South Australia's 20-Year

State Infrastructure Strategy 2025

infrastructure.sa.gov.au

Acknowledgement of Country

We acknowledge and respect the First Peoples of this land and their deep ongoing spiritual and cultural connection to Country.

We will work together with our First Nations people to share our collective knowledge and recognise the enduring impact of infrastructure on Country.

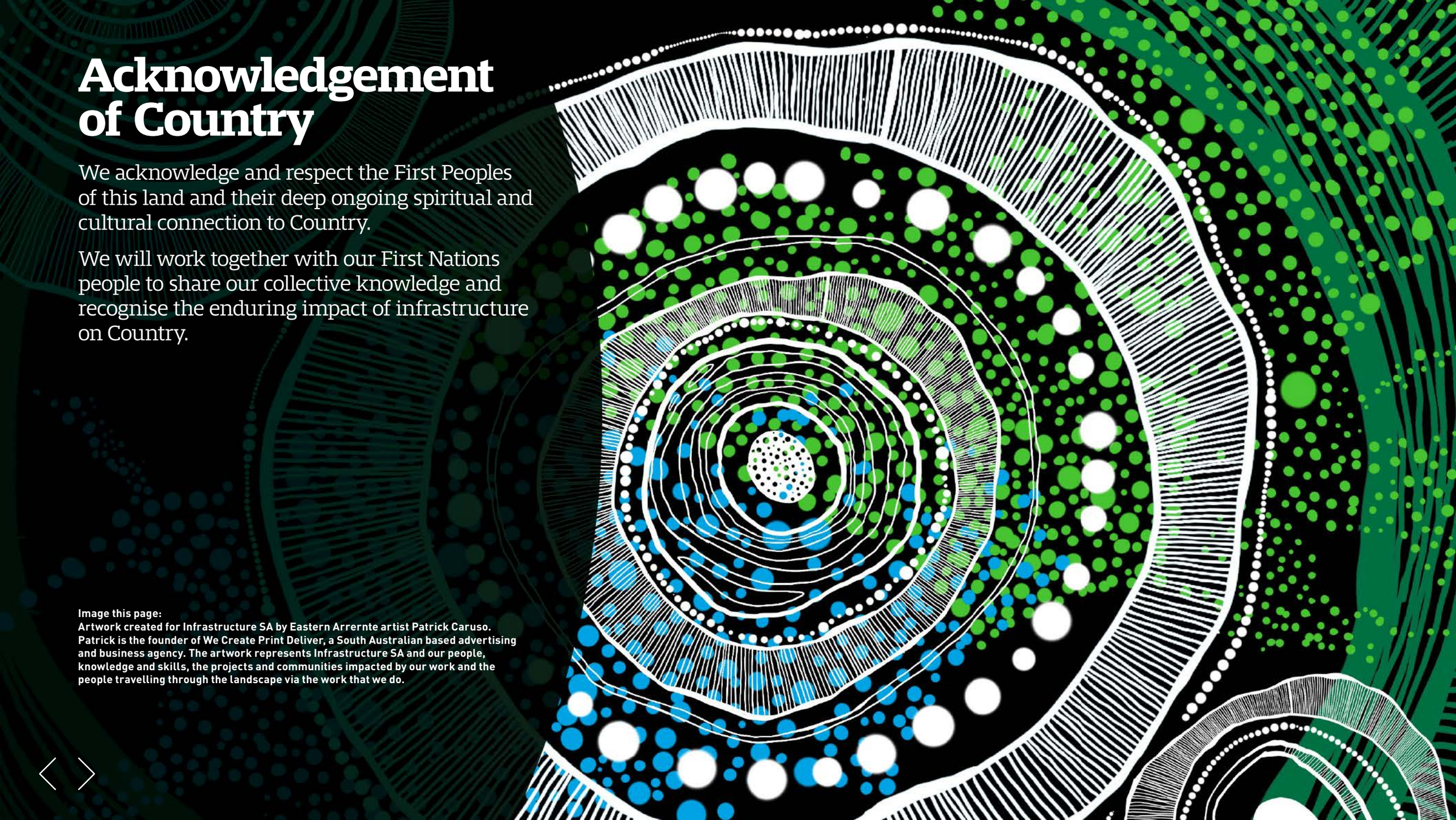

Image this page:
Artwork created for Infrastructure SA by Eastern Arrernte artist Patrick Caruso. Patrick is the founder of We Create Print Deliver, a South Australian based advertising and business agency. The artwork represents Infrastructure SA and our people, knowledge and skills, the projects and communities impacted by our work and the people travelling through the landscape via the work that we do.

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Front cover image: Adelaide Torrens Riverbank, South Australia
Image – James Knowler, JKTP

From the Chairperson

Dear Premier,

I am pleased to present South Australia's 20-Year State Infrastructure Strategy 2025 (the Strategy) to the South Australian Government, on behalf of the Board of Infrastructure South Australia.

As required by the *Infrastructure SA Act 2018* (SA) and your Statement of Expectations, the Strategy sets out Infrastructure SA's independent advice on the needs, strategic goals, and priorities for infrastructure in the State for the next 20 years.

The long-lead times and life of infrastructure means we must plan now for the future, and ensure we are delivering the right infrastructure in the right location, when it's required.

This Strategy takes an outcomes-based approach, looking across sectors to identify the strategic economic and social infrastructure necessary to ensure economic growth, prosperity, and quality of life for all South Australians. The Government is already committed to record infrastructure investments, creating a pipeline that will extend beyond the current $25.6 billion forecast to 30 June 2028.

