of service that may require human intervention.

This information enables operators to respond to incidents and redirect resources to where they are most needed. Sensors can detect minor faults before they cause disruption, improving safety for workers and improving service reliability for consumers.

Owners save costs by optimising maintenance schedules and extending asset lives. They no longer need to manually monitor assets during the vast majority of time when no action is required. Data can be used to guide future investments and to better meet customer demand.

Electronic ticketing, remote surveillance and improved connectivity of transport systems provide operators with detailed, immediate feedback on network performance and user demand.

In particular, electronic ticketing systems record a range of valuable information such as the time and location of the first vehicle boarded and subsequent transfers and the time of arrival at the final destination. This information, collected from fare databases, can be used to monitor patronage levels and plan new and enhanced public transport services. This can also facilitate greater opportunities for growth in intermodal journeys, with vehicles able to synchronise departures to provide seamless interchanges for passengers – an essential characteristic for increasingly complex urban transport networks.

Across electricity grids, sensors and monitors can notify providers when abnormal line losses are detected, or faults are caused by weather events, such as a tree falling on an overhead cable in a storm. Similarly, in the water sector, sensors can identify leaking pipes or overloaded stormwater systems.

Across freight networks, the average shipping container is only in use about 20 per cent of the time.⁹ The complexity of networks means operators can have difficulty locating and retrieving their containers. This inefficient use of containers ultimately causes higher costs to customers. Using smart, connected networks to track and monitor the use of shipping containers can significantly improve freight handling, reducing costs and time delays for businesses at both ends of the supply chain.

Better understanding drives better use

The productivity of Australia's infrastructure relies on the quality of the infrastructure decisions we make today.

Extracting more from our infrastructure means we must better understand how assets function within networks. We must find ways to more accurately forecast the broader impact of potential projects, and use a deeper evidence base to make decisions on where public capital will be most productively employed.

Opportunities for improving the efficiency of our infrastructure are not always easy to identify. Decisions made on the basis of incomplete or inaccurate information are more likely to lead to imperfect results. Improving the evidence base on infrastructure performance will sharpen decision making on infrastructure investments.

For example, improving the availability of data on freight costs and supply chains is critical to improving national productivity. Better freight data allows governments to identify network constraints and plan investments to maximise the growth of local industries, while for businesses this provides greater confidence to improve supply chain efficiencies and expand their operations.

The Audit provided a starting point for governments by providing a top-down assessment of the value-add – or direct economic contribution (DEC) – of infrastructure across the energy, telecommunications, water and transport sectors, projected to 2031. This provides an indication of where investments and reforms will be required to support growth and change across the economy.

The Audit also provided detailed analysis of transport use and congestion in our six major urban areas, projected to 2031. This information can guide decision makers across governments and industry to identify where networks are most likely to need augmentation over coming decades. Future audits will extend similar analysis beyond transport to other infrastructure sectors.

Governments should improve the evidence base for infrastructure. Gaps in the evidence base need to be identified to guide best practice decision making. This includes better understanding the economic, social and environmental impacts – or wider economic benefits (WEBs) – of new and existing infrastructure. More accurately measuring WEBs allows decision makers to target infrastructure investments and reforms to where they are most required.

Further discussion of the development of a robust, data-driven evidence base on which to base infrastructure decisions is included in the **Governance** and **Best Practice** chapters.

Recommendation 1.8:

Infrastructure operators should generate, collect and use data to drive greater productivity in infrastructure service delivery.

Information on the performance of, and demand for, Australia's infrastructure networks should be collected and made available to infrastructure operators, third-party developers and users – being sensitive to confidential information and privacy concerns. Readily available data can facilitate improvements to the delivery and use of services and the productive capacity of networks.



Population

Capitalise on the opportunities delivered by population growth in cities to enhance our economic prosperity and world-renowned liveability

Over the period from 2011 to 2031, Australia's population is projected to increase by 8.2 million people. The bulk of this growth will occur in our cities, which are forecast to grow by almost seven million people by 2031.

For the purpose of the Plan, a city is defined as Australia's eight capital cities, and the adjacent areas of Newcastle, Wollongong, Geelong, the Gold Coast and the Sunshine Coast.

Almost-three quarters of our population growth will be in our four largest cities: Sydney, Melbourne, Brisbane and Perth. In contrast, our other cities are projected to grow collectively by just under one million people. Darwin, Canberra, the Gold Coast and the Sunshine Coast are expected to grow strongly, while Hobart, Adelaide, Wollongong, Newcastle and Geelong are forecast to grow more slowly.

Population growth on this scale will transform our cities. It will create new opportunities to enhance our economic prosperity and increase the vibrancy and diversity of our communities. But we must act now to ensure these opportunities are realised and the challenges posed by such growth are well-managed.

Our four largest cities are set to undergo a higher density urban transformation. We must ensure this process is positive. Our aim for these cities should be to deliver high-quality, higher density living, connected by world-class infrastructure services, to maintain liveability, improve affordability and capitalise on opportunities for increased economic growth.

In our smaller cities, we should ensure their many and diverse advantages are maximised. These cities are world-renowned for their liveability and in some cases, in close proximity to the big four cities. The opportunity exists to ease the pressure on our larger cities by growing the populations of the smaller ones.

Delivering these solutions will require us to reform how we plan and govern our cities.

National leadership is required. Historically, the Australian Government has had an intermittent interest in the development of cities. This arrangement is no longer sustainable. Cities are the key drivers of national productivity and economic growth. The Australian Government should maintain an active involvement in



cities through population policies and use of *Infrastructure Reform Incentives* to lead positive, enduring change.

State, territory and local governments should aim to deliver effective whole-of-city governance to meet the needs of growing and changing metropolises.

At the state and territory level, the need for high-quality medium to long-term metropolitan planning for Australia's cities has never been greater. Currently, many of the planning and delivery functions for our cities are characterised by complex and overlapping processes,

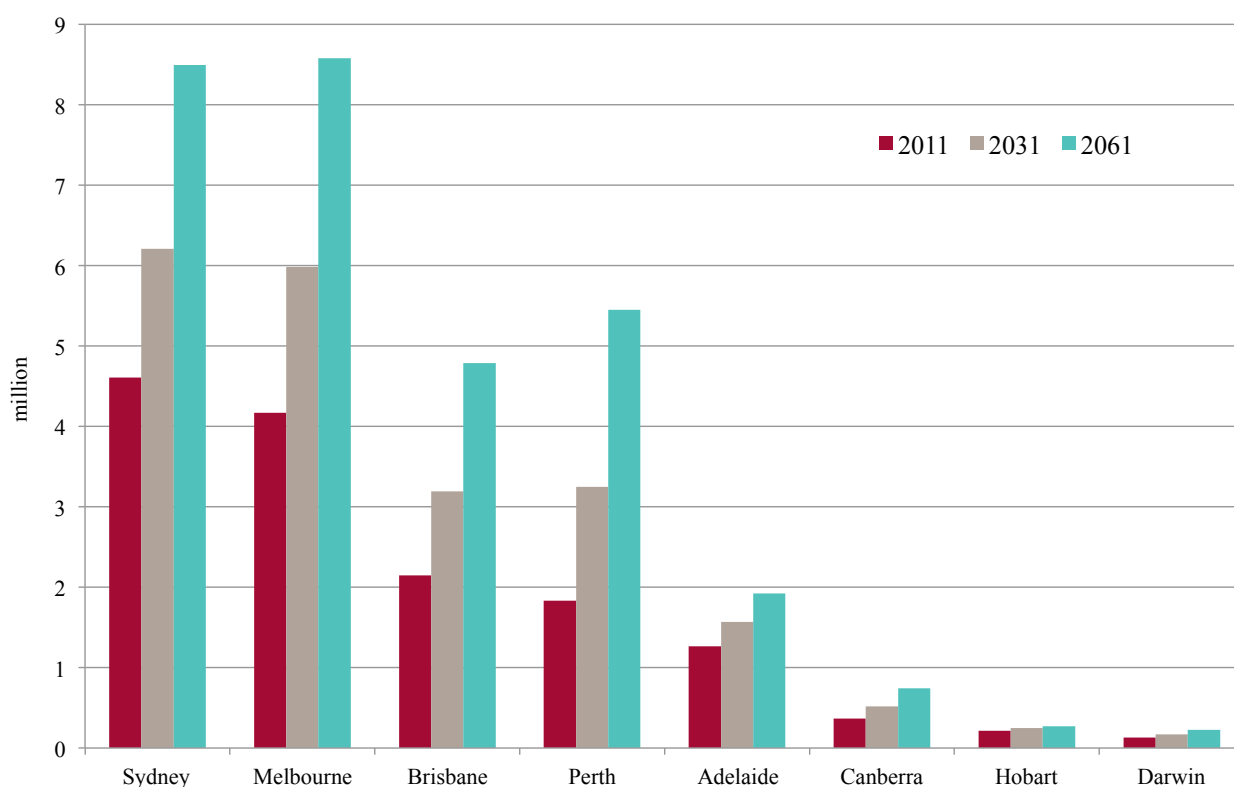
and lack clear lines of accountability. Consistent and integrated metropolitan planning, supported by an effective governance and delivery function, should be a high priority for state and territory governments.

The system of local government is not working as well as it could. The division of many of our cities and regions into small councils has resulted in fragmented services and increasingly unsustainable financial settings. The amalgamation of councils into larger councils is an opportunity to enhance the strategic impact of this tier of government.

What the Audit found

- Almost three-quarters of Australia's population growth is projected to be in the four largest capitals (Sydney, Melbourne, Brisbane and Perth), placing pressure on urban infrastructure already subject to high levels of demand.
- Steps should be taken to foster greater long-term growth in Australia's smaller capital cities, increasing their vitality while moderating the infrastructure challenges facing the larger cities.
- Amalgamation of local government is required to enable local councils to achieve the necessary scale and financial capacity to meet their local infrastructure needs.
- Australia needs integrated infrastructure and land use planning, across all levels of government. Improvements in planning are necessary if Australians' infrastructure and economic aspirations are to be realised.

Figure 2.1: Population of Australia's capital cities in 2011, and projected to 2031 and 2061



Source: Infrastructure Australia analysis of Australian Bureau of Statistics, 2013¹⁰

Establish a stronger role for the Australian Government in cities

The health of the economy and the vitality of our communities are tied to how well our cities function.

Australia is one of the world's most urbanised nations. The majority of Australia's population lives in our cities and the bulk of our national economic output is generated there. It is therefore appropriate that the Australian Government plays an increased role in the planning and development of cities.

This is not entirely new territory. While the Australian Government has historically had varied engagement with cities policy, there are instances where it has sought to become more involved. For example, it:

- **1940s:** Established the Commonwealth Housing Commission and negotiated the first *Commonwealth State Housing Agreement*. This led to the provision of loans to state and territory governments to improve the supply of affordable housing within cities.
- **1950s and 1960s:** In partnership with state and territory governments, substantially increased funding to expand the campuses and infrastructure of existing universities. The Commission also supported the development of new institutions, including Monash and La Trobe Universities in Melbourne and Flinders University in Adelaide.

- **1970s:** Established the Department of Urban and Regional Development and undertook a program of land-use interventions in Australian cities. These included investment programs to fund the extension of urban sewage systems, and growth centre policies aimed at shifting urban activity from CBDs to suburban centres.
- **1990s:** Introduced the Building Better Cities program, which allocated federal funding to infrastructure and land-use projects. Projects included public housing, urban consolidation and renewal, open space, transport, and sewage and flood mitigation works.
- **2000s:** Prioritised the planning and development of cities through the articulation of a National Urban Policy and initiation of a significant infrastructure investment program.

The Australian Government's past involvement with cities demonstrates that there is a range of mechanisms available to influence their development. The Australian Government possesses taxation and funding powers as well as primary responsibility for immigration policies, which in turn impact urban population growth rates. The Australian Government should use two of these levers – infrastructure funding and population policy – to improve our cities.

Applying Infrastructure Reform Incentives to improve our cities

The Australian Government makes a material contribution to the delivery of infrastructure in our major cities through its grants and other funding to state, territory and local governments.

This funding relationship can be an important mechanism to support the development of Australia's cities as modern, thriving and affordable metropolises.

Australian Government infrastructure funding to state, territory and local governments should continue, but be better aimed at increasing the efficiency and effectiveness of our cities. Infrastructure funding, in particular for transport, should be aimed at addressing a problem rather than prioritising one mode over another. Funding needs to be 'modally agnostic'.

The Australian Government should use *Infrastructure Reform Incentives* to improve how our cities function through partnership with state, territory and local governments. This would see the Australian Government tie the provision of additional funding for infrastructure to the delivery of a range of city-based reforms, focused on improving the quality of planning, development, and infrastructure across Australia's cities.

Ahead of introducing the city-based component of *Infrastructure Reform Incentives*, the Australian Government will need to identify a reform agenda and administrative architecture to determine how incentives would be applied and reform progress monitored.

The reforms outlined in this Plan as it relates to cities (see also the **Productivity, Population, Connectivity** and **Competitive Markets** chapters) provide a good foundation for the reform agenda.

The Australian Government should also review the applicability of previous domestic and international examples of incentive programs, in particular the Australian Government's National Partnership payments and the City Deals program in the United Kingdom, when designing the administrative architecture of the program.

Recommendation 2.1:

The Australian Government should drive change in the planning and operation of Australia's cities through the use of *Infrastructure Reform Incentives*. The Australian Government should identify a reform agenda and administrative structure that would incentivise state, territory and local governments to implement necessary change. The city-based reforms outlined in the *Australian Infrastructure Plan* will be a useful reference for government when doing this work.

Deliver a National Population Policy to guide infrastructure decisions

Population growth has the potential to deliver substantial benefits for the economy and the community. However, if we fail to effectively prepare for this growth, these benefits will not be realised.

The Australian Government currently holds the principal levers to influence population growth. It is charged with determining migration policies and has an indirect influence on natural population increases through taxation and social policies (for example, with family benefit payments and child care subsidies). It is also best placed to provide long-term leadership to other levels of government.

The delivery of a *National Population Policy* (building on and updating the *Sustainable Australia: Sustainable Communities* report released in 2011)¹¹ will enable the

articulation of a vision for growth and the identification of the necessary services, infrastructure, housing and reforms to accommodate this growing and changing population. The Policy should:

- Identify Australia's long-term population pathway over a 50-year period;
- Identify the necessary requirements to service Australia's population growth and change; and
- Outline what role the Australian Government will play in managing the challenges and opportunities of growth.

Once developed, the Policy will be used to inform the development of migration policy by the Australian Government and the development of infrastructure and land-use planning by state and territory governments.

Recommendation 2.2:

The Australian Government should deliver a *National Population Policy* to identify Australia's population pathway over the next 50 years and outline the Australian Government's options to shape that growth.

The articulation of a national policy will enable the Australian Government to establish a vision for Australia's growing population and identify the necessary options to ensure we fully capitalise on the potential benefits for the economy and community.



Enable the four biggest cities to grow up, not out, to meet population growth

The scale of population growth expected in Australia's four biggest cities is considerably larger than the rest of the country. Sydney, Melbourne, Brisbane and Perth will need to transform the structure of their built environments to accommodate their projected population increases.

Well-planned housing supply must rapidly increase. The Audit found that each of these cities will need to deliver about 500,000 to 700,000 additional dwellings over the next 15 to 20 years.

The capacity of infrastructure networks will need to expand. Larger populations will exert greater pressure on already constrained transport infrastructure. New housing will need to be matched with new or upgraded infrastructure. The capacity of each city's social infrastructure, such as schools, universities and hospitals, will need to increase to meet the demands of a larger population.

Decreasing housing affordability across all Australian cities – but in particular the four biggest – will also need to be addressed. House prices have increased strongly in the past two decades. Data from the *2011 Census of Population and Housing* shows the number of households paying more than 30 per cent of their income on housing (a common measure of affordability) had risen by 17.8 per cent since 2006.¹²

Responses to population growth in cities have historically focused on one of two growth pathways:

- Greenfield development: the release of undeveloped land located on the periphery of cities for the delivery of low-density housing; and
- Redevelopment in established areas: the delivery of medium to high-density residential development in existing urban areas.

Historically, Australian cities have grown principally through the delivery of low-density housing at the edge of established urban areas. In the 1950s and 1960s, this strategy worked well. Widespread car ownership, combined with the relatively smaller size of Australia's cities and comparatively higher rates of employment in manufacturing areas on the outskirts of cities, meant that new suburbs remained in close proximity to employment and service centres.

Over time, the continued expansion of Australia's cities through greenfield development has meant

that the outer suburbs of our cities are increasingly removed from major employment centres. The outcomes have been long journey times, high transport costs for individuals and families, high infrastructure connection costs for taxpayers, and negative social and environmental consequences.

Population growth across Australia's cities in the next 15 years and beyond will exacerbate these problems. A re-think of the current development pattern of our cities is required to ensure Australia is able to effectively capitalise on the potential opportunities delivered by a growing population.

Well-designed, higher density living for our biggest cities

Increasing the delivery of high-quality, medium to high-density development in established urban areas and close to transport infrastructure will provide Australia's four largest cities with a viable path towards more compact, affordable and environmentally-sustainable urban environments.

Meeting the projections for a larger population with higher density provides five key benefits:

- The infrastructure costs of housing are usually lower for developments in established urban areas. Much of the necessary connecting infrastructure already exists. Depending on the intensity of the development, investment to augment existing assets, rather than delivery of wholly new infrastructure assets, will be required. By contrast, greenfield developments must be accompanied by connecting infrastructure such as roads, water and sewer lines, energy sub-stations, connections to telecommunications networks, and access to social infrastructure such as schools and medical facilities. Research undertaken by Curtin University indicates that the cost difference between the two development pathways can be substantial. The research finds that, the average cost (in 2007 dollars) of providing energy, telecommunications, water and transport infrastructure services to a unit of housing in existing inner urban areas is \$26,500, while for outer urban greenfield locations the cost is \$69,500. This represents a difference of \$43,000 per unit.¹³

- Development in existing areas is more likely to be located close to public transport, employment centres, services and amenities. Residents benefit from shorter journey times, lower transport costs and more opportunities for recreational and work-related walking and cycling. The result is improved social, economic and public health outcomes. At the same time, increasing the density of people living and working within an area improves the economic feasibility of delivering high-frequency public transport services in that neighbourhood and city.
- Increasing densities across a city places employees and businesses in closer proximity with each other, creating robust labour markets and facilitating the clustering of economic and social activity. There are economy-wide benefits in enabling businesses, in particular knowledge-intensive businesses, to be closely located to employees, and other similar businesses. The clustering of economic activity, known as agglomeration, provides individual businesses with wider benefits including economies of scale and improved networks, which reduce transaction costs and provide greater opportunities for knowledge sharing and innovation. These benefits extend beyond our knowledge-intensive sectors. Increasing densities in existing urban areas could also enable a greater number of key workers to live close to where they work, increasing the available labour pool for essential services.
- Densification in existing urban boundaries has the potential to deliver a range of wider benefits for the ongoing health of Australia's natural environment. Containing development within existing urban boundaries allows cities to preserve valuable rural land on the outskirts for other uses, such as agriculture, recreation and environmental preservation. Densification creates opportunities for lower motor vehicle use, and increased uptake of public and active transport. As a result, the intensity of greenhouse gas emissions can be reduced.
- The increased delivery of higher densities can assist in addressing housing affordability by increasing the total level of housing supply. The delivery of higher densities also presents an opportunity to expand the range of housing choice in our cities; increasing the availability of lower cost options, such as apartments and townhouses. While additional reforms are ultimately required to address Australia's housing affordability issues, the movement towards greater densities can play a useful supporting role.

Given projected population growth, densification within Australia's four largest cities needs to be significantly increased. Each state and territory government, through its metropolitan planning processes, should aim to deliver most new housing supply within existing urban areas. Governments should seek to focus development on the delivery of *higher* rather than high density. In practice this would see the development of five to eight storeys along transport corridors, and three to five storeys in other locations. Areas with underutilised existing infrastructure are particularly attractive for increased infill development.

Recommendation 2.3:

To meet the demands of population growth Sydney, Melbourne, Brisbane and Perth should accelerate the delivery of high-quality, higher density development within established urban areas. As part of their metropolitan planning processes, governments should take steps to reduce urban sprawl and ensure the majority of new housing supply is medium to high-density and delivered in established urban areas.

Higher quality density to address community concerns

The move towards denser, more compact cities is already underway. In Sydney, Melbourne, Brisbane and Perth, structural changes in the economy and cultural changes are driving higher density inner-city living. The shift of the national economy towards knowledge-intensive industries has triggered the clustering of high-value jobs in and around our city centres. Demographic and cultural change and the progressive ageing of the population have also seen some people move to the inner-city to access smaller and denser housing options.

Despite this transition, deep reservations still exist in some parts of the community regarding the potentially adverse impacts of increasing density. This is understandable. Examples of low-quality housing development, delivered without appropriate investment in critical infrastructure, have made some sections of the community suspicious of change in their local area.

Densification alone is therefore not enough. Governments, business and the community must also ensure that higher

density housing offers high-quality, affordable design, is well-connected to infrastructure, and provides access to necessary green space and community amenities.

Governments should align densification with the upgrade of connecting infrastructure. Many of the benefits associated with higher densities – reduced travel times, agglomeration benefits and lower environmental impacts – are contingent upon access to reliable infrastructure, in particular public transport. Any failure to upgrade infrastructure condemns new and existing residents to congestion and delays. It will also reduce public support for densification in other communities.

Governments should also improve access to high-quality public open space and amenities, such as art and cultural spaces, for higher density infill development.

Currently, greenfield developments are much more likely to have ready access to public and private spaces. Residents of higher density housing therefore place a premium on access to high-quality public space. One study estimates that the price of an apartment close to the boundary of a public park is 18 per cent higher than an equivalent apartment 800 metres away.¹⁴

Local governments should develop open space strategies to understand what currently exists and what are the likely demands and trade-offs that will be sought by future populations, in particular those living in higher density housing. To service these demands, governments may be required to upgrade existing public assets to better meet the needs of denser housing environments. Governments should continue to open more spaces for public use and explore what role developer levies can play in contributing to the delivery of these new assets.

At the same time, some property developers need to raise the quality of their design so as to deliver higher density development that meets the privacy, amenity and aesthetic expectations of residents and the surrounding community. A legacy of low-quality, high-density apartments has given density a bad name. Alternatively, the delivery of world-class higher density developments in Australian cities provides a demonstration to the community of successful higher density housing (see Box 2.1).

“It is crucial that urban planning and infrastructure delivery are coordinated to ensure that land-use plans, development controls and funding are timed to coincide with the delivery of infrastructure to support higher density residential development.”

Urban Taskforce Australia submission, 2015

Governments should also support the development of well-designed and affordable housing. State, territory and local governments should explore options to encourage good outcomes through incentives in the planning approval process. For example, increased floor space could be offered as an incentive for developers who:

- Partner with an architect with proven credentials for delivering high-quality, high-density developments;
- Increase the provision of private open space in their development proposal; or
- Include an affordable housing component on site or as a financial contribution.

Importantly, consistent and genuine community consultation must underpin all stages of planning and development. State and territory governments should engage the community on their long-term vision for the whole city. The initial strategic planning stage is the time for governments to identify the challenges and opportunities facing the city and seek community feedback. If this engagement is successful, it reduces the likelihood of divisive opposition in the later stages of development.

Within local communities, government should strike an appropriate balance between addressing legitimate local concerns and the need to meet wider metropolitan outcomes. Effective community consultation is discussed further in the **Governance** chapter.

Box 2.1: High-quality design in Central Park, Sydney

Central Park is a high-density precinct located on the southern edge of Sydney's central business district.

The \$2 billion development, which consists of seven residential towers and student accommodation representing 2,200 apartments and 5,000 residents, provides easy access to infrastructure and green space.

The development is located within walking distance of Central Station and is serviced by high-frequency bus routes. It also hosts a substantial car share fleet, which can be booked by the hour. The precinct provided space for local artists during construction and continues to support local artists by hosting public art pieces.

The precinct is built around Chippendale Green, a 6,500 square metre public green space. Most of this space is lawn, which is surrounded by shaded seating options including a communal barbecue area. Pedestrian paths and cycleways increase the precinct's connectivity with surrounding areas.

The precinct boasts good sustainability credentials, with all buildings expected to achieve a minimum five Green Stars environmental rating. Central Park incorporates on-site tri-generation and water recycling, which reduces the precinct's demands for electricity and water.

As part of the development, a contribution of \$32 million was also made to the Redfern Waterloo Authority to support the development of affordable housing in the surrounding area.¹⁵

The response to the development from prospective residents, the local community, wider city and international experts has been generally positive. Strong demand for apartments prompted developers to bring forward the rollout of the final apartments by 12 months. In 2014, the flagship apartment complex of the development, One Central Park, won the International Green Infrastructure Award, Development of the Year from the Urban Taskforce, Best Tall Building in Asia and Australia and was a Finalist for the International Highrise Award from the City of Frankfurt.¹⁶

Recommendation 2.4:

All governments should ensure that processes are in place to deliver high-quality, well-designed, higher density development, connected to infrastructure and public amenities. Mechanisms available to government include:

- At state and territory level, governments should ensure that statutory planning instruments deliver high-quality design and they should examine options to encourage good design through providing incentives in the planning approval process;
- State and territory governments should integrate their metropolitan land-use and transport planning processes to ensure that the delivery of new housing is located near transport infrastructure; and
- At the local level, governments should align the delivery of higher density developments with related upgrades to community infrastructure and amenities.

Helping Australia's smaller cities to grow their populations

The growth of Australia's smaller cities over the next two decades is expected to be slower than that of our largest cities.

Of our four smaller capitals, Hobart and Adelaide are projected to grow the slowest, increasing by 14 per cent and 24 per cent respectively between 2011 and 2031. Darwin is projected to grow more quickly (32 per cent), however as this applies to a relatively small base, its population will remain small by comparison. In contrast, Canberra will experience high growth (41 per cent) resulting in a boost of around 150,000 people to the city's population by 2031.

Outside the capitals, the Gold Coast and the Sunshine Coast are forecast to experience relatively high levels of population growth. Wollongong, Newcastle and Geelong are projected to grow more slowly at 15.9 per cent, 15.4 per cent, and 19.2 per cent respectively (see Figure 2.2).

Capitalising on the many advantages of our smaller cities

Under the current population growth scenarios, the advantages of our smaller cities will be under-utilised. Governments should ensure that we make the best use of our big and small cities. While we would not expect our smaller cities to match the growth of our big four, there is an opportunity for our smaller cities to capitalise on their many advantages and grow faster than current projections.

Australia's smaller cities are world-renowned for their liveability. They offer access to impressive natural and built environments, high-quality infrastructure and services, cultural diversity and a skilled and dynamic workforce. Adelaide and Hobart have been ranked second and third respectively in the Property Council's *2014 Liveability Survey*.¹⁷

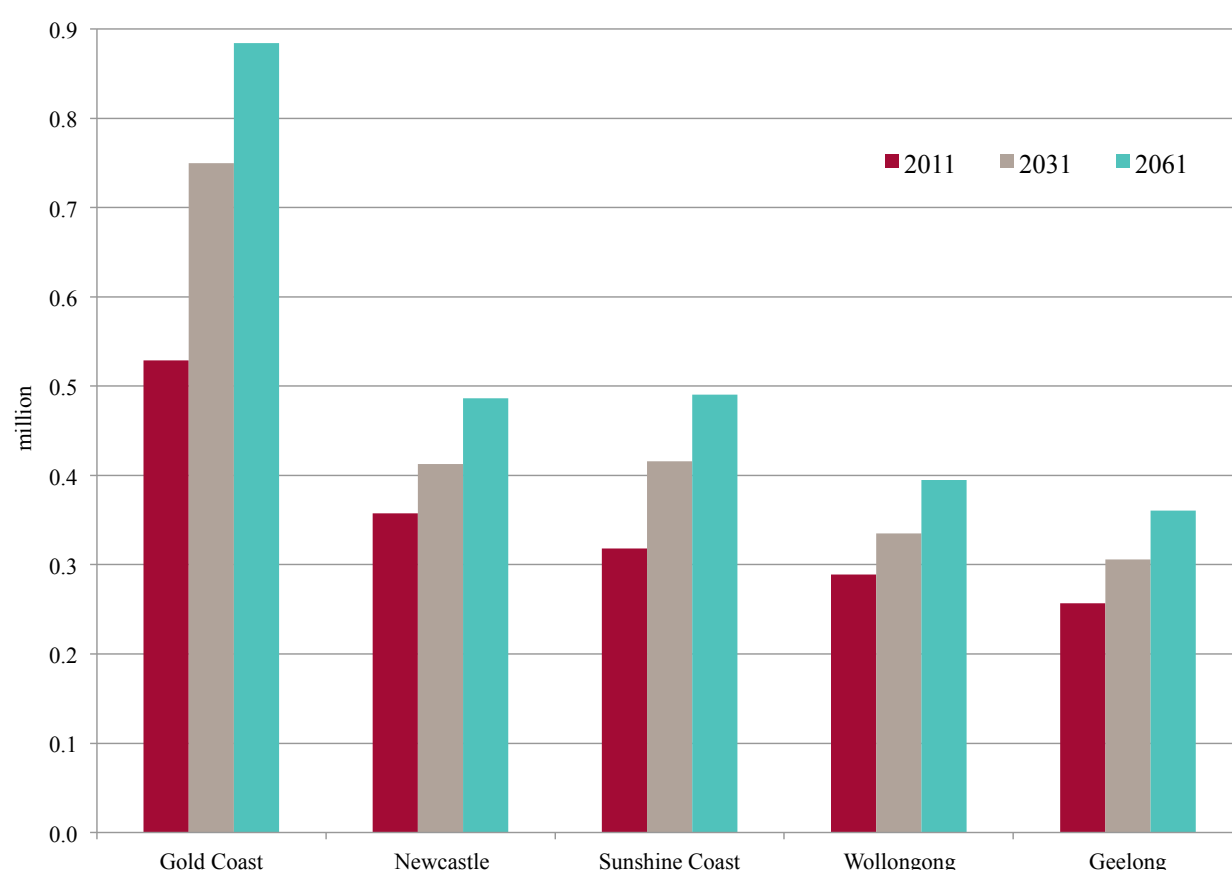
Newcastle, Wollongong, Geelong, the Sunshine Coast and the Gold Coast are close to Sydney, Melbourne and Brisbane. With the right infrastructure, such as high-speed broadband and high-frequency public transport connections, these cities could enable more Australians to live in a smaller city and access employment opportunities in one of our major metropolises. This does not necessarily mean these workers will be required to commute between cities. Rather, advances in technology and infrastructure may enable a greater number of Australians to capitalise on opportunities for telecommuting (making use of telecommunications to work from home or a local workspace).

The projected divergence in growth between Australia's big and small cities is an opportunity for these cities to relieve the pressure on our big four fast-growing capital cities by absorbing some of their growth.

Similar opportunities exist for many of Australia's regional centres. This opportunity is discussed in the **Regional** chapter.



Figure 2.2: Population of Australia's largest non-capital cities in 2011, and projected to 2031 and 2061



Source: *Infrastructure Australia analysis of Australian Bureau of Statistics, 2013*¹⁸

Government should investigate options to grow the population of our smaller cities beyond that suggested by current projections.

It is not government's role to direct people where to live. These are individual decisions that reflect economic and lifestyle factors. Nonetheless, there are three approaches available to encourage population growth in our smaller cities:

- **Facilitate community and business-led development:** The growth of a city will often require leadership from business and community organisations to grow the economic, cultural or environmental value of a place, thereby encouraging population inflow. This includes community-led campaigns to attract people to live and work in their city and private sector investment aimed at establishing or growing new industries. Government's role in these instances is to ensure essential infrastructure and services are available.

- **Provide transformative infrastructure:** New or upgraded infrastructure, especially where it enables employees to access increased employment opportunities, can lift population growth. For example, the delivery of a new or upgraded railway or road, which connects residents of smaller cities to employment opportunities in a bigger city, would encourage a population shift to the smaller city. The *Infrastructure Priority List* includes a range of initiatives that could serve as a catalyst for increased population growth in smaller cities (such as the example in Box 2.2).
- **Create incentives within Australia's skilled migration program:** Australia's skilled migration program grants permanent residency to individuals who possess skills that are in demand. The Australian Government could incentivise the current approval process to prioritise migrants who choose to live in our smaller cities. Australia's history demonstrates the instrumental role that immigration has played in building a nation. Progressive waves of migration have contributed to our world-renowned cultural diversity. We should recapture this spirit to drive growth and development in our smaller cities.

Box 2.2: Infrastructure Priority List: Relocation of University of Tasmania STEM facilities

The University of Tasmania proposes to relocate their Science, Technology, Engineering and Mathematics (STEM) facilities to a new 23,000 square metre precinct located in the centre of the Hobart CBD.

The relocation of this infrastructure could kick-start population growth and stimulate the Hobart economy. Hobart – and Tasmania more generally – face numerous challenges over the next 15 years. The Tasmanian economy is growing at a slower rate than the mainland economy. Over the period 2005 to 2014, the Tasmanian economy has grown on average by 1.4 per cent per year compared to a national average of 2.8 per cent. Although Tasmania’s population may well stabilise (or grow slowly) over coming decades; under the central population scenario, Tasmania’s population will be declining by 2050. However, the Tasmanian Government has set clear population targets, aiming to grow the state’s population to 650,000 by 2050.¹⁹

The University of Tasmania’s proposal, an *Infrastructure Priority List* initiative, intends to expand the university’s STEM facilities with an extra 200 academic staff, 300 post-doctoral staff and 200 PhD students. This will enable the teaching of an extra 4,000 students.

If delivered, the facility could make a material contribution to population growth in Hobart by attracting an increased number of international and domestic students and academics to locate there. Longer term, the proposal could be a catalyst for promoting growth in the city and state by attracting related research workers and industry to collaborate with the new facility.

Recommendation 2.5:

Governments should aim to grow the population of our smaller capital cities, in particular Adelaide, Hobart and Darwin beyond their current projections. These cities offer access to impressive natural and built environments, high-quality infrastructure and services, cultural diversity and a skilled and dynamic workforce. We must ensure that we make the best use of these cities by growing their population and ensuring their continued economic prosperity.

Recommendation 2.6:

The cities of Newcastle, Wollongong, Geelong, the Sunshine Coast and the Gold Coast should be supported by governments, businesses and local communities to grow their populations and economies. Access to new or upgraded infrastructure will be important in enabling these cities to develop strong economic and employment links with our bigger cities.

Getting the governance of our cities right is fundamental to their ongoing success

The ability of Australia's cities, big and small, to capitalise on the opportunities and challenges created by population growth will depend significantly on the quality of the planning, policy and investment undertaken by governments.

The primary responsibility for the planning and operation of our cities rests with state, territory and local governments. State and territory governments administer strategic planning and approval frameworks, and deliver major infrastructure and services. Local governments implement the bulk of planning policies and approval processes (reflecting local concerns), and deliver key services and local infrastructure. Future population growth will require reforms to deliver a more agile and efficient, city-focused style of planning and governance.

Consolidate local government to improve metropolitan infrastructure

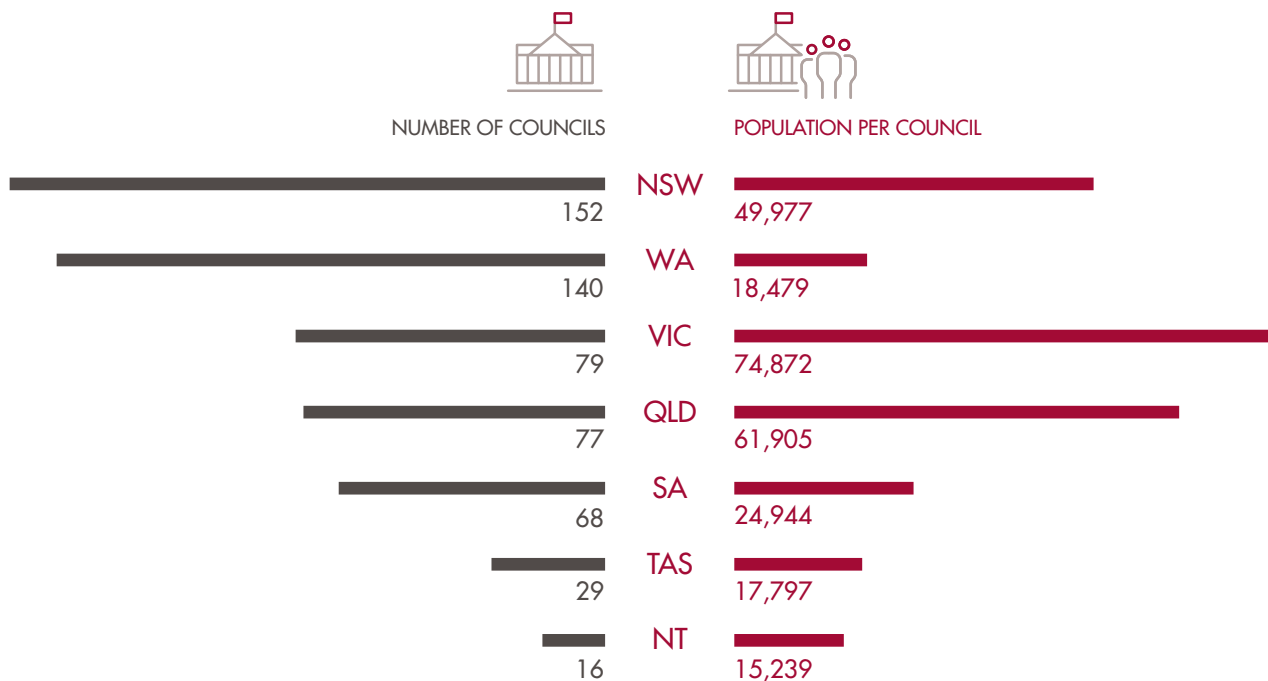
Effective local government is critical for the operation and management of Australia's cities. Done well,

local government supports economic growth, protects environmental assets and enhances the well-being of the community.

Across our cities and regions, the system of local government is not working as well as it could. The proliferation of small local councils has resulted in cases of fragmented infrastructure and service delivery. Many local councils are struggling with weaker revenue and increasing funding needs. Figure 2.3 shows the current state of local government reform across Australia, highlighting the differences in average population per council between jurisdictions.

The amalgamation of local councils brings the benefits of larger scale. Larger councils can employ a wider range of skilled staff, enabling them to undertake more efficient infrastructure delivery and operation, strategic planning and community initiatives. Larger councils can more easily partner with state, territory and federal agencies in the strategic planning and management of their wider cities and regions.

Figure 2.3: Current state of local government reform across Australia



Note: Australian Capital Territory local government services are provided at the territory level.

Source: Infrastructure Australia analysis of State Electoral Commissions, 2015 and Australian Bureau of Statistics, 2015²⁰

The benefits of larger councils extend beyond the local government's immediate boundaries, delivering wider benefits for the national economy. The Organisation for Economic Cooperation and Development (OECD) has found the degree of fragmentation in a city's governance structure to directly impact the productivity of the economy. For any given metropolitan population, doubling the number of local government areas is associated with about six per cent lower productivity.²¹

Local government reform is being (or has been) progressed in a number of jurisdictions, as illustrated by Figure 2.3. Where they have already commenced, these reforms should be continued and extended to other jurisdictions.

Recommendation 2.7:

Local government reform processes should be initiated across Australia to consolidate the number of councils and increase the efficiency, service quality, financial viability and strategic profile of local government. A number of jurisdictions have reformed, or are currently reforming local government service delivery in Australia. State and territory governments should continue to monitor the adequacy of local governance arrangements and, where necessary, enact further reforms to increase the quality and viability of local government.



Long-term, integrated metropolitan land-use plans to manage population growth

The importance of medium to long-term – that is, 15 years and more – metropolitan planning for Australia’s cities has never been greater. The extent of change forecast, in particular the level of population growth and change, will require a transformation of the structure and operation of our cities. State and territory governments will be at the vanguard of this change and will need to start planning for it now.

Done well, metropolitan planning enables state and territory governments to methodically respond to the challenges posed by population growth, environmental degradation and economic development.

The recent history of metropolitan planning for Australia’s cities has been mixed. A 2011 evaluation of metropolitan strategic planning processes in capital cities by the former COAG Reform Council found that there is room for improvement across all jurisdictions.²²

The worst examples have been characterised by:

- Ad hoc delivery and implementation of metropolitan plans;
- A lack of integration within government departments and between the different layers of government; and
- The politicisation of the process, resulting in plans wholly or partially being re-written following a change of government.

“Australia’s current metropolitan planning governance frameworks are lacking. The historic impetus for small local governments, and the failure of state governments to be able or willing to fill the void, has resulted in suboptimal urban planning. Addressing this deficit is critical in a post-resource boom where future economic growth will be generated from urban centres.”

Committee for Economic Development of Australia submission, 2015

In future, consistent and integrated metropolitan planning should be a high priority for state and territory governments.

For planning to be effective it must be supported by a wider governance structure. Metropolitan planning should align with infrastructure planning, budgeting and delivery by other arms of government, and integrate with the land-use planning and implementation functions of local governments.

The responsibility for metropolitan land-use planning rests with departments in state and territory governments. They delegate some planning and implementation functions to other arms of government, including local government. In practice, there are often related planning, policy and investment initiatives underway when metropolitan plans are being developed. As a result, metropolitan plans risk being developed in ignorance of these parallel processes, including those relating to infrastructure planning and delivery. This has the potential for uncoordinated and conflicting development and infrastructure provision.

Governments everywhere are exploring how to better coordinate the delivery of planning with innovative forms of metropolitan governance. State and territory governments should consider what role institutional innovation, focused on delivering metropolitan governance, can play in supporting the implementation of plans.

Additional discussion in relation to planning can be found in the **Governance** chapter.

Recommendation 2.8:

Each state and territory governments should deliver and consistently update long-term land-use plans for all Australian cities. These plans should be integrated with corresponding infrastructure plans. To ensure the effective integration and implementation of these plans state and territory governments should explore what role institutional innovation, focused on delivering metropolitan governance, can play in supporting their implementation.



Connectivity

Deliver efficient infrastructure to connect people to jobs, goods to markets and Australia to the world

Well-connected cities and regions enable us to easily access the places, services and communities we need to lead productive and prosperous lives.

The quality of Australia's infrastructure is key to establishing these connections:

- Access to reliable passenger transport ensures people experience consistent journeys, enabling them to effectively meet the demands of their day-to-day lives;
- Connecting our freight and logistics supply chains ensures that goods are moved efficiently and reliably; and
- The delivery of high-speed and reliable telecommunications across Australia will create opportunities for communities and businesses to access better services, wider markets, new employment opportunities and enhanced social connections, particularly in our regions.

While Australians already enjoy access to generally high-quality infrastructure and services, there is scope to do better. The current reach and capacity of Australia's infrastructure is patchy, with network gaps and constraints

across the telecommunications and transport sectors. The result is higher costs for individuals and businesses.

Australia must upgrade its urban passenger transport networks so that they are more integrated, have higher capacity and are able to meet the twin demands of population growth and rising expectations for service levels. Investment is immediately required to address infrastructure gaps on the outskirts of our major cities, which cause disproportionately longer journey times.

At the same time, we should transform the structure, operation and use of urban transport networks to meet the connectivity needs of a 21st century population. This will see Australians undertake multi-modal journeys, using 'turn up and go' services, with no need for timetables.

Australia's key freight routes need attention. First and last mile issues, bottlenecks and pinch points, increase the time it takes for freight to travel from sender to receiver. These issues will be further exacerbated by population growth.

A National Freight and Supply Chain Strategy, which takes an 'end to end' supply chain approach, is needed to define nationally significant freight corridors and precincts,



identify the gaps, and outline a reform and investment pipeline to address these challenges. Targeted programs of investment will also be required to remove the network constraints and gaps identified by the Strategy.

The delivery of the NBN is a transformational opportunity to enable all Australians to benefit from an increasingly digitised world. Governments should ensure

that the full benefits of high-speed broadband are realised, and that it provides long-term connectivity dividends.