Infrastructure plays a key role in facilitating our economic growth and productivity and leveraging our strengths as a State. South Australia is well placed to realise opportunities associated with our natural resources, energy, and defence sector capabilities. Importantly, our regional centres of economic activity will need to be supported by reliable and affordable enabling infrastructure which provides the water, energy, and transport to attract private investment. While a growing population will help stimulate economic activity, it also brings new infrastructure requirements, especially to support housing and social needs.

A proactive, adaptive and coordinated approach to meeting these needs is required. Our most pressing need is the supply of people with scientific, technical and practical skills that are essential to the delivery and operation of infrastructure. We also need qualified people to operate our new found manufacturing capability.

Our population is ageing and the future demand on our health services is expected to grow. This Strategy identifies that embracing technology, increasing access to home and community care and providing alternative care for patients away from hospitals, will help relieve the pressure on our health infrastructure while supporting a healthy and productive population.

As the population continues to grow, our communities will need access to reliable, comfortable, and available public transport. Congestion negatively impacts the productivity and liveability of Adelaide. Public transport should be a more attractive and economic option, compared to private vehicles.

> *Given the ambitious and essential forward program of infrastructure investment, industry capacity constraints and growing net debt, we must optimise every dollar of our infrastructure spend.*

The growing global focus on sustainability and net zero targets means we need to demonstrate that our infrastructure decisions consider environmental, social, and economic outcomes in support of an equitable future for generations to come. The Strategy recommends we develop a detailed long-term plan to reduce greenhouse gas emissions and acknowledge environmental and cultural values as part of infrastructure planning, delivery, and operations. We also highlight the need to better manage our environmental impact, including adoption of the circular economy.

Given the ambitious forward program of infrastructure investment, industry capability and capacity constraints and growing net debt, we must optimise every dollar of our infrastructure spend. The Strategy recommends a more strategic and consistent approach to asset management across Government, with deeper consideration of infrastructure resilience. We should prioritise our investments to manage capacity constraints, improve visibility of the Government's infrastructure pipeline and lift productivity with technology and modern methods of construction. Where it is logical and efficient, consideration should be given to leveraging private sector finance and user contributions to support future infrastructure.

I extend my appreciation to the industry and community bodies, companies, local and state government agencies, and members of the public who contributed to the development of the Strategy.

I also thank the Infrastructure SA team led by Chief Executive Jeremy Conway for their commitment to developing this Strategy.

We look forward to working collaboratively across Government to implement the Strategy's recommendations, in support of driving a productive and growing economy that will benefit current and future generations of South Australians.

Anthony Shepherd AO,
Chair of Infrastructure SA

March 2025

Northern Connector freight route, South Australia
Image – James Knowler, JKTP

Introduction

Murray River, Riverland, South Australia
Image – Ben Goode for South Australian Tourism Commission

I-1 Infrastructure SA

Infrastructure SA is an independent agency of the South Australian Government which provides expert advice to the government on coordination, planning, prioritisation, delivery, and operation of infrastructure.

Infrastructure SA was established and operates under the *Infrastructure SA Act* 2018 (SA) (the Act) to serve as an independent advisory and assurance body in relation to major infrastructure projects in South Australia. It is governed by an independent board, with both public and private sector expertise, and reports directly to the Premier of South Australia.

Section 5(1) of the Act defines the objects of Infrastructure SA as:

- to promote such efficient, effective, and timely coordination, planning, prioritisation, delivery, and operation of infrastructure as is necessary for the economic, social, or environmental benefit of the State; and
- to promote the adoption and use of policies, practices, information, and analysis to support sound decision-making in relation to infrastructure.

Consistent with the Act, Infrastructure SA has four core deliverables:

- Preparing a 20-Year State Infrastructure Strategy and updating it at least every five years
- Providing project monitoring as independent assurance for projects and programs with a capital value of $50 million or more
- Preparing an annual Capital Intentions Statement that represents Infrastructure SA's views on priority infrastructure initiatives
- Providing strategic advice to the Premier of South Australia as needed.

Infrastructure SA's vision is that efficient and evidence-based infrastructure planning and delivery will grow the economy, create jobs, and improve liveability for all South Australians.

You can find out more about Infrastructure SA on our website infrastructure.sa.gov.au.

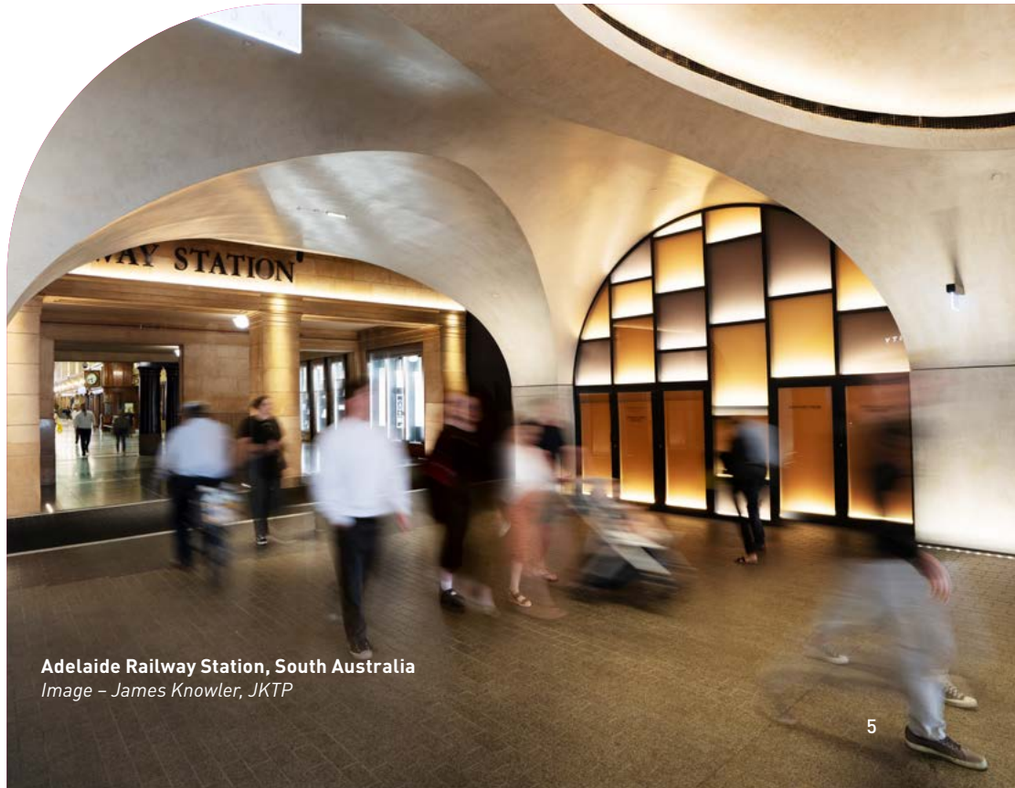
I-1.1 Infrastructure definition

Infrastructure SA uses the following broad definition of infrastructure.

Box 1. Infrastructure

Infrastructure is the physical assets and structures that enable the services necessary to sustain or enhance the economy, environment and liveability of South Australia.

This includes roads, rail, ports, housing, and facilities associated with health, culture, sports, tourism, education, energy, water and waste utilities. It also includes digital connectivity infrastructure and other physical assets that can act as enablers for industry and other sectors of the economy.



Adelaide Railway Station, South Australia
Image – James Knowler, JKTP

I-1.2 Why we need an Infrastructure Strategy

Infrastructure is central to the economic prosperity and liveability of our state. It is the backbone of a productive economy and it impacts and shapes every aspect of our day-to-day lives. Good infrastructure planning requires taking a long-term view as the infrastructure built now will provide services for many years to come.

South Australia's program of infrastructure investments is growing and is estimated to reach $25.6 billion by 30 June 2028.[1] At the same time, we are seeing significant changes globally and locally which are impacting our economy, the infrastructure we need, when and how we deliver it.

Now more than ever, our infrastructure must be well planned and coordinated. We are facing a range of challenges from climate change and net zero targets to global instability, a growing population, changing skill needs and new and disruptive technologies. We are also experiencing a push for a more inclusive society and economy.

This new 20-Year State Infrastructure Strategy (the Strategy) provides expert, independent advice to the South Australian Government on strategic infrastructure needs to 2045. It will inform our government on priorities for infrastructure spending, ensuring it is aligned to economic growth, while balancing social and environmental objectives.

The Strategy is Infrastructure SA's foundational document and provides the basis for advice to Government on infrastructure priorities. It is complemented by Infrastructure SA's other functions, including the Capital Intentions Statement, which identifies major priority infrastructure projects (generally greater than $50 million) for South Australia over the next five years. The Statement is limited to projects not already included in the budget forward estimates and provides a shorter-term view of infrastructure project priorities.

I-1.3 2020 Strategy progress

Infrastructure SA delivered its inaugural 20-Year State Infrastructure Strategy in May 2020 (the 2020 Strategy). The 2020 Strategy set out state-wide, long-term strategic directions and priorities to inform infrastructure investment across a wide range of infrastructure sectors. The 2020 Strategy identified 7 key principles and 38 long-term priorities. Infrastructure SA has tracked these priorities with most having progressed, whilst others require continued, ongoing focus.

In the five years since the release of the 2020 Strategy, our infrastructure needs have continued to evolve in the face of global drivers and local changes, including an ever-increasing infrastructure base, new economic priorities, decarbonisation in the transition to net zero targets, the emergence of new technologies and shifting social expectations. These factors make it timely to review our strategic needs and priorities.

This Strategy builds on and updates the work undertaken in the 2020 Strategy, with a focus on priority areas where ongoing progress is required.

I-2 Strategy from 2020 to 2025

To ensure the development of a robust and relevant strategy, Infrastructure SA undertook a program of work to build strong, evidence-based analysis and recommendations. This included engagement with stakeholders, researching infrastructure trends and directions, gathering data, commissioning studies, and engaging with experts to advise on specific issues. We reviewed the ongoing relevance and implementation of the seven key principles and 38 long-term priorities identified in the 2020 Strategy and considered how best to update and revise these to better align to new and emerging needs and trends.

This Strategy has been developed to provide evidence-based, stakeholder-informed directions, and recommendations to guide infrastructure planning and decision making by government and industry. It targets actions that support a South Australia that is prosperous, liveable, sustainable and a good place to do business.

I-2.1 Strategy framework

To provide a clear direction for this Strategy, the vision of the South Australian Economic Statement[2] was adopted.

An economy that is fit for the future, improving the wellbeing of all South Australians.
An economy that is smart, sustainable and inclusive.

Building on the principles from the 2020 Strategy, six key strategic objectives were identified to guide our early planning and engagement on the 20-Year State Infrastructure Strategy Discussion Paper (2023 Discussion Paper).

The six key strategic objectives were refined into four Strategy outcomes that underpin the vision of the Strategy, as presented in Figure 1.

Four outcomes

1. Paving the way to prosperity

Infrastructure is a catalyst for unlocking economic growth

2. Liveable today, flourishing tomorrow

Well-planned infrastructure creates resilient, inclusive and vibrant communities

3. Shaping a sustainable future

Infrastructure decisions advance climate readiness, safeguard nature and culture and promote a circular economy

4. Elevating impact

Optimised infrastructure investments drive economic, environmental and social value

Figure 1:
2025 Strategy outcomes

I-3 Our approach

In recognition of the interconnection between the individual sectors included in the 2020 Strategy, we carefully considered how to take a more integrated and outcomes-based approach for this Strategy and its recommendations.