Any failure to address these challenges will have adverse consequences for all Australians. But if we get it right, infrastructure that connects our cities and regions can substantially boost the capacity of our economy and the prosperity of our communities.

What the Audit found

- Demand for urban transport infrastructure is projected to increase significantly. Without action, the cost of congestion on urban roads could rise to more than \$50 billion each year by 2031. Demand for many key urban road and rail corridors is projected to significantly exceed current capacity by 2031.
- The national land freight task is expected to grow by 86 per cent between 2011 and 2031, with much of that expected to be handled by road freight.
- Access to transport remains a critical social equity consideration, particularly for the outer suburbs of Australia's cities and most parts of regional Australia. These areas generally have an undersupply of transport services (especially public transport) and of local employment options.
- The quality of telecommunications service across Australia is mixed, with generally good services in cities and with lower quality services in rural and some outer urban suburbs. The NBN is expected to materially improve service levels and the ability of households in rural and remote regions to connect to their wider social networks.

Efficiently connecting people to jobs, services and social opportunities

Integrated, high-functioning passenger transport enables the community and the economy to connect. It makes it easier for people to get to their jobs, ensures businesses can operate efficiently and enables the creation of dynamic communities with strong social ties.

Transport infrastructure faces a number of challenges which, if left unaddressed, will result in a decline in service quality. This is most acute in our cities, where legacy passenger transport networks must meet the demand for increased capacity from a growing urban population as well as connect to residents located on the outskirts.

Transforming our urban transport to meet the demands of a growing population

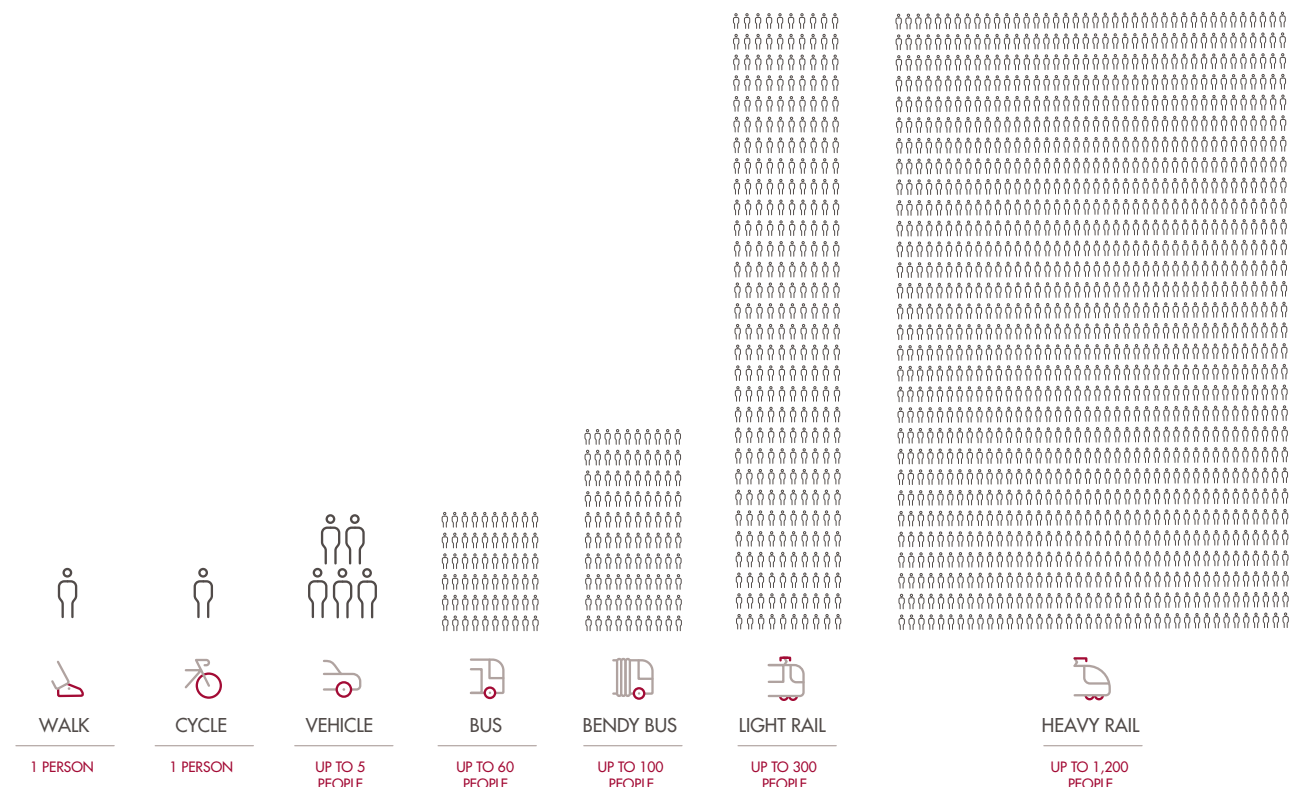
Population growth in Australia's cities, in particular Sydney, Melbourne, Brisbane and Perth, will transform these cities with a generational shift in demand for transport infrastructure and services.

In the absence of appropriate policies and investment, this increased demand will result in delays and congestion. Severe bottlenecks and capacity constraints along critical road arteries and rail corridors are already causing delays, resulting in increased travel times for commuters and lost productivity.

Infrastructure Australia's Audit data indicates that, without action, this trend will continue and deteriorate, with the cost of congestion in Australia's major cities set to rise from \$13.7 billion in 2011 to \$53.3 billion in 2031. Similar trends will occur across key public transport networks, with the Audit forecasting an 89 per cent increase in demand for public transport between 2011 and 2031.

Population growth will likely foster a change in the structure of Australian cities, with higher density living within established urban areas to become the dominant style of new housing. Shifting patterns of urban development will also change the type of transport infrastructure required. Higher volume transport options

Figure 3.1: Indicative carrying capacity of different transport vehicles



will be needed to service larger populations and higher density environments.

We will need to change the structure, operation and use of our legacy passenger transport assets to deliver passenger transport suitable for a 21st century population and built environment.

“Members value their mobility. They want a transport system that moves them efficiently and reliably between destinations, regardless of the mode or combination of modes they may use.”

Royal Automobile Club of Victoria (RACV), 2015

Existing transport networks will have to be upgraded to meet increased levels of demand. Private passenger vehicles are currently the dominant mode of transport across our major cities. Over coming decades, meeting the demands of population growth will require a change in the balance of transport options in our cities, with single modes or combinations of modes servicing different journey

types based on their relative strengths and weaknesses, in particular their carrying capacity (see Figure 3.1).

We need to invest in transport options that can carry more passengers and service higher density environments. Investment should increase public transport capacity and motorway connections, which prioritise the movement of buses and other high-value vehicles, to key employment hubs in our cities. This investment should not just focus on delivering new infrastructure assets but also seek to make better use of existing infrastructure and networks.

The movement of people between our major cities, in particular by air, will also increase. So the quality of connecting airport infrastructure will largely determine how efficiently Australians can travel between our major centres. High-frequency rail links between our major airports and city centres will greatly improve the reliability of these journeys.

Different solutions will be required for different cities. Our cities are growing at varying rates and the appropriate level of investment will depend on their size. Infrastructure Australia’s *Infrastructure Priority List* includes a range of priorities that will contribute to meeting the passenger transport demands of Australia’s current and future urban populations, including a range of city-shaping, public transport proposals (see Box 3.1).

Recommendation 3.1:

Governments should upgrade legacy capital city passenger transport infrastructure to deliver higher capacity, high-frequency services across all modes. To ensure funding is allocated to the right solutions, governments should adopt a modally agnostic methodology (where all infrastructure solutions are considered equally), and consider Infrastructure Australia’s *Infrastructure Priority List* ahead of any funding decisions.



Box 3.1: Infrastructure Priority List: Capital city public transport initiatives

Infrastructure Australia has identified several proposals to expand the capacity of urban passenger rail networks as high priority initiatives on the updated *Infrastructure Priority List*.

These proposals, combined with other investments and reforms, could represent a viable pathway to transform our major passenger transport systems to accommodate population growth and change across Australia's largest cities.

Sydney Metro: Sydney's train network faces a number of challenges. The growth in demand for services combined with worsening capacity constraints, means that without action the network will be unable to meet the city's ongoing transport needs. The New South Wales Government is proposing to deliver a new 30-kilometre metro-style rail line, from the Metro North West Line at Chatswood under Sydney Harbour through the Sydney CBD to Sydenham and then, using converted rail tracks on the existing line, to Bankstown. The proposal would deliver 30 trains per hour through the CBD in each direction, and increase capacity across the network by 60 per cent during the peak.

Melbourne Metro: The Victorian Government is proposing to construct twin nine-kilometre rail tunnels from South Kensington to South Yarra, under the Melbourne CBD and linking the Sunbury and Cranbourne/Pakenham rail lines. If delivered, the proposal would reduce existing and future capacity constraints by enabling 20,000 more passengers to use Melbourne's rail network during peak hour and increasing the capacity, reliability and efficiency of train lines serving growth areas in the city's north, west and south-east.

Brisbane Cross River Rail: On current projections, the rail connections into the Brisbane CBD are expected to reach capacity by 2020 on the back of strong population and employment growth across South East Queensland. The Cross River Rail Initiative would see a new north-south passenger line constructed in Brisbane's inner city, running from Bowen Hills to Salisbury through the CBD and providing a second rail crossing of the Brisbane River. The initiative would ensure that the Brisbane CBD rail network has capacity to meet demand beyond 2031, and reduce journey times and crowding.



Providing passengers with tools to make best use of the transport network

Beyond investment, how we operate and use passenger transport networks will need to change. In a high-population, higher density city, it will no longer be feasible to make a single mode journey, without interchange, from origin to destination.

Instead, the movement to high-capacity, high-frequency transport services will require trade-offs, such as not having a seat in exchange for a shorter, more reliable journey. Mirroring the transport networks of other global cities, public transport networks should transition to a timetable-free ‘turn up and go’ service which combines transport modes to complete a journey. Operators can assist this cultural change by ensuring passengers have access to mobile applications that enable them to navigate the changing network.

Globally, advances in the collection and storage of data, combined with smartphones, are transforming the way passengers use transport infrastructure. Operators now have access to large volumes of data regarding the real-time operation, use and performance of Australia’s transport networks. When this data is made publicly available, developers of mobile applications can provide transport users with real-time information on:

- The quickest and most reliable car, cycling or walking route or the shortest multi-modal public transport journey;
- The level of congestion on specific road corridors and real-time re-routing; and
- Delays or overcrowding occurring on bus, train or ferry routes.

This information, made accessible in a digestible format, will enable transport users to navigate an integrated multi-modal transport system. It would empower users to design journeys that will quickly and reliably deliver them to their destination.

The benefits of these advances are already being felt in Australia’s major cities, with the release of a number of real-time transport applications improving the user experience and improving network outcomes.

There is scope to do much more, with most transport operators yet to make available all of the data they have access to. Opportunities also exist to link the data of different operators so as to enable integrated trip planning tools.

As our transport networks change, the private sector should have access to data, as this will enable them to create dynamic tools to help users adapt to change. The wider application of ‘open data’ policies, where the full release of data is the norm, will ensure that Australia is fully capitalising on open access to transport data.

Recommendation 3.2:

Data regarding the real-time operation, use and performance of Australia’s transport networks should be made publicly available to enable the private sector to develop customer-focused mobile applications. In a high-population, higher density city, public transport networks will need to transition to a model where commuters use an efficient combination of modes to complete a single journey. To assist this process, all governments should adopt an ‘open data’ policy and quickly release new data regarding the operation and performance of urban public transport networks.

“The reality is that while Metropolitan Strategies have tried to shift the balance of growth to established areas with some success, the outer growth has continued. It is time for a dedicated approach to such population hotspots.”

National Growth Areas Alliance submission, 2015

More reliable and frequent transport connections to the outskirts of Australia's cities

There is a disparity between access to transport infrastructure in the inner and outer suburbs of Australia's cities, with those living on the outskirts generally serviced by less reliable road and public transport services.

Recent metropolitan plans have aimed to deliver higher density housing in inner-city locations, which is welcome. Meanwhile the outer suburbs have continued to grow, with many of them now struggling with legacy transport infrastructure gaps.

Work undertaken by the Victorian Auditor-General found that these gaps have common characteristics:

- Geographic coverage: there are fewer transport services available in outer suburbs, so that the geographic footprint of these services is much lower relative to more central suburbs;
- Frequency of service: public transport services are less frequent so residents have reduced connectivity; and
- Directness of service: the public transport service or road routes available are less direct requiring residents to undertake longer journeys.²⁴

This disparity of access has a tangible impact on the quality of life and prosperity of these communities as it limits access to jobs and economic opportunities in a reasonable travelling time (as illustrated in Box 3.2).

Box 3.2: Access to jobs across our biggest cities

The Grattan Institute report *Productive Cities: Opportunities in a Changing Economy* has mapped, by suburb, the percentage of jobs in Sydney, Melbourne, Brisbane and Perth that can be accessed by either a 45-minute car trip or a one-hour journey on public transport. The report shows that large areas of all four cities, mainly on the outskirts, are poorly serviced by critical road and public transport infrastructure.

Sydney: In Sydney, access to jobs by a 45-minute car journey is significantly limited for large sections of the city, with the middle and outer suburbs only able to access between 30 and less than 10 per cent of jobs. Public transport is different. While large sections of the city are only able to access less than 10 per cent of jobs by a one-hour public transport journey, the city's rail network improves access along key corridors. As a result, some middle and outer suburbs can access a larger portion of jobs as a result of their proximity to passenger rail corridors.

Melbourne: There are clear gaps in the connectivity of Melbourne's outer suburbs. Across large parts of the metropolitan centre it is possible to access more than half of all jobs by car. The proportion of jobs that can be accessed by car declines by distance from the city centre. Some outer suburbs are only able to access 10 per cent of all jobs with a 45-minute car journey. Access to work in Melbourne by a one-hour public transport journey is significantly lower. The bulk of the outer suburbs can access less than 10 per cent of the city's jobs with a one-hour journey on public transport.

Brisbane: Mirroring Melbourne, Brisbane displays a high degree of connectivity by car, with a large component of metropolitan Brisbane able to access over 50 per cent of the city's jobs by a 45-minute car trip. In contrast, public transport connectivity is much lower. In large sections of the metropolitan area, fewer than 10 per cent of jobs can be reached by a one-hour public transport journey.

Perth: Access to jobs via car in Perth is higher than the other cities and, except for a small group of suburbs on the city's outer fringe, it is possible to reach more than half of the city's jobs from any point in the greater metropolitan area within 45 minutes. In contrast, good public transport access to jobs diminishes the greater the distance from the city centre. This feature is observed to a varying degree in all four cities.²⁵

The polarisation of access and connectivity between residents in the inner and outer suburbs of our cities has significant implications for the productivity of the economy and the social equity of communities.

The increasing distance between where people live and work creates shallow labour markets, which make it harder for the economy to match the skills of a worker with the demands of an employer. The quality of job matching in a city has a direct impact on productivity and labour force participation. Better job matching increases the human capital of businesses and individuals, in turn increasing the output of the economy.

Disparities in access to infrastructure have an impact on the social and economic status of these suburbs. Residents in outer suburbs face extra barriers in accessing economic opportunities. As a result, disadvantage is more

likely to be concentrated here, with negative implications for social cohesion and workforce participation.

Addressing these gaps will require targeted investments by governments, guided by location-based and population-based data. Not all less accessible suburbs should be serviced by high-frequency, public transport services. Instead, investment will need to prioritise highly populated areas, particularly those that are forecast to grow further.

To be effective, such investments should prioritise the delivery of connecting transport infrastructure and services, such as roads, increased bus routes and services, and interchanges, such as park and ride facilities, which will enable residents to more easily connect to motorway and heavy rail networks.

Recommendation 3.3:

Governments should increase funding to address gaps in access to passenger transport on the outskirts of Australian cities. Investments should prioritise high-population areas and focus on the delivery of connecting transport infrastructure and services, which will deliver ‘hub and spoke’ connections, enabling these communities to more easily access mass transport networks.

Moving goods and services across the economy more efficiently

The efficient movement of freight into, out of and across Australia is critical to the nation’s ongoing productivity growth and competitiveness. In 2011-12, the total freight task was 591 billion tonne kilometres and included the movement of bulk commodities and containerised trade.²⁶ The Audit projected substantial growth in the national freight task over coming decades (see Figure 3.2).

While the private sector is responsible for moving freight, governments provide and maintain much of the supporting infrastructure, such as rail lines and roads. The connectivity of this infrastructure is vital for efficient freight movements and the productivity of the wider economy.

Our international gateways and supporting infrastructure face a number of challenges. Freight networks and supply

chains are subject to a number of constraints such as missing links, pinch points, operational restrictions and first and last mile access challenges.

Without action, the extent of these challenges is likely to worsen. The Audit found that the total domestic freight task is projected to grow by 80 per cent between 2011 and 2031. This growth will result in yet further stress on Australia’s freight infrastructure.

Governments should undertake a program of investments and planning initiatives to address the challenges facing Australia’s freight networks. The *Infrastructure Priority List* includes a range of investments that have the potential to materially improve the efficiency of freight movements across Australia (see Box 3.3).

Figure 3.2: Growing size of the national freight task to 2031



Source: Australian Infrastructure Audit, 2015

Box 3.3: Infrastructure Priority List: Inland Rail

The Melbourne to Brisbane corridor is one of the most important and busiest freight routes in Australia, supporting key population, production and employment precincts along the east coast.

The Inland Rail proposal, an initiative on the *Infrastructure Priority List*, aims to improve the efficiency of freight moving between Melbourne and Brisbane. At present, freight rail travelling through the corridor passes through the Sydney metropolitan rail network, often causing significant delays. Travel time reliability is also poor, due to priority being given to passenger services, freight transit curfews in the Sydney metropolitan area, and substandard rail alignments elsewhere.

A proposed inland alignment would bypass the Sydney metropolitan area, substantially cut the overall journey time to less than 24 hours and increase the reliability of services between Melbourne and Brisbane. This alignment, bypassing Sydney via Wagga Wagga, Parkes, Moree and Toowoomba, would deliver around 1,700 kilometres of dedicated freight railway, including approximately 1,000 kilometres of improvements to existing track and 669 kilometres of new railway. Significant productivity gains could be realised by using 1,800-metre trains with double-stacked containers, with the potential for a shift to 3,600-metre trains in the future, as identified by the Australian Rail Track Corporation.²⁷

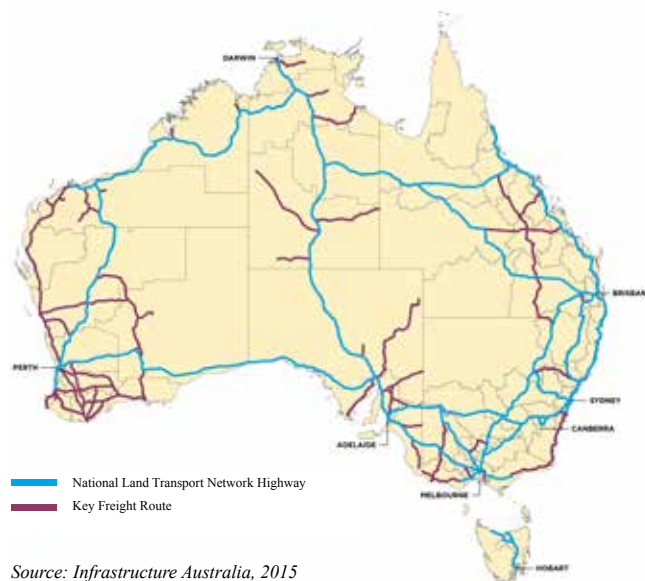
The Inland Rail initiative needs to be considered in conjunction with other investments in the corridor, including the Newell Highway, to ensure they are complementary. The projected growth in demand along the corridor, both for end-to-end freight and intermediate journeys, means that rail and road investments are not mutually exclusive – though the timing of required investments may be impacted. Delivery of Inland Rail will require decisions in the near term to preserve the corridor and ensure the full route is available when required.

A new National Freight and Supply Chain Strategy to guide investments and reforms

Ownership, operation and oversight of Australia's freight networks are fragmented across different levels of government and private sector operators. The key roles of governments include:

- The Australian Government finances the national rail network, provides some funds for major interstate road routes and regulates airports (see Figure 3.3 for a map of Australia's national highways and key freight routes);
- State and territory governments own and manage some metropolitan rail networks, state roads and international gateways; and
- Local governments control local infrastructure access and facilities, and can impose restrictions on operating hours.

Figure 3.3: National highways and key freight routes



Source: *Infrastructure Australia*, 2015

All levels of government undertake freight planning but it is usually not well-integrated with other land-use, transport and strategic planning frameworks. Conflicts emerge when the urban environment impacts key freight corridors. Freight planning is poorly coordinated between jurisdictions. The planning, delivery and operation of key components of national freight networks and supply chains occur largely in isolation and lack a wider national and international network perspective.

For example, in the process of compiling the latest *Infrastructure Priority List*, Infrastructure Australia

received a number of proposals for discrete additions and upgrades to the national freight network. While individual proposals had merit, a wider strategic context would help link priorities to the delivery of network-wide outcomes.

A whole-of-network approach, focused on removing bottlenecks and capacity constraints along key supply chains, is required. A *National Freight and Supply Chain Strategy*, which examines 'end to end' supply chains and is developed in partnership with governments and the private sector, is needed.

The Strategy would map nationally significant strategic supply chains and their connections across ports, airports, roads, rail and coastal shipping; identify the key bodies overseeing their efficient operation; and recommend a series of reforms and investments to enable the more efficient movement of freight.

This would build on work underway at federal, state and territory levels, as well as the previously released *National Land Freight Strategy* and *National Ports Strategy*.

Recommendation 3.4:

Australia needs a *National Freight and Supply Chain Strategy*. Infrastructure Australia, in partnership with governments and the private sector, should lead the development of the Strategy. The Strategy should: map nationally significant supply chains and their access to supporting infrastructure and gateways; evaluate the adequacy of the institutional framework supporting freight networks; and recommend reforms and investments that will enable the more efficient movement of freight.

“Infrastructure Australia should identify and encourage government policies to enable increased private sector investment in, and management of, freight infrastructure and operations aimed at improving the efficiency and competitiveness of Australia's supply chains.”

Australian Logistics Council submission, 2015

Removing first and last mile freight constraints to increase network efficiency

Targeted capital investment will be required to ensure our international gateways and landside infrastructure is operating as productively as possible across the whole supply chain.

Investment focused on addressing first and last mile issues should be a central focus of these investments. The first and last mile of freight journeys routinely occur on local road and passenger rail networks. Conflict and constraint often emerges where freight intersects with residential or other commercial-use activities. For instance, these can occur when a freight train is delayed across the passenger network, or a truck is not able to access a transport hub due to local road limitations. This can result in reduced local amenity, freight delays, lost productivity, and increased costs, which are passed on to consumers, in the form of higher prices for goods at the checkout.

These investments should be guided by a strategic context rather than decided on a project-by-project basis and informed by the forthcoming *National Freight and Supply Chain Strategy*.

Local governments should also play a role. The Australian Government provides significant funding to local councils for investment in local road networks, principally through financial assistance grants, but also through the Roads to Recovery and Black Spot Programs.

Communities and industries alike have argued that more investment in addressing first and last mile constraints should be prioritised. The Australian Government should review the legislation and administrative guidelines covering local road funding, and, where there is an issue that needs to be addressed, consider measures to ensure that a mandated proportion is spent on an agreed network of first mile and last mile roads.

Recommendation 3.5:

All governments should establish targeted investment programs focused on removing first and last mile constraints across the national freight network. These investments should be informed by the findings of the recommended *National Freight and Supply Chain Strategy*.

Efficiently connecting people and businesses to information

Advances in technology, facilitated by access to high-speed broadband, have the potential to profoundly change how we live, work and connect to each other and the rest of the world.

With access to high-speed broadband, businesses are able to introduce tools and operating models, with the potential to drive increased productivity and access greater economic opportunities through a global marketplace. Teleworking arrangements are much more feasible, allowing businesses to access a wider pool of skills and services. Increased online engagement also helps businesses to access a wider customer base, enabling them to grow and diversify their revenue base.

Access to faster and more reliable broadband services also enables communities to better connect with friends, family and ideas from all over the world. Consumers can access a wide range of domestic and international e-commerce opportunities, rapidly changing how people purchase goods and services.

The delivery of high-speed broadband and advances in the transmission of real-time image, data and voice, is enabling government to move an increasing number of services online. As a result, it is increasingly possible for people to access essential services (such as health) without leaving their home.

The delivery of the NBN is an important opportunity for Australia to capitalise on this potential and enable all Australians to benefit from an increasingly digitised world. Once completed, the NBN will deliver all premises a minimum download rate of 25 megabits per second and at least 50 megabits per second to 90 per cent of fixed-line premises.²⁸ As of 14 January 2016, the National Broadband Network Company (NBN Co) reported that more than 1.6 million premises had been passed by with fixed line or covered by wireless and over 750,000 premises had an active service.²⁹

“Adequate and reliable telecommunications are essential for all aspects of contemporary community life, from supporting the state’s economy to creating and maintaining connected and cohesive social networks.”

Western Australian Planning Commission, 2015



Connecting all Australians through faster, more reliable broadband

The opportunities resulting from the delivery of the NBN are particularly relevant for communities living outside major cities. Traditionally, the ‘tyranny of distance’ has made it more difficult for Australians living in regional or remote areas to access (equivalent) jobs, services and social interactions than those living in cities.

These challenges have been compounded by the varied bandwidth provided by internet connections in some parts of Australia. The Audit found that around 80 per cent of premises located outside our cities receive the lowest quality fixed broadband rating. The delivery of NBN will overcome many of these constraints, increasing the viability of regional businesses and the wider regional economy, and improving the connectivity of communities (see Box 3.4).

We should ensure we realise the full suite of benefits for cities and regions made possible by the delivery of the NBN. The ongoing rollout of the hard infrastructure is only half of the story. The entry of the NBN into

communities should be met by initiatives that ensure businesses and individuals take advantage of this transformational investment. Building on work already underway, governments should deliver tailored toolkits, information packs and education courses to support individuals and businesses to understand and capitalise on the technological advancements made possible through access to high-speed broadband services.

Recommendation 3.6:

The Australian Government should work with communities and business to maximise opportunities created by the National Broadband Network. This will boost productivity and increase the efficiency of services and infrastructure. Government should lead the way by increasing the delivery of government services and information online.

Box 3.4: Realising the connectivity benefits of the NBN for regional Australia

While the NBN is still being rolled out, organisations in regional Australia have begun to capitalise on access to high-speed broadband to increase the efficiency and effectiveness of their operations.

Hume Rural Health Alliance, Victoria: The Alliance comprises regional hospitals, 14 community health providers and nine health information service providers. In partnership with the Victorian Department of Health and the Cystic Fibrosis Service at Alfred Health, the Alliance is using high-speed broadband to deliver high-capacity videoconferencing to rural Cystic Fibrosis patients. This enables patients to access specialist services provided from major Melbourne hospitals.³⁰

City of Onkaparinga, Willunga, South Australia: With access to the NBN, local governments can now more effectively provide social services online. The City of Onkaparinga has used high-speed broadband to accelerate the replacement of paper submissions with online applications for planning approvals. The council also provides in-home planning consultations using high-definition videoconferencing. This reduces the need for applicants to travel, often long distances, to attend meetings at council offices.³¹

Regional

Maximise opportunities for growth in productive regional economies and support sustainable regional communities

Australia's regions contribute substantially to the nation's growth and prosperity. Regional Australia produces many of our key exports – such as minerals, energy, agriculture and tourism. It is also home to around a quarter of our population. For the purposes of this Plan, regions are defined as those areas outside our capital cities, Newcastle, Wollongong, Geelong, the Gold Coast and the Sunshine Coast.

Our regions are being presented with some major opportunities:

- The booming economies of south-east Asia and China will demand more of our exports;
- Rapidly-evolving technologies and better information present new business, energy, telecommunications, water and transport opportunities for our regions; and
- The ageing of our population will continue to drive the growth of regional towns, particularly those along the coast, as people consider their retirement and lifestyle choices.

To take advantage of these opportunities, infrastructure needs to be targeted to the varying conditions and dynamics across regional Australia.

The quality of infrastructure in regional Australia is generally good, but some areas lag behind. In many cases, this is because the cost of investing in and maintaining infrastructure is higher. Much of regional Australia has a sparse population and dispersed industry, making it more difficult to deliver good-quality infrastructure services.

In fast-growing regions where economic and population growth is increasing pressure on existing infrastructure, we need to deliver targeted investments to ensure our strongest regions remain strong. Investing in our fast-growing regional hubs and service centres will lift national productivity.

Some of our regions are growing more slowly. In these regions, the infrastructure challenges are quite different. Governments should base decisions on a better understanding of current service levels, community expectations, what is affordable and how infrastructure can best support social outcomes.

The application of new technology and better information is an essential part of any regional infrastructure approach. The NBN will improve access to national and international markets. New technology will help identify the most efficient route from farm to market (and perhaps



target investment towards these routes). It will also help support new off-grid renewable energy. More information on water, particularly in northern Australia, will underpin more private investment in the water infrastructure we need to grow our industries and population.

Poor-quality drinking water and limited mobile telecommunications services are challenges that should be addressed quickly. Policies that create greater scale

will help reduce costs relating to large distances and sparse populations. For mobile services, this means a better targeted Universal Service Obligation (USO) and more sharing of mobile and NBN infrastructure. For drinking water, the aggregation of shared services and council amalgamations could help where multiple local councils are responsible, while a regional structure could improve service delivery in those jurisdictions with a single water provider.

What the Audit found

- Policy makers do not have sufficient information on the level of service Australians need and expect from their infrastructure, how much different service levels cost and how they will be paid for.
- Reforms such as the amalgamation of local government and shared service arrangements are necessary to achieve the scale and financial capacity for some local governments to meet their infrastructure responsibilities.
- Regional areas often suffer from lower quality telecommunications services. Governments should consider what steps are required to provide equitable telecommunications services. The NBN should improve regional service levels.
- Water quality in parts of regional Australia does not meet relevant drinking standards. Underinvestment in regional potable water infrastructure means communities may not be able to access reasonable levels of service in the future.
- Access to transport services remains a critical consideration in most parts of regional Australia.
- Reforms and investments that enable the wider use of higher productivity heavy vehicles and increase the performance of our national highways (such as increasing bridge load limits) are needed to meet the expected increase in the national land freight task.

Support fast-growing regions with coordinated, long-term planning and investment

Coordinating government and private sector investments to support high-potential regional hubs will help lift regional and national productivity.

Fast-growing regional hubs often have the following three features. They:

- Are increasingly the economic and service centres for their regions;
- Have transport links to major capitals giving them access to a large base of suppliers and customers; and
- Will continue to grow rapidly provided they have better infrastructure and access to skilled workforces.

Infrastructure in regional hubs is not always keeping pace with growth. For instance, the transport networks connecting regional hubs and capital cities are increasingly congested and do not support larger, more productive freight vehicles.

Regional infrastructure programs are spread over a variety of projects covering vast areas. They generally do not distinguish between struggling regions and those with strong growth prospects.

Australia is one of the most sparsely populated countries in the world, with an average density of three people per square kilometre. This is only slightly more than Mongolia and fewer than Canada and Russia.³²

As a result, the cost of infrastructure in the regions can be higher than in the cities and metropolitan areas, largely due to low population density, along with large distances from population centres. For instance, the cost of construction in Broken Hill can be more than 25 per cent higher than in Sydney and in Rockhampton can be 15 per cent higher than in Brisbane.³³

In northern Australia, seasonal weather also contributes to the high cost of delivering infrastructure. In the wet season, major roads are subject to closures and unsealed roads can become impassable, preventing the movement of freight and people, often for extended periods.

“An important element of regional development activities within Victoria has been the development of Regional Strategic Plans. These [regional] plans outline the long-term vision for each region and provide a framework for communities to partner with industry, business and government to deliver initiatives and projects tailored to local needs.”

Committee for Economic Development of Australia submission, 2015

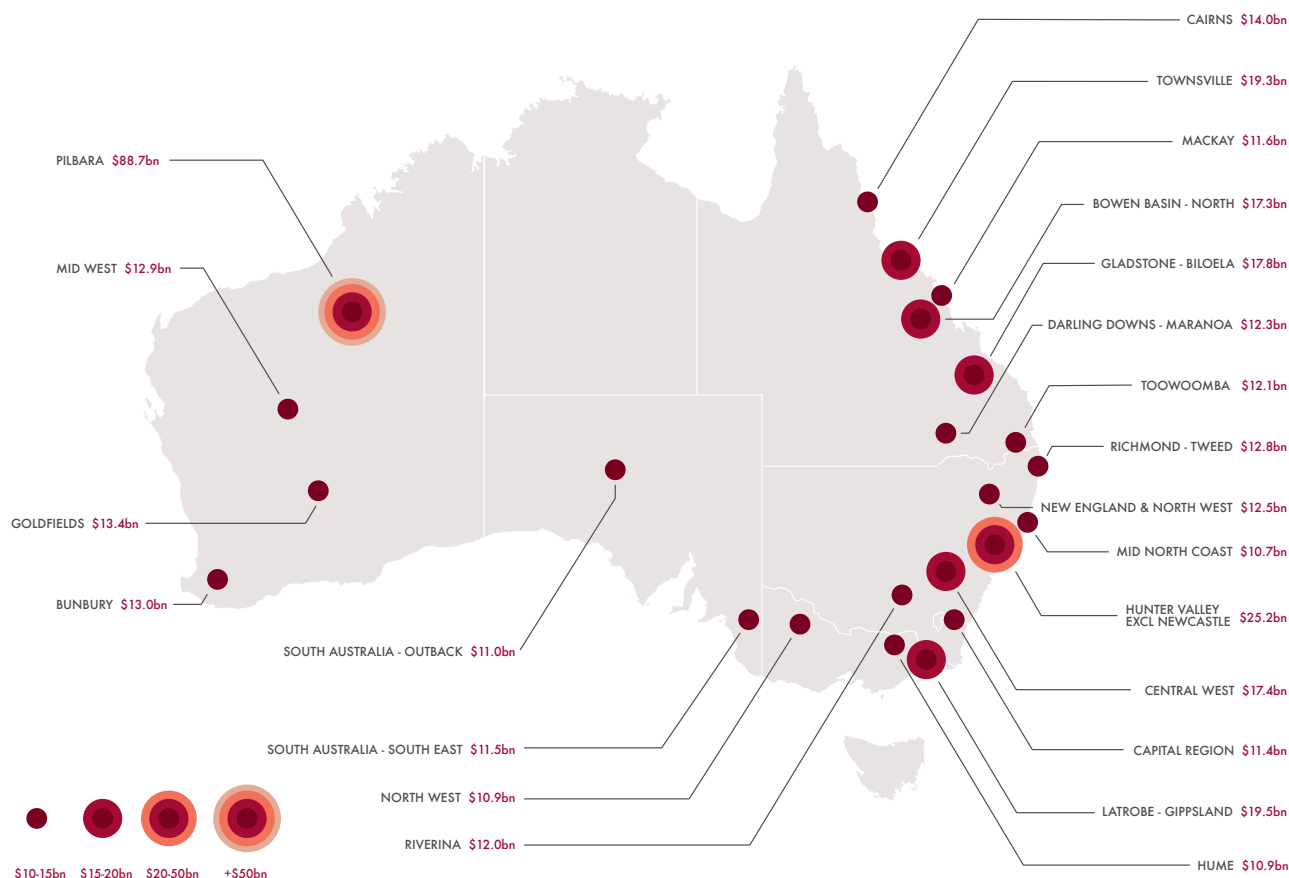
Maximise the potential of fast-growing regions to boost productivity

Our fastest growing hubs are providing businesses inside (and outside) the hub with opportunities for domestic and international trade.

Figure 4.1 presents information on the projected economic contribution of fast-growing regions. The figure presents the centres of regional growth expected to contribute over \$10 billion to the national economy in 2031. Many other parts of regional Australia will contribute substantially to our national economy in the coming decades.

The Audit found that, in the coming decades, the Pilbara, Townsville, Gladstone and Cairns are likely to rapidly grow their populations and economies. The Hunter Valley and La Trobe are already contributing billions to our economy and will need careful investment to maintain this. Areas such as the Riverina, New England and Richmond-Tweed will continue to be some of our most important economic centres.

Figure 4.1: Projected gross regional product for major regional centres in 2031



Source: Australian Infrastructure Audit, 2015

In some regions, the private sector funds almost all the infrastructure, such as in the Pilbara and Gladstone. These regions are home to several of Australia's largest private infrastructure projects, such as the Gorgon LNG project on Barrow Island, 60 kilometres off the Western Australia coast. Private funding is feasible largely because the value of the resources is more than sufficient to absorb the infrastructure costs.

But in most regions, government investment is needed, either in part or full, to deliver economic infrastructure. While infrastructure investment can promote growth, it should be based on well-informed decisions about demand, scale, timing and funding of projects.

Building on existing information and independent advice, including from Infrastructure Australia, governments, business and community should develop strategic long-term infrastructure plans for key regions. These plans should be tailored to the particular attributes of the fast-growing regions and identify the types of infrastructure

and service levels that will be needed to support growing populations and business in the coming decades. These plans should identify gaps in existing regional infrastructure networks and develop priorities to support regional industries, businesses and communities. Plans should also identify how to make better use of existing infrastructure (for example, see Box 4.1).

Funding should also be coordinated across all levels of government. This will provide better value from government spending and offer useful information to the private sector on future investment opportunities.

The Victorian Government already implements long-term regional growth plans that support coordinated responses across municipal borders and different levels of government. Multiple councils work together with the state government to identify infrastructure needs in response to population growth. These plans consider the infrastructure and services needed to support agriculture, tourism, and commercial and residential developments.

Box 4.1: Infrastructure Priority List: Northern Adelaide water infrastructure development

This *Infrastructure Priority List* initiative seeks to use wastewater from an existing treatment plant to support agricultural development on the Northern Adelaide Plains in South Australia.

This region already produces approximately one-third of South Australia's horticulture, equivalent to 160,000 tonnes of fresh produce valued at over \$250 million per annum. This includes intense farming of tomatoes, potatoes, almonds, vines, broiler chickens and dairy.

The growing demand, both domestically and from the booming Asia-Pacific, presents an opportunity to further expand food production. But the region has a limited availability of natural water – it relies on a ground-water aquifer which is already over-allocated.

Expanding the Bolivar Wastewater Treatment Plant will make an additional 20 gigalitres of recycled, treated wastewater available for agricultural production. The alternative is to invest hundreds of millions of dollars to update the treatment plant in order to meet stricter environmental standards for wastewater to be released offshore. Such an approach would cost much more and would need to be paid by SA Water's sewerage customers.

Using recycled water from the Bolivar wastewater treatment plant has the potential to increase the value of agricultural production by at least \$115 million per annum, and create in the order of 450 new jobs. This initiative could also have flow-on benefits to the Barossa and Clare Valley and throughout the broader Mallala District and Wakefield Plains.



Long-term planning should also assess the potential for the regions to ease pressure on our cities. Some regional centres, with smaller populations, will grow and change because of their proximity to major cities. Governments, via appropriate planning, can help assess the quality of infrastructure in these locations and the investments required to support population growth in the short, medium and long term. This includes hubs such as Ballarat and Bendigo in Victoria, Goulburn and Kiama in New South Wales and Toowoomba in Queensland.

Recommendation 4.1:

State and territory governments should deliver long-term regional infrastructure plans.

These plans should:

- Identify gaps in infrastructure networks and identify priorities to support productive regional industries;
- Be developed with involvement from all levels of government to help coordinate investments and remove duplication;
- Provide transparency for the private sector to allow for government funding to be leveraged and private investment to be maximised; and
- Assess the potential for regions to ease pressure on our largest cities.

Capitalise on opportunities to develop the north

The northern Australia economy – that is, all of the Northern Territory and those parts of Queensland and Western Australia north of the Tropic of Capricorn – is growing quickly. This is particularly the case for north-east Queensland in Townsville, Cairns and Rockhampton.

These places will dominate the north in the coming decades because they have some of the highest population growth rates in the country. They also contain important sea ports, airports, major roads, railways and logistic centres that are gateways to Asia, which is likely to represent around two-thirds of the global middle-class population and consumption by 2031.³⁴

Some of these areas will come under pressure without further investment. For example, the Audit found growth in demand for ports by the resources and energy sectors, coupled with increasing competition from agriculture, tourism and defence sectors are already creating infrastructure capacity constraints. Without additional water supply (or demand management), population growth in Cairns is projected to lead to a shortfall of approximately 20,000 megalitres each year by 2055.³⁵

Given the scale of growth and the importance of fast-growing regions to our national economy, the Australian Government should work closely with other levels of government and the private sector to maximise economic potential of these regions. This includes establishing policy frameworks to ensure they sustain and diversify their growth. Important lessons from regions that have experienced substantial growth over recent decades, such as the Pilbara, can guide these frameworks (see Box 4.2).

Each level of government has policy levers that can be directed to specific outcomes. For example, the Australian Government can contribute via its planning rules, visa and immigration processes and national access regimes, as well as specific initiatives such as the new \$5 billion Northern Australia Infrastructure Facility. State and territory governments are responsible for providing schools, most roads, railways and emergency services. Local governments control zoning, development approvals, the delivery of essential services and local infrastructure.

Overall, a more coordinated approach to priority regions will ensure that private sector investment aligns with the long-term strategic goals for the region.

Recommendation 4.2:

The Australian Government should prioritise investment in regional infrastructure where the population is growing quickly and where the bulk of our regional economic growth can be found. Efficient, liveable and productive regional hubs should be considered national economic assets and be a key priority of every level of government, including capitalising on opportunities to develop the north.

Box 4.2: Taking lessons from the mining boom – growth in the Pilbara

In fast-growing regions, it is vital to plan infrastructure to ensure it supports sustainable growth.

The Pilbara, which has some of the world's most valuable high-grade iron ore deposits and offshore gas reserves, has been a remarkable growth story. This is likely to continue, with new industries emerging – including irrigated agriculture. Indeed, the Audit found that between 2011 and 2031 the Pilbara region is projected to grow by 30,000 people and its gross regional product to more than double to around \$89 billion.

A key lesson from the Pilbara is that good infrastructure planning is essential to ensure we make the most from fast-growing regions. And this planning must occur well before rapid growth takes hold, to ensure growth opportunities are maximised. This also helps ensure communities share the rewards of growth by accessing high-quality services and amenities.

In the Pilbara, the rapid 'boom' has, in some instances, led to infrastructure duplication and inefficiency across networks, making it more difficult for new industries and smaller business to access crucial infrastructure which remains in the hands of single operators. Specific lessons for regional infrastructure investment include:

- Early planning and coordination between private and public sectors is essential to deliver infrastructure efficiently, avoid duplication and minimise costs;
- Governments should encourage multi-user infrastructure and efficient, integrated supply chains to ensure equitable access to infrastructure for present and future businesses, and to support diverse, sustainable investment in the region; and
- Government and industry should work together to understand the available complementary resources, such as water, to meet the needs of immediate development and sustainable use over time.

The Western Australian Planning Commission's *Pilbara Planning and Infrastructure Framework* identifies infrastructure to address the scale and distribution of future economic and population covering housing, telecommunications, water and wastewater, and transport.³⁶ While this report represents good planning, such approaches need to be in place well before a boom takes hold to ensure best outcomes for local communities and industry.

Tailor investments to support our slower growing regions with better information on service needs

Our economy is always adapting to changing conditions and opportunities. At any one time, some areas will be doing better than others. So while our national economy may be growing, there will be parts of Australia that are not.

In regional areas that have a limited or declining economic base, governments face difficult decisions. Investments need to be affordable (making the best use of taxpayer funding) and equitable (serving the long-term interests of communities).

Spreading infrastructure investments thinly across all regional communities is not the answer. Infrastructure

programs are not only expensive, particularly in our regions, but there is also limited evidence to indicate they accelerate slow-growing areas, at least beyond the construction phase.