Throughout the development of the Strategy, we consulted and engaged with a range of stakeholders including government agencies, businesses, industry and industry groups, community organisations and the broader South Australian community.

We employed a range of collaboration approaches through the 2023 Discussion Paper. These approaches helped us gather evidence, inform the direction of our research, and were used to test and shape our responses and recommendations.

Through our program of engagement and consultation, we sought to understand the needs and views of different communities, sectors, and regions which has helped shape the direction of the Strategy. Stakeholder consultation and engagement enabled information and data collection, furthering understanding of strategic context, leading to identified needs, views, and gaps, and ensuring consideration and alignment with relevant State Government strategies and plans.

Draft responses were also tested with relevant stakeholders as part of a targeted set of consultation and engagement activities. Details on how we collaborated and key findings from our engagement activities are discussed in the following sections.

I-3.1 Collaborate

I-3.1.1 2023 Discussion Paper

To garner broad stakeholder feedback, Infrastructure SA released the 2023 Discussion Paper and invited South Australians to share their insights and views on state-wide infrastructure challenges, needs and opportunities to support the state's economy and liveability into the future.

The 2023 Discussion Paper was made available on the YourSAy and Infrastructure SA websites. Feedback was sought via written submissions over a six-week consultation period between 1 October and 13 November 2023.

To promote awareness and encourage feedback, we used a range of media and communication channels including print, radio, digital and social media, together with electronic mail distribution to subscriber lists and direct targeted email approaches. Throughout the six-week consultation period we also attended a range of forums, presentations and held face-to-face meetings where we introduced the Strategy, outlined the 2023 Discussion Paper and encouraged feedback via written submissions.

Image – iStock.com/Insta_photos

I-3.1.2 What we heard

The 2023 Discussion Paper consultation generated strong interest, with feedback and submissions from a diverse range of stakeholders including individuals, industry and representative bodies, companies, government agencies and statutory authorities, advocacy groups and local government, as presented in Chart 1.

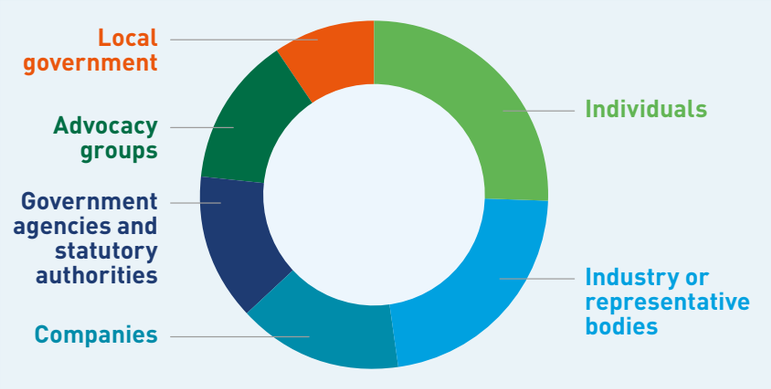


Chart 1:
Submissions received by stakeholder groups – 2023 Discussion Paper

A What We Heard Report, summarising the 2023 Discussion Paper consultation process and feedback received, was published on the YourSAy and Infrastructure SA websites. Written submissions received were published on the Infrastructure SA website. A summary of engagement activities and level of response is shown at Figure 2, providing a snapshot of consultation reach and level of interest.

A total of 118 submissions were received during the consultation period. Submissions covered a diverse range of topics. Review and analysis of the submissions identified six common themes which emerged as the most frequently raised topics of discussion, as summarised in Figure 3. The most frequently raised topic in the submissions from public and community advocacy groups was public and active transport. Topics raised in submissions from industry, industry bodies and other stakeholders were broader and typically focused on the challenges and opportunities most relevant to each industry or body.

2,440 active YourSAy website visits

Infrastructure SA launched the Discussion Paper on YourSAy, the South Australian Government's online consultation hub. The Paper was also made available on the Infrastructure SA website.

2,440

1,863 downloads

There was a total of 1,863 downloads of the Discussion Paper from the YourSAy website.

1,863

10,000 LinkedIn® impressions

Infrastructure SA published regular posts throughout the six week consultation period to encourage submissions, resulting in a total of 10,000 views.

10,000

Facebook reach

YourSAy utilised their Facebook reach to publish posts encouraging submissions. A total of 7,480 people saw content about the Discussion Paper.

7,480

94 Rapid surveys completed

To capture perceptions on the objectives and the most important infrastructure areas to unlock economic growth.

94

Written submissions

A total of 118 submissions were received through the YourSAy webpage and Infrastructure SA's email inbox.

118

Figure 2:
Engagement activities and response statistics – 2023 Discussion Paper

Integrated planning

We heard that industry currently experiences a fragmented approach to planning, with strategic planning undertaken across multiple government agencies. Better coordination and greater transparency in planning, funding and decision-making, especially relating to water, wastewater, and public transport infrastructure was sought.

Energy transition

The unknown role of different technologies in the future energy market is causing uncertainty for investments. There is concern on the current and forecast lack of a skilled workforce for energy projects and requests for a coordinated approach to decarbonising hard-to-abate industries.

Public and active transport

There is a desire to see improvements to public and active transport. The most common areas of focus are improved connectivity, further investment in outer and growth areas, electrification of existing rail lines, and the extension of the rail and tram network.

Freight

Reactivation of former rail lines, as well as new extensions, were suggested to improve freight efficiency for regional industries such as grain and mining. It was suggested that shifting more freight from road to rail could alleviate the funding backlog for the maintenance of regional roads and improve safety on the road network. Intermodal hubs and improvements in connections between the rail network and ports were suggested to improve export efficiency.

Climate resilience

Feedback indicated that efforts towards climate change adaption and mitigation require better coordination across government. Respondents also discussed concerns in relation to climate change risks for new and existing infrastructure and saw a role for government to ensure there are clear and uniform reporting frameworks for assessing climate risk, and to give certainty for investment.

Digital connectivity

Hard infrastructure (cables and masts) is seen as an enabler for economic growth and bridging regional, metropolitan and socio-economic divides. There is a desire for government to coordinate digital platforms which enable technologies, such as digital twins, to enhance decision-making and sharing of information.

Figure 3:
Six common themes of engagement responses – 2023 Discussion Paper

I-3.1.3 Online survey

In parallel to the release of the 2023 Discussion Paper, we ran a short online survey to gauge perceptions on the importance of the six key strategic objectives and gather views on what stakeholders saw as the most important infrastructure needed to unlock economic growth. The survey was hosted on the YourSAy website and was open for the duration of the 2023 Discussion Paper consultation period.

We received 94 responses to the online survey which asked respondents to rank the objectives by perceived importance, ranging from 'not important' to 'very important'. Survey results showed strong support and high levels of perceived importance across all six key strategic objectives presented in the 2023 Discussion Paper. There was particularly strong support for the importance of liveable and well-planned places, with 96% of respondents identifying it as either important, fairly important, or very important. Similarly, 95% of respondents identified accessible and inclusive infrastructure as either important, fairly important, or very important.

Where participants were asked to rank what infrastructure was most needed to unlock growth, survey responses identified access to energy, water and freight were all a level of high priority, closely followed by digital connectivity.

I-3.1.4 Targeted engagement and related strategies

In recognition that several government agencies were in the process of updating or developing their own long-term plans or strategies, regular coordination forums were established. These forums facilitated information sharing and helped support consistency and alignment with the planning being progressed, particularly in relation to the development of the Greater Adelaide Regional Plan (GARP) and the Transport Strategy, as outlined in Table 1.

Table 1:
Key government infrastructure, land use and transport strategies and plans

The 20-Year State Infrastructure Strategy	The Greater Adelaide Regional Plan and other non-metropolitan area plans	The Transport Strategy
The Strategy looks at state-wide infrastructure needs for the next 20 years. It represents independent advice provided by Infrastructure SA to the Premier in accordance with the Act. The Strategy considers existing infrastructure, trends in infrastructure provision and assesses the needs, strategic goals and priorities for infrastructure in the State for the next 20 years.	The GARP will determine how urban growth will be managed over the next 30 years by investigating and guiding where houses and employment land will be situated and what infrastructure is needed to support these. Plans are also prepared for the non-metropolitan regions of South Australia. These plans will look at long-term infrastructure needs to support sustainable growth within these regions over the next 30 years.	The Transport Strategy sets the Government's overarching vision for transport in South Australia. It is supported by the: • SA Road Safety Strategy • Active Transport and Personal Mobility Strategy • Freight and Supply Chain Strategy • Passenger Transport Strategy • Strategic Asset Management Plan

I-3.2 Integrate, adapt and implement

In developing the Strategy, integration of the government's existing strategies was considered, to draw on their action plans, find efficiencies, and to leverage experience and knowledge.

Our world is constantly changing, and the uncertain nature of what the future holds means we need to manage our system adaptively as new information becomes available. Infrastructure has a long lifespan and needs to be informed by long-term strategic planning and thinking. Planning over long time horizons requires preparing for uncertainty, anticipating what our world will look like and what we will need in the future.

Our approach to developing the Strategy has been reflective of an adaptive approach. The Strategy sets a direction for the longer term to inform short-term decisions, whilst considering areas of future uncertainty such as climate change, technology, and population growth and how they might impact possible futures if different scenarios were to arise. This allows for consideration of how options and recommendations may work in practice and the identification of triggers in readiness for where we may need to pivot or adopt a new or additional measure, approach, or intervention.

To provide focus for the vision and outcomes, the Strategy identifies 34 recommendations, with each including a lead agency and timeframe. Each recommendation is preceded by an explanation of the case for change, as shown in Figure 4, and discussed in detail in the relevant outcome section. The case for change and associated recommendations are shown in Section I-4, with a complete list of all recommendations and responsible government agency at Appendix A. The outcomes identified for this Strategy and the subsequent recommendations are shaped to inform agencies and sectors, to allow alignment of their own strategic infrastructure approaches accordingly. This integrated approach will drive improved coordination in state-wide infrastructure provision and productivity for the long term.

Recommendations in the Strategy do not represent State Government financial commitments. As the recommendations are implemented, requests for capital funding will be made through the annual budget process, consistent with the Infrastructure SA Assurance Framework, which includes undertaking an options analysis and developing a business case, prior to requesting funding.

Infrastructure SA will monitor progress on achieving the recommendations and Strategy outcomes and report to government at regular intervals.

The case for change – In brief

Each recommendation is preceded by a brief 'case for change'.

This summary outlines the key issue or opportunity to be addressed, to enable the reader to quickly understand the context and why change is needed.

Recommendations

Recommendations are the actions identified to address each issue or opportunity.

Recommendations were formed based on extensive research and consultation, to support the Strategy's vision and outcomes.