Service levels differ across Australia. Infrastructure should be tailored to each community's particular needs, its demographics, and what is affordable. Not every community needs a metro-rail system or an extensive bus network, nor expects one. Understanding how service levels differ between fast-growing and slower growing regions, and between our most urbanised regions and remote communities, will help inform investment decisions. Currently, there is insufficient information to fully inform such decisions.

There is a rationale for investing in slower growing regions based on social reasons or to unlock potential opportunities. Our slower growing regions should have access to vital services such as schools, hospitals, transport and other community facilities. Such regions will still be great places to live, and may score more highly than larger cities on measures of well-being and social connection. Over the longer term, as regional hubs expand and technology continues to connect our regions, these areas could become even more attractive places to live and work.

Where governments provide infrastructure, they should be clearer about the size of the investment, what taxpayers (including those living beyond the benefitting region) can expect in return and how such investment will be funded over time. Governments should provide information on the specific equity issues being addressed and how infrastructure is being targeted to help achieve these outcomes. The rationale for investment should be made available to the public so that the community can be engaged with the relative merits of its investment.

Recommendation 4.3:

Regional infrastructure investment should respond to each community's particular needs, its changing demographics, and what is affordable. Where governments are providing infrastructure in slower growing regions, they should make available information on how infrastructure is being used to address efficiency and equity issues, what taxpayers can expect in return and how such investments will be maintained over time.

Invest in technology and information to support productive regional infrastructure

Connecting regions to broadband should provide people and businesses with increased opportunities to access domestic and international markets, education, health and other services.

The challenge for governments and providers is to make sure this technology translates into new regional opportunities. Technology is a significant driver of innovation and has enormous potential to overcome the tyranny of distance in service delivery. It can help reshape regional economies and influence the growth and connectedness of communities with major cities.

Further discussion of the potential benefits of high-speed broadband can be found in the **Productivity, Connectivity and Remote and Indigenous Communities** chapters.

Mobile services in regional Australia are not as accessible as in our cities. There is generally less choice for consumers between mobile network providers. The lack

of competition is largely due to the cost of investing in mobile infrastructure. In areas of low population density, there is often insufficient mobile revenue to support two sets of competing infrastructure. In many areas there is a single mobile network provider – typically Telstra.

Without better mobile services, regional Australia will not fully benefit from new technologies and the associated business opportunities and better service delivery. For example, mobiles (and other technology) enable remote control of agricultural tasks including monitoring soil moisture, supplying water to drinking troughs for cattle and opening and closing gates (see Box 4.3).

Mobile coverage also means a quicker response to car accidents and greatly assists in fighting bushfires, floods and other natural disasters. Mobile access is important for regional tourism because visitors expect to have mobile services wherever they stay.

Box 4.3: How mobile services has created business opportunities in regional Australia

Bligh Lee Farms in Mingenew, Western Australia: The 17,000 acre Bligh Lee family farm in Northern Western Australia has, in partnership with an entrepreneur, developed probes that automatically measure soil moisture, rainfall, temperature and humidity. This data is remotely transmitted to mobile devices and allows farm management to optimise their crop spraying. Previously this information was recorded by taking physical measurements across the property and manually entering the data into a computer.

Aeeris in Kingscliff, New South Wales: Aeeris is an Australian Stock Exchange-listed technology company based in regional New South Wales. Aeeris has developed an Early Warning Network: a system which aggregates data on potential hazards such as weather, traffic and power outages for over 100 corporate and government subscribers. Aeeris has released a free mobile application with geographically-targeted weather warnings. The app currently has over 250,000 users.

Precision Agriculture: Precision Agriculture integrates new spatial technologies with cropping management systems to improve farming practices. Their service includes digital mapping of farms, satellite imagery to assess conditions such as crop health, and farm management software. Precision Agriculture has conducted trials in Victoria using satellite imagery to determine how and where nitrogen fertiliser should be used. Fertiliser is a major cost in agriculture so using it more efficiently can save money and increase yields.

Redirect the Universal Service Obligation from fixed lines to mobile services

Each year about \$300 million, funded by the Australian Government and an industry levy, is spent to ensure that all Australians have access to a ‘standard telephone service’ and that payphones are reasonably accessible. This includes maintaining fixed-line telephones in regional areas. This is known as the telecommunications USO.³⁷

The USO is important for consumers living in regional and remote areas of Australia. It recognises that our vast area and low population density makes it difficult for providers to offer competitive telecommunications services in all regions.

But the relevance of fixed-telephone services – and this obligation – is declining. Fixed-line services are gradually becoming redundant. More people are choosing to forego fixed voice services and rely on mobile services alone. For example, more than half of Australians identified a mobile phone as their most used telecommunications service, compared to 16 per cent who identified a fixed-line telephone.³⁸ And close to one-third of adult Australians are mobile-only phone users (with a mobile phone but no fixed-line telephone at home).³⁹

The NBN is replacing copper lines in regional areas with fixed wireless and satellite, which will deliver internet services, but also high-quality fixed-line telephone services.

The Australian Government should consider phasing out its existing USO and diverting it to improved mobile coverage. Diverting funding to provide better mobile coverage in the regions will support greater use of new technologies that rely on smartphones. This could involve introducing a technology-neutral USO to support mobile services, in conjunction with existing programs.

More access to NBN infrastructure to attract mobile providers to the regions

A major barrier to increased coverage in regional areas is the cost of fixed-line transmission – otherwise known as backhaul – which is needed to connect mobile phone towers with a data centre to process calls, texts and connect users to the internet.

The cost of backhaul is directly related to the capacity required to supply mobile services and the distance of the backhaul link. In regional and remote areas, the backhaul link from a base station to a mobile network provider’s core network involves longer distances. It is therefore

more costly than in metropolitan areas. The substantial capital cost of building long backhaul infrastructure is enough to discourage operators from building their own network, thereby denying services to some regions or limiting consumer choice.

The NBN is investing in backhaul infrastructure as part of delivering broadband infrastructure in the regions. This infrastructure could also be used by mobile network providers, in appropriate circumstances, to expand their coverage in more regional areas at relatively low cost. The NBN itself would not become a mobile service provider, but rather it would be allowed to make its infrastructure available to encourage greater competition among mobile companies.

The NBN has already been examining the viability of using its backhaul to connect the cell-sites of existing mobile network providers.⁴⁰ The Australian Government should work with the NBN and business to develop a viable framework to deliver low-cost backhaul. This would involve a relatively minor change in its scope but could improve mobile services in regional areas and deliver significant long-term benefits to consumers and businesses.

In developing a suitable approach, the NBN and Australian Government will need to consider the impact of this on current operators who own backhaul and mobile networks.



Share mobile towers to encourage competition

Current Australian Government policy requires base stations funded under the Mobile Black Spot Program be designed and built for use by more than one mobile network provider. This program aims to harness investment from multiple network operators and increase competition.⁴¹

But in Australia there is limited uptake of co-location – most sharing is at a network level rather than specific infrastructure. In the United Kingdom there is a more rigorous approach, where new base stations are only funded by the government if all network operators agree to make use of the site. This ensures that funding results in an immediate increase in coverage and choice for mobile customers.

Wherever possible, NBN towers should also be made available to mobile network providers. This would build on the current situation, whereby tower locations are published and mobile network providers are able to request co-location. Sharing of towers can avoid duplication of infrastructure, minimise the visual disruption associated with towers, and support increased coverage and choice in regional areas.

Recommendation 4.4:

The Australian Government should remove barriers to entry for mobile network providers in regional Australia to facilitate improvements in coverage, competition and service quality.

This should include:

- Considering the merits of modifying the existing fixed-line Universal Service Obligation in regional areas toward improving mobile coverage;
- Where possible and appropriate, making National Broadband Network backhaul and towers available to mobile network providers; and
- Taking steps to encourage mobile network providers to co-locate their mobile infrastructure.



Better use of technology to increase the efficiency of regional industries

Technological improvements and innovation can transform industries and open up opportunities for regional business. Innovations that help overcome geographic challenges are particularly relevant to regional infrastructure.

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) has developed a number of models to help analyse road improvements and prioritise supply chain investments. Greater use of this technology will enable funding to be directed to where strategic regional

projects will make the biggest difference – for example, pinch points or last mile access issues.

For example, CSIRO is already applying the TRAnsport Network Strategic Investment Tool (TRANSIT) to inform the Australian Government's \$100 million Northern Australia Beef Roads Fund to maximise transport cost savings in beef supply chains across the north (see Box 4.4). CSIRO is also extending TRANSIT to broader Australian agriculture transport as part of the *Agricultural Competitiveness White Paper*.⁴² This will involve around 25 commodities, accounting for more than 95 per cent of Australia's agriculture transport volume.⁴³

Box 4.4: Using technology to support more efficient regional supply chains

CSIRO's TRANSIT model assesses all possible transport route combinations, including road and rail options and determines the route that will optimise vehicle movements between businesses in the agriculture supply chain. It identifies ways to reduce travel distance and time, saving fuel costs, reducing wear and tear and minimising stress for both truck drivers and livestock.

The TRANSIT model is particularly relevant for northern Australia, where cattle travel as much as 2,500 kilometres to get to east coast abattoirs. TRANSIT has modelled the potential benefits of sealing the remaining 105 kilometres of the Hann Highway north of Hughenden in central Queensland. It shows that this would reduce travel time on the Highway from five hours to three and a half hours, producing significant time savings for the estimated 1,300 road trains using the road each year. TRANSIT has also identified that the number of road trains using the fully-sealed Hann Highway would increase by 25 per cent, as it would become an optimal travel route, and remove heavy vehicles from the congested coastal highways.⁴⁴

Recommendation 4.5:

The development of the proposed *National Freight and Supply Chain Strategy* should be informed by CSIRO's *TRAnsport Network Strategic Investment Tool* (TRANSIT). This tool should be used to identify the most efficient routes along major supply chains and to inform funding decisions on where strategic regional projects will have the most substantial economic impact.

New renewable technologies to power our regions

In parts of regional and remote Australia, energy networks need to service sparse populations spread across large areas. Accordingly, power delivery from large, centralised generation plants via extensive networks of ‘poles and wires’ is expensive and, in some cases, unfeasible.

New technologies have the potential to transform how energy is provided to these communities. Over the coming years, it is likely to become more cost-effective for towns to employ stand-alone power systems (‘micro-grids’) with only a small connection to the main grid for backup power, or disconnected completely. A micro-grid is a local energy grid that connects homes, businesses and other buildings to a local energy source such as solar panels, wind power and batteries.

There are still some technical challenges to overcome before more substantial deployment can occur in the regions but these are likely to be resolved in the coming few years. Governments should update regulations to provide more certainty around the operations of micro-grids.

This issue is discussed in further detail in the **Competitive Markets** chapter.

More information to support water infrastructure for irrigated agriculture

Successful irrigated agriculture is dependent on farmers having access to reliable and secure water resources. Regional water infrastructure that supports irrigated agriculture faces particular challenges because of our increasingly variable climate, growing demand, and differences in the ability or willingness to pay.

More detailed information on water resources in regional Australia will help government and business make better decisions about priority water infrastructure to support agriculture. Water managers and investors alike need information upon which to base allocation and investment decisions about surface and ground water. We now have better ways of measuring stream flow, forecasting impacts of floods, along with broader water modelling systems that underpin our regional and national water accounts and resource assessments (see Box 4.5).

Detailed water resource assessments, which are undertaken by CSIRO with states and territories, provide

a comprehensive and integrated evaluation of the feasibility, economic viability and sustainability of water infrastructure. They are also needed to inform a suitable allocation of water entitlements – a necessary pre-cursor to water markets.

CSIRO’s recent resource assessment of the Flinders Gilbert catchments in far north-west Queensland – a two-year, \$6.8 million initiative – found that the area could add up to 50,000 hectares of irrigation with a combination of in-stream and on-farm dams.⁴⁵ Each catchment offers the possibility of irrigation developments approaching (in Flinders) or exceeding (in Gilbert) the scale of the current Ord River irrigation area.

Before this assessment, such irrigation potential was unrecognised. But as a result of this information, the Queensland government has approved large-scale irrigation in this catchment area. The private sector is already showing strong interest in investing in new infrastructure to support agricultural business in north Queensland.

Through the *White Paper on Developing Northern Australia*, the Australian and northern state and territory governments recently committed to water resources assessments in the Mitchell Catchment (Queensland), West Kimberley (Western Australia) and the Darwin region (Northern Territory). CSIRO has identified numerous other water catchments as having potential but lack data on water and agricultural resources – for example, the Archer, Wenlock and Normanby catchments on Cape York Peninsula (Queensland), the Fitzroy catchment (Western Australia), and the Victoria and Roper catchments (Northern Territory).⁴⁶

The Australian Government’s *White Papers on Developing Northern Australia* and *Agricultural Competitiveness* also committed to a new \$500 million National Water Infrastructure Development Fund.⁴⁷ The Fund includes a feasibility component for the detailed planning necessary to build new dams. This has commenced with an assessment of the economic feasibility of Nullinga Dam (Queensland) and Ord Stage Three development (Western Australia/Northern Territory), including examination of soil salinity in the Ord.

More detailed catchment level resource assessments would inform the level of investment needed to increase surface water storage – which could substantially boost broad-scale irrigation in regional Australia.

Box 4.5: Using information to unlock agricultural opportunities

There is strong private sector interest in developing irrigation infrastructure and farming in the Pilbara. There are suitable soils and an available workforce and services in Port Hedland and Karratha, along with freight and port capacity.

About 200 gigalitres of water is removed from open pit mines to reach iron ore deposits (de-watering). While Rio Tinto is using some of this for forage and hay production, more than 60 per cent of this water is discharged back into the environment. In some instances, it is not natural for waterways or evaporative basins in the north to have constant base flows of water.

A recent joint CSIRO and Pilbara Development Commission study found the sustainable yield of the existing aquifers is estimated to be 200 to 400 gigalitres per year. This information is critical in determining the total sustainable use of water that can be used to support more agriculture in the region.⁴⁸

Recommendation 4.6:

Governments should commit to increasing information on the feasibility, economic viability and sustainability of new water resource developments and infrastructure in priority catchments. Water resource assessments will provide information to establish water management plans, allowing for better informed decisions about public and private investments and supporting further development of water markets.



Pool resources to support more efficient services and greater competition

The way in which potable water is managed and supplied varies across regional Australia. Some jurisdictions are serviced by a single state-owned utility, while others are serviced by a number of smaller, mostly local government-owned and operated utilities. Water prices are regulated for all states and territories (with varying degrees of independence) except for regional towns in New South Wales and Queensland, where they are set by the local water supplier (see Table 4.1).

Smaller regional water providers often face a number of challenges, including:

- Growing costs of service delivery;
- Insufficient scale to deliver high-quality, sustainable services;
- Limited capacity to recover costs of provision from customers;
- Declining asset condition due to age and under-investment in maintenance;
- Difficulty attracting and retaining expertise; and
- Lack of capacity to respond to emerging technologies.

Faced with these challenges, local water utilities are often forced to compromise the quality and reliability of services, resulting in water quality in some regional areas routinely failing to meet accepted standards. This challenge is particularly acute in smaller communities where the limited scale of operations and low population densities reduces the capacity of providers to meet minimum service standards.

Deficiencies in service quality and reliability of regional water services can, in large part, be traced to the lack of sustainable funding for capital investment and ongoing operation and maintenance. Historically, where local utilities have been unable to fully recover costs from users, state and territory governments have provided additional payments to local councils.

The *Australian Drinking Water Guidelines* developed by the National Health and Medical Research Council provide an authoritative reference to the community and the water supply industry on standards for safe, quality water, how it can be achieved and how it can be assured.⁴⁹ While they provide a basis for determining the quality of water to be supplied to consumers in all parts of Australia, they are not mandatory standards.

Table 4.1: Drinking water utilities supplying water to regional Australia

State	Number	Provider	Pricing-setting body
New South Wales	106	Local Councils	Local water utility
Victoria	13	Regional water utilities	Victorian Essential Services Commission
Queensland	81	Local councils and utilities	State government in south-east Queensland; local governments elsewhere.
Western Australia	3	Government-owned corporations	WA Government
South Australia	1	SA Water	Essential Services Commission of SA
Tasmania	1	TasWater	State economic regulator
Northern Territory	1	NT Power and Water	Utilities Commission
Australian Capital Territory	1	Icon Water	Competition and Regulatory Commission

Source: Bureau of Meteorology, 2015;⁵⁰ Infrastructure Partnerships Australia and Water Services Association of Australia, 2015⁵¹

Achieving the right scale to increase the quality and viability of regional potable water services

Challenges associated with a lack of scale at the local water provider level are mostly prevalent in regional areas of Queensland and New South Wales. The regional customer base is smaller, limiting providers' ability to deliver services at scale. For example, in New South Wales, around 45 local councils provide water to fewer than 3,000 people and in Queensland, around 34 local councils provide water to fewer than 1,000 people.⁵²

In South Australia, Western Australia and Northern Territory, drinking water is provided by individual public

water corporations. Both Victoria and Tasmania have consolidated their water services into larger, regionally-focused water and sewerage utilities (see Box 4.6).

Achieving the appropriate scale to deliver efficient, safe and customer-focused regional water services requires a tailored response. In some circumstances, retention of the single state and territory-wide corporation may remain the most appropriate way to deliver services. In other circumstances, aggregation of operations to achieve greater scale will deliver higher quality and more affordable services to customers.

Box 4.6: Regional water reform: The Victorian and Tasmanian experience

In Victoria, evidence that the small water utilities were unable to consistently supply high-quality drinking water was the driver for substantial water reform in the latter half of the 1990s. These reforms resulted in the consolidation of water services into larger, regionally-focused water and sewerage utilities now servicing customer bases of between 14,000 and 134,000. This has delivered clear benefits to consumers, including:

- A larger customer base has meant regional water utilities can fund capital works with a smaller impact on residential water bills, addressing a key equity concern with full cost recovery by small water utilities;
- The regional utilities are large enough to justify oversight by independent pricing regulators, which can deliver greater economic efficiencies and price benefits for consumers; and
- Larger regional water bodies are better positioned to attract highly skilled employees.⁵³

Tasmania has recently reformed the operation of its water and wastewater services. This initially involved consolidating 28 local council providers into three bulk water authorities. The Tasmanian Government then further amalgamated these into a single operator – the Tasmanian Water and Sewerage Corporation (TasWater). TasWater began operating in 2013.⁵⁴

Like the Victorian experience, consistently poor service outcomes contributed to a strong case for structural reform. Tasmania's local water and wastewater infrastructure included a range of ageing legacy assets set against a background of limited financial sustainability and a growing customer base. More than 20 areas were on permanent boil-water alerts and the Tasmanian Government was regularly required to fund councils to address acute water and sewerage issues.

Under the new operating model, capital projects can be combined to provide more attractive packages to industry. TasWater has been able to rationalise ageing infrastructure and realise significant capital, maintenance and operational savings.

This is not to say the reform is complete, with substantial challenges yet to be overcome. Some areas remain on boil alert and fewer than 50 per cent of TasWater's sewage treatment plants comply with effluent discharge limits. However, a single Tasmanian utility now has the scale to plan, maintain and invest in its assets to ensure the quality of the services it delivers.

In jurisdictions with a substantial number of small-scale utilities, such as New South Wales and Queensland, a foundation step to reform should be to commission an independent audit of regional councils to determine:

- The capacity to provide technically and financially-sustainable services at a reasonable cost to customers;
- The extent to which existing charging arrangements achieve full cost recovery; and
- Forward capital expenditure requirements and the extent to which charges provide for these investments.

Having assessed the viability of local council water services provision, governments should define a forward reform agenda which places customer safety and services efficiency at its core.

The South Australian, Western Australian and the Northern Territory Governments should undertake independent assessments of whether a jurisdiction-wide delivery model is sufficiently responsive to the specific requirements of regional customers.

Consideration should be given to the lessons from the Victorian and Tasmanian approaches.

Recommendation 4.7:

Drinking water in all regional communities should meet the minimum standards in the *Australian Drinking Water Guidelines*. State and territory governments should undertake an independent audit of the performance, financial viability and capacity constraints of local councils to identify areas of highest risk. In New South Wales and Queensland, these audits should inform pathways to more sustainable models, including consideration of:

- Shared services;
- Council amalgamations;
- Transferring water operations to government-owned regional water corporations;
- Outsourcing or franchising; and
- Privatising water where commercially-viable.

Recognising the different governance arrangements in South Australia, Western Australia and the Northern Territory, governments should focus on achieving efficient water and wastewater services. In these jurisdictions, governments should commission independent audits to consider whether the single utility model delivers the highest achievable customer outcomes.



Efficient Infrastructure Markets



Funding

Increase and sustain funding to deliver the infrastructure Australia requires

Infrastructure has to be paid for and funding is the means by which we pay. Ultimately, funding for public infrastructure is available from only two sources: taxpayers and users (see Box 5.1). Even when debt is raised, it is fundamentally supported by either taxpayers or users, or both.

Delivering more and better infrastructure to support a growing and changing economy will require more funding, and better use of that funding. The funding task extends beyond the substantial capital investments associated with new infrastructure, to include the costs of operation, maintenance, renewal and disposal.

In some infrastructure sectors, we have latent capacity. However, given projected growth, more infrastructure will be required in most areas. A lack of sustainable funding constrains our collective capacity to deliver more and better infrastructure.

Infrastructure funding in Australia: The good, the incomplete and the unreformed

Across Australia's four primary economic infrastructure sectors (energy, telecommunications, water and transport) there is a mix of user pays and taxpayer funding.

In energy and telecommunications, the provision of services, and the networks upon which they are delivered (the poles and wires of the electricity network, gas grids and fixed-line and mobile telecommunications networks), are paid for by user charges. In both these sectors, the charges levied on customers largely reflect each user's own level of consumption.

The direct link between usage and supply delivers services that are efficient, responsive to consumer demands and financially-sustainable. These market structures provide price signals to users that reflect the cost of supply, and communicate the demand profile back to infrastructure providers. Notwithstanding the Australian Government's substantial investment in telecommunications through the NBN, the market and regulatory settings in the sector are generally efficient and provide good-quality outcomes for users.

For potable water and wastewater services (particularly in metropolitan areas) infrastructure is largely funded by user charges. Users pay for the provision of infrastructure through a combination of access or connection charges and (for some customers) a consumption charge based on how much water they use.



This approach, however, is not uniform and even in its most sophisticated deployment the approach contains a number of cross-subsidies. Not all consumers are subject to network and consumption charges, for instance:

- Many older multi-unit dwellings do not have consumption metering for individual units, so residents are charged flat fees irrespective of the volume of water they consume as individual households;
- Uniform access pricing regimes mean all users pay the same for a connection to the system, irrespective of the actual cost of connecting those users, giving rise to substantial cross-subsidies; and
- Scarcity is not accounted for, so water costs the same to the user irrespective of whether the dams are full, half-full or nearly dry.

The transport sub-sectors also demonstrate mixed approaches to user pays. On the one hand, aviation, ports and freight rail have a strong link between usage and charging in an independent economic regulatory framework. On the other, the road network and public transport system have comparatively weak links (with the notable exception of urban toll roads). In these cases, the absence of user pays means the taxpayer remains directly involved in funding infrastructure across inception, planning, delivery and operations.

In the case of road networks, the collection and distribution of charging is inefficient, unfair and unsustainable. Access and usage charges are opaque and

blunt, bearing a very limited relationship to actual use of the road network. Once collected by governments, these charges are treated the same way as other taxation revenue, from which the government allocates funding to recurrent spending and specific priorities both within and outside of transport. This approach provides limited links between use and charging, and leaves the connection between demand and supply to little more than the informed guesses of policy makers.

For road networks, cyclical funding and inefficient allocation means that we do not invest enough in maintaining and renewing our current transport infrastructure, resulting in a ‘hidden deficit’ of maintenance liabilities and declining service standards. Governments must better understand the liability they face from the future cost of maintaining and operating transport infrastructure.

“The Australian Chamber believes that assets are likely to be used more efficiently if users are required to pay at least a portion of the costs associated with their provision.”

Australian Chamber of Commerce and Industry submission, 2015

For public transport, the gap between what users pay and the cost of provision is even more acute. Public transport operators (generally government entities) typically recover a small fraction of costs from users. This supports a ‘low-cost, low-quality’ paradigm and means substantial taxpayer subsidies are required.

While there will likely be a continuing long-term case for partial taxpayer funding of public transport, the financial sustainability of the system demands a frank discussion about the fairness and efficiency of such large transfers from taxpayers to specific users.

Together, road networks and public transport are the strongest candidates for reform because current

approaches are not working, and the benefits of reform are so substantial.

Accordingly, this chapter focuses on transport funding rather than the energy, telecommunications and water sectors (with the exception of the regional potable water sector), where user pays frameworks are relatively mature.

We must also diversify the pool of funding we apply to infrastructure to meet the needs of a growing economy. Recognising that public finances will not support substantial subsidies in perpetuity, we need to use broader options such as value capture, increased cost recovery in public transport and better use of governments’ borrowing capacity.

Box 5.1: Only two sources of funding for infrastructure: Taxpayers or users

Taxpayers: Taxpayer contributions to infrastructure investment may take the form of construction grants, operating subsidies for services such as public transport, and financial support such as concessional loans and guarantees. Whatever the mechanism by which the allocations are made, they are ultimately paid for from the general tax base. At the federal level, this includes income taxes from individuals and corporation taxes from business, while at the jurisdictional level this includes payroll taxes, stamp duties and other charges.

As a result, capital allocations are subject to the annual budget cycles of governments and the changing policy landscape over time. It also means that all taxpayers (both individuals and businesses) pay for infrastructure investments, irrespective of whether they use the infrastructure or benefit directly from its provision. For instance, a taxpayer from far western New South Wales partly subsidises public transport operations in Sydney, even though they may never use the service.

Users: Under a user pays approach to funding, most or all of the money required to plan, procure, finance, build, operate and maintain infrastructure is collected from the people and businesses that use it. User pays recognises that those who use the infrastructure are generally the principal beneficiary of its provision, so should bear the principal cost of its provision.

In practice, many user pays models involve some averaging of costs between users. Typical examples of a user pays approach to infrastructure funding include traditional utilities such as water or gas services where the householder or business might receive a monthly or quarterly utility bill, mobile phone services with a pay-as-you-go or periodic billing cycle, or toll roads where motorists pay on a per-use basis for access to a specific route. In each of these examples, it is the consumers of the service that collectively fund its provision.

What the Audit found

- The current level of public sector expenditure – especially in the transport sector, which remains largely funded by government rather than user charges – may be unsustainable in the face of increasing budget pressures.
- Current arrangements for the funding of land transport represent the most significant opportunity for public policy reform in Australia's infrastructure sectors.
- Government funding alone is unlikely to be sufficient to provide the infrastructure that Australia requires. Maintaining or strengthening conditions to facilitate private sector investment in and operation of Australia's infrastructure networks is fundamentally important.
- Australia needs to consider a broader system of transport pricing, both for road and public transport..



Understanding the long-term liability of, and funding for, maintenance of infrastructure

While population and economic growth will require augmentation of networks, maintaining and renewing existing infrastructure will also be crucial. For assets with long lives, these operational costs are often many multiples of the funding required in the planning and building phase. The majority of infrastructure that Australians will use in the next 15 years (and indeed the next 50 years) has already been built, but this infrastructure will require substantial additional funding for maintenance, renewal and upgrade as population and usage grows.

Despite this reality, the Audit found that sections of our infrastructure asset base are already in poor or declining condition. In short, there is an infrastructure maintenance deficit in Australia – though its scale and extent is often unknown and its potential financial impact rarely accounted for. It can therefore be considered a ‘hidden deficit’.

Where is the deficit and why is it hidden?

Infrastructure investments are often multi-decade in nature, with a design life that requires routine, periodic and urgent maintenance, and renewal. However, the typical annual budget cycle means that public infrastructure maintenance budgets are vulnerable to shifting priorities in government spending, with an underinvestment in any given year having only an incremental impact on asset condition. The result is sub-optimal maintenance and, over time, the potential for significant deterioration in infrastructure performance and much higher costs over the life of an asset.

In practice, some of the costs of poor maintenance are borne by users. For instance, users of a poorly-maintained road will likely have higher vehicle maintenance costs from the increased wear and tear of driving through pot-holes. Poor maintenance also imposes other costs on users. For example, load limits prevent some vehicles from using a bridge, while speed and load limits constrain many rural rail lines.

This structure, combined with more extreme weather events and a tendency to favour capital investment over maintenance spending, has left a substantial maintenance deficit. This deficit will, on a business-as-usual basis, continue to worsen as a growing population and economy increases demand for infrastructure networks.

In addition to entrenching underinvestment in infrastructure maintenance, the current approach may also generate perverse incentives between levels of government for infrastructure delivery. For instance, a local council may be resistant to state or federal funding for an otherwise economically-beneficial capital investment in the local road network. This is because the resulting asset would sit on the council’s balance sheet as a forward unfunded maintenance liability, while any fiscal benefits are predominantly captured by the other tiers of government.

These factors, compounded over time, have resulted in a substantial backlog of required routine and remedial maintenance. Unfortunately, there is little transparent information available on the extent and depth of that deficit.

The Audit identified the road and the regional urban water (potable and sewerage) sectors as those with the highest risk of exhibiting a systemic maintenance gap. The Audit also recognised that both good and bad examples of maintenance practice occur in these sectors.

Both these sectors have the common feature that the principal funding burden is borne by taxpayers rather than users. Road network maintenance is funded by taxpayer allocations from state, territory and local governments through annual budget cycles, while regional water networks are funded largely through council rates.

Exposing and addressing the hidden deficit of infrastructure maintenance

Exposing and addressing Australia’s infrastructure maintenance backlog requires a sustained response. Understanding the condition and forward maintenance needs of the asset base is crucial. When forward needs are established, there should be a process to transparently account for forward maintenance liabilities associated with the existing asset base and better approaches to funding whole-of-life costs for new assets.

By creating a means of considering outlays across all types of government expenditure – infrastructure and services, capital and recurrent – the use of a comprehensive balance sheet supports efforts to improve whole-of-government service delivery. It is an

approach to public finances with considerable relevance for all levels of government in Australia. Experience in jurisdictions such as New Zealand (see Box 5.2) indicates Australia should adopt a systematic approach to infrastructure maintenance funding in the sectors which are falling further behind. Generally the approach should:

- Acknowledge the existence of an infrastructure maintenance shortfall;
- Gather appropriate information to understand the scope and depth of the backlog;
- Quantify the maintenance deficit and transparently account for the shortfall through government accounting processes;
- Allocate appropriate funding to address both the backlog and the forward maintenance liability for existing assets; and

- Ensure that forward whole-of-life costs are routinely accounted for when new assets are added to the network – including an ‘if not, why not’ approach to whole-of-life procurement of infrastructure.

Allocating appropriate funding to address the maintenance task represents a particular challenge for state, territory and local governments due to their substantial asset balance sheets and constrained fiscal conditions. However, some jurisdictions have partially addressed this structural problem through the use of longer term maintenance contracts in certain infrastructure sectors. For instance, locking in medium-term contracts for road maintenance in New South Wales has allowed investment decisions to be made on a more efficient basis rather than being subject to annual budget cycles. This delivers the same or better maintenance outcomes more efficiently, while users benefit from higher quality assets across the life of the contract (see Box 5.3).

Box 5.2: New Zealand Government’s ‘comprehensive balance sheet’ to increase transparency

The New Zealand Government is reforming its budgeting processes to focus more on whole-of-life and whole-of-government costs.

In its *2014 Budget*, the New Zealand Government observed that government balance sheets do not adequately reflect the full range of assets and forward liabilities. As a result, the government has found it difficult to assess the resilience of its finances and capacity to provide services – whether for individual programs or overall – in the long term.

Using a new approach – known as a ‘comprehensive balance sheet’ – the New Zealand Government is using detailed modelling to assess the net present value of both future tax flows and ‘forward liabilities’ (spending needs), and therefore the ability to sustainably provide services. This assists the government in understanding where prudent investment today can reduce pressure for large, ongoing recurrent outlays in the future. Changes in the calculated forward liability can then be used as one input when the government is considering alternative policy proposals.^{55 56}

This approach is not just focused on physical assets. The ‘comprehensive balance sheet’ approach has identified a NZ\$17 billion forward liability associated with welfare and services for 50,000 people with back pain and depression. People in these circumstances stay on the balance sheet for an average of 22 years. This approach, through identification and exposure of a hidden long-term liability, has allowed the New Zealand Government to focus relatively small, targeted investments with substantial long-term savings and reflect these savings in their forward long-term liabilities.⁵⁷

Given the scale of prospective spending on social services, the government has started applying the new approach to welfare, state-owned housing, educational and correctional outlays. Other sectors, including maintenance in the transport sector, are likely to be addressed in the future.

Box 5.3: New South Wales Roads and Maritime Services stewardship maintenance contracts

Annual expenditure on road maintenance, renewal and minor improvement works in New South Wales is around \$1.46 billion, including \$375 million allocated to council grants and natural disaster funding. Around \$280 million is spent in the Sydney region each year.

In 2012, the New South Wales Government commenced a reform program to subject Sydney's road maintenance to contestability (known as 'stewardship contracts'), allowing private contractors to bid for road maintenance responsibility over defined areas of the network under seven-year contracts. Influenced by international experience, the new model of contract includes specified performance outcomes but ensures risks and responsibilities are allocated to the private sector maintenance provider, allowing government to focus on strategic management.

Under these new contracts, the provider is responsible for asset management and road maintenance, incorporating resurfacing and rebuilding, minor improvement works, maintenance of mechanical and electrical assets, and support for major incidents and events.

Built-in mechanisms for continuous improvement, such as performance adjustments that share the benefit of savings and the burden of overruns, align contractor incentives with public interest outcomes. Contractors are incentivised to consider public needs when planning road maintenance – scheduling projects and bundling work in the same vicinity, so that they have less impact on road users, as well as providing drivers with better information so they can plan alternative routes.

This has resulted in projected savings of between five and seven per cent.⁵⁸



User pays: A longer term pathway to better maintenance

There is a strong link between the degree of user pays and the quality of maintenance outcomes. Those sectors which have the most advanced user pays frameworks also have the lowest likelihood of maintenance gaps. Those sectors where costs are met largely by taxpayers have the highest likelihood of systemic maintenance failings (see Figure 5.1).

This causal link between maintenance outcomes and the funding balance between users and taxpayers adds weight to the argument that infrastructure best supports

strong customer outcomes when it is underpinned by a user pays model. As such, the most appropriate and sustainable structural solution to the maintenance deficit in public infrastructure markets is a transition to a user pays model. Maintenance outcomes are demonstrably better in infrastructure sectors where funding is derived from users rather than taxpayers; meaning transition to a predominantly user pays model is a logical mechanism to deliver a more sustainable funding platform for maintenance.

Further discussion of required responses to Australia's maintenance deficit is outlined in the **Regional** chapter.

Figure 5.1: Comparison of user pays and maintenance across infrastructure sectors



Source: Infrastructure Australia analysis, 2015

Recommendation 5.1:

The Australian Government should require all project proponents seeking Australian Government funding to consider whole-of-life maintenance costs in their business case, and where possible they should be captured within the proposed contract structure. Including a mandatory test for inclusion of maintenance costs within procurements will place a discipline on proponents seeking funding to understand, expose and account for the future maintenance needs of public infrastructure.

Recommendation 5.2:

Australia's public infrastructure asset owners should routinely use fixed-term maintenance contracts to deliver funding certainty for providers and better asset condition for users. Depending on the characteristics of the particular network and service, it may also be desirable to include asset operations alongside maintenance contracts.

Fixing our road funding model by delivering whole-of-system road user charging

The current approach to charging for road use and investing in road infrastructure is unfair, unsustainable and inefficient. Figure 5.2 provides a breakdown of the current government charges associated with road use for light vehicles.

The system is *unfair* because the link between usage and charging is weak. The system sees taxpayers subsidise all users, while those who use the network less are in effect paying a subsidy to support those who use it most.⁵⁹ For instance, users in the bush driving on poorly-maintained roads ultimately pay for a share of capacity on capital city roads they do not use. The current approach also sees differential rates of excise charged for several fuel types (including between liquid and gaseous fuels) with the potential to generate perverse outcomes for vehicle selection and use.

The system is also *unsustainable* because fuel excise revenue will continue to decline in real terms as fuel-efficiency continues to rise and the uptake of alternatively-fuelled vehicles gathers pace. CSIRO found that fuel excise revenue is projected to fall in real terms by up to 45 per cent by 2050, despite our population, economy and number of vehicle kilometres travelled all growing.⁶⁰ This situation is made worse because the inadequate links between usage and charging provide no direct mechanism to grow infrastructure supply to meet infrastructure demand.

Finally, the system is *inefficient* because road users do not receive signals to use the network in the most cost-effective way. The result is a network which is chronically congested for portions of the day, but with excess capacity across most of the 24-hour cycle. The absence of price signals means users have only limited information and incentives to use the network efficiently, while providers have poor information on which to base investment decisions.

The Audit showed that congestion will continue to grow, costing the economy \$53 billion per year by 2031 (as shown in Figure 5.3).

Australia needs a road market that reflects the true costs of providing, maintaining and using the network. Pricing our roads to reflect these costs is not just about creating a system of sustainable funding.

“Now, with the support of motorists there’s a unique opportunity to fix transport pricing to make roads cheaper for many and fairer for all. The first step is a national process to lead and explain the case for change and the options for better transport.”

Infrastructure Partnerships Australia submission, 2015

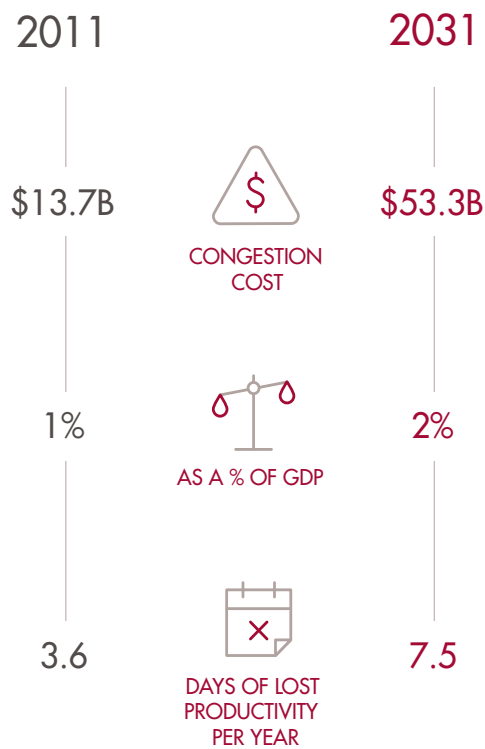
Figure 5.2: How we pay for roads

AVERAGE ANNUAL ROAD BILL PER VEHICLE		
	FUEL EXCISE	\$592 46%
	VEHICLE REGISTRATION FEES	\$263 20%
	LICENCE FEES	\$21 2%
	STAMP DUTY	\$136 10%
SUB-TOTAL		\$1,012
TOP-UP THROUGH OTHER TAXES		\$289 22%
TOTAL		\$1,301*

* EXCLUDES FUEL, VEHICLE OPERATION, DEPRECIATION, INSURANCE AND OTHER COSTS

Source: Bureau of Infrastructure, Transport and Regional Economics, 2014⁶¹

Figure 5.3: Growing cost of congestion



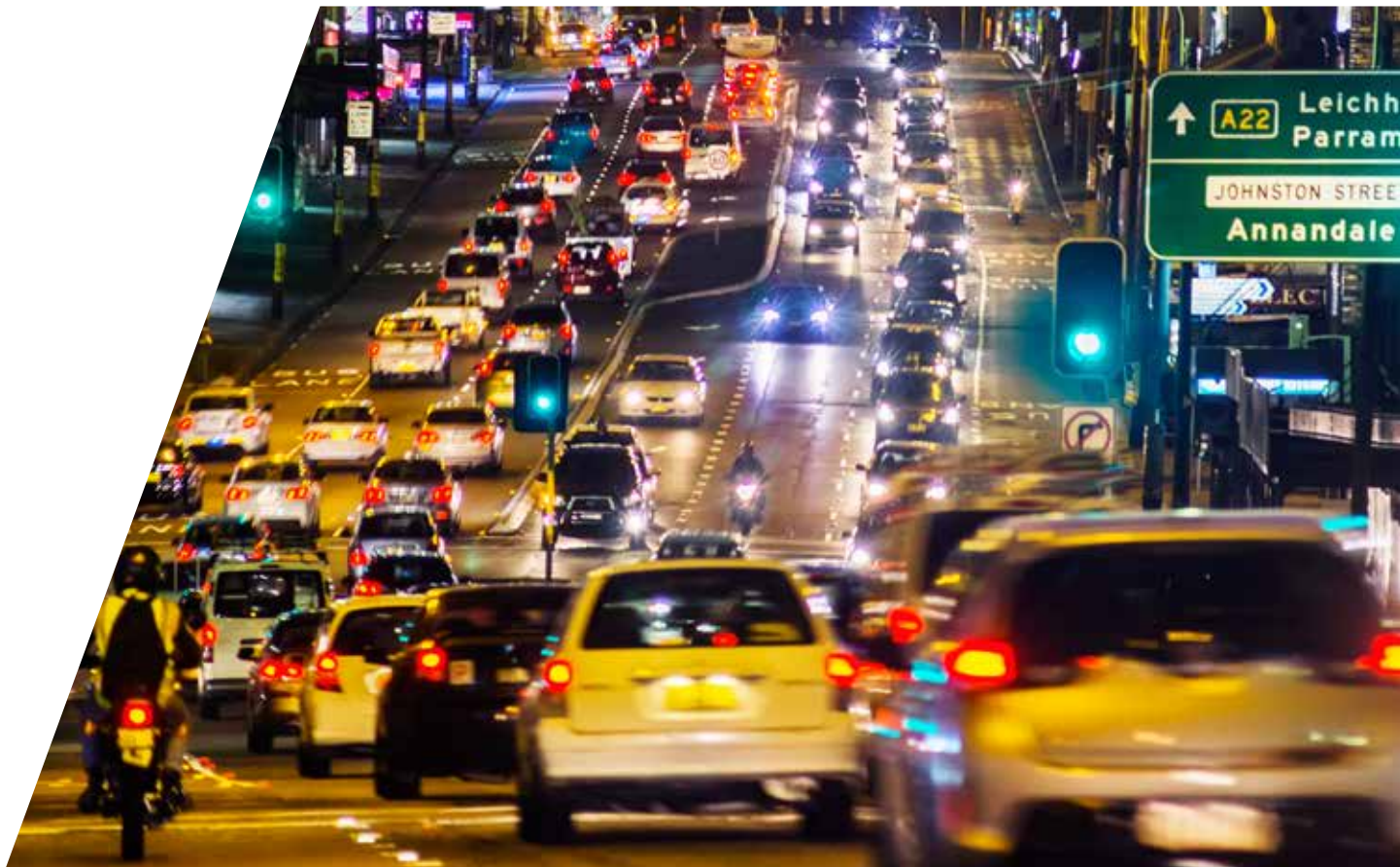
Source: Australian Infrastructure Audit, 2015

How road user charging can address these challenges

Road user charging provides a platform to reduce congestion, to identify where and when additional capacity is required, to deliver environmental benefits and to help determine how to best use roads as part of an integrated transport system.

While the structure of a future road user charging model requires careful consideration and development, at a conceptual level, reform offers opportunities to make the system fairer, more sustainable and more efficient.

Employing available technology, a reformed charging framework for roads would see all existing taxes and fees removed and replaced with direct charging that reflects each user's own consumption of the network, including the location, time and distance of travel, and the individual characteristics of their vehicle such as weight and environmental impact. Reform would also necessarily require all charging revenue be hypothecated – that is, quarantined and directed – to investment in the road network. This differs from the current approach where taxes and charges enter consolidated revenue and are allocated to various government spending priorities – both in transport and other areas.