Figure 4:
Description of the case for change and recommendations

I-4 Strategy overview

Outcome	Overview	
1. **Paving the way to prosperity:** Infrastructure is a catalyst for unlocking economic growth	• Infrastructure is key to lifting productivity and economic performance across South Australia, as we grow and realise our ambitions to capitalise on the global green transition, be a partner of choice and build our talent. • South Australia's key comparative advantages, linked to the State Prosperity Project, are reliant on capital intensive infrastructure to bring their product to market. • Integrated long-term planning and collaboration is needed to aggregate demand, so that there is sufficient scale to underwrite the necessary investment in productivity boosting infrastructure.	
	The case for change – In brief	**Recommendation**
	• South Australia has the minerals, processing and industrial capabilities, and renewable resources the world needs to decarbonise. However, many of our resources are remote and lack the scale required to underwrite the significant investment in infrastructure needed to bring products to market. • We have Australia's largest operating copper mine and reserves, with global copper demand forecast to double by 2035. • With over seven billion tonnes of economically demonstrated magnetite ore, the potential for the green iron and green steel industry is immense, with a 2.5 million tonnes per annum direct reduced iron plant forecast to create 800 permanent jobs and $3 billion gross state product per annum over 25 years. • The SA Government is introducing legislation to establish an Office of the Coordinator General who will have the ability to coordinate diverse needs for common user infrastructure, noting this will also require a collaborative, whole of government effort from key agencies. Infrastructure SA has been allocated implementation responsibility until the Office is established.	1. Prioritise common-user infrastructure where possible to aggregate demand and provide more efficient infrastructure solutions to realise the value of our natural resources.
	• Access to secure, reliable, and affordable water is needed to unlock the state's economic priorities and support our communities. • Water supply constraints are currently being experienced in the Far North, Upper Spencer Gulf, and eastern Eyre Peninsula regions of South Australia, which are reliant on constrained resources such as the Great Artesian Basin and the River Murray. • A climate-independent water source is required to unlock economic growth in the emerging green iron industry to capitalise on the growing demand for minerals critical to global decarbonisation, such as copper. • As a response, the South Australian Government is leading the Northern Water project, which involves a commercial model that aggregates demand from multiple users, minimising the financial risk to the state. • Economic modelling forecasts that the Northern Water project will contribute an additional average $5.2 billion to gross state product and employment of over 4,200 full-time-equivalent staff each year.	2. Prioritise achieving a final investment decision for the Northern Water project at the earliest opportunity.

Outcome	The case for change – In brief	Recommendation
1. **Paving the way to prosperity:** Infrastructure is a catalyst for unlocking economic growth	• The Braemar Province has enormous potential to contribute to green iron industry, with over seven billion tonnes of defined magnetite resources across different tenement holders. • The lack of access to a sustainable, economical, and reliable bulk water supply is a major constraint to growth of the province and the state's ability to improve productivity through value-add activities. • Numerous studies have been undertaken with no viable solution confirmed. • Its relative remoteness means providing infrastructure to the Braemar Province will be capital intensive, with a risk that proponents may develop individual project solutions that do not deliver the most efficient outcome to unlock the province.	3. Undertake feasibility planning to identify an economic water supply solution to unlock the Braemar Province.
	• The design of the National Electricity Market in the 1990s is not well suited to the current needs of the market which is in rapid transition, with a potential step change in demand and intermittent generation capacity. • The current national frameworks mean the reliability and security of our network is exposed to decisions and events that happen interstate. • The step change in demand and required investment in generation and transmission will need to be tied to industry policy in South Australia. • The energy transition will require significant investment and future energy prices will be influenced by the required return on those investments. Ensuring that investment is as efficient, and derisked as much as possible, will keep downward pressure on pricing.	4. The State Government form and maintain its own view on network forecasts and requirements to develop policies that encourage and provide certainty for efficient investment in the electricity network.
	• South Australia has seen a rapid expansion of renewable energy sources with renewables contributing 74% of the electricity mix in 2023. The State Government has a target that electricity generation will be sourced from 100% renewables by 2027. • The decarbonisation of our electricity network is a competitive strength for South Australia, but electricity needs to be affordable, reliable and secure to maintain this competitiveness. • To achieve this, our mix of renewables needs a sufficient supply of flexible firming generation capacity. While batteries are likely to play an important frequency and grid stability role, for the foreseeable future the network is likely to require gas peaking plants to play this role. • Firming capacity achieved through gas peaking plants will maintain reliability in the system through extended wind and solar droughts, help maintain system strength and should reduce some of the volatility in retail prices.	5. Identify the amount of flexible firming capacity required to support the South Australian electricity network and explore policy initiatives that could encourage the necessary investment (likely to be gas in the short term).

Outcome	The case for change – In brief	Recommendation
1. **Paving the way to prosperity:** Infrastructure is a catalyst for unlocking economic growth	• The state will have an ongoing need for gas for power generation, industrial purposes, and liquid fuels for transport. Gas and liquid fuels presented around 75% of state total energy consumption in 2023. • Details of the transition pathway to a 100% net zero energy system by 2050 are uncertain. Economical solutions will need to be adopted as they become both technically and commercially feasible. • With gas and liquid fuels having a role over the next 20 years, the state needs to identify the pathway to decarbonise these energy sources and the infrastructure required. • Gas will be key to realising the green iron opportunity until hydrogen is able to be commercially produced at scale. • The supply of gas to Whyalla and Port Pirie is currently constrained by infrastructure capacity. Port Augusta currently has no gas network.	6. Prepare a Future Net Zero Fuels Strategy and Roadmap that identifies the infrastructure investment requirements. 7. Undertake a feasibility study into increasing the supply of gas to the Upper Spencer Gulf to meet green iron and green steel goals at scale.
	• South Australia needs efficient freight networks to support the complete supply chain, maintain our competitive position and support our products getting to market efficiently. • High productivity vehicles carry more freight per vehicle, resulting in fewer vehicles required to move the same freight. To maximise benefits, the network design needs to contemplate the origin and destination of key freight tasks. • The Adelaide Hills forms a barrier to efficient freight movements with restrictions on the descent. Alternative free flowing corridors would improve congestion, safety and efficiency for some freight tasks. This should consider a longer-term southern connection to the North South Corridor to leverage the completed Torrens to Darlington section.	8. Identify key freight corridors and improve our competitiveness by planning for strategic investment to improve their end-to-end efficiency and resilience of these corridors.
	• Intermodals connect different modes of transportation and include warehousing and supply chain services that enable on-site processing, helping to create an integrated freight network. They are a critical enabler for modern, efficient supply chains. • Enhancing the efficiency of our intermodals and developing additional intermodals at strategic points across the state will help drive our economic vision and global competitiveness. • Where rail is proven to be a more efficient mode for a particular freight task, it could help underpin a business case for investment in intermodals to improve the overall freight efficiency, while also reducing demand on our road network.	9. Investigate future needs for intermodals, including a detailed origin and destination analysis.
	• The Le Fevre Peninsula and the Port of Adelaide are critical economic, social, and environmental assets for the state and are undergoing unprecedented levels of investment, largely driven by the Australia, United Kingdom and United States (AUKUS) submarine program. • A significant increase in vehicle movements is forecast in a spatially constrained environment. Strategic planning is required to ensure the infrastructure is in place to support the economic activity and optimise the opportunity for the State.	10. Complete a Masterplan and critical infrastructure study for the Le Fevre Peninsula.

Outcome	The case for change – In brief	Recommendation
1. **Paving the way to prosperity:** Infrastructure is a catalyst for unlocking economic growth	• The pipeline of renewables projects requires over-dimensional loads to be imported by ship, inspected and transported to dispersed, distant locations across South Australia. • This is creating demand for additional import facilities capable of handling the volume and large size of materials required. The associated land-side corridors, appropriate customs and biosecurity requirements, and common-user infrastructure needs will also need to be considered. • Currently, Port Adelaide is South Australia's only port accredited for customs and border security imports. As multiple large projects progress in regional areas, this single port of entry increases project delivery constraint, cost, and risk.	11. Identify locations for open access material offloading facilities and associated supply chain needs to support the state's economic priorities.
	• Carbon capture and storage is an emerging opportunity for South Australia, which will support meeting net zero goals for hard to abate industries and complement the State Prosperity Project. We are well positioned due to our depleted oil and gas basins and a progressive regulatory framework. • South Australia has an opportunity to establish an industry that uses carbon dioxide for industrial processes including sustainable fuels, and storage in depleted oil and gas basins. • A carbon capture aggregation hub around Whyalla with a pipeline to the Cooper Basin near Moomba is a viable option. • There is a growing international market for sustainable fuel products, with Japan setting targets for e-methane to decarbonise their gas networks. • The Upper Spencer Gulf is ideally placed as the basis for an initial industry. The existence of the Port Bonython Jetty and liquid fuels export facility, connected to the Cooper Basin, with the pipeline easements means many elements of the requisite infrastructure and corridors already exist.	12. Identify key carbon capture and storage infrastructure opportunities and sequencing to aggregate demand and support net zero and commercial opportunities at scale. 13. Identify the key opportunities for value-add use of carbon dioxide and enabling infrastructure.

Outcome	Overview
2. **Liveable today, flourishing tomorrow:** Well-planned infrastructure creates resilient, inclusive and vibrant communities	• South Australia's population is increasing, which will help us provide the labour and skills to grow our economy. To support this population growth, we need a supply of affordable housing in the right locations. • Infrastructure plays a critical role in unlocking land for housing and ensuring our communities have access to jobs and services. Our housing strategy needs coordinated, forward planning, using sustainable funding approaches. • Forecast growth means we need to optimise use of our infrastructure and plan for new and/or expanded capacity in key areas such as water, wastewater, schools, transport, and the health system.

The case for change – In brief	Recommendation
• Applying trigger measures for future infrastructure requirements is the first step in planning at a network level, in support of our future growth. • Trigger measures can help identify the type of infrastructure required, when it is required and indicative costs. Trigger measures should be used to inform more detailed investigations to determine optimal network system solutions, prior to decisions on infrastructure investment. • Understanding the trigger measures for additional infrastructure capacity can inform the sequencing of future land releases. • Sequencing land releases in urban development helps to ensure that growth occurs in a managed, efficient, and sustainable manner, leveraging existing infrastructure to its full potential while minimising costs and environmental impact.	14. Sequence land releases to ensure that growth occurs in a managed, efficient, and sustainable manner, leveraging existing infrastructure to its full potential.
• Historically, the reservation of land and corridors for future infrastructure provision has been ad-hoc, leading to a lack of value for money for government and sub-optimal outcomes. • Reserving strategic infrastructure growth corridors and land at an early stage in the planning process supports an integrated, transparent approach to providing core infrastructure aligned to new developments and community needs. • The implementation of a digital planning system, and the formation of the Department for Housing and Urban Development, provides an opportunity to drive all infrastructure providers to identify strategic land needs early.	15. Reserve strategic infrastructure corridors and lands for future infrastructure needs.
• Across South Australia, much of our water is sourced from climate-dependent resources, such as the River Murray, surface water catchments, reservoirs, or groundwater. • Climate change, ageing infrastructure and increasing expectations for greening our communities all compound the pressure that population growth places on our infrastructure. • A more integrated, circular approach to water is needed to maximise all sources of water and ensure investment in new infrastructure is efficient. • Governance and responsibilities across the water cycle is disjointed and is a barrier to truly integrated water management.	16. Establish a governance model that supports water security through adaptive integrated water management.