This road user charging approach allocates the costs of providing and using roads more fairly. By using additional information about a user's interaction with the network, such as the distance travelled and location of travel, a direct charging model would ensure those who consume more are charged more, and those who consume less are charged less.

A sustainable approach to network funding is fundamental to any new road user charging framework. By capturing the full costs of provision from the users of the network, a reformed approach would provide the foundation for a sustainable funding base with revenue linked to usage and supply. For instance, a shortcoming of the existing model will see fuel excise revenue collected per kilometre travelled continue to decline as vehicles become more fuel-efficient. Under a renewed approach with a distance-based charging component, revenue would grow in line with travel demand, providing a sustainable funding base.

Road user charging reform would also support more efficient use of the road system – and broader transport networks. Location and time-based charging parameters enable providers to actively manage supply and demand. For instance, one response to peak demand may include building additional capacity, and user charging would provide the funding stream to add that capacity. Alternatively, demand could be managed through changes to pricing, such as incentivising off-peak use or charging a premium to use congested roads during peak periods. Road user charging would provide levers for both these responses as well as provide data to inform decision makers.

Concerns about the privacy and accuracy of such data-reliant measures are likely to continue to recede as consumers become more comfortable with the options available. Indeed, a market-led approach to the provision of supporting technology could respond to concerns about privacy, with different charging options based on a user's individual preferences.

Social equity and transitional implications of charging reform

Inefficient infrastructure ultimately leaves all users, taxpayers and businesses worse off because infrastructure costs more than it should, and delivers lower quality services than it could. However, reform to charging regimes in pursuit of efficiency, equity and sustainability may generate transitional and longer term unintended consequences for some households. It is important that efforts to reform user charging for road networks are sensitive to the implications for households – particularly those on modest or fixed incomes, and those with limited or no alternative transport options. For some businesses, including those in trade-exposed industries, charging reform may have transitional implications in the near term.

While reform to user charging would not necessarily see an overall immediate increase in the total revenue collected from users, by linking charging to consumption it would remove some existing inequities. This process would inevitably see the distribution of charges reallocated across the user base, generating a sense that reform would create 'winners' and 'losers'. In reality, this



simply redresses the existing imbalance which sees all users subsidised by taxpayers and heavy network users subsidised by lower impact users due to the flaws of the current charging framework.

Notwithstanding the opportunities to generate a fairer system through reform, there is a clear imperative to ensure that vulnerable households and trade-exposed industries are protected from unintended consequences. Generally these protections can be most efficiently and fairly delivered through the broader taxation and welfare system.

Reform will be complex

Introducing road user charging will be complex. It will require the removal of familiar taxes and charges such as excise on fuel and registration fees; the introduction of new charging methodologies and systems; implementation of supporting technologies; fundamental change to layers of legislative and funding arrangements; and many other complex undertakings. Its impacts will be as wide as any major microeconomic reform.

The existing approach to charging for road use is not well-understood by users. Many users see roads as free, or at least free at the point of use. Fuel excise is charged at the fuel pump, but is not disaggregated from the per-litre cost, nor displayed on the fuel docket in the same way as the GST. Together, these factors further the misconception that roads are free and create public perceptions that reform is about new taxes rather than fixing the current flawed charging system.

A mature and reasoned public debate about the way we charge for and invest in roads is crucial. Change will not occur without public understanding of the existing system, its flaws and weaknesses, and greater understanding of the opportunities and challenges of reform. Detailed discussion amongst policy makers of the need for road charging reform has been underway in Australia since at least the early 1990s by the Industry Commission,⁶² and more recently through the Productivity Commission,⁶³ the *Harper Review*,⁶⁴ among others. But that debate has rarely extended beyond policy circles.

“A road user charge should only be implemented as a part of genuine reform of taxation on motorists and must not be imposed on top of the existing fuel excise charges.”

Australian Automobile Association submission, 2015

A lack of public awareness about the flaws in the existing structure, the need for change, and the options available, are impediments to reform. Developing the public debate and interrogating the options for reform will be a crucial step to moving beyond conceptual models. Infrastructure Australia welcomes the voluntary trial of road pricing options currently being undertaken by Transurban in Melbourne, which will serve to increase public understanding of the current framework and the options for reform.

The scale of the challenge should not prevent its implementation, not least because the rewards of reform are so substantial. With policy leadership and community support, road user charging reform can deliver a system which is more efficient, fair and sustainable.

Recommendation 5.3:

The Australian Government should initiate a public inquiry, to be led by a body like the Productivity Commission or Infrastructure Australia, into the existing funding framework for roads and development of a road user charging reform pathway. The public inquiry should consider:

- Flaws in the existing charging framework – including fairness, financial sustainability and economic efficiency;
- The optimal approach for road user charging and transport infrastructure funding in Australia;
- The social implications of charging reform, including transitional and distributional impacts of replacing current taxation with direct user charges; and
- A detailed reform pathway for transition to a full user pays model for roads covering the whole network and all users.

A public inquiry into road user charging reform should be supported by large-scale voluntary trials of road user charging options, funded by the Australian Government.

Reform to heavy vehicle charging and investment is the first logical step

Since 1992, heavy vehicle operators have paid for road use through PayGo, a model that uses fixed annual registration and fuel-based charges to recover the cost of infrastructure investment to support heavy vehicles. While this model has resulted in a shift to more cost-reflective pricing in the trucking industry, PayGo is limited in its capacity to measure the full costs of heavy vehicle access to the road network and to efficiently charge users for these costs.⁶⁵

Ensuring heavy vehicles are charged for the true costs they impose on the broader road network is essential to increasing competitiveness of Australia's freight networks. A national heavy vehicle road user charging scheme provides an opportunity to illustrate the benefits of shifting to a more cost-reflective transport pricing model across all vehicles.

Technology to support heavy vehicle charging has been used in parts of Europe and in New Zealand for some time (see Box 5.4). In Australia, large fleet operators are already using tracking technology to gather data on their vehicles, including data to understand where, when and how their vehicles are being operated on the road network.

Low-cost in-vehicle transponders and satellite tracking are increasingly being used to open up parts of Australia's road network to suitably-specified trucks. Productivity improvements of up to 100 per cent are being realised,

and associated reductions in fuel use are cutting emissions. By 2014, the technology had already been installed in 25,000 trucks, a 65 per cent increase from two years earlier.⁶⁶

In New South Wales and Queensland, technology is now being used to remotely monitor truck mass, thereby providing assurance to road owners that overloaded vehicles are not damaging their assets. In addition, the technology allows road managers to accredit heavy vehicles to be used on roads that, previously, they would not have been able to use. Testing of these on-board mass units has shown that, in 95 per cent of cases, the units were providing results within two per cent of measurements achieved at weighbridges.⁶⁷ Other jurisdictions are yet to authorise the use of this technology, although they are reviewing its potential.

A substantial body of work has been developed over recent years around the form and function of a reformed approach to heavy vehicle charging. Both the National Transport Commission *Heavy Vehicle Charging and Investment Reform* process⁶⁸ – and the *COAG Road Reform Plan* process that preceded it⁶⁹ – saw development of detailed analysis and modelling in support of reform. While these processes did not ultimately lead to implementation of a heavy vehicle charging regime, the body of work remains and is available to be drawn on – meaning a contemporary reform process would not begin from a standing start.



Box 5.4: New Zealand's heavy vehicle Road User Charge

New Zealand first introduced heavy vehicle road user charging in 1978 with the passage of the *Road User Charges Act 1977*. As a result, drivers of trucks and light diesel vehicles pay a fee through a Road User Charge (RUC), while drivers of petrol vehicles contribute to road network upkeep through government fuel levies.⁷⁰

The RUC system is a cost recovery mechanism applicable to all vehicles over 3.5 tonnes as well as all diesel vehicles, regardless of vehicle weight. This fee is levied as a distance-based licence charge, determined on the basis of vehicle type, size and weight.⁷¹

The New Zealand Ministry of Transport uses a 'cost allocation model' that calculates the charging rates for various vehicle types, according to differences in the costs those vehicles generate for the road network. Thus, heavy vehicles that impose relatively greater wear and tear on the road network have a higher charge than lighter vehicles. As an example, the charges vary between \$62 per 1,000 kilometres for a diesel vehicle weighing less than 3.5 tonnes up to \$359 per 1,000 kilometres for certain vehicles where the parts combined (for example, a truck and trailer) have at least eight axles.

In order to improve the efficiency of the charging system, electronic road user charges (eRUC) were introduced in 2010 as an alternative collection method to the original paper-based system. In general, motor vehicles weighing more than 3.5 tonnes are now required to be fitted with an approved automated means of recording the distance travelled. Under a market-led approach to technology, users can select a solution that meets their specific needs from a range of suppliers.

Under the *Land Transport Management Act 2003*, the New Zealand Transport Agency assesses spending proposals and determines spending priorities, having regard to the *Government Policy Statement on Land Transport* which sets out the broad objectives sought by government from its transport investments. In effect, this model provides a degree of independence from government and Ministers over individual funding allocations.⁷²

Recommendation 5.4:

Federal, state and territory governments should commit to the full implementation of a heavy vehicle road charging structure in the next five years. This reform must include the removal of all existing registration and usage charges under the PayGo model and the introduction of supporting regulatory and investment frameworks.

Recommendation 5.5:

Federal, state and territory governments should also commit to the full implementation of a light vehicle road charging structure in the next 10 years. This reform must include the removal of all existing inefficient taxes – including fuel excise and registration charges – and the development of supporting regulatory and investment frameworks.

Diversifying the available pool of funding for infrastructure investment

Australia's immediate and longer term infrastructure shortfall will require substantial capital investment. The scale of the funding required will be beyond one tier of government and beyond the revenue-generating capacity of existing user charging structures. Accordingly, we must diversify the pool of funding available for public infrastructure investment, including through:

- Greater use of capital recycling, where governments divest suitable public infrastructure assets and use the released capital and balance sheet capacity to invest in new productive infrastructure;
- Greater cost recovery from public transport passengers;
- More effective use of public borrowing that differentiates between 'good debt' for infrastructure investment and 'bad debt' to meet unsustainable operating expenses; and
- Accessing funding from a broader range of infrastructure beneficiaries through value capture.

The difference between funding and financing in the delivery of infrastructure is explained in Box 5.5.

Releasing capital to re-invest in infrastructure

The Australian Government's Asset Recycling Initiative, which incentivises jurisdictions to recycle capital from existing mature public infrastructure assets toward new productive investments, has offered short-term increases in available capital funding for infrastructure in some jurisdictions.

In most cases, these divestments have helped complete efficient, regulated markets by transferring assets to private ownership and removing the conflict that governments face as both owner and regulator of economic infrastructure. In addition to market completion, privatisations have released substantial capital and balance sheet capacity for jurisdictions to re-invest in productive infrastructure.

In this regard, asset recycling has offered a catch-up funding mechanism for infrastructure investment, but one that will need to be supported by broader reform to maintain sustainable funding over the longer term. Given the structure offered by the Asset Recycling Initiative to both complete infrastructure markets and release capital for infrastructure investment, it represents a valuable reform incentive payment and should continue.

Recommendation 5.6:

The Australian Government should continue providing incentives for state and territory governments to improve the efficiency of their balance sheets by recycling appropriate publicly-owned assets to fund investments in productive infrastructure, and consider broader applications of incentive payments to advance reform. Recycling capital represents a valuable reform and funding tool as it can help complete efficient regulated markets and release substantial capital to be reinvested in productive infrastructure.

Box 5.5: The important difference between funding and financing

It is important to differentiate between funding and financing.

Funding refers to how infrastructure is paid for. Ultimately, there are only two sources of funding for infrastructure, either taxpayers through government spending or directly by users, such as through electricity charges or road tolls.

Financing refers to the supply of capital, such as loans and equity, used to pay for the upfront investment costs of an infrastructure project. The sources of funding are then used to pay back the money raised through the initial financing.

Increase cost recovery on public transport to deliver higher quality services

Around 20 to 25 per cent of the cost of public transport provision in Australia is typically collected from users. Or put another way, up to 80 per cent of every public transport journey taken in Australia is paid for by taxpayers. This funding mix is both inequitable and unsustainable.

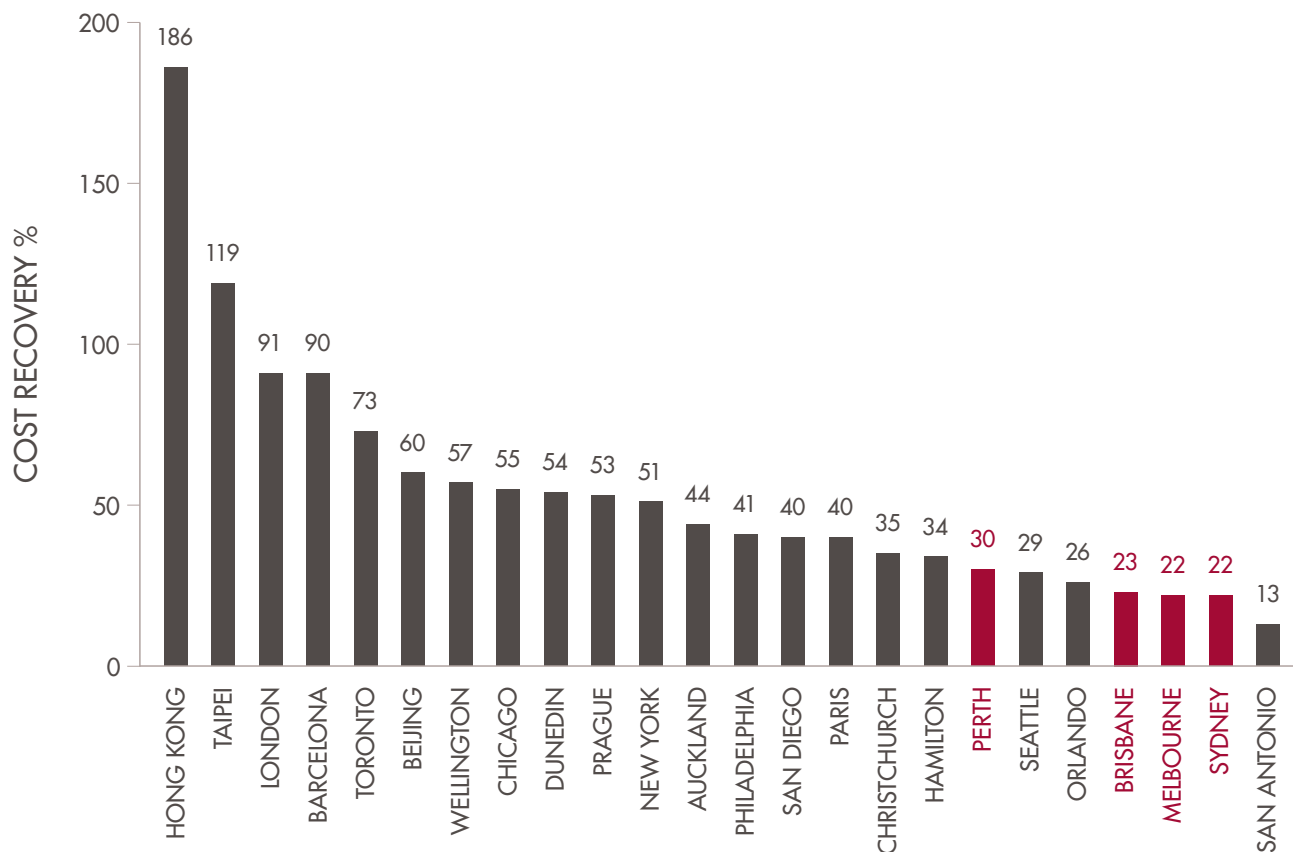
There is likely to be a strong continuing case for some degree of taxpayer funding for infrastructure investment over the medium and longer term, reflecting the broader economic benefits of public transport and the requirement to efficiently move growing volumes of passengers in increasingly dense urban environments.

However, the current balance creates substantial funding pressure on delivery agencies and jurisdictions and is highly unlikely to represent the optimal allocation of costs and benefits.

This lack of balance is echoed in a comparison of typical cost recovery rates of Australian urban public transport when compared with international peers, as shown in Figure 5.4.

The current funding balance also drives a ‘low-cost, low-quality’ paradigm for our public transport services and delivers a system that is relatively unresponsive to changes in demand and customer expectations.

Figure 5.4: Cost recovery of public transport across global cities



Source: LEK Consulting, 2015 ⁷³

Increasing cost recovery of public transport provision does not simply mean increasing fares to users. While this is likely to form a substantial component of the response, it is also the case that operational efficiency can serve to increase cost recovery by reducing operating costs. The pursuit of operational efficiency in public transport provision is discussed further in the **Competitive Markets** chapter.

Recommendation 5.7:

Australia's state and territory governments should seek to increase the funding sustainability of public transport provision both through the pursuit of operating efficiencies and a more appropriate alignment of the funding burden between public transport users and taxpayers.

Recognising that public transport provides a range of benefits which accrue beyond the users, including through reduced road congestion and increased urban amenity, there is likely to be a continuing case for appropriate taxpayer subsidies over the medium and longer term.

More effective use of balance sheets through public sector borrowing

Financing new infrastructure through public borrowings represents a further option for Australia's governments. Australia's public debt is, by international standards, relatively low. This suggests that the Australian Government may have additional available borrowing capacity to finance economic infrastructure which will drive greater productivity over time.

While financing infrastructure investments through government borrowings can be politically complex, this is an option that should be explored further. Provided new infrastructure assets are economically-viable, investments could unlock greater productivity across Australia and support current structural shifts to a greater focus on a competitive, service-based economy in the Asia-Pacific region.

Public sector borrowing to support infrastructure investment presents a potentially more equitable approach by distributing the costs of infrastructure across both current and future taxpayers, rather than the funding burden falling only on current taxpayers through allocations from general revenue. Future taxpayers also benefit from infrastructure provision and can share the burden of funding. Paying for infrastructure from general revenue alone is akin to a family buying a home with only the wages they earned in the year they bought it, thereby restricting what they are able to purchase and ignoring the continuing benefits they will gain from owning the home.

When discussing the appropriate role of public debt in infrastructure investment, caution is required. At the project level, infrastructure is sometimes financed using a combination of private equity and debt. It is the balance of these financing sources and the composition of the debt capital (amongst other factors) that provide a powerful incentive framework for efficient delivery of infrastructure.

Discussion of the role of public debt should not seek to alter the effective contemporary approaches to debt at the project level, but should instead focus at the macro government funding level. At the project level, procurement should be motivated by what is appropriate for the specific project rather than the accounting treatments available.

“While government budgets are constrained, in part by prior borrowings, there is a genuine opportunity for high-return infrastructure investment to be financed by borrowing at exceptionally low interest rates. The challenge is to ensure that any such borrowing is identified, selected and managed wisely and transparently, to the benefit of the economy and community.”

Grattan Institute submission, 2015

At the macro level, options to unlock greater public sector borrowing to support infrastructure investment include:

- Creating specific infrastructure accounts on Australian Government and jurisdiction balance sheets to differentiate between ‘good debt’ for infrastructure investment and ‘bad debt’ to meet operating deficits;
- In some limited circumstances allowing the jurisdictions appropriate access to Australian Government borrowing capacity for priority nationally significant infrastructure; and
- Increasing available funding within existing debt thresholds, recognising the productive dividend of infrastructure investment over the medium and longer term.

Each of these options offers merits and risks requiring detailed analysis and consideration. Evaluation of the options and a considered public debate about the appropriate role of debt within the structure of public balance sheets is a critical opportunity for Australia to invest more productively in infrastructure.

Recommendation 5.8:

The Australian Government should undertake a review of its capacity to use increased public borrowing to support an expanded economic infrastructure investment program. Increased use of public debt to support investment can provide a smarter approach to delivering economic infrastructure, provided investments are well-considered, well-executed and make a definitively positive contribution to the economy. Public debt can also provide intergenerational equity around infrastructure investments by distributing costs between current and future taxpayers who will benefit from the provision of enhanced infrastructure.

Recommendation 5.9:

The Australian Treasury should evaluate the viability of reporting debt under a more transparent structure, at all levels of government, to allow for greater clarity and support increased investment in productive infrastructure. Reporting of debt should remain as transparent as possible. Further clarity about the composition of investments to which debt is allocated will increase public awareness of the valuable role borrowing can play in meeting Australia’s infrastructure needs.



From user pays to beneficiary pays: Value capture

Investments in infrastructure often deliver significant amenity and financial gains for owners of property that stand to benefit from improved levels of service or proximity to services. For instance, land prices around new or more efficient transport connections can increase substantially, reflecting the increased connectivity provided by new investments. Where these investments have been made by taxpayers, there is a strong case for private owners' windfall gains to be shared with taxpayers. Mechanisms that unlock and share these gains are known as 'value capture'. Examples of where value capture has been implemented are included in Box 5.6.

A number of mechanisms are available to governments seeking to capture value from public (and private) infrastructure investments. The appropriate mechanism to capture value will depend on the characteristics of the jurisdiction and the specifics of the infrastructure involved. They range from project-specific levies through to broad-based taxes such as a tax on land values. Under some models, the captured revenue stream is used to repay a portion of the up-front financing used to deliver the infrastructure.

The absence of value capture mechanisms can confer windfall gains on relatively small groups of private beneficiaries. Capturing some of this windfall increases fairness because each dollar of captured value is a dollar that can be invested in other priorities such as hospitals, schools or further transport improvements.

A major challenge for governments is to identify specific beneficiaries from infrastructure investments. Better transport planning enables more accurate identification of those property owners likely to benefit from value uplifts, and to implement appropriate measures to divert a portion of future gains towards funding the enabling investments or to be shared with taxpayers.

Value capture is a potentially useful source of incremental funding alongside conventional user charges and taxpayer allocations. Even a small percentage of total project cost recovered from beneficial land holders can make a marked difference to the funding case for an investment, especially in the context of a substantial pipeline of large-scale investments required in Australia's largest capital cities. These incremental funding opportunities are important and should be routinely delivered in conjunction with the other user pays options described in this chapter.

Recommendation 5.10:

Governments should routinely consider value capture opportunities in all future public infrastructure investments. Opportunities for value capture should be identified and implemented early in planning processes, before specific options are developed, to maximise benefits to taxpayers. To encourage the application of value capture models, the Australian Government should impose a mandatory requirement for initiatives and projects seeking Australian Government support to demonstrate a consideration and implementation plan for value capture.

Box 5.6: Value capture overseas and in Australia

Value capture is routinely used in a number of international jurisdictions to provide additional funding for infrastructure investments and precinct renewals.

United Kingdom: Value capture is a key feature in funding the Crossrail project in London. The project, featuring a 42-kilometre tunnel and 10 new stations, is scheduled to open for services in late 2019 at a cost of £14.8 billion. A further £1 billion is to be spent on trains that will use the tunnel. Approximately £5 billion, around a third of the cost of the project, is to be raised from various forms of value capture or developer contributions. Of this amount, the principal source (£4.1 billion) is a business rate supplement charged at 2p per £1 on commercial properties with a rateable value over £55,000 in the Greater London Authority area. The rate supplement is expected to apply for at least 30 years.

Victoria: Value capture has also been used in Australia to fund the provision of new infrastructure. Melbourne's City Loop, completed in 1985 at a cost of approximately \$650 million, was partly funded through two rate levies. The first was levied by the Melbourne and Metropolitan Board of Works across the Melbourne metropolitan area, while the second was levied by Melbourne City Council, initially on CBD properties and then on all properties in the municipality.



Competitive Markets

Complete, refine and create the world's most sophisticated infrastructure markets to deliver more efficient, customer-focused and cost-effective infrastructure services

Markets are the best mechanism at our disposal for delivering effective, efficient and high-quality infrastructure services.

A market facilitates the exchange of goods or services between buyers and sellers. In an efficient market, the price of a good or service is determined by the interaction of supply and demand. Markets operate best when they are most competitive. Effective competition means there are many buyers and many sellers with little or no individual influence over market settings.

Non-competitive markets exist in numerous forms or structures, including monopoly, where one party controls the supply of a good or service. In these cases, regulation is essential to ensuring services are delivered affordably to best meet the needs of users. Where a competitive market is not possible, a well-regulated monopoly presents an effective and practical means of providing high-quality services to customers.

Historically, our infrastructure sectors – energy, telecommunications, water, and transport – have been dominated by vertically integrated public monopolies, reporting directly to Ministers through government

departments. This ownership and management structure offered limited incentives to deliver infrastructure efficiently because government was simultaneously the owner, operator and regulator of services.

The introduction of market-based reforms through the 1990s under the NCP process sought to remove these conflicts of interest, inject competition and develop efficient and responsive infrastructure markets.

The reforms saw corporatisation of public businesses, the removal of artificial advantages for public entities operating in commercial markets (such as lower effective tax rates or protected markets), the development of robust and independent economic regulation, and the introduction of contestable supply through market deregulation and privatisation.

A key outcome of the reform process was to expose contestable elements of supply to market pressures, while genuine natural monopoly elements were subjected to independent economic regulation, even where those businesses remained in public ownership.



The NCP reforms underpinned a period of substantial economic success for Australia. Our productivity grew faster in the 1990s than in the two decades before that. The NCP process, in combination with other major reforms, has helped Australians benefit from uninterrupted economic growth over the last quarter-century.

But the benefits achieved under the NCP have lost momentum. The argument for renewed reform of how infrastructure is conceived, delivered, regulated and operated is well-defined, and the urgency is clear. Our regulatory maturity has now developed to better align the public interest with financial incentives, without requiring public ownership. Australia should enter a new period of competition-based infrastructure market reform. Without action, we will continue to under-use the infrastructure we have, and underinvest in the infrastructure we need.

In some areas, work remains to refine and complete the reforms started in the 1990s. Elsewhere, there remains considerable scope to extend the principles of the NCP, open markets to direct competition or contestable supply, and to extend the benefits of efficient infrastructure markets.

Meeting our national economic and population growth aspirations will require further infrastructure market reform. Efforts should focus on:

- Market *completion* where the principles of the NCP reforms remain undelivered;
- Market *refinement* where well-functioning markets face disruptive challenges; and
- Market *creation* where the opportunity exists to deliver efficient infrastructure services free from the conflict of simultaneous ownership, operation and regulation.

What the Audit found

- Existing electricity generation capacity should be sufficient for at least the next 10 years but tariff reform is needed to reduce peak period demand and enable more efficient infrastructure investments.
- An efficient and competitive rollout of the NBN is a key challenge in the telecommunications sector. The NBN is likely to reduce service disparities between urban and regional areas. Demand for telecommunications infrastructure is expected to rise sharply over coming decades.
- Regulations in the water sector are not providing the consistency, certainty and transparency necessary to support further private investment. The metropolitan potable, regional urban potable and rural productive water sectors should be subject to more transparent and cost-reflective pricing.
- The road and public transport sectors have pricing inefficiencies and limited market-based mechanisms.

Infrastructure markets: a powerful structure, but a partial reform story

The default role of government in infrastructure delivery should not be to fund, own and operate services and networks. Instead, the role of government should be to set the right conditions – good planning, regulatory and market structures – to ensure the efficient delivery and use of infrastructure. A role for governments in funding infrastructure will likely remain, but it should be restricted to those circumstances where there is real and unresolvable market failure (see Box 6.1).

Reform is an ongoing task, with a need for agility as new technology and service innovations disrupt traditional models of supply. Table 6.1 provides a qualitative view of the infrastructure reform landscape in Australia. It demonstrates that the most reformed markets deliver the strongest customer benefits, while highlighting the sectors that require greatest reform focus. The table is designed to be illustrative and ultimately define a broad reform category for each infrastructure area, recognising that the extent and pace of reform differs across sectors and jurisdictions.

Table 6.1 gives an indication of where reform focus should be applied within the framework of *completing*, *refining* and *creating* markets. For example, we need to further refine our energy and telecommunications sectors, commit to a new round of policy and regulatory reforms in our metropolitan potable water and rural productive water sectors and create new more efficient market approaches to our regional potable water (discussed further in the **Regional** chapter) and transport sectors.

Separating contestable, competitive and monopoly components

Efficient infrastructure markets distinguish between natural monopoly components and competitive (or contestable) components of the sector. For instance, it would be impractical and undesirable to build two identical competing electricity networks alongside one another. Rather, a monopoly network is better placed to

serve the public interest within appropriate regulatory structures. Conversely, a competitive market is better placed to provide consumer benefits in the generation and retailing of electricity, even though electricity is transmitted by monopoly poles and wires.

Neither monopoly nor competitive components require public ownership of assets. On the contrary, continued public ownership of infrastructure in well-regulated markets has consistently led to worse outcomes for consumers and taxpayers.

Contestable and competitive components

In areas where in-market competition is possible, such as electricity generation and retailing, the direct role of government as a market participant generally distorts outcomes and reduces consumer benefits. In these circumstances, governments should restrict their involvement to ensuring that the market operates in the best interests of consumers.

This can normally be addressed with the broad monitoring and intervention powers retained by the Australian Competition and Consumer Commission (ACCC), and other appropriate regulatory bodies.

Competition on the Manly ferry corridor in Sydney, for example, has delivered substantial benefits for customers. Since 2009, competition on the route has existed variously between public and private operators, after the previously government-operated fast ferry service was tendered for private provision in 2008. Deregulation saw two private fast ferry operators compete for patronage between 2009 and 2015, driving service levels up, ticket prices down and eliminating the need for public subsidy of the premium fast ferry service. Innovations driven by competition have included complimentary Wi-Fi, food and beverage offerings, fare reform and customer information enhancements.⁷⁴

Recommendation 6.1:

Where a competitive market for supply of infrastructure services exists, or could exist, governments should efficiently exit direct service provision, allowing the market to allocate supply to meet demand.

Where the conditions exist for multiple suppliers to meet the needs of multiple consumers through an open, transparent and competitive framework, there is no compelling case for continued direct participation by governments in those markets.

Box 6.1: What is a market failure?

Market failure occurs when the supply of goods and services does not meet demand. Governments may have a role to intervene in cases where there is insufficient commercial incentive for businesses to provide a publicly-beneficial service, or when private delivery of a service has negative consequences for the community. Given the public good and monopoly characteristics of some infrastructure, governments have historically maintained an active role in the delivery of many services.

Table 6.1: High-level ('traffic light') assessment of reforms in Australian infrastructure sectors

Market characteristics		Energy	Telecoms	Water			Transport		
				Metropolitan potable	Regional urban potable	Rural productive	Freight	Public transport operations	Roads (light vehicles)
Market settings	Separate regulation and ownership	●	●	●●	●	●	●	●	●
	Separate monopoly and contestable components	●	●●	●	●	●●	●	●●	●
	Price reflects cost	●	●●	●	●	●	●●	●	●
	Changes reflect consumption	●●	●	●	●	●	●	●	●
Regulation	Independent	●	●	●●	●	●	●	●	●
	Evidence base for decision making	●	●	●	●	●	●	●	●
	Transparent and stable	●	●	●	●	●●	●	●	●
	Supports innovation	●	●●	●	●●	●●	●	●	●
Community service obligations	Transparent	●	●	●	●	n/a	●	●●	●
	Contestable	●	●	●	●	n/a	●	●●	●
Overall response required		Refine	Refine	Complete	Create	Complete	Complete	Complete	Create

Source: Infrastructure Australia analysis, 2015

Monopoly components

Where a monopoly provider is preferred due to scale, complexity and other features, governments should create the market structures and regulatory frameworks to support efficient infrastructure that meets customer needs.

Where monopolies present the most efficient means by which to deliver infrastructure, such as with energy grids, water utilities, rail and road networks, consumers and businesses are best protected if governments do not own and operate those monopolies and regulation is independent. Australia has substantial experience and success in deploying these approaches, although to varying degrees of completion. Approaches used include:

- Independent economic regulation of monopoly networks: Where the cost of infrastructure provision can be met from charges levied on consumers, independent and robust economic regulation can incentivise private owners to provide efficient services. Sophisticated incentive-based regulation can provide a framework in which to compare operators and regions, and to incentivise performance improvements.
- Creation of discrete markets within a network: For instance, through facility-based tolling on urban motorway networks, where the government competitively tenders the right to levy tolls for a fixed period (a concession) in return for the provision of infrastructure. In turn, the tolls collected reflect the cost of designing, financing, building, operating and maintaining the asset, plus a risk-weighted return to investors. Successful examples of this approach exist in Sydney, Melbourne, Brisbane and in other parts of the world.
- Franchises for delivery of monopoly services where governments remain the dominant source of funding: Rather than competing in the market, operators compete for the market. Where a service outcome

can be clearly defined, private providers may be invited to compete to deliver services over a fixed period (typically seven to 12 years). This exposes previously monopoly public infrastructure provision to contestable supply. It applies downward pressure to costs, incentivises innovation and improves service quality. Services are regulated by contract so that the government retains a substantial degree of control over outcomes and service providers are more accountable to customers and taxpayers. Government simultaneously retains ownership of the underlying assets and limits its exposure to the risks of operating transport businesses. Examples of successful franchising in Australia include train and tram operations in Melbourne, harbour ferry services in Sydney and bus operations in multiple jurisdictions.

Domestic and international evidence shows that cost-minimising, profit-maximising ownership structures are the best means to deliver efficient and customer responsive infrastructure. Private owners have the best incentives to respond to these drivers when compared to public ownership, but the integrity of the model relies on governments retaining an active role of market maker and sophisticated regulator. Markets rely on good regulation to ensure customers and market participants are well-served. In short, effective infrastructure policy requires effective regulation.

Having an independent, credible, stable and well-mandated regulatory framework gives confidence to users and businesses. Users' interests are served by a strong regulator to ensure monopoly owners are not able to exploit consumers, while businesses benefit from stability and the knowledge that smart investments can expect a fair risk-weighted return without unwarranted government intervention.

Recommendation 6.2:

Where commercially-viable monopoly infrastructure remains in public ownership, governments should define an appropriate independent regulatory framework which protects consumers and taxpayers, before divesting those assets into a well-functioning, well-regulated market. Where infrastructure is not commercially-viable, and government determines that there is limited prospect of near-term commercial viability, governments should have a default position of defining the service offering and testing the market for contestable supply.



Securing and sustaining community service obligations

As a society, we choose to deliver particular infrastructure services to all Australians irrespective of the economic or commercial viability of doing so. This approach is captured by the term community service obligations (CSOs) and includes services such as the maintenance of road connections to remote communities, and some fixed-line and mobile telecommunications in the bush. CSOs are generally funded either explicitly through government contributions, or implicitly through cross subsidies from one group of users to another.

Our current approach to infrastructure CSOs is unsophisticated. Most CSOs are hidden or their funding is determined either by informed estimates or historical precedent without clear and transparent objectives. This is undesirable because it delivers poor service outcomes and imposes inefficient costs on taxpayers and/or other users.

As a general rule, where it is efficient to do so, governments should seek to:

- *Define* the outcome sought by providing a CSO;
- *Disclose* the current cost and funding source for the CSO;
- *Ensure* that CSOs are paid for by taxpayers rather than by cross-subsidies from other users; and
- *Expose* delivery of CSO outcomes to a competitive process.

This approach retains the commitment to deliver CSOs on behalf of all Australians, but provides a platform to ensure they are delivered at the right quality and least cost.

Recommendation 6.3:

Infrastructure community service obligations should be well-defined, transparently disclosed to the community, paid for by taxpayers rather than other users and, wherever possible, exposed to a competitive process to ensure services are routinely delivered at the right level, for an efficient price. Currently, most community service obligations are hidden or their funding is determined without clear and transparent objectives, resulting in poor service outcomes and imposing inefficient costs on taxpayers.



Complete the National Electricity Market and refine broader energy markets

Australia has one of the world's most advanced energy markets. Reforms to date have seen public sector monopolies separated into corporatised generation, retail and network components, a number of which are now in private ownership. Indeed, by some metrics, Australia has one of the world's most competitive retail electricity markets. For example, when measured by customer switch rates, New South Wales and Victoria have been identified as the world's fourth and fifth most competitive electricity markets.⁷⁵

Despite this success, reform of the energy sector in Australia is incomplete. Substantial sections remain in public ownership and regulatory frameworks need to be refined to meet emerging challenges such as disruptive technologies and service models.

Complete the National Electricity Market

All electricity businesses, including retail, generation and networks, remaining in public ownership should be transitioned to private ownership.

The original objective of the NCP and National Electricity Market reforms was to encourage cost minimisation by profit-maximising businesses. Corporatised state-owned businesses resembled private entities and were expected to behave in the same way as a private enterprise in reducing costs and maximising efficiency. This has yet to occur in all instances, while increased regulatory sophistication and market capability now means that private ownership of electricity assets is both possible and desirable across the National Electricity Market.

Those jurisdictions that have already made full transitions to private ownership – Victoria and South Australia – have delivered substantial benefits to consumers. In 2014, the Australian Energy Regulator (AER) found that privately-owned Victorian and South Australian businesses were more productive than the government-owned businesses in New South Wales, Queensland and Tasmania. The AER also found that privatisation had no material adverse impact on network reliability.⁷⁶

New South Wales has recently privatised its high-voltage transmission assets and is currently engaged in a process to partially lease its distribution assets. That process will

see New South Wales retain a minority ownership stake in urban network businesses, and full ownership of its regional grid. All other jurisdictions retain full ownership of their respective network businesses, with the exception of the Australian Capital Territory, which has a joint venture structure to deliver electricity distribution services (see Table 6.2).

Publicly-owned electricity network assets and retail and generation businesses are falling short of the efficient investment and operation that could be achieved under a commercial approach. Private operators bring commercial rigour to investment decisions. Private businesses have active shareholders who face investment risks if the business performs poorly, providing a powerful discipline to increase efficiency and foster innovation.

This discipline is less likely for publicly-owned businesses, where credit ratings are managed centrally, there is no threat of insolvency and there are limited incentives to innovate and increase efficiency. While both privately and publicly-owned network businesses are subject to government-imposed objectives – for example, social or environmental requirements – the ownership structure of state-owned businesses and the attendant conflicts of interest tend to limit their capacity to respond efficiently, and in a manner that serves community interests.

Continued public ownership of electricity businesses is not in the best interests of consumers, providing an imperative to act swiftly. Given this imperative, the capacity of the market and the opportunities available through capital release, all governments should divest their state-owned electricity generation, network and retail businesses as soon as practically achievable.

“To usher in a new phase of stable, or even declining energy prices, will require a reform agenda that involves state governments divesting their ownership of network service provision assets.”

Committee for Economic Development of Australia submission, 2015

Table 6.2: Ownership structure of Australia's energy market

	Generation	Transmission*	Distribution*	Retail
New South Wales	✓	✓	●	✓
Victoria	✓	✓	✓	✓
Queensland	✗	✗	✗	✓
Western Australia	✗	✗	✗	✗
South Australia	✓	✓	✓	✓
Tasmania	✗	✗	✗	✗
Northern Territory	✗	✗	✗	✗
Australian Capital Territory	n/a	✓	●	●

✓ Privatised ✗ Public ● Partially Privatised

* Transmission networks transport power over long distances at high voltages. Distribution networks transport electricity from the transmission network to urban and regional areas at lower voltages to provide electricity to customers.

Source: Infrastructure Australia analysis of Australian Energy Regulator, 2015⁷⁷

Recommendation 6.4:

All governments should transfer their remaining publicly-owned electricity generation, network and retail businesses to private ownership. Public ownership of commercial businesses, including monopolies in well-regulated markets, distorts outcomes, stifles competition and harm consumers. Priorities include:

- All remaining retail and generation businesses in public ownership should be prepared for sale, including Snowy Hydro; and
- Queensland, Western Australia, Tasmania and Northern Territory should begin the process of explaining the need for reform to the community, with a view to divesting all electricity network assets. New South Wales should articulate a pathway to a full sale as soon as practically achievable following the partial lease process currently underway.

Commit to more flexible approaches to electricity charging

Our energy sector is facing substantial challenges, with considerable implications for infrastructure investment. Australia has experienced a decline in overall electricity demand alongside a widening differential between average and peak demand, driven by increased energy costs, greater energy efficiency and a changing industry mix. Emerging technologies – such as distributed generation and battery technology – will continue to change the way consumers interact with the network.

New technology at a customer level, combined with overall changes in the patterns of electricity use, is disrupting our traditional thinking about the infrastructure needed to efficiently, safely and reliably supply

electricity. This has implications for how we charge for the use of electricity grids.

Network tariffs typically comprise usage and fixed-charge components. However, the structure limits the extent to which providers can signal for more efficient use – particularly in an environment with a more diverse range of generation sources and high peak demand.

The current structure of network tariffs means that households with roof-top solar photovoltaic (PV) systems can avoid some network charges, even though overall network costs remain broadly the same. Instead network costs are recovered from higher usage charges – which effectively amounts to an indirect subsidy from those users who do not have solar PV systems to those who do. This flaw is exacerbated by generous feed-in tariffs

aimed at incentivising uptake of solar PV in a number of jurisdictions. Improving network tariff structures will be increasingly important as technology continues to evolve and more households take up solar PV systems.

A further consideration is the provision of network capacity to meet peak demand. The cost of infrastructure required to supply households and businesses with electricity during peak demand is much higher than at other times. Network owners spent nearly \$18 billion between 2009 and 2013 installing infrastructure to avoid power failures during peak periods.⁷⁸ For example, around 25 per cent of retail electricity bills in New South Wales is required to meet just 40 hours of very high ('critical peak') demand each year.⁷⁹ If prices had encouraged consumers to use less power in periods of peak demand, \$7.8 billion of this investment could have been avoided and the savings passed on as lower power bills.⁸⁰

Despite the substantial need for additional infrastructure capacity to meet this peak demand (capacity that is only used for less than half of one per cent of the year), for the majority of customers there is currently no mechanism for differential pricing between peak and off-peak periods. A better approach to pricing electricity could help reduce peak demand. This would avoid the need for electricity businesses to invest in infrastructure to cater to the extremes of peak demand. More than 50 per cent of the average household's electricity bill is comprised of transmission and distribution components (see Figure 6.1).

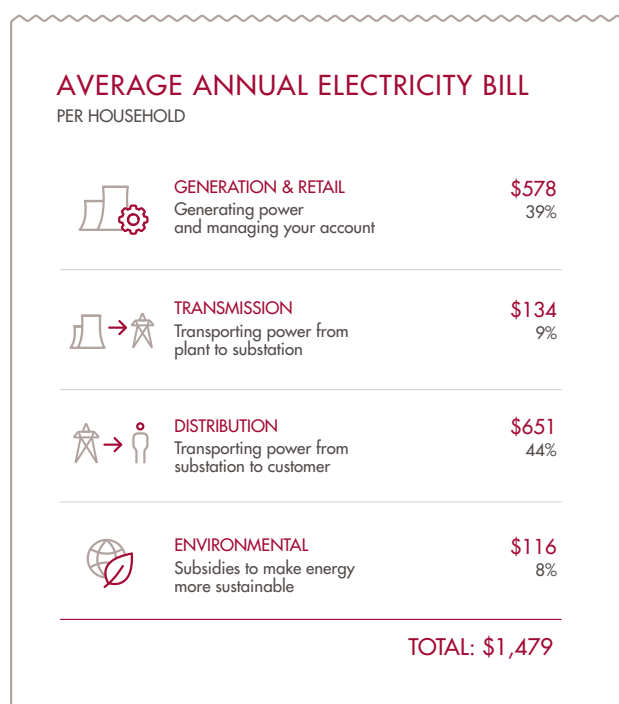
More flexible tariffs (including time of day and peak demand pricing) are a step towards a more accurately cost-reflective pricing model. Electricity prices would provide a more sophisticated link between the actual costs incurred to provide electricity and the prices charged to consumers. In particular, it would provide a platform for greater equity between users by removing the perverse outcomes that exist in the current structure. For instance, under the current structure, households that do not have air-conditioning effectively subsidise those that do, and some households effectively subsidise those that have taken advantage of generous solar feed-in tariffs.

“Tariff reform is needed to remove economic distortions in the Australian electricity market.”

QIC submission, 2015

COAG has already committed to the efficient integration of new technologies and lower future network costs. This involves the COAG Energy Council working with the Australian Energy Market Commission (AEMC) to reform network tariffs. To help pave the way for a faster transition and take up of new tariffs, governments should work with energy bodies and industry to communicate the benefits of tariff reform.

Figure 6.1: How much each household pays for electricity



Source: Infrastructure Australia analysis of Australian Bureau of Statistics, 2013⁸¹

Recommendation 6.5:

Governments, through the COAG Energy Council and the Australian Energy Market Commission, should introduce more flexible network tariffs in the near term. Governments should publicly renew their commitment to this reform and work with relevant bodies to communicate the consumer benefits of a more flexible tariff arrangement.

Deliver technology to support more flexible electricity pricing

Currently most Australian households have a traditional meter that measures total electricity consumption. The exception is Victoria, where the rollout of smart meters is now effectively complete with almost 2.8 million meters installed across that state.⁸²

Traditional meters do not provide detailed information to network operators on when businesses and households are consuming electricity. Nor do they provide customers with real-time information or price signals about their own consumption of energy.

Smart meters measure how much electricity a household or business uses and when it is consumed, and communicates this information to both the user and the provider in near-real time. They eliminate the need for on-site meter reading and can notify an electricity distributor if a premise's power is out as soon as it occurs.

Replacing traditional meters with smart meter technology will provide a platform for more effective approaches to charging for electricity. For example, operators can reward customers who use less energy during peak periods. In turn, lower peak demand may remove or delay the need for additional network capacity and reduce the cost of provision for all users.

Tariff reform should include developing a market for more flexible provision of smart meters. Allowing competition in the supply of metering services will mean smart meters will be delivered where and when they are most needed. Rolling out smart meters can also produce substantial savings in network operating costs through remote meter reading and fault detection (see Box 6.2).

Efforts by the AEMC to facilitate appropriate electricity metering competition will help the rollout of smart metering technology. Governments should consider an objective for all residential and small business customers to have the next generation of electricity meters offered to them through a market-led process.

Recommendation 6.6:

The Australian Energy Market Commission, in cooperation with governments, should develop electricity metering competition to facilitate the efficient, market-led rollout of smart metering technologies, taking into account positive and negative lessons from Victoria. Smart meters will support more flexible and efficient electricity tariff arrangements.

Box 6.2: Learning from the rollout of smart meters in Victoria

There have been multiple studies of the costs and benefits of introducing smart meters and the potential for demand management schemes in Australia. A comprehensive Ministerial Council for Energy study suggested that a national rollout would result in net benefits for most states and territories in the National Electricity Market.⁸³

A previous cost-benefit analysis of the smart meter rollout in Victoria, which used actual cost data and various forecasts, found that for the period 2008 (the time of project commencement) to 2028, the program would likely produce net costs, due largely to cost blowouts in the initial years of the program.⁸⁴ Nevertheless, the study recommended that the rollout be completed, given that the costs that most contributed to this adverse outcome had already been incurred, while many of the benefits could be realised in the future.

Delivering electricity and gas retail price deregulation

Deregulating electricity and gas retail prices will create more efficient and competitive retail energy markets. The shift to a more competitive energy market without price controls has seen some progress since the 2004 *Australian Energy Market Agreement* in which

governments agreed to phase out retail electricity and gas price regulation in markets where competition was effective.⁸⁵ Since then, despite an increase in competition, the majority of jurisdictions continue to apply some form of electricity retail price regulation, except Victoria, South Australia and recently New South Wales. In retail gas, New South Wales and Western Australia regulate prices for some customers (see Table 6.3).

Table 6.3: State of electricity and gas retail price regulation

	NSW	Qld	Vic	WA	SA	Tas	NT	ACT*
Electricity	✓	✗	✓	✗	✓	✗	✗	✗
Gas	✗	✓	✓	✗	✓	✓	✓	✓

✓ Deregulated ✗ Regulated

Source: Infrastructure Australia analysis, updated from Australian Energy Regulator, 2015⁸⁶



Where competition is sufficiently developed in an electricity market, jurisdictions should remove retail price regulation. Benefits include:

- Retailers are no longer required to offer customers regulated retail electricity prices;
- A reduction in red tape for retailers, which can lower the cost of electricity bills;
- Retailers have greater freedom to offer tailored and more innovative utilities packages to consumers; and
- Governments can continue to employ independent regulatory bodies to monitor and report on the competitiveness and effectiveness of the retail market, while monopoly components of the market (transmission and distribution) remain subject to explicit price regulation.

The AEMC is well-placed to assess the effectiveness of competition in jurisdictions where retail price deregulation has not occurred and provide advice on a pathway to price deregulation.

Competition in the gas market is effective, although there appear to be some barriers to entry as there are

fewer retailers than in the electricity market. The Australian Government should review competition in the gas sector to better understand these barriers and identify ways to encourage competition as recommended by the *Harper Review*.⁸⁷ Reform will need to be supported by better information for customers on how to benefit from greater choice.

Recommendation 6.7:

Australia's electricity and gas markets should move to full retail price deregulation as soon as practically possible. To support this:

- Where price deregulation has not occurred in the retail electricity market, the Australian Energy Market Commission should provide advice and a pathway for removing price regulation; and
- The Australian Government should undertake a review to identify ways to increase competition in the retail gas market (consistent with the *Harper Review*).



More clarity over renewable energy infrastructure

Our energy market developed when there were clear and distinct roles in the electricity supply chain. But the growth in solar and wind energy infrastructure and other emerging technologies has the potential to dramatically disrupt the traditional model of electricity supply.

The ability of consumers to choose their own energy infrastructure, such as combining solar with battery technology located at home, is likely to reduce demand from the grid. Renewable energy will also continue to supply more power to the grid.

This transition is however having impacts on the wider energy market. For instance, the Australian Energy Market Operator (AEMO) has very little real-time information about how much energy is supplied through household solar PV. The natural volatility of solar energy generation and decentralised generation makes it more complex for AEMO to estimate demand and manage the grid.

Governments need to determine whether existing economic regulation of the energy sector requires change given that consumers have an increased range of electricity supply options. The challenge is to have a regulatory environment that is flexible enough to take advantage of the opportunities offered by new and emerging renewable energy infrastructure, while protecting consumers.

Decentralised energy is also likely to require adjustments in electricity generation and transmission networks. Further development of renewables and supporting storage systems is required to replace the continuous, reliable capacity currently supplied by coal-fired plants.

New investments in the physical capacity of transmission networks are likely to be required to accommodate the greater number of decentralised electricity sources, while minimising transmission losses from remote generation sites.

It is unclear how our energy system will look in the coming decades. For instance, as large-scale battery storage becomes more economically-viable, new models of supply have the potential to reshape the existing market and repurpose existing infrastructure.

Government, business and regulators will need to assess the various options in a way that encourages efficiency, promotes competition and sustainability, attracts investment in new technologies and builds support from all sectors. This will require government and business leaders working together to guide the transition in a way that creates community and business confidence.

Further work is needed to explore the implications of recent and emerging technologies, such as solar PV, at-home batteries, large-scale energy storage systems, and smart grids, including the frameworks needed to support their efficient rollout.

Renewable energy is discussed in greater detail in the **Regional, Sustainability and Resilience**, and **Remote and Indigenous Communities** chapters.

Recommendation 6.8:

Governments and regulators should evaluate the likely impacts of emerging and disruptive technologies on the national electricity market and recommend specific reforms to address potential regulatory failure and technology disruption. Government and business leaders should work together to guide the transition in a way that creates community and business confidence.

Refine the telecommunications market to maximise competition

Reforms over the past three decades have transformed the telecommunications sector from what was a government-owned, fixed-line monopoly. In the 1980s, the provision of fixed-line telecommunications was vertically integrated without competition and was self-regulated. In the 1990s, reforms allowed for limited network competition in fixed-line and the development of a competitive market for mobile voice and data services. Optus was selected to compete against the (then) government-owned Telstra, in both fixed-line and digital wireless services. Vodafone entered the market later, delivering digital wireless services. In the late 1990s, further reforms led to the entry of resellers of fixed-line and mobile voice and data services, while Telstra was progressively privatised through the late 1990s and 2000s.

Because of these and related reforms, the telecommunications sector's regulatory and market structure has responded effectively to major technological disruption, such as the development of mobile services and the growth in demand for data services.

Over the coming decades, our demand for telecommunications infrastructure will continue to grow rapidly. In 2014 alone Australian mobile data traffic grew by more than 50 per cent.⁸⁸ Globally, almost half a billion mobile devices and connections were added in the same year.⁸⁹

Having the right telecommunications infrastructure is critical to taking advantage of new technology and will help grow Australia's economy. Reforms should aim to deliver an efficient and competitive rollout of the NBN, meet demand for telecommunications over the coming decades and reduce service disparities between urban and regional areas.

Competitive NBN infrastructure to support innovation and new technology

The NBN is a transformational investment for Australia and will bring new opportunities for communities and businesses across the country.

The near-term challenge for the Australian Government will be to ensure the efficient rollout of an open-access, wholesale-only, fixed-line broadband network. Over the medium term, the Australian Government should transfer NBN Co to private ownership.

It may be desirable to defer the privatisation of NBN Co until the rollout is complete, both to avoid disrupting a complicated infrastructure project and in recognition that private investors are likely to have less appetite for risk during the rollout phase.

Consistent with the findings of independent bodies such as the ACCC,⁹⁰ National Commission of Audit,⁹¹ and the National Broadband Network Panel of Experts led by Dr Michael Vertigan AC,⁹² NBN Co should be split into distinct business units to encourage infrastructure competition, promote private investment, and allow for specialisation in managing different networks. Two prominent options include:

- NBN Co could be split along technology lines: one company selling services over the Hybrid Fibre Coaxial cable networks (technology developed by the cable television industry), one over Fibre to the Premises or Fibre to the Node networks, and others through the satellite and wireless networks; and
- NBN Co could be split along geographical lines: for example, by major city. Remote and regional services covered by satellite services could be managed separately through CSOs, where there is insufficient commercial appetite to deliver services through a private model.

To prepare for a future sale, it will be important that NBN Co does not 'enmesh' different technologies in a way that cannot be separated later. Accordingly, NBN Co could establish separate internal business units in anticipation of creating a more competitive network.

Prior to privatising NBN, the Australian Government should undertake a scoping study to consider the objectives of a sale, including:

- The preferred method and structure of sale;
- Actions required to prepare NBN for sale and the industry structure in which the entity operates;
- The appropriate regulatory approach; and
- Any CSOs.

The scoping study for the sale of NBN Co should consider how a future model could deliver a CSO to supply high-speed broadband to areas that are non-commercial. Currently, NBN Co is providing equivalent

broadband services at the same wholesale price, regardless of geographic location or the technology platform used to deliver them. This allows for consistent retail pricing for equivalent services – a requirement set by the Australian Government – but it constrains the recoverable revenue through wholesale pricing. It means densely populated cities and urban centres are cross-subsidising our regional and more remote areas.

A hidden cross-subsidy does not support transparency for service delivery in regional areas. This arrangement could also inhibit the transition to greater competition. Where possible, the Australian Government should make clear the aim of this CSO, its present cost and funding source, and establish a competitive process for delivering the CSO. Exposing the CSO to the market should improve the quality of services and lower the cost to taxpayers.

Recommendation 6.9:

NBN Co should be privatised into an appropriately regulated market in the medium term. In the near term, the Australian Government should commission a scoping study to assess the most appropriate approach, structure and timing to deliver a privatised NBN model. The scoping study to assess the most appropriate approach and structure for a privatised NBN should include options to efficiently support delivery of NBN services in regional and remote areas that are non-commercial.



Complete the water market reforms

The water sector can be separated into metropolitan, regional urban and rural productive sectors. Each sector has different governance and delivery arrangements.

Australia's *metropolitan* water sector has complex regulatory structures, with each state and territory having distinct regulatory frameworks. In 1994, COAG committed to market reforms that separated metropolitan water regulators from corporatised government-owned service providers. This resulted in a better quality of services at a lower cost to consumers. A decade later, COAG agreed to the National Water Initiative (NWI), which committed to the introduction of full cost recovery and established independent economic regulation. While the corporatised model has delivered some efficiencies, consistent with the experience in the energy sector, the model has not fully reproduced the efficiency, clarity of incentives and consumer benefits delivered by private ownership.

The *rural productive* water sector began moving toward a market-based model in the 1980s, with further substantial reform agreed by all governments through the NWI. Through this commitment, the productive sector, especially in the Murray-Darling Basin, has been transformed from a system of water rights tied to land title to one considered world-leading with the separation of water entitlements from land and the introduction of temporary and permanent trading within and between irrigation areas. Water trading now enables flexible and autonomous relocation of water based on secure, tradeable water allocations and entitlements with a well-defined cap on surface water and ground water available for consumptive use. However, further reform is needed to ensure these arrangements remain robust and are rolled out more comprehensively across Australia where it is appropriate to do so.

The *regional urban* sector has various governance and institutional arrangements. In some jurisdictions water is delivered by local councils, in others by jurisdiction-wide public corporations. Many water utilities do not fully recover costs. In some areas, drinking water does not meet relevant standards. Reforms to improve the various existing structures are discussed in detail in the **Regional** chapter. Reforms to improve the quality of drinking water in remote communities are discussed in the **Remote and Indigenous Communities** chapter.

Reform across the water sector should seek to build on the core principles and strong foundations of the NWI.

“A process for resolving the role for competition in urban water should be a key element of the *Australian Infrastructure Plan*.”

Water Services Association of Australia
submission, 2015

Efficient, cost-effective and customer-focused service delivery in metropolitan areas

Subject to robust, independent regulation there is no longer a case for public ownership and operation of metropolitan water utilities in Australia.

In the past two decades, through COAG and specifically the NWI process, states and territories have undertaken substantial metropolitan water reform. We now have more commercially focused service providers, clearer and more effective regulation of the sector, and better long-term water planning.

But in many areas of Australia, metropolitan water utilities continue to be subject to government interventions inconsistent with the enduring policy reform principles. This is possible because water and wastewater in capital cities continues to be delivered by large, state-owned monopolies. Under present arrangements, governments can direct businesses to deliver services at a price well-below what is needed to pay for the water infrastructure; or seek to extract additional revenue from water utilities (through dividends paid into consolidated revenue), which is in turn collected through higher household and business bills. This inherent conflict of interest, crystallised through governments' dual role as both the owner and regulator of a utility, drives inefficient services and poor outcomes for users.

Ownership structures limit the rollout of new infrastructure in some jurisdictions. The constrained fiscal position of state and territory governments and high debt-to-equity ratio of government-owned water utilities may limit the availability of capital for new water and wastewater infrastructure.

It is undesirable for large quantities of public capital to be tied up in commercially-viable metropolitan water utilities, where the capital could be released and invested

elsewhere. Replacing public sector financing with private investment will promote innovation, boost productivity and result in a more customer-focused service.

In the first instance, governments should update regulatory frameworks to ensure state-owned businesses are delivering services efficiently and in the long-term interest of consumers. They should:

- Establish genuinely independent economic regulation that is free from policy interventions designed to reduce water prices, or extract monopoly rents;
- Ensure full cost recovery, which includes a commercial rate of return on capital;
- Enforce existing minimum standards for environmental and health regulation so that they are met by all jurisdictions and providers;
- Assess the financial viability of water utilities to protect the long-term interests of customers and stakeholders; and
- Manage the impact of rising water bills on low-income households through considered CSO mechanisms.

With these reforms implemented, governments should then transfer state-owned metropolitan water utilities to private ownership into a well-regulated market structure. An efficient regulatory approach is needed to reassure the community that the quality of water will meet world's best health and environmental standards.

Moving to a private ownership model will unlock potentially billions of dollars to fund other priority infrastructure and services. It will also remove the existing conflict of interest where state and territory governments are both owners and regulators of water infrastructure.

Recommendation 6.10:

Governments should define a pathway to transfer state-owned metropolitan water utility businesses to private ownership to deliver more cost-effective, customer-responsive services.

That pathway will:

- Implement policy and institutional reforms to promote competitive neutrality in advance of privatisation, including full cost recovery pricing and commercial rates of return on capital;
- Introduce independent economic regulation, with the potential for the regulatory framework to be set nationally to avoid perceived conflicts of interest; and
- Apply uniform drinking water quality and environmental regulation.

These reforms should be delivered within five years.



Box 6.3: Progress to date on the National Water Initiative

NWI elements include water planning, establishing sustainable diversion limits, entitlement specification and registration, water metering and accounting. These elements are fundamental to good water resource management. They have been critical in establishing water markets, particularly in the Murray-Darling Basin, where Australia is recognised as a world leader in water management.

The former National Water Commission analysis found that water markets in the southern Basin have:

- Facilitated the movement of water to higher value uses, resulting in an increase in the value of irrigated agriculture;
- Helped maintain productive capacity within the southern Basin, which would otherwise have moved to other parts of Australia during the millennium drought; and
- Given individual irrigators more flexibility in their water use and production decisions by allowing them to pay off debt and supplement their income.

There is strong recent evidence of private sector agricultural investment (including in irrigation infrastructure) being attracted to the Basin as a result of the market-oriented water management reforms.⁹³

The *Basin Plan* sets environmentally-sustainable water diversion limits across the Basin. Australian Government water buy-backs and infrastructure upgrades are assisting the transition to the new limits.⁹⁴

More productive rural water

The flexibility and autonomy offered by water trading has increased agricultural production, helped farmers and communities to survive severe drought, and provided the mechanism for recovering water for the environment (see Box 6.3).

But many challenges remain. In the Murray-Darling Basin, further work is required to identify and communicate the benefits of water trade, partly to build support for further reforms, but also to safe-guard against governments overturning their earlier commitments – for example, recent calls for the re-introduction of water trade barriers to protect some industries.

Further work is also required to enable water trade in parallel with initiatives to develop northern Australia. While river systems are less connected in the north, and unlikely to experience water trading at a scale similar to the Murray-Darling Basin, there are still benefits from secure, tradeable water rights in priority northern catchments. Presently, markets in which water users and investors can trade entitlements are under-developed or non-existent in the north. Existing water rights can be overly prescriptive or uncertain due to the lack of a transparent water planning process.

The current national focus on developing northern Australia presents an opportunity to roll out the NWI in the north, building on existing policy achievements by the Queensland, Western Australian and Northern Territory governments.

The north can learn important lessons from the south, where communities, the environment and business have suffered from over-allocation of water entitlements, resulting occasionally in too little available water. While in many cases the supply of water in the north is currently meeting demand, long-term investments in many businesses requires long-term certainty over water supply. As development increases, statutory water planning arrangements provide users with a secure, legally-defined entitlement and transparency for everyone as to how water will be allocated.

Infrastructure Australia supports the Australian Government's Northern Australia *White Paper on Developing Northern Australia* commitment to providing new investments in water infrastructure to those projects where there is a commitment to accelerate water reform through the creation of secure water rights and statutory water plans.

For these reasons, governments should commit to:

- Improve market functionality in the Murray-Darling Basin – for example, improving trade processing times, register compatibility and market information; and
- Establish NWI-consistent entitlements underpinned by water resource assessments in priority catchments in northern Australia as quickly as possible.

Recommendation 6.11:

The Murray-Darling Basin Authority should undertake a comprehensive investigation into issues inhibiting the efficient functioning of water markets in the Murray-Darling Basin including information and transparency, trade processing times and register compatibility. COAG should recommit to establishing entitlements consistent with the National Water Initiative in areas where this has not yet occurred, such as in priority catchments in northern Australia.

Establish a water reform plan and independent national body to complete water market reforms

Water infrastructure is capital intensive and characterised by long-lived network assets. Effective policy, regulatory and operational settings should consider the long-term needs of customers, the community, and the economy at large.

The establishment of corporatised metropolitan water and competitive productive water market structures through the NWI has improved the use of our metropolitan

and productive water. But renewed national effort is needed to complete these reforms. The reform agenda should address challenges related to the efficient use of and investment in water, wastewater and drainage infrastructure and align with the expectations of customers, communities and environmental protection. The agenda should extend the benefits of reforms to parts of the water sector and areas of Australia that have been slow to progress reform commitments to date – particularly in the north, and better position the sector to deal with a range of existing and emerging challenges.



To achieve this, COAG should recommit to a national water reform agenda, consistent with and building on the NWI, to deliver market reforms across metropolitan, regional and remote areas in a financially and environmentally-sustainable manner. A new *National Water Reform Plan* would help drive change. It would:

- Identify areas where further market reforms are needed to complete the reforms contemplated under the NWI;
- Establish better regulations for metropolitan water supply, including a credible pathway for the privatisation of metropolitan water businesses;
- Determine whether existing governance arrangements are appropriate to meet long-term challenges facing metropolitan, regional urban and rural productive water markets; and
- Consider opportunities to address regional and remote safe and secure potable water supply challenges.

This is particularly important given the projected rapid growth in Australia's population over the coming decades will increase demand for water, sewerage and drainage infrastructure. As noted in the Audit, increasing climate volatility is likely to exacerbate water shortages over coming decades, especially in the south-eastern regions.

Governance and institutional arrangements in the water sector are complex. The abolition of the National Water Commission means that there is no independent umpire to assess reform implementation and to drive further reform in the water sector. The costs of not pursuing further reforms are high and national leadership is required.

Given the scale of change required, there is a clear need for a dedicated reform body to define the pathway and work with jurisdictions to drive reform. A national body will bring transparency to the process and ensure that jurisdictional flexibility is consistent with the agreed high-level principles and objectives of the reform program. The new body would report to Parliament on progress in implementing reform measures under a new *National Water Reform Plan*.

Recommendation 6.12:

The Australian Government should work with state and territory governments to establish an independent national body to deliver a *National Water Reform Plan* and drive market reforms across the metropolitan and regional water sectors. Water is critical to Australia's economic prosperity and environment, and to our social and cultural life. The plan should build on the success of the National Water Initiative, and the body which will deliver it should energise governments and communities to take actions needed to progress national water resource management over the coming decade.



Create efficient transport markets

Across the transport sector, there are varying degrees of market maturity.

For instance, aviation and maritime markets are well-developed. Indeed, aviation is highly competitive in its contestable components, well-regulated in its monopoly elements, and represents a highly successful example of transport market reform. For these markets, this section will concentrate on proposals to refine the operation of already well-functioning markets.

Despite these successes, the transport sector as a whole remains largely unreformed.

Roads are the least reformed of all Australia's infrastructure sectors and represent the focus of this section, with the creation of a road transport market as the principal aim.

Public transport also warrants close attention. With some notable exceptions, public transport in Australia is subject to uncontested public sector monopoly provision. Completing a public transport market would extend the benefits experienced in some jurisdictions to all.

Freight rail reforms are delivering effective infrastructure

Demand for freight rail infrastructure is projected to grow substantially in coming decades, in particular for resource bulk commodity haulage in Western Australia, Queensland and New South Wales, as noted in the Audit. Freight rail will also need to play a growing role in the movement of goods between ports and inland freight terminals, and in the movement of containerised and general freight over longer distances.

The competitive market structure for freight rail is working well. At a national level, the objectives set by the NCP process have largely been met. Price controls and regulatory oversight have promoted above-rail competition.⁹⁵

However, competitive neutrality between road and rail freight is yet to be established. The absence of effective heavy vehicle user charging distorts the efficient movement of freight across the economy and undermines the economics of freight rail for some cargo profiles, meaning modal choices and pricing outcomes for freight are not always optimal. Consistent with the

recommendations developed in the **Funding** chapter, Australia should commit to full implementation of heavy vehicle road user charging within five years.

While current arrangements create incentives for business to provide the right freight rail infrastructure in response to demand, regulators and policy makers should continue to seek flexible and pragmatic approaches in response to new and emerging issues.

Regulating our domestic and international gateways

As an island nation and vast continent, Australia relies on its air and sea ports to provide vital links both within our own borders and to the global economy. Given the similar roles that ports and airports play in the economy, and the shared characteristics they have as nodal infrastructure with single monopoly landlords and generally multiple competing operators and terminals, useful parallels can be drawn to inform appropriate regulation and market structure.

The Audit found that demand for airport infrastructure is projected to approximately double between 2011 and 2031, while Australia's demand for container and bulk terminal infrastructure is projected to grow faster than our GDP – with traffic through some ports projected to significantly exceed current capacity by 2031.

Australia's major airports have been privatised, with the owners of facilities assuming the primary role of developing infrastructure to meet customer and economic needs. The ACCC monitors information relating to prices, costs, profits and service quality of aeronautical services and facilities at Australia's four largest airports, publishing its findings at regular intervals.

The Audit found that the regulatory framework for airports, which requires private airport operators to maintain airport capacity, appears to be working appropriately.

Conversely, Australia's major ports are in a period of transition. Some major ports previously under public ownership have been privatised, or have been identified for privatisation in the near term, while a number of smaller facilities remain in public ownership.

The nation's larger ports are generally operated as commercial enterprises under a landlord model, whether they are publicly or privately-owned. Under this structure, port owners (landlords) do not provide core services but lease terminal capacity to competing service providers (stevedores or terminal operators). This arrangement encourages dock-side competition. As with airports, the investment required for port infrastructure is met by charges levied on users.

Despite competition between operators, this approach preserves the natural monopoly characteristics of ports through the single landlord model. For this reason, there remains a strong case for independent economic regulation of nationally significant ports. The *Harper Review* found that, "...as with airports, an important issue

when privatising ports is ensuring the regulatory regime can sufficiently influence port authority activities to constrain their monopoly power."⁹⁶

Given the strategic significance of major ports, the potential mixed incentives for governments as both owner and regulator of some ports, and the increasing role of private ownership in the container and bulk ports, there is an important role for the ACCC, or relevant state and territory regulators, in overseeing the nation's major ports, consistent with the regulatory and monitoring approach to nationally significant airports. The ACCC has appropriate reserve powers to maintain regulatory oversight to avoid monopoly pricing and consider the longer term infrastructure funding requirements.



A new framework to drive investment and improve the performance of our road network

To have a better funded, high-performing road network, we need to consider a new approach that better aligns the delivery and maintenance of infrastructure with demand for services and takes advantage of the benefits of greater use of private investment.

If we continue with our current approach we can expect the same results: a deteriorating and congested road network that costs more than it should, and delivers less than it could.

The road system is conceptually similar to any other utility network. In the case of reformed utilities, such as those explored earlier in this chapter, the costs of provision are generally borne by the users of the network, charges are set by economic regulators and delivery risks are borne by providers not taxpayers.

Creation of a market for mobility should include reforming road network provision to mirror the successful structure of other utility networks; that is, to establish a market structure that attracts private investment, with arms-length government oversight through independent economic regulation. This would form the delivery structure that underpins the user pays principles discussed in the **Funding** chapter.

There is growing acceptance that a new approach is needed. The Productivity Commission recently recommended that Australia should adopt a corporatised public road agency model to deliver the funding and provision of roads.⁹⁷ The *Harper Review* also suggested creating a company to own and run the national road network, corporatising its operations through a ‘regulated utility’ approach, which would eventually enable cost-reflective user charging.⁹⁸

One option is to set up a regulated asset base (RAB) approach similar to that used in other infrastructure sectors. Under a RAB for roads:

- Governments transfer responsibility for the quality and affordability of the road network to an independent economic regulator, and risk and returns are transferred to corporatised or privatised delivery entities;

- Prices are set to recover the efficient cost of network delivery, including a commercial return on the asset base;

- Charges are levied on users either through existing frameworks (fuel excise and registration charges) and passed onto road network providers (hypothecation) or, over time, through direct user charging; and

- Operators build, own and maintain different components of the road network, with direct incentives to improve standards and efficiencies.

With hypothecation or user charging in place, a RAB approach allows network operators access to a predictable revenue stream. This provides a platform for efficient investment, free from the variability of annual budget cycles with an incentive framework to provide additional capacity to meet demand. The approach also provides a basis for exposing CSOs and making their funding requirement explicit. Above all, a RAB approach provides a customer service model with a discipline on providers to deliver high levels of service in return for the charges levied on users. Further information on a RAB approach is in Box 6.4.

“The ACCC considers that there are three stages to an effective reform program for Australia’s roads, namely revenue from road use to flow directly to the entities that build and maintain Australia’s roads; transitioning to a forward-looking approach to revenue requirements for roads; and in the longer term, increasing the use of price signals for more productive use of roads.”

ACCC submission, 2015

Box 6.4: What is a regulated asset base?

The concept of a RAB is used by infrastructure regulators, such as the Victorian Competition and Efficiency Commission and the New South Wales Independent Pricing and Regulatory Tribunal, to understand the efficient price for regulated infrastructure services such as the supply of water. The RAB:

- Identifies the range of assets such as pipes, pumps, dams and water treatment plants, that need to be valued; and
- Values those assets, having regard to what they cost to provide efficient expenditure since they were provided, and allowing for depreciation.

This value is then applied, using a transparent pricing formula, to set the regulated prices which can be charged to customers for use of the network. According to the OECD: "...at any given time, the RAB refers to the cumulative historical investment made by the company, net of cash recovered from regulatory depreciation. The RAB is also usually indexed to a measure of price inflation in order to allow for the effects of inflation on the regulated company's capital stock over time."⁹⁹

RAB frameworks offer stability and predictability to investors and consumers. They offer predictability to investors by giving them certainty that their investment can be recovered; and, it provides peace of mind to users that they will be charged a fair price for the use of natural monopoly infrastructure, reflecting the cost of efficient provision. It also reassures users and investors that user charges provide the right signals as to where new investments should be made, and that investments are made with the optimal efficiency. Thus the RAB ensures, through independent economic regulation enforced by legal stability and judicial recourse, that pricing is linked to supply such that providers are able to recover costs and a reasonable rate of risk-weighted return if they invest efficiently.

Experience in the United Kingdom water sector: The privatisation of the English water and sewage sector in 1989 resulted in significant private sector investment and drove a range of improvements in service delivery and systems efficiency. Water prices have remained regulated by the United Kingdom's Water Services Regulator (Ofwat), which administers a Service Incentive Mechanism that ranks water businesses based on the number of complaints and calls they receive, and various consumer surveys. The regulated price limits are published every five years and are indexed to the CPI. Both negative and positive price adjustments (within the range of +0.5 to -1 per cent) can be made to reflect each water company's ranking. This mimics a competitive market and provides a financial incentive for companies to prioritise the key performance criteria.¹⁰⁰

The commercialisation of the English water and sewage network initially led to price increases reflecting substantial investments needed to replace ageing water and wastewater infrastructure. The asset replacement requirement was a principal driver for reform and, in the two decades following privatisation, over £98 billion in private investment was spent on water network renewal and expansion. Since the late 2000s, prices have remained relatively stable.¹⁰¹

Globally, the regulated asset approach has a strong track record of attracting private capital, as well as regulating performance and controlling prices. In Australia, this approach has been applied successfully to the energy and water sectors. In Europe, the approach is being implemented as the preferred model in the privatisation of various transport networks. In the United Kingdom, investigations are underway to explore new ownership and financing models for the road network utilising the regulated asset approach.

Although not a mandatory requirement of the approach, efficiency can be achieved by setting performance standards and pricing for all participants at the levels of the best performer (that is, an entity can only charge what the best performing peer charges). Companies that fail to perform at an efficient level will suffer financial losses and be vulnerable to commercial failure or takeover. Even where the regulated pricing is set at average levels (rather than the lowest peer levels), it will continue to drive efficiency as below-average performers strive for cost efficiency.

Governments, through regulators, can use this approach to ensure adequate maintenance and renewal by setting minimum-outcome specifications and ensuring revenue recovery meets the long-run funding requirements of the network.

By establishing a range of suppliers over the entire network, regulators can use benchmark performance measurement to provide strong incentives across the network for cost efficiency and network improvements.

To further develop the most suitable market framework for our road network, work is required to:

- Better understand the value of the road network, in terms of its physical state and attributes, but also existing management costs and financial commitments;
- Assess current motoring tax revenues, CSOs and funding shortfalls; and
- Assess the feasibility and process of setting up ‘road funds’ for fuel taxes and other indirect taxes levied on road users to increase transparency around road funding as a pre-cursor to establishing a more market-orientated structure.

Recommendation 6.13:

Australia should seek to transition the revenue and funding framework for roads to be consistent with other utility networks by establishing a corporatised delivery model. A regulated asset base approach provides a strong framework to achieve this outcome. As part of the broader public inquiry into road funding reform, the Australian Government should direct a body like Infrastructure Australia or the Productivity Commission to:

- Research the merits of a corporatised model for Australia’s road network(s) to establish a reform pathway over the medium term; and
- Evaluate and define the pathway to establish the corporatised road fund model in jurisdictions, including provisions for hypothecation of existing taxes and charges to support the delivery of transport infrastructure in advance of the introduction of user charging.

This work should be delivered in tandem with heavy vehicle charging and investment reform.

Create contestable markets in our public transport system to improve service quality

With the population of Australia’s four largest capitals projected to grow by close to 50 per cent by 2031, effective and efficient public transport will be key to making our cities function smoothly.

With a small number of notable and successful exceptions, our public transport networks are mostly government-owned and operated. Cost recovery in the sector is very low, typically around 20 to 25 per cent of operating costs, and in most cases, the cost of operating public transport is rising faster than passenger fare revenue. In some cases, this is because governments limit fare increases to CPI, in pursuit of affordability over independent financial sustainability. But this means costs are not being recovered from public transport users and operations are heavily subsidised by taxpayers.¹⁰²

The future shape and operation of bus and rail networks across the country needs to consider options to lower the cost of provision and improve the quality of services.

Franchising services, where sections of a public transport network are tendered to select service operators over a time limited concession, is the most practical option and has already had substantial success in Australia.

Victoria’s reforms to the operations of its rail and tram network have delivered improvements in performance and significant investments in new and refurbished rolling stock. This experience has been consistent with the customer benefits delivered by opening public transport provision to contestable supply both in Australia and overseas (see Box 6.5).

Franchising creates a contestable market, where the government holds the private sector to account via a contract on specific outputs, performance standards and conditions. Financial penalties may be imposed on operators if contracted standards are not met, including the potential to miss out on future contract extensions or cancellation of existing arrangements. Together, this combination of contracted requirements, financial rewards and sanctions create a powerful incentive to improve performance and efficiency.

Key features of successful franchise operations include:

- Recognising that it is not a sale, but a process of seeking the best operator to bring a better customer experience at a lower ongoing cost to government, in partnership with government;
- An explicit competitive process to select the best operator from the full market of providers – with regular references back to market to ensure value for money; and
- Selecting the optimal franchise and franchisee structure to align the public interest with the incentives of the private provider – for example, Victoria’s vertically integrated model (where the franchisee is responsible for operations, rolling stock and infrastructure) has proven effective, while the United Kingdom model which separates network delivery from train operations has revolutionised their national rail system.

Franchise models are not an easy fix, nor is there a one-size-fits-all approach. The optimal approach will depend on the form of transport – whether that be train, bus or ferry. But, done well, franchising can introduce a more market-oriented approach to public transport operations.

Experience has shown that franchising public transport can reduce operating costs by between 20 and 30 per cent and as much as 50 per cent in some circumstances,¹⁰³ mostly driven by the incentive framework placed on franchised operators to deliver services more efficiently. The structure also places a focus on customer experience with common improvements including the introduction

of quiet carriages, catering facilities, station amenities, Wi-Fi, in-seat power connections, improved ticketing and customer information.

One option is for governments to pilot franchising arrangements in some parts of the network or particular public transport modes to help make an informed assessment of the models’ viability for wider application. At the same time, a pilot can ascertain and build the level of public support for reform. For instance, franchising discrete bus routes allows for demonstration of the model and benefits, allowing policy makers to make informed decisions around further rollout.

Recommendation 6.14:

Governments should adopt a default option of exposing public transport services to contestable supply through franchising. The focus of reform should be to improve customers’ experience by exposing delivery to contestable supply and selecting the best operator to provide services. Private operation of public transport through time limited, exclusive franchises – where providers compete to deliver services – is a proven model both in Australia and overseas in raising service quality and value for money for customers. It should be the default option for public transport provision, with capital city bus and rail services as immediate candidates for franchising.

Box 6.5: Bringing private sector innovation and service delivery to public transport

Governments in Australia and overseas have realised a range of benefits from the private sector provision of public services. Benefits include the transfer of revenue risk, commercialisation efficiencies, improved customer experience, and the opening up of previously uncontested monopoly provision to the full market of potential suppliers.

One area where this is particularly prevalent is in the provision of public transport. The model has been used both internationally and domestically to improve customer services and achieve cost efficiencies for taxpayers.

Since the early 1990s, public procurement by competitive tendering has become commonplace in the Swedish passenger rail market. This system has resulted in a substantial reduction in public subsidies leading to an initial 20 per cent cost saving, as well as ongoing innovations in rolling stock, management and ticketing generated from private sector involvement.¹⁰⁴

In Australia, the current Metro Trains Melbourne franchising contract links financial rewards to both the reliability and punctuality of trains and trams. Since Metro took over the franchise in 2009 customer satisfaction has increased from 74 per cent in 2010 to 85 per cent in 2015.¹⁰⁵

In the United Kingdom, ownership and operation of railways has progressively been transferred from government to the private sector from 1993 to 1997. Consequently, customer satisfaction levels, reported by the National Passenger Survey, have increased from 76 per cent in 1999 to 80 per cent in 2015,¹⁰⁶ reaching 85 per cent in 2012.¹⁰⁷

Sustainable and Equitable Infrastructure



Sustainability and Resilience

Deliver infrastructure that is resilient to dynamic risks and supports a transition to a more sustainable economy

The world is changing, bringing challenges and opportunities for Australia's infrastructure networks. Infrastructure needs to adapt to global and domestic risks and support Australia's transition to a more sustainable economy. In many cases, this means responding to risks and realigning incentives to trigger positive changes.

Sustainability and resilience should not be seen as fringe concepts in infrastructure debates, but as good economic practice. Infrastructure that is sustainable and resilient can support growth and a higher standard of living.

Sustainability aims for the right balance of economic, environmental and societal outcomes to meet our needs now without compromising our future. It should be a guiding principle for decision makers across the public and private sectors in achieving the best outcomes from scarce resources.

Infrastructure must play its part in supporting an economy that provides socially-equitable growth within and between generations. The Audit found that infrastructure makes up around half of Australia's total greenhouse gas emissions. More efficient infrastructure will help us meet Australia's 2030 target of reducing national emissions by 26 to 28 per cent below 2005 levels.

Resilience is the effective management of risks over time, taking into account how our assets operate and how our networks interact. Our infrastructure must be robust in the face of dynamic risks so as to minimise economic, social and environmental costs.

Enhancing the resilience of infrastructure networks requires infrastructure planners, owners and operators to plan for the threats and opportunities of a changing world. The capacity of our infrastructure to continue operating through minor disruptions, and recover quickly from major disruptions, will be critical to supporting people and businesses over coming decades.

This is no simple task. Extreme weather events, inadequate maintenance, accidents, terrorism and cyber-attacks pose major risks to our infrastructure assets. Robust infrastructure requires planning and coordination across networks to diversify the supply of services, and ensure that faults and failures can be isolated and resolved quickly.

There are costs – both upfront and ongoing – in making our infrastructure more sustainable and resilient. These should not be seen as an economic or administrative burden. Incorporating sustainability and resilience



as foundation concepts in design, construction and operation often reduces whole-of-life costs by improving the efficiency of operation and maintenance, while optimising benefits for the community and environment. These upfront costs represent an opportunity to invest in our future and secure our well-being, quality of life and prosperity.

Governments should create a fertile environment for developing emerging sustainable technologies and

industries, such as renewable energy generation and lower emission vehicles. Effective, consistent policies and regulatory settings across infrastructure sectors manage risks within commercial and accountable frameworks.

But ultimately the private sector must drive progress. Incentives for developments that deliver sustainability and resilience benefits will be critical to delivering the most innovative solutions to users at the lowest price.

What the Audit found

- Infrastructure-related emissions account for half of Australia's total greenhouse gas emissions, mainly from the electricity sector (33 per cent) and the transport sector (17 per cent).
- Transitioning to a lower emissions economy will require full consideration of reducing greenhouse gas emissions when infrastructure plans, construction methods and operational frameworks are being developed.
- Adapting to climate change and pursuing sustainable environmental outcomes is a core responsibility of infrastructure planners, owners and operators.
- The number and intensity of extreme weather events is increasingly likely to threaten certain infrastructure assets. Repairing these assets, and enhancing their resilience, will require an increase in expenditure and new approaches to planning and delivery.

Infrastructure must play its part in supporting a more sustainable economy

Australia's infrastructure must be able to adapt to the changing needs of its population while minimising negative impacts on the environment.

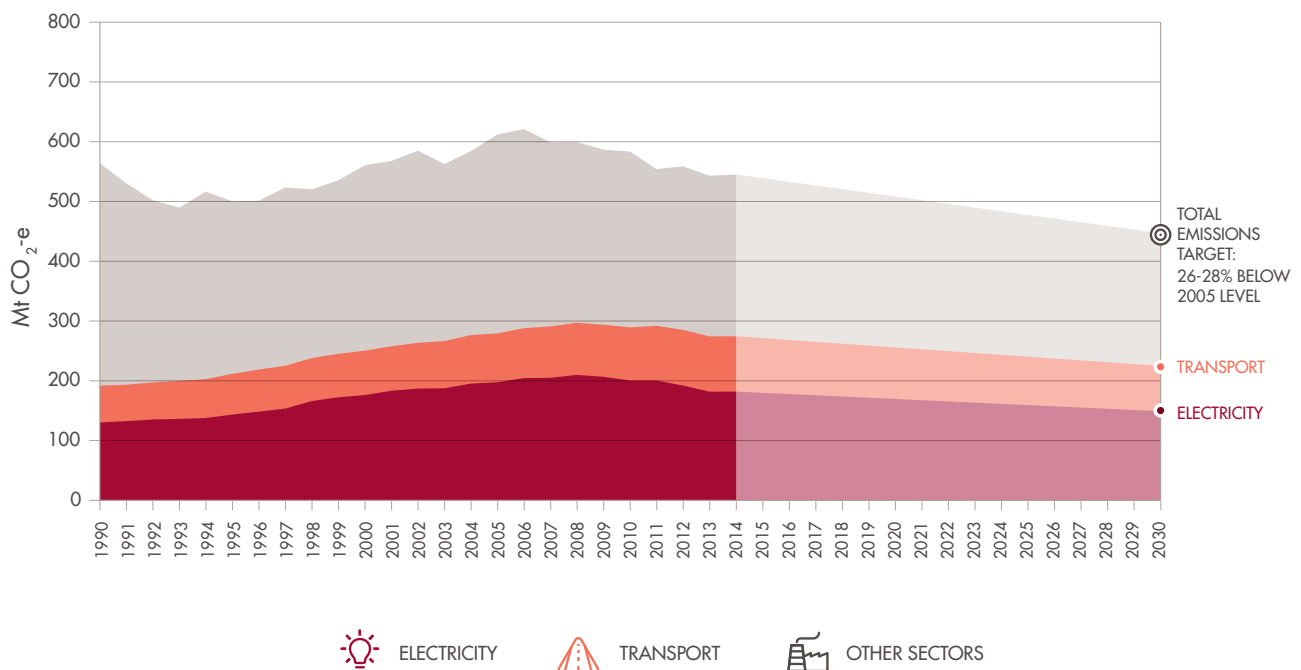
Australia has one of the highest rates of greenhouse gas emissions per capita in the world.¹⁰⁸ The electricity and transport sectors contribute half of the nation's total emissions each year. Our infrastructure must support Australia's transition to a lower emissions economy.

Our energy and transport sectors are already supporting this transition. Emissions from electricity generation have declined markedly since 2009, while transport emissions

have stabilised over recent years. But more needs to be done to reduce our energy and transport emissions to meet our 2030 target (see Figure 7.1).

Meeting our commitments arising from the 2015 United Nations Framework Convention on Climate Change negotiations in Paris and earlier international agreements requires a national effort, including by the infrastructure sectors. Improvements in the viability of less emissions-intensive forms of energy and transport infrastructure will be crucial to Australia's capacity to reduce emissions across the economy and meet our obligations.

Figure 7.1: Energy and transport must play their part in meeting Australia's 2030 target



Source: Australian Government Department of the Environment, 2015¹⁰⁹

Improve the efficiency of our infrastructure to drive greater sustainability

Improving the sustainability of our infrastructure often simply means using networks more efficiently. Infrastructure that is planned and operated well minimises the resources required by people and businesses, reducing emissions, waste and costs. Integrated urban planning improves the efficiency and sustainability of our cities, delivering both environmental and economic benefits.¹¹⁰

Changing how infrastructure services are used can also deliver benefits. Clear communication of how and when customers require a service – and pricing services to encourage better network outcomes – allows users to modify their demands and suppliers to respond efficiently. Communication is becoming easier and cheaper, with information provided directly to users via technology, such as in-home meters and smartphone applications.

Making smarter use of transport networks by spreading peak demand or shifting passengers and freight to their most efficient mode reduces time and costs to transport network users. This also reduces the need to maintain assets or construct new capacity, which cost both taxpayers and the environment. Similarly, vehicles use less fuel and produce less pollution on free-flowing road networks than those that are congested.

Reducing leaks and losses, recycling supply and improving efficiency across energy and water networks offers many benefits. Service providers can reduce costs by minimising waste and making better use of their infrastructure, meaning lower prices for consumers. It can also improve resilience by increasing the security of supply during times of need.

“The shift towards more sustainable and productive cities and regions must inherently be underpinned by more of the right infrastructure. That infrastructure must be delivered with a view to its long-term sustainability, and maximise productivity across transport, water, electricity and telecommunications networks.”

Australian Sustainable Built Environment Council submission, 2015

Finding the least cost pathway to a lower emissions future

The economic and environmental benefits of reduced emissions cannot be achieved without cost. Shifting to newer, more efficient practices may require upfront capital expenditure and a transfer of workforce skills. Consumers will likely bear most of these costs. However, as shown in the Audit, the long-run costs of inaction will be far greater if we defer the necessary changes.

Achieving greater sustainability presents opportunities for growth alongside the costs of adjusting to new, more sustainable practices. Finding the least cost path to emissions reductions is essential.

Governments can help by establishing considered policies and regulatory frameworks aimed at achieving long-term reduction targets. Furthermore, gradual implementation of policies reduces the burden on businesses and consumers in the near term, while allowing businesses to determine the most efficient means of contributing to long-term national goals and to develop innovative ways of achieving greater sustainability.

Recommendation 7.1:

Australia’s energy and transport sectors should deliver emissions reductions in line with international commitments. While some progress has been made, considerable further action is required for our infrastructure to play its part in helping Australia meet its obligations and aspirations. Governments of all levels should consult with industry and clearly communicate reforms to allow the private sector to find the lowest cost pathway to reducing their environmental impact over time.

Progress has been made on reducing emissions from electricity generation

Reducing emissions from electricity generation is a priority for Australia. Significant progress has already been made, with electricity emissions declining over recent years.

Part of this decline is due to falling demand for electricity, largely caused by:

- Improved energy efficiency of appliances and machinery;
- Uptake of household solar PV driven by taxpayer subsidies; and
- Reduced consumption in response to a sharp increase in electricity prices in recent years.

Changes to the supply of electricity have also reduced emissions. Generation from renewables has increased from eight per cent of total supply in 2003-04 to 15 per cent in 2013-14. In absolute terms, renewable generation capacity more than doubled within the decade.¹¹¹

Despite these changes, Australia's electricity generation sector is still among the most carbon-intensive of all major economies, with higher emissions per unit of electricity than the United States or China. Black and brown coal contributes about 61 per cent of Australia's total electricity generation.¹¹² Many of Australia's coal-fired plants were constructed over 40 years ago, limiting the capacity for cost-effective improvements to their efficiency.

We need to consider the future electricity generation technologies required to support a lower emissions economy. Coal-fired plants currently provide consistent, reliable electricity to the grid at relatively low economic cost. Decisions on how this 'base load' electricity generation is to be replaced over coming decades will have a significant impact on the growth and development of renewable and other forms of energy generation. It will also have a considerable impact on our sustainability and productivity over the long term.

Growth in renewable energy generation is likely to drive reduced greenhouse gas emissions from the energy sector over coming decades. Given our abundance of sun and wind, Australia can support significant growth in renewable energy generation (see Figure 7.2).

Growth in renewable generation capacity over the past decade has been largely driven by reductions in the cost of technology and government subsidies to underpin the installation of local solar PV systems. Renewables

have been supported by government subsidies and co-investment. Growth in renewables is likely to continue over the coming years.

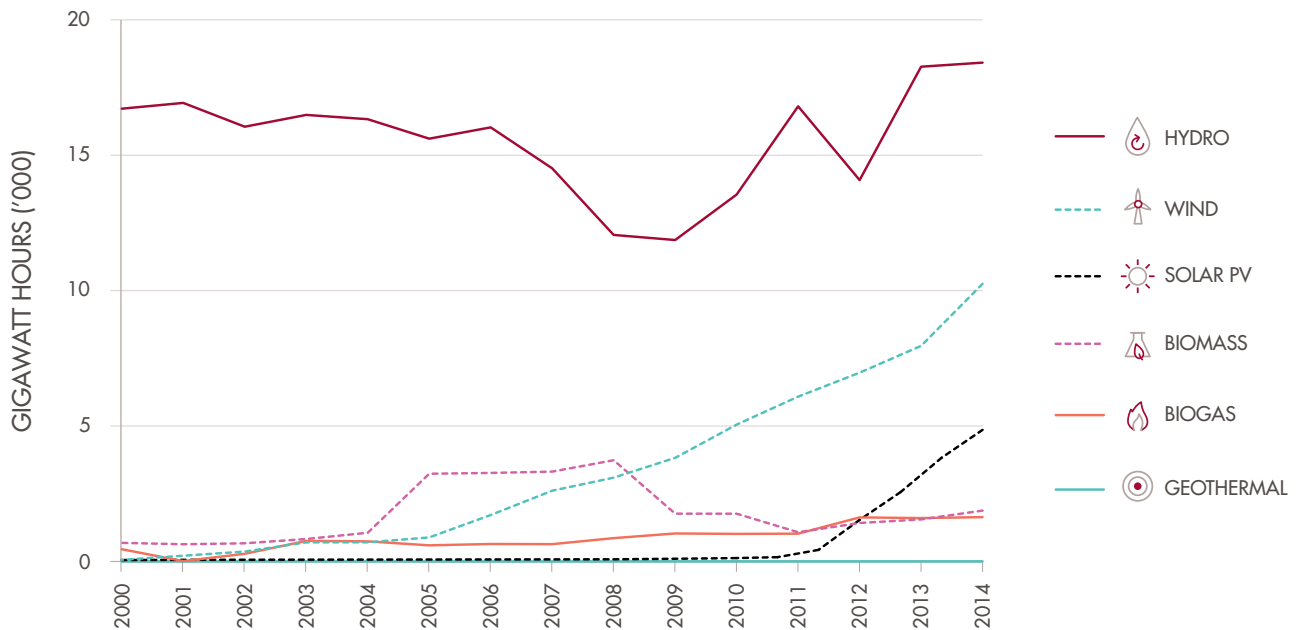
Wind energy is the fastest growing renewable, having more than doubled generation capacity in Australia over the past five years. Some of the world's best wind energy sites are in the south-western, southern and eastern parts of the country. Wind technologies are largely proven, with costs of development and implementation likely to decline further over coming decades as clusters of turbines share connections to the grid.

Australia has the highest average solar radiation per square kilometre of any continent. Research and development into large-scale solar PV (where fields of panels capture energy from the sun and generate electricity) and solar thermal (where energy from the sun is used to heat air, water, or other fluids) are being undertaken by businesses, academic institutions and research agencies such as CSIRO.¹¹³

Hydroelectric generation accounts for about half of Australia's renewable capacity. The total generation capacity of hydro has been static over recent decades, dipping generally when our south-eastern regions experiences low rainfall. Opportunities for significantly expanding hydro capacity are limited by the lack of suitable new sites,¹¹⁴ though in some cases, man-made environments could create suitable conditions for hydroelectric generation (see Box 7.1).



Figure 7.2: Total renewable generation capacity has grown strongly since 2000



Source: Office of the Chief Economist, 2015 ¹¹⁵

Box 7.1: Hydroelectric generation in disused gold mines

Located 270 kilometres north-west of Townsville, the site of the former Kidston gold mine is being transformed into Australia's third-largest hydro power plant, with a planned generation capacity of 330 megawatts. Genex Power has recently completed a pre-feasibility study for the development of a project that will use adjacent pits created by the mining operations for a pumped hydroelectric generation plant.

During times of peak electricity demand, water can be released from the upper to the lower reservoir, passing through reversible pump/generators and providing electricity to the grid when it is most required. The water can be pumped back to the upper reservoir during off-peak periods.

The existing features and connections of the site are expected to reduce costs of construction and operation. Aside from the pits, the site benefits from an existing power distribution substation, a 132-kilovolt transmission line to the grid and water supply (including existing annual water rights of up to 4,650 megalitres) from the nearby Copperfield Dam. Construction of a new 275-kilovolt transmission line is likely to be required to provide supply to the existing network line between Cairns and Townsville, and to minimise transmission losses.

By smoothing patterns of supply, the Kidston project can reduce costs for existing electricity retailers catering to peak demand by reducing the need for new generation capacity. The facility can also help to regulate total electricity supply by offsetting the intermittent generation patterns of solar and wind facilities. If successful, the project will result in lower costs of supply to consumers and provide a model for similar projects across Australia. ¹¹⁶

Other forms of renewable energy account for a small share of generation capacity but have potential for a larger role as technologies are developed. These include bioenergy, geothermal and ocean energy (including wave, tidal and thermal forms), as well as hybrid combinations of renewable energy sources and storage devices.

Emerging technologies such as battery storage systems have the potential to alter patterns of energy demand over coming decades. When combined with solar PV, battery storage is likely to greatly improve the economic viability of renewable generation for many households. Greater energy storage capacity will enable households to sustain longer periods of low sunshine without requiring electricity from the grid. This will facilitate a smoothing of demand across the day, reducing the costs of providing electricity through the grid and extending the life of existing network components. The ability of household systems to store more energy for transfer to the grid during peak periods in the morning and evening means many localised networks could become net contributors to the grid.

Develop the role of government to promote innovation and investment

Development of renewable energy technologies will drive lower supply costs leading to increased uptake over coming decades. Governments can accelerate this by supporting research and development and reducing barriers to entry for renewable energy suppliers.

For change to occur, there must be sufficient commercial reward for innovation. But research and development costs for emerging renewable technologies can be prohibitive for smaller businesses, especially given the generally long timeframes for revenue generation.

Governments can accelerate innovation by creating a fertile environment for research and development of renewable technologies, and in some cases co-investing

with businesses to support the commercial viability of projects during their early stages (see Box 7.2).

Disruptive technologies, such as battery storage systems, present a challenge and opportunity for governments. Changing market conditions are also likely to pose commercial risks to existing energy providers in some circumstances. Regulatory settings should accommodate new technologies so as to deliver the best outcomes for consumers and minimise environmental costs. Increased uptake of household renewable generation and storage ultimately improves the sustainability and productivity of the economy, while diversifying supply.

As noted in the *Energy White Paper*, Australia's governments should maintain stable, predictable and technology-neutral policy settings. Certainty on governments' energy policy and investment strategies underpins the confidence of electricity businesses and investors to develop innovative solutions to our energy challenges.¹¹⁷

Recommendation 7.2:

Building on the *Energy White Paper*, governments should work with the private sector to develop a cohesive strategy for supporting a transition to a lower emissions electricity generation sector at lowest cost to users and taxpayers. Governments should continue to encourage innovation and growth in renewable and lower emissions technologies and other developments to reduce emissions. Regulatory barriers to entry for decentralised energy sources should be lessened and, where necessary, governments should support the commercial viability of developments through co-investment of projects through research and demonstration phases.

Box 7.2: Government co-investment in renewables

The Australian Renewable Energy Agency (ARENA) and the Clean Energy Finance Corporation (CEFC) support development of emerging technologies by matching funding and co-investing in selected projects.

By bridging an investment gap for early-stage projects, ARENA supports renewable technologies through the research and development, demonstration and deployment phases. This delivers more innovative renewable energy projects to a stage of commercial viability sooner, absorbing some early technical risk while ensuring longer term commercial risks remain with the project proponent.

Acting more as a traditional financier, the CEFC seeks to maximise private investment in renewables, as well as low-emissions and energy-efficiency developments. By investing for a positive return, the CEFC seeks to leverage public funds to deliver both commercial returns and emissions reductions for Australian taxpayers.

Reducing the environmental impact of transport

Improving the sustainability of transport networks will help lower Australia's greenhouse gas emissions. The Audit found that the transport sector contributes 17 per cent of the nation's total emissions, having grown by 51 per cent since 1989-90, faster than any other sector. However, transport emissions have levelled out in recent years, largely due to improved fuel-efficiency and emissions ratings of new vehicles.

Beneficial changes in technology and usage patterns will occur in the transport sector, with flow-on effects for the energy sector. A shift towards plug-in electric vehicles will likely increase demand for high-flow electricity and charging networks, resulting in an accelerated decline in petrol demand that will, without change, cause a sharp decrease in fuel excise revenues and vehicle emissions.

Innovation will make our transport infrastructure more sustainable. The private sector can deliver lower emissions with the construction and operation of more sustainable vehicles and networks if regulations incentivise or mandate them. Governments should support innovation and more sustainable travel through implementation of global best practice and sustainable transport policies, such as:

- The provision of high-quality, high-frequency public transport services in cities;
- Planning that minimises the need to travel and improves options for travelling by foot or bicycle;
- Supporting a transition to less emissions-intensive modes for freight modes where feasible; and
- Promoting uptake of telecommunications technologies as an alternative to travel where practical and efficient.

The fuel-efficiency and emissions-intensity of all vehicles will continue to improve over coming decades. Engines will be refined and vehicles' acceleration and braking will be further automated. Uptake of hybrid, plug-in electric or hydrogen fuel-cell vehicles will increase as upfront and ongoing costs decline relative to petrol and diesel vehicles, especially if fuel prices rise over time.

Given the significance of road transport-related emissions in Australia, governments should leverage sustainability gains by ensuring Australia maintains global best practice vehicle efficiency standards.

Similarly, emissions from passenger and freight trains will decline in line with network improvements. For electrified urban train networks, these include greater automation of acceleration and braking, improved timetabling and signalling to reduce latent capacity. For diesel locomotives, these include shifts to greater automation or driverless trains – for example, those operated by resources businesses in Western Australia on closed rail networks.

Recommendation 7.3:

Australia's light and heavy vehicles should keep pace with global best practice efficiency and emissions standards. The Australian Government should update and enforce standards to minimise emissions from road vehicles. Ensuring consumers are informed of the relative efficiency and emissions of new vehicles will be essential to driving more sustainable consumer behaviour.

“More sustainable and resilient rail infrastructure that can handle an increasing part of Australia's land transport task will be an important element of any national climate change adaptation and mitigation strategy.”

Australasian Railway Association submission, 2015

Encouraging more sustainable, lower emissions transport modes

Modal shift can help improve network efficiency, reduce emissions and improve air quality.

Travel behaviours have evolved over recent decades, often adversely impacting the efficiency and sustainability of our networks. For example, more than 60 per cent of children in Australia are driven by passenger vehicle to and from school – constituting approximately 17 per cent of peak-hour traffic. Aside from contributing to road congestion, emissions and pollution, this means children and parents often miss out on the health benefits of alternative forms of transport, including walking and cycling.¹¹⁸

Transport planning and decision making should consider all modes and options across networks. Shifting passengers from one mode to another could have benefits for users of both. For example, investing in public transport services may result in trips shifting from car to bus, train, tram or ferry. Road congestion and vehicle emissions can be reduced, while greater public transport patronage will allow operators to run more frequent, higher quality services for users.

Similarly, shifting freight from trucks to trains – especially for longer trips – reduces emissions and improves the efficiency of freight networks. Improvements in heavy vehicle productivity and fuel-efficiency are likely to cause a gradual decline in road freight emissions-intensity over coming decades. Encouraging a greater proportion of freight onto rail is likely to more significantly reduce overall freight emissions.

Supporting active transport as a connected, accessible and safe alternative

Walking and cycling – or ‘active transport’ – reduces demand for roads and rail for short journeys, and improves sustainable use of transport network capacity.

Cars are the default option for many trips in Australia. Policies that increase the proportion of people travelling by foot or bicycle result in a reduction in car use, freeing up capacity on road networks. This reduces congestion and emissions and provides greater efficiency and accessibility for buses, emergency vehicles and tradespeople.

Research by the Institute of Transport and Logistics Studies at the University of Sydney indicates that more than half of all car trips are less than five kilometres and that, in many cases, users would arrive sooner if they walked or cycled.¹¹⁹ As more people choose to live in higher density housing, close to employment, active transport will become an increasingly practical way of meeting total travel demand.

Minor alterations to existing networks can often enable safer, quicker commutes by foot or bicycle. Pedestrian and cycle paths can be built more quickly and at lower cost than augmentations to road and rail networks. Active transport projects can deliver strong returns at low costs for taxpayers, representing a relatively efficient means of supplementing network capacity.

Cycle and pedestrian paths should enable people to travel quickly and safely, and not just be built where it is easiest to supplement existing infrastructure. Separation of active transport paths from roads improves safety and efficiency for walkers, cyclists and motorists alike.

Various active transport strategies have already been developed, including the Australian Government’s *Walking, Riding and Access to Public Transport*,¹²⁰ Austroads’ *National Cycling Strategy*,¹²¹ and various other reports at state, territory and local government levels. Overseas examples are detailed in Box 7.3.

Ensuring that specific strategies integrate with broader transport investments improves the quality and use of active transport infrastructure across the nation. Governments should focus on improving active transport options by:

- Incorporating cycling and pedestrian needs into the design of larger projects;
- Integrating cycling and pedestrian areas in street design to improve local amenity; and
- Investing in localised networks.

Recommendation 7.4:

Where this has not already begun, state, territory and local governments should demonstrate integration of active transport strategies through transport and land-use planning. Governments should provide active transport that is connected, accessible and safe, and encourage shifts to more efficient, sustainable transport options to improve transport sustainability and provide greater public amenity.

Box 7.3: Active transport strategies: Lessons from overseas

Transport strategies should integrate options for walking and cycling within broader networks. This maximises the value of investments in active transport infrastructure, improves the affordability of transport and reduces demands for other forms of transport infrastructure. Major cities across the world have delivered cost-effective sustainability and network-efficiency benefits from targeted investments identified through integrated active transport strategies.

London: Transport for London’s *Vision for Cycling* sets out a plan for a city-wide, interconnected cycle network – including high-capacity ‘superhighways’ for fast, direct commutes and back-street ‘quietways’ for local communities. The network has been designed to work alongside key Tube, rail and bus routes with clearly marked radial and orbital cycleways. Bike-sharing facilities across the cycling network promote active transport for tourists and occasional cyclists. The Plan aims to double the number of people travelling by bike and transforming urban spaces within 10 years.¹²²

Portland: Portland Bureau of Transport aims to make cycling more attractive than driving for trips of less than three miles (approximately five kilometres), leading to a cycling mode share of 25 per cent by 2030. The *Bicycle Plan for 2030* establishes a bikeway network, supported by policies to improve safety and uptake – including installation of bike parking, intersection and signalling upgrades, school education programs and updating building standards to accommodate bike facilities.¹²³

Singapore: Singapore’s *Land Transport Master Plan* integrates active transport within the broader transport strategy. The plan aims to improve connectivity, safety and health through construction of a 700-kilometre network of cycling paths and an extensive network of above and below-ground pedestrian paths. The plan focuses on promoting cycling for short commutes and recreation, with users encouraged to plan trips through a mobile application. Pedestrian links connect metro train stations to local developments and amenities. This improves safety for pedestrians, reduces road congestion and creates new commercial opportunities in combined transport and economic hubs.¹²⁴



Our infrastructure networks must be resilient to dynamic risks

Australia's infrastructure has long been exposed to extreme conditions. Floods, droughts, bushfires, cyclones and high temperatures have influenced the design and operation of our networks.

But what has been considered 'extreme' has shifted over recent decades. Our infrastructure is threatened by increasingly frequent and intense weather events, extended periods of high temperatures, floods, droughts, accidents and threats of terrorism. As noted in the Audit, the Bureau of Meteorology and CSIRO forecast – compared to the period 1980 to 1999 – climate change is likely to result in:

- More frequent and intense extreme daily rainfall for most regions;
- Rising temperatures, with more hot days and fewer cool days;
- A rising sea level;
- More frequent extreme fire weather days; and
- Lower annual average rainfall in southern Australia, with an increase in droughts.¹²⁵

Accordingly, some infrastructure is no longer fit for purpose, with design standards failing to keep pace with the resilience needs of a changing world. Infrastructure planners, operators and regulators need to evaluate these risks, and adapt our networks and response planning.

Resilient infrastructure is important, especially when networks are most stretched. Access to safe, reliable and connected infrastructure networks during disruptive events assists emergency services to respond quickly and effectively. Resilient infrastructure minimises the social, economic and environmental impacts of these events, helping communities to withstand or recover quickly from disruptions.

As a general rule, risks should be managed by those best placed to do so. However, the risks to infrastructure or the implications of failure may extend beyond a single asset. During extreme events, the capacity for infrastructure to continue operating and not trigger cascading failures across other networks is critical to supporting emergency services and recovery efforts. Governments should ensure

that effective mitigation strategies are in place for all infrastructure networks and, where necessary, partner with private owners and operators to provide incentives to strengthen resilience where specific vulnerabilities extend beyond the control of any single entity.

Improving network planning, design and maintenance to build resilience

Changing risks at a global and local level expose the complexity and fragility of our interconnected infrastructure networks. Too often this complexity is not reflected in how our infrastructure assets are designed and delivered. This can have very real costs, which may become evident during a major disruption.

Projects should be scoped, selected and delivered on the basis that they strengthen the network, and that they reliably deliver services over their economic life. Collaboration between governments, infrastructure operators and emergency service providers will help ensure networks withstand or recover quickly from serious disruptions.

A lack of infrastructure resilience can undermine user confidence and investment certainty.

Greater collection and sharing of information on the condition and performance of infrastructure networks is critical to building confidence in the resilience of our infrastructure. Engaging with communities and industries allows infrastructure owners and operators – whether governments or private businesses – to more effectively identify and manage risks to networks. Where the resilience of infrastructure is improved, communicating changes to local people and businesses helps to build confidence in the reliability of services. This supports greater investment and growth in surrounding areas.

Improving the resilience of infrastructure will generally have a cost. But the costs of not adequately managing risks to our infrastructure assets and networks can be far greater. Major events like floods and bushfires not only impose repair and replacement costs, they can cause widespread losses of productivity and connectivity when infrastructure is unavailable.

“Managing risk in the built environment is crucial, as ill-considered decisions leave communities and critical infrastructure vulnerable to extreme weather events of increased incidence and severity.”

Consult Australia submission, 2015

Perfectly resilient infrastructure is neither possible nor productive. Our response to risks should be proportionate and efficient. We must accept that even resilient infrastructure will on occasion be negatively impacted by extreme events or conditions, and will fail in some circumstances. Resilience strategies should seek to minimise the impact of disruptions and restore services as quickly as possible in the case of failure.

Tools for assessing environmental and man-made risks to infrastructure assets are often disconnected from planning and costing processes. Attempts to achieve perfect resilience through project design – without consideration

of the most efficient response – can result in ‘gold-plating’ of proposed solutions, where the cost or scale of risk management components are not in proportion to the costs of potential disruptions posed by these risks.

Resilient assets generally require less frequent or substantial maintenance and renewal. Planning processes should encompass whole-of-life considerations. Constructing assets to be resilient to the effects of a changing climate can deliver lifecycle cost savings to infrastructure operators and owners. Users benefit from infrastructure that is more reliable, efficient and safe.

Recommendation 7.5:

Infrastructure owners and operators should develop and maintain strategies to improve the resilience of infrastructure, and minimise the costs of mitigating risks by considering resilience within whole-of-life cost projections. Regulators should ensure that responses to threats are proportionate and efficient. The costs of managing risks should reflect consumer preferences, balancing pricing and reliability considerations.



Improving the resilience of critical infrastructure services: Energy and water

Supplies of electricity, gas and petroleum should be resilient to extreme events, global market shocks and changing climatic conditions. Energy is a fundamental input to businesses and households across the country. Resilient energy networks are essential to supporting economic growth and quality of life.

Achieving the appropriate level of risk mitigation relative to cost is important. Compliance with reliability standards and asset augmentations to cater to peak demand, have resulted in significant price increases for consumers. Electricity regulators should ensure that network redundancy is balanced by consumer preferences for cost and reliability.

Australia's economy is highly dependent on imports of crude oil and petroleum. Liquid fuel supply is managed on a daily basis by the Australian fuel industry. Evolving risks to supply, such as geo-political tensions, piracy or broader supply chain disruptions, as well as changing patterns of demand, should continue to be closely monitored by the Australian Government.

The Audit noted that Australia does not enforce national requirements for oil companies to hold minimum stocks of petroleum in accordance with the 90-day stock level requirements of the International Energy Agency (IEA). In June 2015, the Australian Government announced its in-principle agreement to meet the 90-day stockholding obligation and will advise the IEA in mid-2016 of its plan to comply.¹²⁶

The domestic supply of gas is largely determined by market mechanisms. Development of export capacity from the east coast gas market will expose domestic markets to global prices, potentially leading to price rises for east coast consumers. Governments should maintain a role of strategic oversight to ensure gas markets continue to provide reliable supply to consumers.

Substantial progress in water management has been made over the past two decades, with prolonged periods of water scarcity helping to accelerate important reforms. Water service providers have generally invested appropriately to improve security of supply and maintain existing assets.

Despite this progress, water is likely to become an increasingly scarce resource relative to demand.¹²⁷

During hot and dry periods, demand generally increases as supply decreases, with greater need for water to be supplied for irrigation of crops, parks and gardens. This trend exacerbates water shortages, and can only be partly mitigated through water use restrictions.

The Audit found that regulation of the water sector is fragmented and may not effectively protect the long-term interests of consumers. Responding to the challenges of Australia's changing climatic conditions will require long-term planning and coordination between service providers and governments.

Diversifying supply through non-rainfall dependent sources, such as desalination plants, may improve resilience in urban areas during periods of drought. These facilities represent a significant cost to users, both to construct and operate. Desalination plants only provide part of the solution to improving Australia's water security, but represent an effective means of managing some water supply risk.

Recommendation 7.6:

Australia's energy and water supplies should be resilient to market and environmental changes and risks. Governments should maintain oversight of energy and water markets to ensure the incentives of service providers in managing risks are appropriately aligned with consumer needs.



Remote and Indigenous Communities

Implement infrastructure solutions that are well-coordinated, make use of new technology, and support broader reforms to make remote and Indigenous communities more resilient and sustainable

Infrastructure should provide a strong foundation for all Australians. But for remote and very remote communities – which are characterised by small populations, long distances by road to population centres and poor access to services¹²⁸ – there are distinct challenges.

Many remote and very remote communities lack reliable energy supply, quality telecommunications, clean water and wastewater services, and adequate road access. These are difficult infrastructure challenges. Extreme weather puts more pressure on infrastructure. Low population densities result in higher per capita construction and maintenance costs. Long distances drive up transport costs for people and freight. High demand for tradespeople over large and widely-dispersed areas leads to shortages in services. This affects health, education and other social services, and makes it harder to sustain an economy to support jobs.

Remote and very remote Australia makes up close to 90 per cent of our land mass but is home to only three per cent of Australians.¹²⁹ Sixty per cent of our mines operate

in remote Australia, along with important tourism, pastoral operations and other industries, generating around \$90 billion in income per annum.¹³⁰

Remote and very remote areas are particularly important for Indigenous Australians. Approximately 143,000 Indigenous people – or one in five – live there, compared to one in 50 non-Indigenous.¹³¹ The more remote the community is, the higher the representation of Indigenous people. In total, there are around 1,200 remote Indigenous communities, mostly in northern Australia and north-west of South Australia. They often have fewer than 100 people and are generally no more than around 1,000 people (see Figure 8.1).

Indigenous communities in remote areas face many of the same infrastructure challenges as remote communities more generally. Rather than comment on remote Indigenous policy, Infrastructure Australia is better placed to advise on remote infrastructure solutions. With the right solutions, all remote communities will benefit.



Governments should continue to work with remote communities to develop, implement and maintain their infrastructure. This includes better coordinating and pooling funding across governments and business and by tendering out the provision of infrastructure services to attract more private sector innovation.

Finding ways to integrate new technology into infrastructure delivery, particularly energy and telecommunications, will deliver more reliable and

affordable infrastructure that supports new opportunities for remote communities.

Infrastructure investments should also be tailored to support broader reforms that increase economic opportunities for communities. These reforms include recent COAG and Australian Government-proposed actions that aim to improve land administration and use, support Indigenous-led economic development and create greater certainty for private investment in remote areas.

What the Audit found

- Poor approaches to the delivery of essential infrastructure services often result in duplication and a lack of coordination across agencies.
- Infrastructure has the opportunity to provide economic development opportunities and social outcomes by improving access to education, health and employment services, and build stronger links with the rest of Australia.
- Individual communities should play a central role in determining their infrastructure priorities.
- The NBN is expected to materially improve the capacity of households in remote regions to access essential services and expand social opportunities.
- Underinvestment in the maintenance of local roads in remote areas is reducing the ability of these networks to provide a reasonable level of service.

Coordinate resources to deliver better remote infrastructure

Infrastructure exists to provide services. Essential infrastructure services such as water, wastewater and power in remote and very remote communities involves different levels of government, multiple public sector agencies and non-government organisations. Better coordination and greater clarity of roles will increase the effectiveness of this investment and the services they provide.

Integrate essential service delivery and associated infrastructure investments

Federal, state and territory governments have invested billions of dollars to deliver infrastructure support in remote essential services.¹³² In the past, responsibility for service provision in remote communities has been unclear. As a result, there has been much duplication and inconsistency.

In many cases, governments and communities have worked together to devise local solutions for local problems. However, there is room to improve the quality of infrastructure, particularly for water, wastewater and power.

Many remote Indigenous communities experience a lower standard of essential infrastructure services compared with non-Indigenous communities of a similar size and location. In many remote Indigenous communities:

- State, regional and local government planning processes and regulations to oversee land use and development, service delivery, and building and construction codes are either not in place or are not enforced; and
- Stable revenue streams from rates and user charging are unavailable which contributes to poor asset management practices, and exacerbates infrastructure capacity and reliability issues.

Governments have recently agreed to a more streamlined approach to funding municipal and essential services

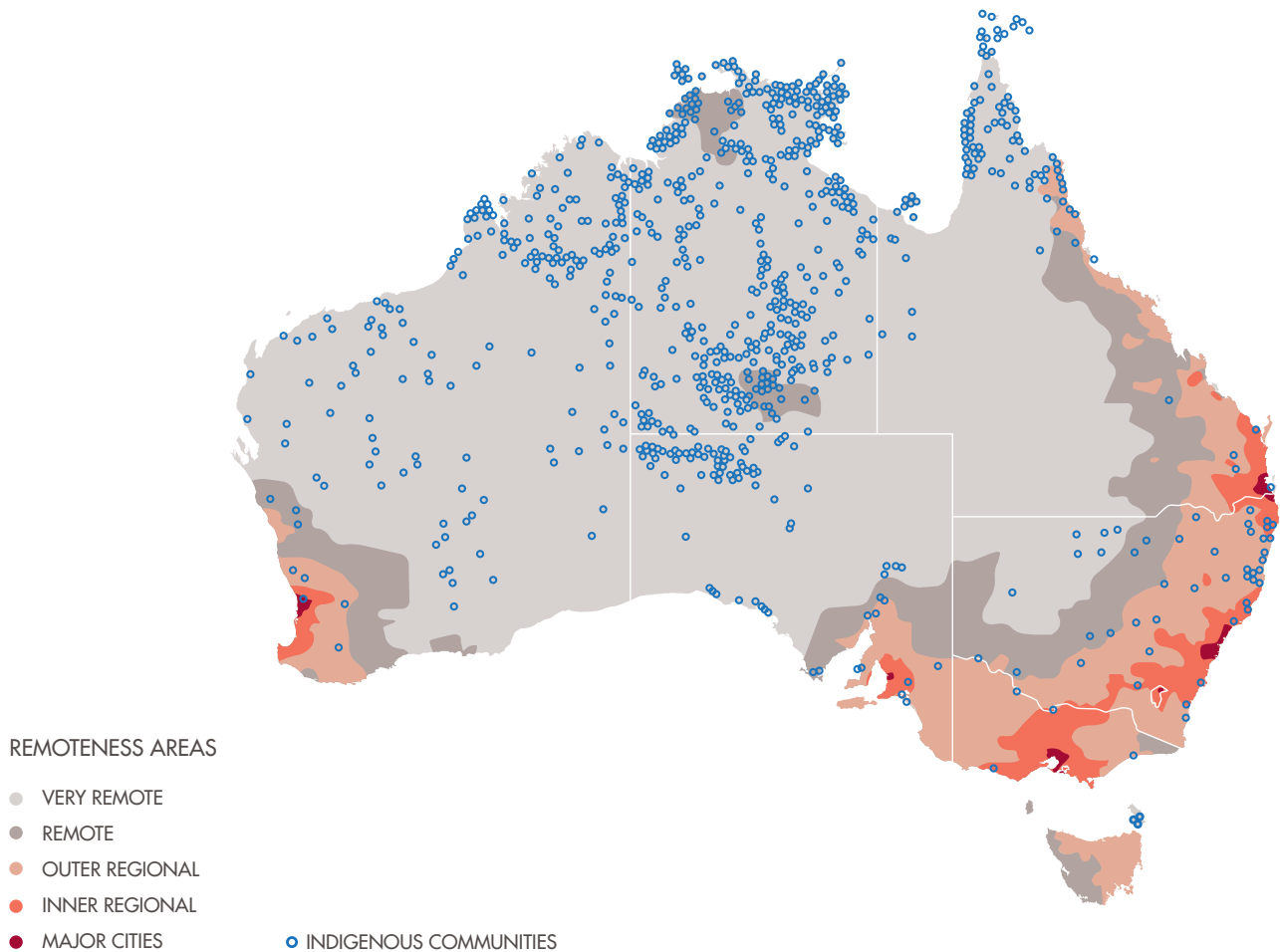
in Indigenous remote communities. All states and the Northern Territory are now responsible for the provision of these services. The Australian Government provided funding to assist with the transition of responsibility, but no longer has a direct service provision role. However, the Australian Government will continue to fund services in the Anangu Pitjantjatjara Yankunytjatjara Lands until responsibility can be transferred to the South Australian Government. As this reform progresses, there is expected to be greater integration of essential service delivery and associated infrastructure investment via existing local government frameworks.

With time, the success of these reforms can be measured by their contribution to improving essential services in remote areas and the infrastructure that supports them. To this end, more streamlined governance arrangements, combined with an increased state and territory government focus on service delivery, should provide a stronger foundation for remote community planning over the longer term. It will also support a more strategic and coordinated basis for considering infrastructure investments to support the economic resilience of remote communities.

“While Australia’s cities have important infrastructure needs, because regional and remote communities often face unique challenges such as transport and locational disadvantage, their infrastructure discussion and priorities need to be considered.”

Australian Council of Social Service
submission, 2015

Figure 8.1: Indigenous communities in remote and very remote regions



Note: This map shows Indigenous communities in remote and very remote regions, some of which are geographically small and isolated and can be part of broader regions classified as non-remote. It is not a reflection of how the Indigenous population is dispersed nationally.

Source: Australian Bureau of Statistics, 2006¹³³

Tailor delivery of remote infrastructure following best practice principles

Despite recent reforms, service providers in remote communities still face the substantial challenges and costs associated with servicing large remote areas. Construction costs in remote locations are typically at least double those of non-remote locations.¹³⁴ This is mostly due to:

- Distances from sources of building materials and a lack of competition;
- Shortage of local tradespeople and the high costs of labour;

- Poor economies of scale in purchasing;
- Higher labour costs from having only a six to seven-month construction season due to the wet season in northern Australia; and
- Limited or no accommodation for workers available.¹³⁵

Governments can improve value for money during project delivery by building infrastructure with a more coordinated package of investment or construction. Examples of better integration would see housing, health, education and essential infrastructure projects delivered as coordinated packages (see Box 8.1).

Box 8.1: Infrastructure Priority List: Provision of essential services to remote Northern Territory communities (Wadeye, Tiwi Islands, Jabiru)

This *Infrastructure Priority List* initiative seeks to address the current limited available infrastructure services for a number of remote Northern Territory communities. It proposes pooling essential services infrastructure to improve water quality and wastewater management, along with upgrades to roads that provide access to three remote regions.

- The Arnhem Highway, which connects Jabiru in the Kakadu region to Darwin;
- The Daly River Road, which connects Wadeye (Port Keats) and other remote communities to the Stuart Highway; and
- The Tiwi Islands.

The Arnhem Highway and the Daly River Road can be severely affected by floods during the wet season, severing land transport access for remote communities for extended periods of time to metropolitan centres, such as Darwin, and also between and within local communities. This affects access to health and education services, and restricts business access. The Arnhem Highway is also used by mining companies and the defence force and is a popular tourist route into Kakadu National Park. Approximately 4,100 vehicles use the corridor each day, making it one of the busiest corridors in the rural arterial road network. The 280 kilometres of road on Melville Island (the Tiwi Islands) offer little or no immunity to floods.

Investments in water storage and sewerage management will improve the liveability, sustainability and resilience of numerous remote communities. The road upgrades will reconstruct low-lying sections of roads susceptible to inundation, reducing the incidence of road closure due to flooding. Providing year-round access for freight will increase the reliability of freight movements, supporting tourism and other industries.

Infrastructure Australia has identified a set of principles to coordinate the delivery of remote infrastructure investments. These principles act to better pool and coordinate resources, reduce duplication, and deliver more effective and sustainable remote infrastructure. Principles for delivering remote infrastructure are:

- Community expectations and objectives about infrastructure should guide decisions on when, where and how to invest in remote communities;
- Identifying infrastructure needs and developing plans for remote communities should involve government agencies and service providers sharing information as well as early and effective consultation with Indigenous land owners;
- Planning agencies within and across jurisdictions, working with communities, should establish common goals and agreements to identify infrastructure gaps, duplications or inconsistencies in remote communities;
- Different government agencies and service providers should pool resources for infrastructure projects and, where possible, co-locate within a single location;
- Different levels of government should establish joint purchasing and resource sharing procurement frameworks to deliver essential remote infrastructure; and
- Governments should consider pooling funding and tendering services to the private sector where possible, tailored to local conditions.

Bring private sector innovation to remote community infrastructure

A potentially cost-effective way to deliver essential infrastructure is tendering for private provision using funds provided jointly by Australian and state and territory governments. This would promote innovation in service delivery through a competitive model and provide a platform to deliver integrated infrastructure packages.

Poor contracting, agency oversight and, in some cases, a lack of basic information about communities, have led to governments sometimes over-paying for services that are not of an acceptable standard.¹³⁶

A more competitive tender approach would establish clear service level targets in remote areas, using existing government Indigenous procurement policy where appropriate.

Governments and communities should consider aggregating service needs across multiple communities and putting these to tender – for example, the delivery and maintenance of water and sewerage infrastructure or investing in renewable off-grid technologies.

Aggregation is already happening in some areas. For example, mining towns such as Roxby Downs (South

Australia), Weipa (Queensland), and the Pilbara (Western Australia) are aggregating smaller energy projects as demand grows for electricity as a result of fly-in-fly-out workers, along with a permanent population expansion in recent years.¹³⁷

This is particularly important for the provision of potable water infrastructure. Providing these services in remote communities is a significant challenge due to the high cost of service delivery to small, geographically-dispersed and very remote communities, along with labour constraints. As a result, in some communities, the quality and reliability of drinking water does not meet minimum standards. This places Australians living in those communities at an increased level of risk.

Achieving safe and secure water and wastewater service provision for all communities, irrespective of their location, should continue to be a priority for all governments. The *National Indigenous Reform Agreement* requires remote Indigenous communities to have standards of services and infrastructure broadly comparable with that in non-Indigenous communities of similar, size, location and needs elsewhere in Australia.¹³⁸



Jurisdictions are already taking steps to deliver more effective remote infrastructure through various delivery models. For example, Northern Territory Power and Water's not-for-profit subsidiary, Indigenous Essential Services, provides water, wastewater and power to 72 remote Indigenous communities.¹³⁹

Aggregating service needs across multiple remote communities and putting these to tender will also:

- Create more certainty for communities and service providers;
- Facilitate greater involvement of remote communities and service providers in the design and implementation of essential infrastructure programs;
- Support having a publicly-stated long-term measurable indicator of success that aligns with COAG's commitment to better quality remote community infrastructure; and
- Reduce compliance costs and increase efficiency of tendering, contract and reporting requirements.

A similar approach could be adopted for communities elsewhere. For instance, bores supplying drinking water to some remote communities in the Anangu Pitjantjatjara Yankunytjatjara Lands in northern South Australia are approaching the end of their life.

Recommendation 8.1:

To improve planning, coordination and delivery of infrastructure investments in remote and very remote regions, governments should:

- Commit to the ongoing integration of essential service delivery and associated infrastructure investment via existing local government frameworks, along with an increased state and territory government focus on service delivery;
- Draw on best practice principles for delivering remote infrastructure by working with communities, sharing information, developing common goals, pooling resources, developing and implementing consistent procurement frameworks and adopting performance benchmarks based on community expectations; and
- Consider tendering the provision of economic infrastructure services and assess the merits of pooling investments across communities to establish scale and attract more private sector interest and innovation – for example, tendering water and wastewater infrastructure services in suitable clusters of remote and very remote areas to increase quality to minimum standards and extract greater value for money.



Prioritise innovative approaches using new technology

Technology creates new opportunities for remote communities to be more resilient and to better connect with the rest of Australia and the world. For example, smart grid and renewable energy projects are already supporting an increasing number of remote communities and could support hundreds more in the coming decades. Also, the NBN will link communities to higher quality opportunities for employment, health care, and education.

Transitioning away from diesel generators

Many remote communities rely on diesel generators for electricity supply. Diesel has to be trucked in long distances for the generators, which are costly to operate. In the north diesel deliveries are subject to variable weather conditions and possible road closures for more than half the year.

Since 2002, the Australian Government has delivered and maintained around 240 renewable energy systems in about 210 communities.¹⁴⁰ With the increasing affordability of renewable energy, and the small size of remote communities, governments should continue to support a transition toward

renewable energy with the aim of replacing diesel generators in remote communities where practical and affordable. The objective should be to integrate these technologies into existing diesel power stations to help reduce remote communities' reliance on diesel. In the longer term, diesel generators should be replaced altogether.

Governments are already taking important steps. For example, ARENA is partnering with Indigenous Essential Services to deliver 10 megawatts of solar PV to more than 30 remote communities. This will reduce overall reliance on diesel by around 15 per cent. In one community, Nauiyu (Daly River), it could cut the current use of diesel by half (see Box 8.2).¹⁴¹

Under new municipal and essential services arrangements for remote communities, state, territory and local governments are well-placed to work with communities to help them move towards renewable energy options. Solutions should be tailored to the different size of communities given they vary from fewer than 10 people to over 1,000 people. This should also include training of remote communities to maintain such infrastructure.

Box 8.2: Renewable energy to support remote communities and industries

Rio Tinto and ARENA recently commenced Australia's first remote mine-based commercial solar plant in the Western Cape York Peninsula in Queensland, where there is no connection to the electricity grid. The plant will generate electricity for Rio Tinto's Weipa bauxite mine, processing facilities and township. At peak output, the 1.7 megawatt solar plant has the capacity to generate sufficient electricity to support up to 20 per cent of the township's daytime electricity demand. The solar plant will help save up to 600,000 litres of diesel each year.¹⁴²

The Pilbara Meta Maya Regional Aboriginal Corporation (PMMRAC) provides essential services to 29 remote Indigenous communities across 600,000 square kilometres of northern Western Australia. It recently installed 100 kilowatts of solar PV, a 70-kilowatt-hour battery system and a 40-kilowatt diesel generator. This system is off the grid and generates and stores all the energy required by PMMRAC's offices, workshop and depot in Port Hedland. According to the project developers, the cost of the project will be recovered in five years. The project is being used to develop local skills and knowledge in new technologies that can be applied to the remote Indigenous communities (as well as mining camps and pastoral stations) that PMMRAC supports. These communities currently rely solely on diesel generation for their energy.¹⁴³

Recommendation 8.2:

Renewable energy should replace diesel generation in remote communities wherever it is affordable and efficient to do so. Electricity service providers, communities and governments should work together to find cost-effective options for renewable energy generation. This will improve the reliability and self-sufficiency of energy supply to remote communities, reduce costs of fuel and its transportation, and support training of local communities in the operation and maintenance of generation facilities.

The NBN satellite solution will have the capacity to support high-bandwidth two-way applications for tele-health, education and videoconferencing. Notwithstanding new NBN capacity, other barriers will limit the adoption of new services. Remote residents may not be able to afford the cost of equipment and services or lack experience with computers and web services.

In response, governments should work with communities to invest in digital literacy, skills development, technical support, cost-sharing mechanisms, and development of culturally-relevant content and applications. This is already happening in some jurisdictions.

Taking advantage of telecommunications technology

Effective telecommunications are essential for remote communities. In the transition to e-government and online service delivery and retail, high-speed broadband can provide remote communities with access to services that urban populations have easy access to, such as health and education, banking, libraries, news and entertainment and shopping.

The rollout of the NBN presents an opportunity to link remote communities to social and business networks. This is particularly important for remote Indigenous households, the majority of whom have no or limited access to the internet.

Recommendation 8.3:

Governments should develop coordinated strategies with remote communities to remove barriers and maximise the benefits of the National Broadband Network and the opportunities it enables for households and businesses. These plans should consider the necessary support and training that communities require to take advantage of health, education and business opportunities via the National Broadband Network.



Partner with communities to identify infrastructure requirements

The potential for infrastructure to support remote communities is greatest when it can facilitate economic development opportunities by improving the business environment, promoting entrepreneurship and increasing home ownership.

Investing in infrastructure to support remote economic infrastructure

Remote infrastructure investments can help communities become more economically-independent.

To date, some investments have not built economically-sustainable communities. Linking infrastructure investments to address identified needs and opportunities for economic development will build community resilience. As a first step, this requires consultation with communities, investors and Indigenous land owners.

Governments could support remote communities to better participate in the mainstream economy by targeting investments towards addressing infrastructure gaps that realise the full value of Indigenous land. Many remote communities are on or in the vicinity of land held by Indigenous people under statutory land rights regimes or native title. This asset base has not reached its potential in supporting the economic independence of Indigenous people and remote communities.

One of the issues considered by the *COAG Investigation into Indigenous Land Administration and Use* is how governments can better support economic development on Indigenous land through ensuring there was adequate investment in the basic building blocks of land administration, including essential services infrastructure.¹⁴⁵ The absence of infrastructure imposes high start-up costs on proponents seeking to invest and do business on Indigenous land.

The Australian Government is working with remote communities to support Indigenous people use their land for economic development and home ownership. For example, township leasing and better land planning arrangements have provided the basis for long-term, transferable interests in Indigenous land in the Northern Territory. This is helping attract private sector investment. It has also created land administration arrangements that give more confidence to business and financial institutions.

The Queensland Government is also continuing to work with Indigenous communities on reforms to enable long-term tradeable leases to be granted and converted to freehold where desired by Indigenous communities, largely in remote areas.

Carefully-targeted infrastructure will further support these economic reforms and help remote Indigenous communities develop new home ownership arrangements and increase economic opportunities.

Recommendation 8.4:

Governments should consider infrastructure investments that support reforms to increase the economic independence of remote

Indigenous communities. Reforms should take into account the findings and recommendations of the *COAG Investigation into Indigenous Land Administration and Use*, and draw on the *Commonwealth Indigenous Procurement Policy* and the *White Paper on Developing Northern Australia*'s commitment to piloting land tenure reforms and improving land administration.

“To allow Indigenous land use to fulfil its potential, government needs to support Indigenous people in their economic initiatives and to work with Indigenous people and their representative organisations to remove or reduce the barriers which prevent entry into the mainstream economy.”

COAG Expert Indigenous Working Group, 2015 ¹⁴⁴

Using local expertise to sustain infrastructure investment

Governments spend billions maintaining and upgrading remote communities.¹⁴⁶ It is difficult to ascertain how much of this expenditure has resulted in employment for local people. Employing locals to maintain those investments can help sustain infrastructure.

Services for remote communities are most effective when the community is involved in both their planning and implementation. Indigenous leaders, community members, and other local service providers can help identify the infrastructure needs of the community.

Some jurisdictions are drawing on more local people for specific transport infrastructure projects in remote communities. For example, the Australian Government recently committed to working with northern jurisdictions to achieve Indigenous employment and/or supplier use target for roads and other projects involving the transfer of Australian Government funding in the north.¹⁴⁷ The South Australian Government has also committed to ensuring that at least 30 per cent of the total labour hours spent on the Anangu Pitjantjatjara Yankunytjatjara Lands access project will be undertaken by the local Anangu people.¹⁴⁸

Where governments consider aggregating service needs across multiple remote communities and putting these to tender, communities should also be central to the design and implementation of these programs.

The Australian Government's *Indigenous Procurement Policy* has a target that three per cent of all new domestic federal government contracts will be awarded to Indigenous businesses by 2020, reflecting the projected proportion of Indigenous adult working age population in 2020.¹⁴⁹ This will contribute to growing Indigenous businesses and increasing employment through remote infrastructure procurements. It will also provide a procurement approach for jointly-funded projects across governments.

Recommendation 8.5:

Governments and private sector proponents should liaise with remote communities to better understand unique local characteristics and ensure infrastructure projects best meet their needs. Remote communities can identify priority needs and suitable approaches to implementation tailored to local circumstances.

Better Decisions and Better Delivery



Governance

Establish a culture of infrastructure decision making guided by long-term planning, rigorous evidence and transparent engagement with the community

Good governance – that is, the processes and institutions that set infrastructure policy and determine the planning and selection of investments – has a fundamental impact on the benefits delivered by infrastructure.

By international standards, Australia has a strong record of delivering high-quality infrastructure with robust governance arrangements, but instances of poor project selection and weak governance continue to occur. Recent history shows governments committing to investments before completing long-term planning or rigorous economic analysis; favouring large ‘iconic’ projects over smaller, often higher value, investments; and not releasing the full business case for multi-billion dollar projects.

In addition, a lack of transparency and genuine community engagement has undercut public confidence in governments’ ability to make the best investment decisions. This makes it harder to build community support for future investments and complex reforms that will be required to meet Australia’s infrastructure needs.

The consequences of oversights can be substantial because investment in public infrastructure is so significant. The Productivity Commission has estimated that engineering construction work done for the public sector has been equivalent to more than two per cent of GDP per annum since 2008.¹⁵⁰ Major city-shaping projects, such as a new railway line or motorway, can cost many billions of dollars. Failure to select the best solution can inflict a considerable cost on taxpayers.

We cannot afford these mistakes. The rising budgetary costs of an ageing and growing population will limit the funds available for infrastructure. We must therefore extract the maximum value from our investments and existing networks.

Strong and effective governance arrangements will ensure that the substantial funds allocated to infrastructure are directed towards those projects that deliver the highest value for the community.



We need to replace short-term thinking with a culture of long-term planning and transparent, evidenced-based decision making. We can do this by increasing the delivery and quality of integrated infrastructure planning, stakeholder engagement and project development studies. At the same time, we should preserve corridors and strategic lands for future investments.

Over the medium to long term, we should modernise the processes and institutions that underpin Australia's infrastructure investment decisions. The development and implementation of *National Governance Principles* would improve the quality and transparency of infrastructure decision making.

What the Audit found

- Rigorous project selection is fundamental to boosting economic activity and supporting productivity growth. Investment in poorly conceived projects can undermine a country's economic prospects.
- The failure to preserve corridors can lead to significantly higher construction costs.
- Improvements in long-term planning, project appraisal and project selection are necessary if Australians' infrastructure expectations are to be realised.
- Australia needs integrated infrastructure and land-use planning, across all levels of government.
- Sound infrastructure planning requires an ongoing commitment to engage communities throughout the decision-making process. This improves the likelihood of meeting community needs and expectations, and reduces objections to development.

Deliver long-term integrated infrastructure plans for every state and territory

By taking a long-term view (15 years and beyond), governments can better plan for changes in demand for infrastructure, identify emerging challenges and establish a pipeline of well-conceived infrastructure reforms and investments.

To be effective, planning should be integrated across different infrastructure sectors and networks, and aligned with broader land and economic development. Investments within one particular sector should be considered in the context of whole-of-government infrastructure responsibilities. For example, the delivery of a new hospital cannot occur in isolation, but should be supported by upgrades to the surrounding energy, telecommunications, water and transport infrastructure.

Long-term planning should not simply be a list of capital investment intentions. Though new construction will be required to support growing populations and changing demographics, strategic planning should also consider how to better use the infrastructure asset base we already have, and explain to the community the reforms required to deliver new investments.

The certainty created by long-term planning and the resulting pipeline of investment, increases the quality and reduces the cost of infrastructure. A well-developed long-term plan will limit the influence of short-term thinking by providing decision makers with a robust evidence base from which to identify future infrastructure priorities.

Long-term planning will generate confidence across the infrastructure sector regarding governments' ability to commit to and deliver projects. Confidence is particularly important for infrastructure, given the long construction periods and vast capital requirements often associated with investments.

It presents government with an opportunity to preserve strategic lands and corridors for future investments, which will typically lower the cost of delivering projects over the long term and make some future projects viable that would otherwise be unviable. The establishment of a pipeline of future investments, as a result of rigorous long-term planning, provides the public and private sectors with the necessary information to effectively plan and coordinate their resources.

“A lack of long-term strategic planning, coordination, integration and cooperation between levels of government and between different authorities remains a severe constraint on Australia’s infrastructure.”

Engineers Australia submission, 2015

Ensure the consistent delivery of long-term strategic planning

Australia has a history of undertaking infrastructure planning (see Box 9.1). However, in recent times the delivery of planning has been sporadic. While most state and territory governments have developed infrastructure plans, the depth and scope of these exercises have been of varying quality and completeness. Moreover they are rarely integrated with land-use planning.

Australia must instil a culture of long-term planning to deliver infrastructure that will serve current and future generations. These plans should take a long-term view (15 years and beyond), and be updated on a regular basis to ensure that infrastructure planning remains current and responds to emerging challenges. To be effective, these plans should also be integrated with corresponding planning exercises, including the delivery of regional plans (discussed in the **Regional** chapter) and metropolitan land-use planning (discussed in the **Population** chapter).

Governments should continue to develop the specialised skills and institutions required to deliver and implement long-term planning. The recent establishment of state-based infrastructure advisory bodies – including Infrastructure NSW, Infrastructure Tasmania, Building Queensland and Infrastructure Victoria – has strengthened infrastructure planning and decision-making processes. While each advisory body is different, they lend a more strategic focus to planning and project evaluation. In jurisdictions where advisory bodies have not been established, governments should consider what role a similar organisation could play in establishing a consistent and robust long-term planning process for their infrastructure.

Box 9.1: A history of long-term planning by past governments

Victoria: Victoria has had numerous land-use and transport plans since 1929, each of which has effectively built on the previous plan. The 1954 *Melbourne Metropolitan Planning Scheme* aimed to limit the sprawl of urban Melbourne through land-use zoning, and provided for future infrastructure needs through the reservation of land. As a result, access to the city from southern and eastern suburbs was improved through completion of the King Street Bridge and the South-Eastern Freeway. The 1969 *Melbourne Transportation Plan* proposed a significant freeway network, much of which has now been completed. It also recommended the underground city rail loop, which moved into construction after the Plan's completion and began operation in 1981.¹⁵¹

New South Wales: The 1948 *County of Cumberland Plan* (see Figure 9.1) is commonly regarded as Sydney's first metropolitan strategy. It laid a platform for Sydney's future development. The Plan outlined a long-term vision for Sydney, partly through the preservation of land corridors which today comprise the Sydney Motorway Network. Aspects of the Plan have proved resilient, with components of the strategy delivered by governments with different political affinities.¹⁵²

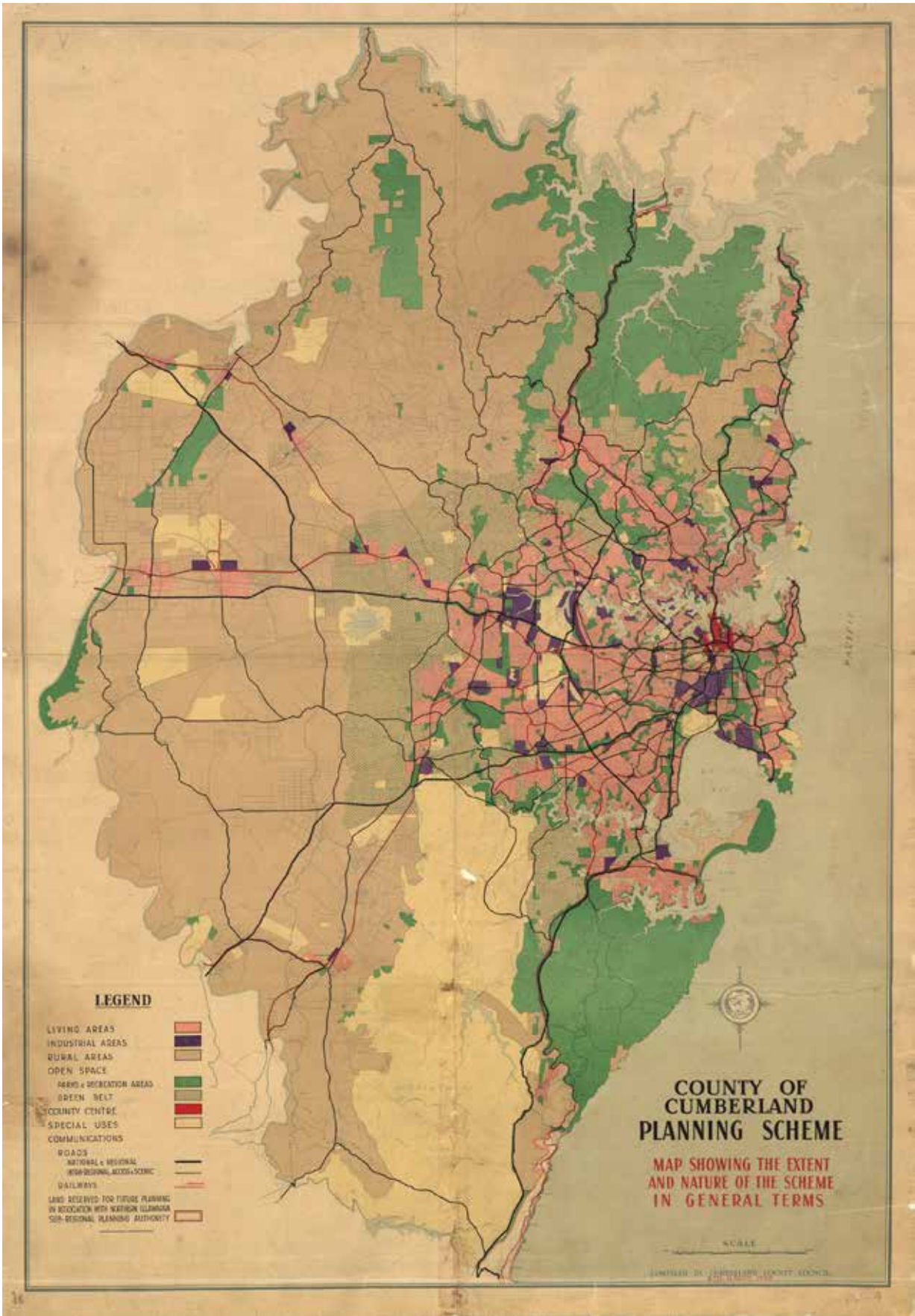
Western Australia: The 1955 *Plan for the Metropolitan Region, Perth and Fremantle* was an integrated long-term plan for Western Australia's capital. The Plan included a regional improvement tax to pay for corridor preservation and the appointment of an independent expert body to manage the implementation of the planning scheme. Successive governments have continued to use and build upon the original plan.¹⁵³

Recommendation 9.1:

All state and territory governments should deliver long-term infrastructure plans. These plans should take a 15-year-plus view, be updated regularly and integrated with long-term land-use planning processes. By taking a long-term view of infrastructure, governments can better plan for projected changes in demand, identify emerging challenges and establish a pipeline of well-conceived infrastructure reforms and investments.



Figure 9.1: County of Cumberland Map



Source: Cumberland County Council, 1948¹⁵⁴

Long-term planning and project development needs to be informed by clear service standards

The Audit highlighted the need for public debate about infrastructure service levels, and the funding required to meet Australians' expectations for infrastructure.

Minimum service levels exist for some infrastructure, notably the telecommunications and water sectors. For example, there are *Australian Drinking Water Guidelines* (although these are not always mandatory) and, following the rollout of the NBN, an expectation of minimum download data rates.

Similar standards do not exist across all sectors and, where standards exist, they are not widely understood or debated. In particular, the funding implications of standards are not well-understood. Taxpayers, government and the users of infrastructure need to make informed decisions about:

- The level of service they can expect to obtain from the nation's infrastructure networks and the funding required to deliver that service level; and
- Competing priorities, including the trade-off between new investment and maintenance of existing assets and the trade-off between spending in alternative locations.

Service levels and their corresponding funding implications therefore need to be combined and applied throughout the infrastructure life-cycle, starting with an outcome-focused strategic planning process. In turn, the service levels and assessment of their funding implications should be used to inform subsequent project development efforts.

Recommendation 9.2:

Infrastructure service standards (both minimum and desired standards) should be used by all governments to guide future planning and project development.

The standards will need to be reviewed periodically, to reflect potential changes in the wider environment, changes in expectations, and changes in economic and financial circumstances.

Linking long-term strategic planning to community engagement processes

The establishment of a steady culture of long-term infrastructure planning is an opportunity to improve the value of community engagement.

Current consultation processes typically engage the community to a greater extent at the project assessment and delivery phases rather than at the earlier strategic phase. This has led to mixed outcomes, with the community often feeling that consultation is superficial, while leaving government and the private sector frustrated by delays.

If meaningful engagement occurred at the earlier phase (when long-term infrastructure plans are being developed and reviewed), governments could have raised the community's understanding of the infrastructure challenges and the proposed solutions. Stakeholders could be provided with a genuine opportunity to provide useful input into the process and, for example, to participate in the discussion about development-offset options and community safeguards.

Earlier and mutually-respectful engagement should raise the quality of planning and reduce later opposition to project approval and delivery. Governments can gain insights into community needs and tailor planning and investment accordingly. Users gain certainty about the timing of new infrastructure and the service levels it will provide; while the community is more informed about the problems that need to be addressed and is able to help find acceptable solutions.

Recommendation 9.3:

Alongside the delivery of integrated long-term infrastructure plans, state and territory governments should initiate an ongoing process of community engagement to discuss present and future infrastructure challenges and potential solutions. Engaging the community at the strategic stage of infrastructure planning engenders a greater understanding within the community of future challenges and reduces the likelihood of opposition resulting from a lack of genuine consultation.

Establish a mechanism to preserve corridors for future infrastructure investment

Corridor preservation is critical in translating long-term planning into infrastructure. Corridor preservation is a broad term covering the range of steps – planning, feasibility studies, land-use controls and funding arrangements – necessary to ensure that land is available to enable the efficient delivery of future projects.

While successful corridor preservation regimes have existed in the past, this is now rarely the case. Corridor preservation is often overlooked in government budgets in preference to funding other near-term priorities.

The failure to preserve corridors reduces the ability of governments to respond to infrastructure pressures and raises the cost of delivering future projects. Nor does the solution lie underground. It is estimated that tunnels – a necessary response to the failure to preserve corridors – can be eight to 10 times more expensive than surface alternatives.¹⁵⁵

We need to re-learn old corridor preservation skills, as was shown with the successful preservation of the corridor for Melbourne's EastLink Motorway (see Box 9.2 and Figure 9.2).

Box 9.2: Preserving the corridor for the EastLink Motorway

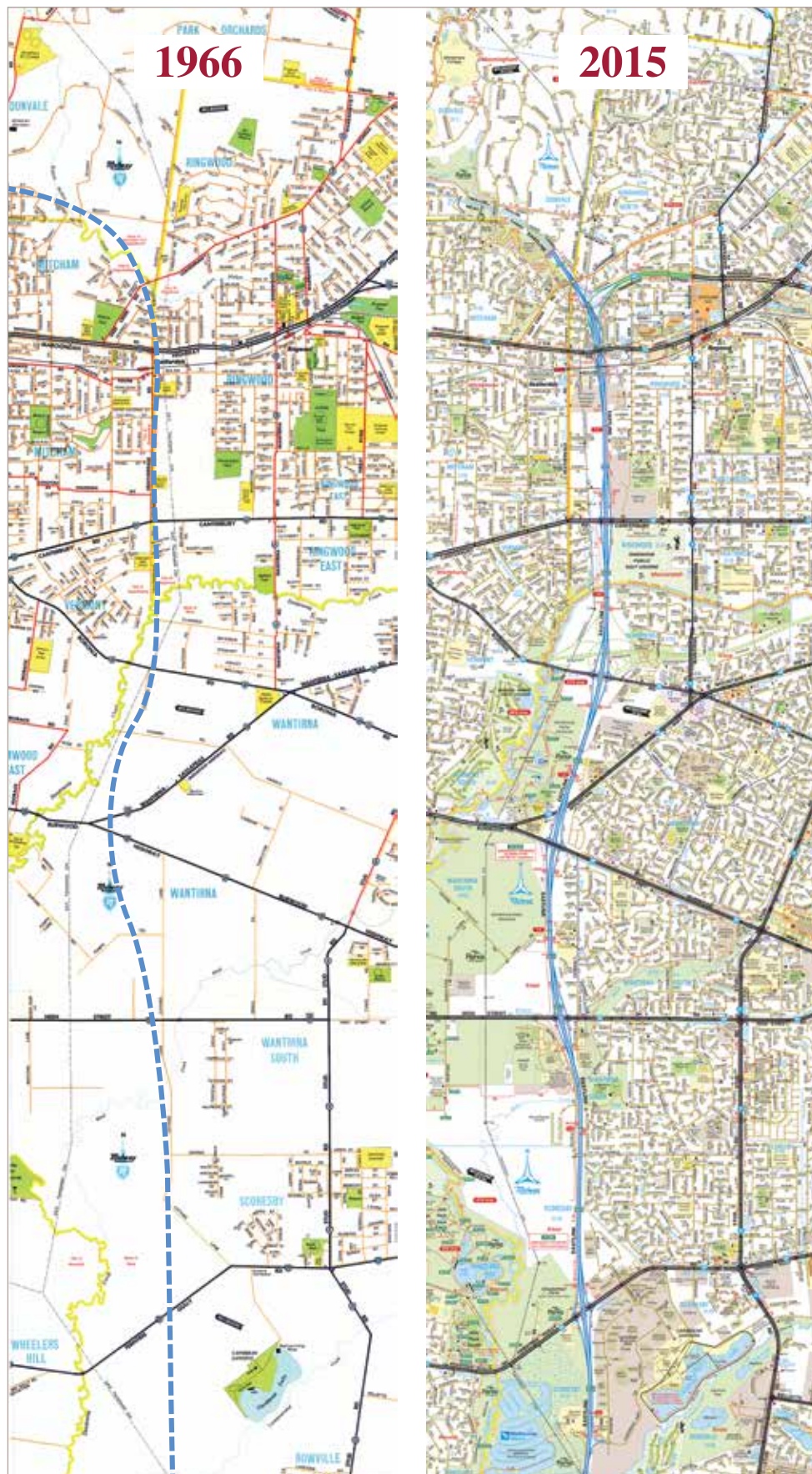
The EastLink Motorway in Melbourne, which opened in 2008, largely follows a corridor identified in the 1969 *Melbourne Transportation Plan*. Following publication of the plan, action was taken to protect the corridor from development that might otherwise compromise construction of the transport link.

In Figure 9.2, the extract from the 1966 edition of the Melway street directory shows the largely undeveloped tracts of land through which the future road would be built. As shown in the extract from the 2015 edition, much of the land adjoining the motorway has been developed over the last 50 years. In most cases, the land on which the motorway was eventually built was also suitable for housing and commercial development.

If corridor preservation measures had not been implemented, it is almost certain that the corridor would have been lost to competing uses. This could have prevented construction of the road entirely, or required acquisition of many homes, adding substantially to the cost of the road, and potentially jeopardising the viability of its delivery.



Figure 9.2: Value corridor preservation, illustrated by 1966 and 2015 maps of the EastLink Motorway



Source: Melway, 1966¹⁵⁶ and 2015¹⁵⁷

The implementation of a national approach to corridor preservation will ensure Australia's governments can deliver critical future infrastructure projects that would otherwise be prohibitively expensive.

A national corridor preservation strategy should feature:

- Strategic planning and project development to define long-term infrastructure needs (ideally a 50-year timeframe) and identify the necessary corridors;
- Stable and independent governance to ensure that the identification, protection and funding of corridors is undertaken in an objective manner, which balances the need to address nearer term priorities with the long-term interests of the community; and
- Shared financial responsibility between the Australian Government and jurisdictions so as to minimise the risk of individual governments failing to preserve corridors or reneging on agreements.

Corridor preservation will make future projects more affordable, increasing the likelihood they can be delivered when required. The *Infrastructure Priority List* provides

the first steps for a national approach, identifying an initial suite of nationally significant corridors that will be critical in coming decades (see Box 9.3).

Recommendation 9.4:

The Australian Government, in partnership with state and territory governments, should establish effective corridor protection mechanisms to ensure the timely preservation of surface, subterranean and air corridors, and strategic sites, for future infrastructure priorities. The mechanism should include:

- Long-term strategic planning and project development work to identify corridors and lands;
- A stable and independent governance framework; and
- Shared financial responsibility between the Australian Government and its state and territory counterparts.

Box 9.3: Infrastructure Priority List: East coast high-speed rail corridor preservation

A proposal to preserve the necessary land and corridors for a future Brisbane – Sydney – Melbourne high-speed rail line has been identified as a high priority initiative on the *Infrastructure Priority List*.

By 2061, 21.9 million people are projected to be living in Sydney, Melbourne and Brisbane (up from 11.6 million in June 2014). Without action, population growth on this scale, combined with increasing demand for inter-city travel, will place significant pressure on inter-city passenger transport services. This would adversely impact the productivity of some of Australia's largest economic centres.

Australia's governments should start planning now for how they are going to meet this future demand.

In 2011, the Australian Government commissioned a planning study into the feasibility of delivering an east coast high-speed rail line. Preserving the corridor is the next step. Key actions would include updating the work of the 2011 study (including re-confirming the corridor), identifying appropriate protection mechanisms, and working collaboratively with governments to establish a mechanism to fund preservation of the corridor.

Failure to preserve the corridor will almost certainly mean that the land is not readily available for development in the future. Strong population growth along the east coast makes it very likely that, in the absence of a suitable preservation regime the corridor will be encroached on by alternate land uses. This would increase capital costs and potentially jeopardise the initiative.

Create a rigorous evidence base to inform better infrastructure decision making

Proponents of new infrastructure which do not undertake the prerequisite project development work risk poor outcomes, preventing the community from accessing the infrastructure they require, and restricting economic opportunities.

Prior to investment decisions, governments should define the problem that needs to be addressed. Problems are identified through long-term integrated infrastructure planning and the analysis of strategic data sources such as Infrastructure Australia's Audit. Once the problem has been defined, early project development studies should then proceed. These include:

- *Strategic options assessments*: demonstrate the nature and scale of the problem(s) and identify solutions which may or may not involve the delivery of new infrastructure;
- *Feasibility studies*: undertake engineering, environmental and economic assessments to develop solutions into fully-scoped projects; and
- *Project business cases*: provide more detailed economic assessments, including cost-benefit analysis.

These studies help ensure the right infrastructure solution is selected and that benefits to the community are maximised. The importance of this work has been built into Infrastructure Australia's Assessment Framework methodology. The completion of high-quality project development work is a criterion for investment proposals progressing onto the *Infrastructure Priority List*.

Invest in project development studies to deliver the right decisions

Failure to complete rigorous options analysis or undertake appropriate feasibility studies risks projects being 'gold plated'. On the other hand, a poorly executed cost-benefit analysis increases the likelihood that a project fails to provide the promised benefits or meet community expectations.

To date, the consistency and quality of this work by governments has been uneven.

There have been several recent instances of governments announcing a project before detailed planning or economic analysis has been done. While the 'prerequisite' project analysis may occur at a later date, it is much harder to retain project flexibility once a specific solution

has been committed to. This increases the likelihood of a 'failed' project or inappropriate project scope.

Governments should increase funding for the delivery of early project development work for infrastructure proposals or policy reforms to ensure that decisions are guided by a detailed and robust evidence base. The Australian Government, in particular, should provide leadership by increasing the level of funding available to other jurisdictions for this type of work. State and territory governments should also increase their spending on rigorous planning and project development.

The updated 2015 *Infrastructure Priority List* includes a new category of nationally significant infrastructure investment – that is, 'initiatives'. These are priorities that have been identified to address a strategic infrastructure need, that nevertheless require further development and rigorous analysis to determine the most appropriate option to address that need. These proposals are preferred candidates for federal, state and territory governments to direct funding for project development work.

Recommendation 9.5:

Prior to deciding to fund an infrastructure investment, governments should undertake project development studies. This work will materially increase the quality of decision making through enabling the proponent to understand the problem that needs to be addressed; developing a range of options to address it; identifying the solution that will deliver the greatest benefit; and determining the best approach to deliver the project.

Recommendation 9.6:

The Australian Government, and state and territory governments should allocate increased funding for project development work for initiatives identified on the *Infrastructure Priority List*. These initiatives are priorities that have been identified by Infrastructure Australia as addressing a strategic infrastructure need, that nevertheless require further development and rigorous analysis to determine the most appropriate option to address that need.

Increase transparency and rigour in planning, project selection and governance frameworks

Project selection involves government initially identifying a problem, followed up with many other intermediate decisions, finally culminating in a signed contract for the delivery of a specific project.

Key decisions include:

- What is the problem that needs to be addressed?
Is an investment in infrastructure required?
- Can we address the problem wholly or partly by making better use of the infrastructure we already have?
- If not, what type of infrastructure should be provided?
- What outcomes should the infrastructure deliver?
- Where should the infrastructure be located?
- What is the best design for the infrastructure?

The Productivity Commission's 2014 *Public Infrastructure Inquiry Report* concluded that the governance arrangements for the selection of much of Australia's infrastructure are deficient and contribute to unsatisfactory infrastructure outcomes.¹⁵⁸ This conclusion was supported by the findings of the Audit.

Instances of poor project selection and governance include:

- Committing to a project ahead of undertaking appropriate investigative work or completing cost-benefit analysis;
- Limited public debate about the opportunity cost associated with proceeding with proposals;
- The tendency to favour large 'iconic' projects over smaller investments that can often deliver a higher benefit at a lower cost;
- Proceeding with a project, in spite of an unfavourable economic analysis; and
- Choosing to not release the full set of data and analysis that underpins an investment decision.

Increase the rigour and transparency of project selection and governance

Project governance frameworks are fundamental to ensuring that Australia's infrastructure investments deliver the best outcomes for the community. To be effective, project decisions must be supported by robust evidence and early community consultation, and be based on an objective assessment of what best meets the needs of the community.

Clear lines of responsibility and accountability ensure that decisions are undertaken in the public interest.

Following project delivery, there are important lessons for governments, community and industry regarding what worked and what did not. This information is best identified by robust post-completion reviews, which evaluate the delivery and operation of a project with the evidence that was used to support its selection.

Critically, these processes should be transparent to the public. Making project data and analysis publicly-available, including the publication of a project business case, exposes government processes to scrutiny, allowing assumptions to be tested and lessons to be identified and shared. As a result, the quality of analysis is improved and the likelihood of positive project outcomes is increased.

“There should be automatic publication of business cases for major projects seeking government funding, particularly the assumptions underlying the cost-benefit analysis and the evidence in support of those assumptions, so that experts and the community can scrutinise proposals.”

Grattan Institute submission, 2015

While there is an ongoing debate across the infrastructure sector regarding how to identify good infrastructure governance, there has not been a collaborative process to identify the best practice principles, policies and broad institutional arrangements for planning, project selection and governance.

To embed good practice in our infrastructure decision-making frameworks, Infrastructure Australia will work in partnership with governments, business and the community to identify *National Governance Principles* to help drive better infrastructure decision making.

Key components of the *National Governance Principles* are likely to include:

- Development of long-term integrated infrastructure plans;
- Publication of full project business cases, including supporting data and analysis;
- Completion of in-depth community engagement, starting at the strategic planning phase; and
- Preparation and publication of robust post-completion reviews.

The *National Governance Principles* would be relevant to infrastructure decisions at all levels of government, irrespective of the funding source or procurement mechanism used.

Once developed, this approach will be a tool for governments to assess their current governance arrangements against best practice. It will identify opportunities to increase the rigour and transparency of decision making.

Beyond the articulation of the *National Governance Principles* by Infrastructure Australia, incentives will also be required to encourage all governments to adopt them. The Australian Government is in the best position to initiate wider application by making federal infrastructure funding to state, territory and local governments contingent on proponents meeting the requirements of Infrastructure Australia's *National Governance Principles*.

Recommendation 9.7:

Infrastructure Australia will develop *National Governance Principles* in partnership with governments and the private sector to support better project decision making across the public infrastructure sector.

Key components of the *National Governance Principles* are likely to include:

- Development of long-term, integrated infrastructure plans;
- Publication of full project business cases, including supporting data and analysis;
- Completion of in-depth community engagement; and
- Commitment to the preparation and publication of robust post-completion reviews once a project has been delivered and throughout the lifecycle.

Once they are established, the Australian Government should make the provision of infrastructure project funding to state, territory and local governments contingent on compliance with the *National Governance Principles*.



Best Practice

Establish frameworks and use data to identify and drive improvements throughout the infrastructure lifecycle

Australia has one of the world's most sophisticated infrastructure and construction sectors and is a world leader in some areas, including infrastructure financing and energy market regulation. However, when compared to our peers, there is clear room for improvement in the delivery and operation of infrastructure across some sectors and jurisdictions.

Meeting world's best practice is a moving frontier, requiring continuous improvement as skills and markets mature.

The Audit identified a number of areas where our performance has been inconsistent or where Australia is falling behind our competitors. The Audit also demonstrated the need to extract more value from our existing networks, while being more innovative in how we plan, fund, finance, deliver, maintain and operate new and existing infrastructure.

Driving best practice across the infrastructure sectors requires focus in three areas:

- **Information:** to generate, capture and use data to assess performance and identify best practice;

- **Skills and innovation:** to develop and retain the people, processes and technologies to improve the quality and efficiency of our infrastructure; and

- **Harmonisation:** to align practices and standards to reduce duplication, improve delivery and develop nationwide capability.

Improving the delivery and operation of infrastructure requires detailed *information*. Reliable, comparable data about how projects, networks and systems are performing supports a 'feedback loop' that guides continuous improvement. Sharing these lessons, and exposing areas in need of additional attention, can inform policy makers and drive better decision making.

Developing and retaining *skills* and facilitating *innovation* will provide a platform so best practice is applied now and improved over time. There are skills shortages in some sectors and areas of innovation, such as digital engineering and Building Information Modelling (BIM), where we are behind our peers – these, and others, require immediate attention.



Applied in the right circumstances, *harmonisation* can raise the standards of infrastructure delivery and decision making. Australia's federated system has resulted in instances of poor infrastructure coordination between jurisdictions. The adoption of different rail gauges by different states and territories is a compelling example of a failure to harmonise that delivered poor outcomes for over a century. Harmonising where appropriate, and

adopting domestic and global standards, should be a focus for policy makers.

Together, the approach of using information to understand our performance and define good practices; using skills and innovation to apply lessons learnt; and harmonising approaches to spread best practice, provides an agenda to improve the efficiency and productivity of our infrastructure.

What the Audit found

- Post-completion reviews are not regularly undertaken for infrastructure projects, limiting the opportunities for governments and others to learn from their mistakes and successes.
- Current procurement practices should be streamlined and coordinated, reducing costs and delivery time.
- Skills shortages contribute to cost increases for infrastructure construction. Development of an infrastructure pipeline presents an opportunity to develop a better skilled workforce and to minimise skills shortages in the future.
- Governments, industry and the community should ensure there is a continuous focus on reducing construction costs and promoting world-class building practices.

Information: Generating, capturing and using data to assess performance and inform best practice

Understanding how our infrastructure is performing, and identifying means of improving that performance requires objective, reliable information. There are many opportunities where this information is not collected or analysed; where it is, there are often issues of consistency and comparability between jurisdictions and over time. This is a substantial hurdle to accurately identifying and understanding which infrastructure policies and practices work best – and why. It is also a hurdle to prioritising investments decisions on a rigorous and transparent basis. Better information will bring greater objectivity to infrastructure debates, enable better management of existing infrastructure and allow for improved allocation of taxpayer funds.

The development of transparent frameworks to assess infrastructure performance requires data. Data, once generated and collected, can be standardised and analysed – in effect turning raw data into usable information. In turn, information can be used to measure performance over time and benchmark performance between comparable projects, networks and systems.

The Audit showed that data to support infrastructure decision making in Australia is inconsistent, with notable deficiencies around project outcomes, asset condition and network performance. In many cases, data is generated but not collected; in others it is collected but not fully analysed and used to provide systemic measures of performance. Finally, where performance is measured, the data is rarely used to compare and benchmark performance – often because the data hasn't been collected or collated in a format that enables meaningful comparison.

There is, in effect, a shortage of available data on the performance of Australia's infrastructure. Addressing this shortage will require the generation, collection, analysis and measurement of data across three levels:

- **Projects:** to understand how individual assets perform in delivery and operation, including construction costs and benefits delivered;
- **Networks:** to understand the relative performance of infrastructure networks over time; and
- **Systems:** to understand the performance and integration of networks, particularly in complex urban environments.

Building a comprehensive framework to measure performance across these streams will provide detailed information to make meaningful comparisons (benchmarking) between operators and jurisdictions. Benchmarking allows policy makers to establish best practice, and provides proponents and operators with valuable information to improve their performance.

In 2014, the Productivity Commission identified insufficient benchmarking capability as an issue in Australia, citing the United Kingdom's 2010 *Infrastructure Cost Review* as a positive example of benchmarking to achieve cost reductions (see Box 10.1).

A national Infrastructure Performance Measurement Framework

Australia should develop and implement a national approach to infrastructure performance measurement across our infrastructure sectors.

A national approach will promote data consistency and allow, over time, for reliable comparisons between jurisdictions and, as far as possible, between Australia and our international peers.

The development of a national *Infrastructure Performance Measurement Framework* (the Framework) should consider what features are most useful and practical to measure. These can be categorised as:

- **Inputs:** financial, human and material resources required for networks to be created and to function; for example, the cost of constructing or operating a road asset, electricity network or rail line;
- **Outputs:** products, capital goods and services that result from inputs; for example, kilometres of highway delivered or number of bus services added;
- **Outcomes:** the short, medium and long-term effects of an investment's outputs; for example, the average travel time to work in a particular city or data connection speeds achieved by broadband users; and
- **Impacts:** the 'higher order' effect of outcomes on the economy and quality of life; for example, economic performance through impact on GDP or the health outcomes from increased active transport.

Measurement of *inputs* and *outputs* in infrastructure, while inconsistent across Australia, is not uncommon. Measuring inputs and outputs can be a valuable exercise in exposing some best practice behaviours; however it offers limited insights to guide decision makers beyond relatively simple metrics. For instance, measuring the lane kilometres of a road built in a given year tells us only about the quantity of infrastructure delivered but offers no information about the performance of networks, or whether the additional infrastructure has efficiently addressed a given problem. Measurement of inputs and outputs is important, and should be enhanced, but these metrics will only be of moderate use to decision makers.

The measurement of higher level *impacts* is also relatively common in Australia. The Australian Bureau of Statistics, and a range of other bodies, regularly

publishes indicators of economic performance related to infrastructure. However, the necessarily high level of these metrics, and the costs of data collection and analysis, mean that the measurement of impacts cannot provide sufficiently specific or regular information on infrastructure and its effect on the broader economy.

The proposed Framework could add significant value to the infrastructure debate by focusing on the measurement of *outcomes*. This approach prioritises the user's experience – that is, good infrastructure outcomes are first and foremost achieved when the investment or policy meets the needs of the user. For instance, a road user is more interested in a journey with a low level of traffic congestion (an outcome) than the delivery of a certain number of road kilometres (an output).

Box 10.1: Using benchmarks to achieve cost reduction targets in the United Kingdom

The United Kingdom Government's 2010 *Infrastructure Cost Review* called for improved quality and transparency of infrastructure data to support more informed decision making. Better data was expected to provide annual savings of at least 15 per cent, an estimated £2 billion to £3 billion.¹⁵⁹

The United Kingdom's *National Infrastructure Plan 2010* outlined an approach to improve the quality and transparency of infrastructure data. The United Kingdom currently publishes annual unit cost benchmarks in the energy, water and transport (highways, airports and rail) sectors.¹⁶⁰

Examples where benchmarking data has been used to reduce cost estimates include High Speed 2, where tunnelling data was used to reduce cost estimates by £400 million to £800 million. In addition, the United Kingdom Highways Agency's commercial intelligence and data systems has allowed it to save 14 per cent in negotiating the target cost on a major project, and £70 million over three schemes.¹⁶¹



“There needs to be clear technical information available that is measurable. This allows more accurate costing benchmarks for infrastructure construction. It creates the ability to draw on information for future projects, helps standardise projects, and can assist in limiting cost blow-outs.”

Engineers Australia submission, 2015

Developing the Framework will be a necessarily iterative process. The quality and comparability of data currently generated and captured across Australia is inconsistent and incomplete, necessitating an approach that will build over time as data improves. By focusing on outcomes, the Framework can draw attention to user experiences and identify gaps in data generation and collection.

As datasets and analysis around infrastructure performance improve in breadth and quality, best practice will be exposed. Lessons can be shared across sectors and jurisdictions.

Infrastructure Australia is well-placed to support the development of a national Framework. Ongoing reporting against the Framework should be a collaborative function between the Bureau of Infrastructure, Transport and Regional Economics, the Australian Bureau of

Agricultural and Resource Economics, the Bureau of Resources and Energy Economics and the Australian Bureau of Statistics.

By making federal funding support for infrastructure investments at the state, territory and local level contingent on the provision of data, the Australian Government holds a powerful lever to drive the collection and sharing of quality data over time.

Recommendation 10.1:

A national *Infrastructure Performance Measurement Framework* should be developed to provide routine measurement of the performance and efficiency of Australia’s infrastructure projects, networks and systems. The Australian Government should make infrastructure funding conditional on state, territory and local governments agreeing to provide appropriate data to support benchmarking. Performance measurement should be:

- Conducted at the project, network and system level;
- Routinely published;
- Sensitive to genuinely commercially confidential information; and
- Undertaken annually.



Conduct post-completion reviews and incorporate feedback into future projects

Post-completion reviews offer an opportunity to learn from an individual project by comparing the intended inputs, outputs and outcomes with those actually delivered (see Box 10.2). By capturing and analysing this data, assumptions that feed into subsequent projects will better reflect real-world experience. Post-completion reviews should be conducted on all major infrastructure projects.

Despite the potentially substantial benefits of post-completion reviews, they are not routinely used by funders and proponents of public infrastructure. Where reviews are conducted, feedback to future proposals is rarely provided. The inconsistent use of reviews to measure delivery against forecasts makes it challenging to identify systemic successes and failures.

Rectifying these shortcomings, and making better use of post-completion reviews, should be a priority for funding agencies and project proponents. Reviews should be independently-audited to ensure feedback is impartial, rigorous and transparent.

The Australian Government, as a co-funder of state and territory infrastructure, has an important leadership role. Australian Government funding for jurisdictional projects should be contingent on the execution and public release of post-completion reviews.

“Post-completion reviews should be routinely undertaken... This will effectively create a legacy of learning by capturing opportunities to improve project selection, appraisal, and promote an efficient, best public value environment for procurement and successful project delivery.”

Roads Australia submission, 2015

Recommendation 10.2:

The Australian Government should make funding for nationally significant projects contingent upon proponents agreeing to post-completion reviews. Post-completion reviews should be undertaken periodically throughout the operational life of the asset and should measure performance and benefits against forecasts. To ensure robust results, all post-completion reviews should use an independent template, be independently-audited, published in full, and findings incorporated into the planning processes for new infrastructure.

Box 10.2: What is a post-completion review?

A post-completion review provides an objective assessment of a project's performance and how this compares to the forecasts in its business case at set points through the lifecycle, including:

- Upon completion of the delivery phase, evaluating whether the project was completed within scope, on time and on budget, what variances occurred and what unscoped risks materialised; and
- At agreed intervals during the operational phase, to assess whether the demand projections underpinning the project's development were robust, whether the project's forecast benefits materialised and whether any unforeseen additional benefits occurred.

Skills and innovation: Developing people, processes and technologies

With greater pressure on infrastructure to demonstrate better value for money, skills development and innovation should be key components of infrastructure planning, operation and delivery.

Given the slowing down of the capital phase of the recent mining and resources boom, the infrastructure sector faces substantial challenges in developing and retaining skills. Immediate and longer term shortages of skills – including specialisations such as engineers, data analysts, transport planners, program managers, asset managers and others – present a strategic challenge for the sector.

Innovation in planning, delivery, operations and maintenance of infrastructure presents similar challenges. While in many areas Australian jurisdictions lead the world on infrastructure innovation, we remain behind in others. The challenge will be to maintain our advantage in those areas we excel, while improving those areas where we are falling behind. The identification of skills deficiencies and innovation challenges and opportunities should be informed over time by better measurement of infrastructure performance through the *Infrastructure Performance Measurement Framework*.

Develop and retain skills

Australia needs a skilled and experienced workforce to plan, build, operate and maintain the infrastructure we require over the coming 15 years.

Not having the right skills, at the right time, can have an enduring impact on the quality and suitability of our infrastructure. Skills shortages can increase input costs, cause construction delays and increase the risk that infrastructure does not meet the needs of users.

Information on the extent of skills shortages in Australia is limited. The Productivity Commission has suggested current skills shortages are not causing a major impact on construction costs. However, the Commission did note that engineers, technicians and transport operators have been in short supply since the early 2000s.¹⁶² An increasingly competitive global infrastructure labour market will create further demand for these skills and raise overseas demand for the high-calibre professionals that Australia produces.

Major projects, by their cyclical nature, provide fluctuating demand for labour and expertise. This creates challenges for industry in attracting and retaining a highly skilled workforce. This also reduces employers' incentives to train staff beyond immediate projects. Governments can help by providing clear and reliable commitments to future projects.

An infrastructure skills plan can help to ensure Australia has the right people with the right skills to deliver infrastructure to 2031 and beyond. As a first step, the COAG Infrastructure Working Group should produce detailed analysis and modelling of the skills required to meet our national infrastructure investments to 2031. This work should be undertaken in consultation with key stakeholders from industry, professional associations, educational bodies and elsewhere and inform development of a national infrastructure skills plan. Our world-class universities and vocational training facilities provide a sound platform through which to deliver the outcomes of the plan.

Recommendation 10.3:

The COAG Infrastructure Working Group should deliver a national infrastructure skills plan to ensure Australia has the right people with the right skills to deliver our infrastructure to 2031 and beyond. A skills plan should provide:

- Information on the likely professional and workforce requirements to deliver planned and forecast infrastructure supply over the next 15 years and beyond;
- Advice on critical specialist infrastructure skills deficiencies that could delay construction, or add to the costs of projects and maintenance; and
- Information on the impacts of new technology, opportunities to improve coordination across projects and sectors and how employers can work more effectively in partnership with training providers.

Using technology to improve infrastructure delivery and lower costs

Greater use of technology in planning and designing infrastructure can deliver substantial benefits during construction and operation.

For example, BIM uses collaborative processes and sophisticated software to generate, manage and share detailed multi-dimensional models of buildings, infrastructure and places. This allows the interrogation of asset design to inform construction and operation. For instance, the inclusion of material specifications and likely wear, means maintenance and renewal needs can be understood prior to final design approval.

This approach presents a substantial opportunity to increase the efficiency of infrastructure throughout asset lifecycles but has had limited uptake in Australia. The United States, Singapore and Hong Kong governments have each mandated the use of BIM when responding to government engineering and design tenders (see Box 10.3).

The United Kingdom and Spanish governments have announced that BIM will be mandatory on government projects in coming years.

Box 10.3: Singapore's use of Building Information Modelling

Singapore identified BIM as potentially improving the productivity and capability of the construction industry. A plan to implement BIM was developed in 2010, with the aim of making BIM widely used in the construction industry by 2015. The Singapore Government has achieved this by:

- Removing impediments to BIM by developing templates, guides and a library of building and design 'objects';
- Incentivising businesses to adopt BIM through a \$6 million BIM fund, covering training, consultancy, software and hardware;
- Mandating the use of BIM from 2013. The stringency of BIM requirements has increased year-on-year – 96 per cent of businesses will have adopted BIM by the end of 2015; and
- Building capability and capacity through the adoption of BIM training programs. In 2013, over 1,200 professionals were trained in BIM.¹⁶³

Recommendation 10.4:

Governments should make the use of Building Information Modelling (BIM) mandatory for the design of large-scale complex infrastructure projects. In support of a mandatory rollout, the Australian Government should commission the Australasian Procurement and Construction Council, working with industry, to develop:

- Appropriate guidance around the adoption and use of BIM; and
- Common standards and protocols to be applied when using BIM.

Harmonisation: Aligning practices and standards to improve delivery and outcomes

Differing processes and standards for infrastructure planning, procurement, construction, operation and maintenance across Australia can have a detrimental impact on industry efficiency and value for money. While perfect harmonisation across all metrics is neither achievable nor desirable, greater levels of coordination and harmonisation could generate substantial national dividends.

Appropriate alignment between the processes and standards used in each jurisdiction – and, where feasible, those used internationally – can increase access to Australian infrastructure markets by new participants. It can also improve access for existing participants to export skills and services. Locally, it can reduce barriers to the sharing of skills and insights across the country.

Development of standards that are specific to each Australian jurisdiction may be appropriate in some circumstances. However, it should not be the default option when a national or international approach could be applied – or readily modified – to meet national or jurisdiction-specific needs. Developing entirely independent local standards or introducing significant local variations to agreed national standards for infrastructure delivery may increase costs and fail to deliver improved outcomes.

Where an accepted international standard exists for infrastructure (such as the ISO55000 to 55002 asset management standards outlined in Box 10.4), they should be adopted unless there is a compelling rationale for the development of an Australian or jurisdictional-specific standard.

Box 10.4: What are the asset management standards ISO55000 to 55002?

A new set of international asset management standards – ISO 55000 to 55002 – was finalised in early 2014 to help organisations improve the management of their assets. The standards deliver consistent definitions, focus on how to deliver value-for-money service levels that balance performance and risk, describe how to align asset management practices with an organisation's strategic objectives and describe how to establish a proactive and ongoing system to manage assets. Standards Australia was involved in developing the new standards.

Domestic entities applying the ISO55000 suite of standards include New South Wales Roads and Maritime Services. Roads and Maritime Services has established an Asset Management Transformation Program with a target of compliance with the ISO55001 standard within four years.¹⁶⁴

Recommendation 10.5:

Federal, state and territory governments should adopt international standards by default unless there is a compelling rationale for the development of a non-conforming Australian and jurisdictional standard. Where a rationale to create a locally-specific standard or approach does exist, consideration should be given to appropriate modification of a recognised national or international benchmark.

Creating certainty for investors and constructors

Governments should communicate a transparent and reliable agenda for reform and investment. This requires governments to work with infrastructure investors and constructors to provide greater certainty on project commitments and likely timeframes for delivery.

Working closely with overseas governments will also be important. The Global Infrastructure Hub will provide opportunities for collaboration with international agencies – both public and private – to further develop our national pipeline. Development of a Trans-Tasman procurement market, as proposed in the *Thirty Year New Zealand Infrastructure Plan 2015* provides an opportunity to expand the depth of the regional market and establish further cooperation between governments.¹⁶⁵

Recommendation 10.6:

Australia needs strong and dependable commitments to proceed with planned projects and reforms to establish confidence in infrastructure markets. Substantial upfront costs and long construction times mean infrastructure can have a unique risk profile for investors. Investors and constructors rely upon governments to provide a positive agenda for growth and development. To further expand and deepen the market, the Australian Government should work with the New Zealand Government and industry partners to develop the Trans-Tasman procurement market, as proposed in the *Thirty Year New Zealand Infrastructure Plan 2015*.

Fully realising the benefits of infrastructure investment

Over recent decades, infrastructure projects have generally focused on the delivery of physical outputs: on time, to budget and to specification. However, infrastructure should deliver broader positive impacts for users and the wider community. Examples include reduced journey times to and from work and improved productivity from faster, more reliable telecommunications.

An effective infrastructure project – one that maximises the return on investment – requires more than a focus on construction. Other complementary benefits from a project, for example stimulating urban development, also require active management during the delivery and operation of the project.

More can be done to ensure these outcomes are achieved and that taxpayers maximise return on public investments, particularly with complex infrastructure. Additional services in the rail sector, for instance, require the delivery of track, signals, rolling stock, timetable planning, stations, staffing and communications. Building new infrastructure does not necessarily optimise user benefits without active management of these other infrastructure and non-infrastructure elements.

There are examples of well-planned and well-delivered infrastructure, from which the full benefits have not been extracted. Given the high costs of physical infrastructure, ensuring it delivers the appropriate benefits can be a low-cost activity that delivers high value. For example, building community awareness of new transport services or making sure businesses are educated on the opportunities afforded by increased telecommunications capacity and reliability can ensure the benefits of new infrastructure are maximised and shared across the community.

Recommendation 10.7:

Project proponents should routinely develop strategies to ensure the full benefits of infrastructure investments are realised. Benefits associated with given projects should be actively managed to maximise return on investment and monitored through post-completion review processes. This approach could be equally beneficial when applied to under-utilised existing assets and network.

Appendices



Appendix A:

Recommendations

1. Productivity

Recommendation 1.1

The Australian Government should establish *Infrastructure Reform Incentives*, which link additional infrastructure funding to the delivery of reform outcomes. This mechanism would encourage state, territory and local governments to deliver productivity enhancing reforms to the planning, construction, operation, ownership and governance of Australia's infrastructure. *Infrastructure Reform Incentives* should be aligned to key reforms recommended in this Plan including: improving the governance and operation of our cities and microeconomic reform across the energy, telecommunications, water and transport sectors.

Recommendation 1.2

Governments should make greater use of well-regulated market-based solutions to improve the efficiency of Australia's infrastructure and support productivity growth. Governments should focus on improving outcomes for consumers – high-quality services at affordable prices – by seeking greater private sector involvement in infrastructure services. In cases where some users bear an unreasonable burden of service changes, governments should provide transitional support or compensation through tax and welfare systems.

Recommendation 1.3

Caps, curfews and other restrictions on how our infrastructure is operated and used should be avoided where possible. Giving Australia's infrastructure the capacity to freely meet its economic and social purposes will open new opportunities for growth and development. Existing regulatory constraints should be regularly reviewed to ensure they remain relevant and new assets – including new ports and airports – should be planned to ensure curfews and other restrictions are avoided.

Recommendation 1.4:

Innovation in infrastructure service delivery should be encouraged through positive, flexible regulatory frameworks. Where emerging technologies and delivery models disrupt infrastructure markets, governments should respond quickly to ensure regulatory settings maximise productivity growth and reflect the long-term interests of customers.

Recommendation 1.5

Given current expenditure levels are unlikely to be sufficient to provide the infrastructure Australia needs over coming decades, a material increase in funding for infrastructure from both public and private sources is required to meet our infrastructure challenges and boost productivity. Governments should use infrastructure investments to support opportunities for productivity growth across the economy. These investments should be made on the basis of rigorous assessments for which projects display clearly positive productivity benefits.

Recommendation 1.6

The Australian Government should consolidate its existing fragmented funding pools into an integrated and transparent *Infrastructure Fund*. The consolidation of national funding programs for infrastructure would enable the Australian Government to prioritise investments based on national significance and enable greater public transparency around Australian Government infrastructure funding decisions.

Recommendation 1.7

Governments should increase funding for investments in projects and technologies that make better use of existing infrastructure. Australia can extract more from existing infrastructure networks through smarter operation, maximising their productive capacity and delaying the need for large-scale investments.

Recommendation 1.8

Infrastructure operators should generate, collect and use data to drive greater productivity in infrastructure service delivery. Information on the performance of, and demand for, Australia's infrastructure networks should be collected and made available to infrastructure operators, third-party developers and users – being sensitive to confidential information and privacy concerns. Readily available data can facilitate improvements to the delivery and use of services and the productive capacity of networks.

2. Population

Recommendation 2.1:

The Australian Government should drive change in the planning and operation of Australia's cities through the use of *Infrastructure Reform Incentives*. The Australian Government should identify a reform agenda and administrative structure that would incentivise state, territory and local governments to implement necessary change. The city-based reforms outlined in the Australian Infrastructure Plan will be a useful reference for government when doing this work.

Recommendation 2.2

The Australian Government should deliver a *National Population Policy* to identify Australia's population pathway over the next 50 years and outline the Australian Government's options to shape that growth. The articulation of a national policy will enable the Australian Government to establish a vision for Australia's growing population and identify the necessary options to ensure we fully capitalise on the potential benefits for the economy and community.

Recommendation 2.3

To meet the demands of population growth Sydney, Melbourne, Brisbane and Perth should accelerate the delivery of high-quality, higher density development within established urban areas. As part of their metropolitan planning processes, governments should take steps to reduce urban sprawl and ensure the majority of new housing supply is medium to high-density and delivered in established urban areas.

Recommendation 2.4

All governments should ensure that processes are in place to deliver high-quality, well-designed, higher density development, connected to infrastructure and public amenities. Mechanisms available to government include:

- At state and territory level, governments should ensure that statutory planning instruments deliver high-quality design and they should examine options to encourage good design through providing incentives in the planning approval process;
- State and territory governments should integrate their metropolitan land-use and transport planning processes to ensure that the delivery of new housing is located near transport infrastructure; and
- At the local level, governments should align the delivery of higher density developments with related upgrades to community infrastructure and amenities.

Recommendation 2.5:

Governments should aim to grow the population of our smaller capital cities, in particular Adelaide, Hobart and Darwin beyond their current projections.

These cities offer access to impressive natural and built environments, high-quality infrastructure and services, cultural diversity and a skilled and dynamic workforce. We must ensure that we make the best use of these cities by growing their population and ensuring their continued economic prosperity.

Recommendation 2.6:

The cities of Newcastle, Wollongong, Geelong, the Sunshine Coast and the Gold Coast should be supported by governments, businesses and local communities to grow their populations and economies.

Access to new or upgraded infrastructure will be important in enabling these cities to develop strong economic and employment links with our bigger cities.

Recommendation 2.7:

Local government reform processes should be initiated across Australia to consolidate the number of councils and increase the efficiency, service quality, financial viability and strategic profile of local government. A number of jurisdictions have reformed, or are currently reforming local government service delivery in Australia. State and territory governments should continue to monitor the adequacy of local governance arrangements and, where necessary, enact further reforms to increase the quality and viability of local government.

Recommendation 2.8

Each state and territory governments should deliver and consistently update long-term land-use plans for all Australian cities. These plans should be integrated with corresponding infrastructure plans. To ensure the effective integration and implementation of these plans state and territory governments should explore what role institutional innovation, focused on delivering metropolitan governance, can play in supporting their implementation.

3. Connectivity

Recommendation 3.1

Governments should upgrade legacy capital city passenger transport infrastructure to deliver higher capacity, high-frequency services across all modes.

To ensure funding is allocated to the right solutions, governments should adopt a modally agnostic methodology (where all infrastructure solutions are considered equally), and consider Infrastructure Australia's *Infrastructure Priority List* ahead of any funding decisions.

Recommendation 3.2:

Data regarding the real-time operation, use and performance of Australia's transport networks should be made publicly available to enable the private sector to develop customer-focused mobile applications. In a high-population, higher density city, public transport networks will need to transition to a model where commuters use an efficient combination of modes to complete a single journey. To assist this process, all governments should adopt an 'open data' policy and quickly release new data regarding the operation and performance of urban public transport networks.

Recommendation 3.3

Governments should increase funding to address gaps in access to passenger transport on the outskirts of Australian cities. Investments should prioritise high-population areas and focus on the delivery of connecting transport infrastructure and services, which will deliver 'hub and spoke' connections, enabling these communities to more easily access mass transport networks.

Recommendation 3.4:

Australia needs a *National Freight and Supply Chain Strategy*. Infrastructure Australia, in partnership with governments and the private sector, should lead the development of the Strategy. The Strategy should: map nationally significant supply chains and their access to supporting infrastructure and gateways; evaluate the adequacy of the institutional framework supporting freight networks; and recommend reforms and investments that will enable the more efficient movement of freight.

Recommendation 3.5:

All governments should establish targeted investment programs focused on removing first and last mile constraints across the national freight network. These investments should be informed by the findings of the recommended *National Freight and Supply Chain Strategy*.

Recommendation 3.6:

The Australian Government should work with communities and business to maximise opportunities created by the National Broadband Network. This will boost productivity and increase the efficiency of services and infrastructure. Government should lead the way by increasing the delivery of government services and information online.

4. Regional

Recommendation 4.1

State and territory governments should deliver long-term regional infrastructure plans. These plans should:

- Identify gaps in infrastructure networks and identify priorities to support productive regional industries;
- Be developed with involvement from all levels of government to help coordinate investments and remove duplication;
- Provide transparency for the private sector to allow for government funding to be leveraged and private investment to be maximised; and
- Assess the potential for regions to ease pressure on our largest cities.

Recommendation 4.2

The Australian Government should prioritise investment in regional infrastructure where the population is growing quickly and where the bulk of our regional economic growth can be found. Efficient, liveable and productive regional hubs should be considered national economic assets and be a key priority of every level of government, including capitalising on opportunities to develop the north.

Recommendation 4.3

Regional infrastructure investment should respond to each community's particular needs, its changing demographics, and what is affordable. Where governments are providing infrastructure in slower growing regions, they should make available information on how infrastructure is being used to address efficiency and equity issues, what taxpayers can expect in return and how such investments will be maintained over time.

Recommendation 4.4

The Australian Government should remove barriers to entry for mobile network providers in regional Australia to facilitate improvements in coverage, competition and service quality. This should include:

- Considering the merits of modifying the existing fixed-line Universal Service Obligation in regional areas toward improving mobile coverage;
- Where possible and appropriate, making National Broadband Network backhaul and towers available to mobile network providers; and
- Taking steps to encourage mobile network providers to co-locate their mobile infrastructure.

Recommendation 4.5

The development of the proposed *National Freight and Supply Chain Strategy* should be informed by CSIRO's *TRANsport Network Strategic Investment Tool (TRANSIT)*. This tool should be used to identify the most efficient routes along major supply chains and to inform funding decisions on where strategic regional projects will have the most substantial economic impact.

Recommendation 4.6:

Governments should commit to increasing information on the feasibility, economic viability and sustainability of new water resource developments and infrastructure in priority catchments. Water resource assessments will provide information to establish water management plans, allowing for better informed decisions about public and private investments and supporting further development of water markets.

Recommendation 4.7

Drinking water in all regional communities should meet the minimum standards in the *Australian Drinking Water Guidelines*. State and territory governments should undertake an independent audit of the performance, financial viability and capacity constraints of local councils to identify areas of highest risk. In New South Wales and Queensland, these audits should inform pathways to more sustainable models, including consideration of:

- Shared services;
- Council amalgamations;
- Transferring water operations to government-owned regional water corporations;
- Outsourcing or franchising; and
- Privatising water where commercially-viable.

Recognising the different governance arrangements in South Australia, Western Australia and the Northern Territory, governments should focus on achieving efficient water and wastewater services. In these jurisdictions, governments should commission independent audits to consider whether the single utility model delivers the highest achievable customer outcomes.

5. Funding

Recommendation 5.1

The Australian Government should require all project proponents seeking Australian Government funding to consider whole-of-life maintenance costs in their business case, and where possible they should be captured within the proposed contract structure. Including a mandatory test for inclusion of maintenance costs within procurements will place a discipline on proponents seeking funding to understand, expose and account for the future maintenance needs of public infrastructure.

Recommendation 5.2

Australia's public infrastructure asset owners should routinely use fixed-term maintenance contracts to deliver funding certainty for providers and better asset condition for users. Depending on the characteristics of the particular network and service, it may also be desirable to include asset operations alongside maintenance contracts.

Recommendation 5.3

The Australian Government should initiate a public inquiry, to be led by a body like the Productivity Commission or Infrastructure Australia, into the existing funding framework for roads and development of a road user charging reform pathway.

The public inquiry should consider:

- Flaws in the existing charging framework – including fairness, financial sustainability and economic efficiency;
- The optimal approach for road user charging and transport infrastructure funding in Australia;
- The social implications of charging reform, including transitional and distributional impacts of replacing current taxation with direct user charges; and
- A detailed reform pathway for transition to a full user pays model for roads covering the whole network and all users.

A public inquiry into road user charging reform should be supported by large-scale voluntary trials of road user charging options, funded by the Australian Government.

Recommendation 5.4

Federal, state and territory governments should commit to the full implementation of a heavy vehicle road charging structure in the next five years.

This reform must include the removal of all existing registration and usage charges under the PayGo model and the introduction of supporting regulatory and investment frameworks.

Recommendation 5.5

Federal, state and territory governments should also commit to the full implementation of a light vehicle road charging structure in the next 10 years.

This reform must include the removal of all existing inefficient taxes – including fuel excise and registration charges – and the development of supporting regulatory and investment frameworks.

Recommendation 5.6

The Australian Government should continue providing incentives for state and territory governments to improve the efficiency of their balance sheets by recycling appropriate publicly-owned assets to fund investments in productive infrastructure, and consider broader applications of incentive payments to advance reform. Recycling capital represents a valuable reform and funding tool as it can help complete efficient regulated markets and release substantial capital to be reinvested in productive infrastructure.

Recommendation 5.7

Australia's state and territory governments should seek to increase the funding sustainability of public transport provision both through the pursuit of operating efficiencies and a more appropriate alignment of the funding burden between public transport users and taxpayers. Recognising that public transport provides a range of benefits which accrue beyond the users, including through reduced road congestion and increased urban amenity, there is likely to be a continuing case for appropriate taxpayer subsidies over the medium and longer term.

Recommendation 5.8

The Australian Government should undertake a review of its capacity to use increased public borrowing to support an expanded economic infrastructure investment program. Increased use of public debt to support investment can provide a smarter approach to delivering economic infrastructure, provided investments are well-considered, well-executed and make a definitively positive contribution to the economy. Public debt can also provide intergenerational equity around infrastructure investments by distributing costs between current and future taxpayers who will benefit from the provision of enhanced infrastructure.

Recommendation 5.9

The Australian Treasury should evaluate the viability of reporting debt under a more transparent structure, at all levels of government, to allow for greater clarity and support increased investment in productive infrastructure. Reporting of debt should remain as transparent as possible. Further clarity about the composition of investments to which debt is allocated will increase public awareness of the valuable role borrowing can play in meeting Australia's infrastructure needs.

Recommendation 5.10

Governments should routinely consider value capture opportunities in all future public infrastructure investments. Opportunities for value capture should be identified and implemented early in planning processes, before specific options are developed, to maximise benefits to taxpayers. To encourage the application of value capture models, the Australian Government should impose a mandatory requirement for initiatives and projects seeking Australian Government support to demonstrate a consideration and implementation plan for value capture.

6. Competitive Markets

Recommendation 6.1

Where a competitive market for supply of infrastructure services exists, or could exist, governments should efficiently exit direct service provision, allowing the market to allocate supply to meet demand. Where the conditions exist for multiple suppliers to meet the needs of multiple consumers through an open, transparent and competitive framework, there is no compelling case for continued direct participation by governments in those markets.

Recommendation 6.2

Where commercially-viable monopoly infrastructure remains in public ownership, governments should define an appropriate independent regulatory framework which protects consumers and taxpayers, before divesting those assets into a well-functioning, well-regulated market. Where infrastructure is not commercially-viable, and government determines that there is limited prospect of near-term commercial viability, governments should have a default position of defining the service offering and testing the market for contestable supply.

Recommendation 6.3

Infrastructure community service obligations should be well-defined, transparently disclosed to the community, paid for by taxpayers rather than other users and, wherever possible, exposed to a competitive process to ensure services are routinely delivered at the right level, for an efficient price. Currently, most community service obligations are hidden or their funding is determined without clear and transparent objectives, resulting in poor service outcomes and imposing inefficient costs on taxpayers.

Recommendation 6.4

All governments should transfer their remaining publicly-owned electricity generation, network and retail businesses to private ownership. Public ownership of commercial businesses, including monopolies in well-regulated markets, distorts outcomes, stifles competition and harm consumers. Priorities include:

- All remaining retail and generation businesses in public ownership should be prepared for sale, including Snowy Hydro; and
- Queensland, Western Australia, Tasmania and Northern Territory should begin the process of explaining the need for reform to the community, with a view to divesting all electricity network assets. New South Wales should articulate a pathway to a full sale as soon as practically achievable following the partial lease process currently underway.

Recommendation 6.5

Governments, through the COAG Energy Council and the Australian Energy Market Commission, should introduce more flexible network tariffs in the near term. Governments should publicly renew their commitment to this reform and work with relevant bodies to communicate the consumer benefits of a more flexible tariff arrangement.

Recommendation 6.6

The Australian Energy Market Commission, in cooperation with governments, should develop electricity metering competition to facilitate the efficient, market-led rollout of smart metering technologies, taking into account positive and negative lessons from Victoria. Smart meters will support more flexible and efficient electricity tariff arrangements.

Recommendation 6.7

Australia's electricity and gas markets should move to full retail price deregulation as soon as practically possible. To support this:

- Where price deregulation has not occurred in the retail electricity market, the Australian Energy Market Commission should provide advice and a pathway for removing price regulation; and
- The Australian Government should undertake a review to identify ways to increase competition in the retail gas market (consistent with the *Harper Review*).

Recommendation 6.8

Governments and regulators should evaluate the likely impacts of emerging and disruptive technologies on the national electricity market and recommend specific reforms to address potential regulatory failure and technology disruption. Government and business leaders should work together to guide the transition in a way that creates community and business confidence.

Recommendation 6.9

NBN Co should be privatised into an appropriately regulated market in the medium term. In the near term, the Australian Government should commission a scoping study to assess the most appropriate approach, structure and timing to deliver a privatised NBN model. The scoping study to assess the most appropriate approach and structure for a privatised NBN should include options to efficiently support delivery of NBN services in regional and remote areas that are non-commercial.

Recommendation 6.10

Governments should define a pathway to transfer state-owned metropolitan water utility businesses to private ownership to deliver more cost-effective, customer-responsive services. That pathway will:

- Implement policy and institutional reforms to promote competitive neutrality in advance of privatisation, including full cost recovery pricing and commercial rates of return on capital;
- Introduce independent economic regulation, with the potential for the regulatory framework to be set nationally to avoid perceived conflicts of interest; and
- Apply uniform drinking water quality and environmental regulation.

These reforms should be delivered within five years.

Recommendation 6.11

The Murray-Darling Basin Authority should undertake a comprehensive investigation into issues inhibiting the efficient functioning of water markets in the Murray-Darling Basin including information and transparency, trade processing times and register compatibility. COAG should recommit to establishing entitlements consistent with the National Water Initiative in areas where this has not yet occurred, such as in priority catchments in northern Australia.

Recommendation 6.12

The Australian Government should work with state and territory governments to establish an independent national body to deliver a *National Water Reform Plan* and drive market reforms across the metropolitan and regional water sectors. Water is critical to Australia's economic prosperity and environment, and to our social and cultural life. The plan should build on the success of the National Water Initiative, and the body which will deliver it should energise governments and communities to take actions needed to progress national water resource management over the coming decade.

Recommendation 6.13

Australia should seek to transition the revenue and funding framework for roads to be consistent with other utility networks by establishing a corporatised delivery model. A regulated asset base approach provides a strong framework to achieve this outcome. As part of the broader public inquiry into road funding reform, the Australian Government should direct a body like Infrastructure Australia or the Productivity Commission to:

- Research the merits of a corporatised model for Australia's road network(s) to establish a reform pathway over the medium term; and
- Evaluate and define the pathway to establish the corporatised road fund model in jurisdictions, including provisions for hypothecation of existing taxes and charges to support the delivery of transport infrastructure in advance of the introduction of user charging.

This work should be delivered in tandem with heavy vehicle charging and investment reform.

Recommendation 6.14

Governments should adopt a default option of exposing public transport services to contestable supply through franchising. The focus of reform should be to improve customers' experience by exposing delivery to contestable supply and selecting the best operator to provide services. Private operation of public transport through time limited, exclusive franchises – where providers compete to deliver services – is a proven model both in Australia and overseas in raising service quality and value for money for customers. It should be the default option for public transport provision, with capital city bus and rail services as immediate candidates for franchising.

7. Sustainability and Resilience

Recommendation 7.1

Australia's energy and transport sectors should deliver emissions reductions in line with international commitments. While some progress has been made, considerable further action is required for our infrastructure to play its part in helping Australia meet its obligations and aspirations. Governments of all levels should consult with industry and clearly communicate reforms to allow the private sector to find the lowest cost pathway to reducing their environmental impact over time.

Recommendation 7.2

Building on the *Energy White Paper*, governments should work with the private sector to develop a cohesive strategy for supporting a transition to a lower emissions electricity generation sector at lowest cost to users and taxpayers. Governments should continue to encourage innovation and growth in renewable and lower emissions technologies and other developments to reduce emissions. Regulatory barriers to entry for decentralised energy sources should be lessened and, where necessary, governments should support the commercial viability of developments through co-investment of projects through research and demonstration phases.

Recommendation 7.3

Australia's light and heavy vehicles should keep pace with global best practice efficiency and emissions standards. The Australian Government should update and enforce standards to minimise emissions from road vehicles. Ensuring consumers are informed of the relative efficiency and emissions of new vehicles will be essential to driving more sustainable consumer behaviour.

Recommendation 7.4

Where this has not already begun, state, territory and local governments should demonstrate integration of active transport strategies through transport and land-use planning. Governments should provide active transport that is connected, accessible and safe, and encourage shifts to more efficient, sustainable transport options to improve transport sustainability and provide greater public amenity.

Recommendation 7.5

Infrastructure owners and operators should develop and maintain strategies to improve the resilience of infrastructure, and minimise the costs of mitigating risks by considering resilience within whole-of-life cost projections. Regulators should ensure that responses to threats are proportionate and efficient. The costs of managing risks should reflect consumer preferences, balancing pricing and reliability considerations.

Recommendation 7.6

Australia's energy and water supplies should be resilient to market and environmental changes and risks. Governments should maintain oversight of energy and water markets to ensure the incentives of service providers in managing risks are appropriately aligned with consumer needs.

8. Remote and Indigenous Communities

Recommendation 8.1

To improve planning, coordination and delivery of infrastructure investments in remote and very remote regions, governments should:

- Commit to the ongoing integration of essential service delivery and associated infrastructure investment via existing local government frameworks, along with an increased state and territory government focus on service delivery;
- Draw on best practice principles for delivering remote infrastructure by working with communities, sharing information, developing common goals, pooling resources, developing and implementing consistent procurement frameworks and adopting performance benchmarks based on community expectations; and
- Consider tendering the provision of economic infrastructure services and assess the merits of pooling investments across communities to establish scale and attract more private sector interest and innovation – for example, tendering water and wastewater infrastructure services in suitable clusters of remote and very remote areas to increase quality to minimum standards and extract greater value for money.

Recommendation 8.2

Renewable energy should replace diesel generation in remote communities wherever it is affordable and efficient to do so. Electricity service providers, communities and governments should work together to find cost-effective options for renewable energy generation. This will improve the reliability and self-sufficiency of energy supply to remote communities, reduce costs of fuel and its transportation, and support training of local communities in the operation and maintenance of generation facilities.

Recommendation 8.3

Governments should develop coordinated strategies with remote communities to remove barriers and maximise the benefits of the National Broadband Network and the opportunities it enables for households and businesses. These plans should consider the necessary support and training that communities require to take advantage of health, education and business opportunities via the National Broadband Network.

Recommendation 8.4

Governments should consider infrastructure investments that support reforms to increase the economic independence of remote Indigenous communities. Reforms should take into account the findings and recommendations of the *COAG Investigation into Indigenous Land Administration and Use*, and draw on the *Commonwealth Indigenous Procurement Policy* and the *White Paper on Developing Northern Australia's* commitment to piloting land tenure reforms and improving land administration.

Recommendation 8.5

Governments and private sector proponents should liaise with remote communities to better understand unique local characteristics and ensure infrastructure projects best meet their needs. Remote communities can identify priority needs and suitable approaches to implementation tailored to local circumstances.

9. Governance

Recommendation 9.1

All state and territory governments should deliver long-term infrastructure plans. These plans should take a 15-year-plus view, be updated regularly and integrated with long-term land-use planning processes. By taking a long-term view of infrastructure, governments can better plan for projected changes in demand, identify emerging challenges and establish a pipeline of well-conceived infrastructure reforms and investments.

Recommendation 9.2

Infrastructure service standards (both minimum and desired standards) should be used by all governments to guide future planning and project development. The standards will need to be reviewed periodically, to reflect potential changes in the wider environment, changes in expectations, and changes in economic and financial circumstances.

Recommendation 9.3

Alongside the delivery of integrated long-term infrastructure plans, state and territory governments should initiate an ongoing process of community engagement to discuss present and future infrastructure challenges and potential solutions. Engaging the community at the strategic stage of infrastructure planning engenders a greater understanding within the community of future challenges and reduces the likelihood of opposition resulting from a lack of genuine consultation.

Recommendation 9.4

The Australian Government, in partnership with state and territory governments, should establish effective corridor protection mechanisms to ensure the timely preservation of surface, subterranean and air corridors, and strategic sites, for future infrastructure priorities. The mechanism should include:

- Long-term strategic planning and project development work to identify corridors and lands;
- A stable and independent governance framework; and
- Shared financial responsibility between the Australian Government and its state and territory counterparts.

Recommendation 9.5

Prior to deciding to fund an infrastructure investment, governments should undertake project development studies. This work will materially increase the quality of decision making through enabling the proponent to understand the problem that needs to be addressed; developing a range of options to address it; identifying the solution that will deliver the greatest benefit; and determining the best approach to deliver the project.

Recommendation 9.6

The Australian Government, and state and territory governments should allocate increased funding for project development work for initiatives identified on the *Infrastructure Priority List*. These initiatives are priorities that have been identified by Infrastructure Australia as addressing a strategic infrastructure need, that nevertheless require further development and rigorous analysis to determine the most appropriate option to address that need.

Recommendation 9.7

Infrastructure Australia will develop *National Governance Principles* in partnership with governments and the private sector to support better project decision making across the public infrastructure sector. Key components of the *National Governance Principles* are likely to include:

- Development of long-term, integrated infrastructure plans;
- Publication of full project business cases, including supporting data and analysis;
- Completion of in-depth community engagement; and
- Commitment to the preparation and publication of robust post-completion reviews once a project has been delivered and throughout the lifecycle.

Once they are established, the Australian Government should make the provision of infrastructure project funding to state, territory and local governments contingent on compliance with the *National Governance Principles*.

10. Best Practice

Recommendation 10.1

A national *Infrastructure Performance Measurement Framework* should be developed to provide routine measurement of the performance and efficiency of Australia's infrastructure projects, networks and systems. The Australian Government should make infrastructure funding conditional on state, territory and local governments agreeing to provide appropriate data to support benchmarking. Performance measurement should be:

- Conducted at the project, network and system level;
- Routinely published;
- Sensitive to genuinely commercially confidential information; and
- Undertaken annually.

Recommendation 10.2

The Australian Government should make funding for nationally significant projects contingent upon proponents agreeing to post-completion reviews. Post-completion reviews should be undertaken periodically throughout the operational life of the asset and should measure performance and benefits against forecasts. To ensure robust results, all post-completion reviews should use an independent template, be independently-audited, published in full, and findings incorporated into the planning processes for new infrastructure.

Recommendation 10.3

The COAG Infrastructure Working Group should deliver a national infrastructure skills plan to ensure Australia has the right people with the right skills to deliver our infrastructure to 2031 and beyond. A skills plan should provide:

- Information on the likely professional and workforce requirements to deliver planned and forecast infrastructure supply over the next 15 years and beyond;
- Advice on critical specialist infrastructure skills deficiencies that could delay construction, or add to the costs of projects and maintenance; and
- Information on the impacts of new technology, opportunities to improve coordination across projects and sectors and how employers can work more effectively in partnership with training providers.

Recommendation 10.4

Governments should make the use of Building Information Modelling (BIM) mandatory for the design of large-scale complex infrastructure projects.

In support of a mandatory rollout, the Australian Government should commission the Australasian Procurement and Construction Council, working with industry, to develop:

- Appropriate guidance around the adoption and use of BIM; and
- Common standards and protocols to be applied when using BIM.

Recommendation 10.5

Federal, state and territory governments should adopt international standards by default unless there is a compelling rationale for the development of a non-conforming Australian and jurisdictional standard. Where a rationale to create a locally-specific standard or approach does exist, consideration should be given to appropriate modification of a recognised national or international benchmark.

Recommendation 10.6

Australia needs strong and dependable commitments to proceed with planned projects and reforms to establish confidence in infrastructure markets.

Substantial upfront costs and long construction times mean infrastructure can have a unique risk profile for investors. Investors and constructors rely upon governments to provide a positive agenda for growth and development. To further expand and deepen the market, the Australian Government should work with the New Zealand Government and industry partners to develop the Trans-Tasman procurement market, as proposed in the *Thirty Year New Zealand Infrastructure Plan 2015*.

Recommendation 10.7

Project proponents should routinely develop strategies to ensure the full benefits of infrastructure investments are realised. Benefits associated with given projects should be actively managed to maximise return on investment and monitored through post-completion review processes. This approach could be equally beneficial when applied to under-utilised existing assets and network.

Appendix B:

Acronyms

ACCC	Australian Competition and Consumer Commission
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ARENA	Australian Renewable Energy Agency
BCR	benefit-cost ratio
BIM	Building Information Modelling
CEFC	Clean Energy Finance Corporation
COAG	Council of Australian Governments
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSO	community service obligation
DEC	direct economic contribution
eRUC	electronic road user charging system
GRP	gross regional product
GST	Goods and Services Tax
IEA	International Energy Agency
ITS	intelligent transport systems
Mt CO ₂ -e	million metric tonnes of carbon dioxide equivalent
NBN	National Broadband Network
NBN Co	National Broadband Network Company
NCP	National Competition Policy
NWI	National Water Initiative
OECD	Organisation for Economic Cooperation and Development
PMMRAC	Pilbara Meta Maya Regional Aboriginal Corporation
PPP	public private partnership
PV	photovoltaic
RAB	regulated asset base
RACV	Royal Automobile Club of Victoria
RUC	Road User Charge
STEM	Science, Technology, Engineering and Mathematics
TRANSIT	TRANsport Network Strategic Investment Tool
USO	Universal Service Obligation
WEBS	wider economic benefits

Appendix C:

Submissions

1.	Australian Competition and Consumer Commission
2.	Australian Council of Social Service (ACOSS)
3.	Action for Public Transport
4.	Adelaide City Council
5.	AECOM
6.	Alex Stoney
7.	APAC Government Affairs
8.	Australasian Railway Association
9.	Australian Academy of Technological Sciences and Engineering
10.	Australian Airports Association
11.	Australian Association of Local Governments
12.	Australian Automotive Association
13.	Australian Capital Territory Government
14.	Australian Chamber of Commerce and Industry
15.	Australian Communications Consumer Action Network (ACCAN)
16.	Australian Conservation Foundation
17.	Australian Food and Grocery Council
18.	Australian Government Department of Infrastructure and Regional Development (DIRD)
19.	Australian Institute of Landscape Architects (AILA)
20.	Australian Logistics Council (ALC)
21.	Australian Rural Roads Group Inc.
22.	Australian Sustainable Built Environment Council (ASBEC)
23.	Autodesk Asia
24.	AWTY Transport Consulting
25.	Brisbane Airport Corporation
26.	Brisbane City Council
27.	Bunbury Wellington Economic Alliance
28.	Bus Industry Confederation of Australia
29.	Cement Concrete and Aggregates Australia (CCAA)
30.	Cement Industry Federation (CIF)
31.	Chamber of Minerals and Energy, WA
32.	Chris Smith
33.	City of Karratha
34.	City of Mandurah, WA
35.	City of Perth

36.	City of Sydney
37.	City of Wanneroo, WA
38.	Civil Contractors Federation WA
39.	Committee for Economic Development of Australia (CEDA)
40.	Committee for Melbourne
41.	Committee for Perth
42.	Construction Contractors Association of Western Australia (CCA)
43.	Consult Australia
44.	Council of Capital City Lord Mayors
45.	Council of Mayors - South East Queensland
46.	David and Rui Schafer
47.	Engineers Australia
48.	Eriks Velins
49.	Faculty of Engineering and Information Sciences, University of Wollongong
50.	Freewheeler
51.	Freight on Rail Group
52.	Geoffrey Holman
53.	Gladstone Ports Corporation
54.	Grattan Institute
55.	Growing Central Queensland
56.	Hunter Business Chamber
57.	Hunter Development Corporation
58.	IFM Investors
59.	Illawarra Business Chamber
60.	Infrastructure Partnerships Australia (IPA)
61.	Infrastructure Sustainability Council of Australia (ISCA)
62.	ITS Australia
63.	Jacobs
64.	John Austen
65.	Local Government NSW
66.	Mark Pettigrew
67.	Melbourne City Council
68.	Municipal Association of Victoria
69.	National Australia Bank (NAB)
70.	National Electrical and Communications Association (NECA)

71.	National Growth Areas Alliance
72.	New South Wales Government
73.	Northern Territory Government
74.	NSW Business Chamber
75.	Peter Waite
76.	Pilbara Ports Authority
77.	Ports Australia
78.	QIC
79.	Queensland Government
80.	Royal Automobile Club of Western Australia (RAC, WA)
81.	Rail Futures Institute Inc.
82.	Regional Development Brisbane
83.	Regional Development Hunter
84.	Regional Development Illawarra
85.	Regional Development Tasmania
86.	Roads Australia
87.	Royal Automobile Club of Victoria (RACV)
88.	SMART Infrastructure Facility, University of Wollongong
89.	South Australian Government
90.	South West Group, WA
91.	Sustainable Australia
92.	T.M. Whitfield
93.	Tasmanian Government
94.	Transport Australian Society
95.	Transurban
96.	University of Tasmania
97.	Urban Taskforce Australia
98.	Urban4square
99.	Victorian Employers' Chamber of Commerce and Industry (VECCI)
100.	Victorian Government
101.	Water Services Association of Australia (WSAA)
102.	Western Australian Government
103.	10,000 Friends of Greater Sydney

Appendix D:

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Australian Infrastructure Plan

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our nation's future

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