Outcome	The case for change – In brief	Recommendation
2. **Liveable today, flourishing tomorrow:** Well-planned infrastructure creates resilient, inclusive and vibrant communities	• Access to a secure and reliable water supply supports the health and resilience of our communities and ecosystems and is central to urban amenity and liveability. • Projections for Greater Adelaide have shown that in the absence of further investment in new water supplies, under a scenario with high population growth, high impact climate change and full use of the Adelaide Desalination Plant, localised water shortfalls could occur by 2032. • Population growth in the Northern metropolitan Adelaide region of Adelaide, and its location on the edge of the existing network presents a key challenge, with a need to undertake planning now to ensure sufficient water availability, given new water supplies take many years to plan and deliver.	17. Undertake investment readiness activities for a new climate-independent water supply solution for the Northern metropolitan Adelaide region.
	• Access to reliable wastewater services and infrastructure is essential to supporting growing communities. • Unprecedented residential growth in Greater Adelaide and in particular, greenfield developments in the Northern metropolitan Adelaide region are challenging the provision of wastewater services. These new developments are occurring beyond the extent of existing networks and increasing overall network demand, which is forecast to exceed available capacity. • There is a need to undertake long-term planning to identify optimal infrastructure investments that meet future wastewater treatment capacity needs across the network.	18. Undertake and publish a system-wide review of both the network and wastewater treatment plant capacity to identify a long-term solution that caters for growth in northern Adelaide.
	• South Australia's population is growing, and the number of school-aged children will increase by over 18,000 over the next 20 years. The capacity for existing primary and secondary schools to cater for this demand varies across Greater Adelaide. • While land needs to be identified and provisioned for new schools in greenfield growth areas, addressing demand is more challenging in existing metropolitan areas where sites are limited, and land is more expensive. • Maximising capacity in existing schools will be required to absorb and support future growth, to attract additional students and smooth capacity enrolments across the public-school network.	19. Optimise existing education assets by adopting strategies to increase demand for schools with capacity in established areas.
	• Increasing demand, high utilisation of hospital services, and growing health care costs are placing pressure on our health system. Our growing and ageing population are key contributors to this challenge. • Demand on hospitals is exacerbated by patients who are unable to be discharged due to a lack of suitable alternative options, particularly for National Disability Insurance Scheme and aged care patients. • Approaches are needed that better address and provide options for the outflow of patients and avoid hospital admissions. Measures include increasing access to home and community care, preventive actions to improve health and using emerging technologies such as artificial intelligence to detect and monitor disease, as well as tech-enabled delivery to expand access and capture advances in knowledge.	20. Prioritise measures that optimise health system efficiency and reduce burden on hospitals by investing in alternatives to hospital and innovative service delivery models.

Outcome	The case for change – In brief	Recommendation
2. **Liveable today, flourishing tomorrow:** Well-planned infrastructure creates resilient, inclusive and vibrant communities	• Current and future growth in Greater Adelaide's population will continue to place pressure on the transport network, particularly considering our reliance on private vehicle travel. • Congestion negatively impacts our productivity and liveability and is forecast to get worse. • With limited space, budget constraints and the need to meet net zero targets, we cannot continue to build our way out of congestion. • We need to improve uptake of public transport to maintain liveability, improve access to jobs, reduce congestion and meet net zero targets, through an improved network integration. • To address these challenges, a strategic network redesign is required, with consideration to public and active transport and preservation of future mass transit corridors.	21. Strategically review the public and active transport networks to ensure that they provide integrated services that are attractive to consumers. 22. Implement public and active transport targets to drive a focus on initiatives that increase patronage.
	• The Adelaide Railway Station is the central terminus of the metropolitan railway system. • With the new Port Dock service commencing in 2024, the Adelaide Railway Station is now at capacity. The lack of thoroughfare limits the ability of the passenger rail network to expand services on existing or new lines. • The significant growth forecast for the north and south of Greater Adelaide will create a need to provide mass transit options that move large numbers of people. However, Adelaide Railway Station presents a constraint. • Creating an underground link could release significant capacity within the network and connect all lines seamlessly.	23. Identify the long-term solution to address the capacity constraints of Adelaide Railway Station, including the viability of an underground rail link.
	• Providing enabling infrastructure is capital intensive, with high up-front costs that must be funded and ultimately paid for by the beneficiaries. • Existing cost recovery mechanisms are applied inconsistently and are potentially unsustainable. • A holistic approach needs to be adopted that considers all the infrastructure required to support growth areas. It should identify the funding mechanisms that can be applied in a consistent and optimal manner to the benefit of all users.	24. Identify and implement sustainable funding mechanisms for provision of infrastructure to support growth areas and new developments.

Outcome	Overview	
3. **Shaping a sustainable future:** Infrastructure decisions advance climate readiness, safeguard nature and culture and promote a circular economy	• Good infrastructure planning and decision-making balances environmental, social, and economic outcomes in support of a sustainable and equitable future. • Meeting net zero targets requires reducing greenhouse gas emissions from key sources like infrastructure, transport, and our homes, while ensuring an orderly transition and leveraging our existing infrastructure investments. • In addition to meeting net zero targets, we need to avoid or minimise the impacts of infrastructure and enhance resilience. • Increasing expectations for sustainability reporting mean government needs to report transparently and consistently on progress.	
	The case for change – In brief	**Recommendation**
	• Buildings and infrastructure-based projects are directly responsible for almost one third of Australia's total greenhouse gas emissions, and indirectly responsible for over half of all greenhouse gas emissions. • In South Australia, the greenhouse gas emissions associated with buildings and infrastructure are likely to represent a larger proportion of total state greenhouse gas emissions than in other jurisdictions, as we have made significant progress in decarbonising our energy sector. • There is currently a lack of consistency in considering potential greenhouse gas emissions from infrastructure, or options to mitigate greenhouse gas emissions. There is a need for a more coordinated and consistent approach to understand, measure, reduce, and mitigate carbon across the asset life cycle (construction, operations, and use).	25. Develop a South Australian infrastructure decarbonisation policy to manage greenhouse gas emissions across the asset lifecycle.
	• Electric vehicle charging creates an additional load on the electricity network which can have a significant impact, particularly in regional and remote communities with existing capacity constraints. Estimates indicate that residential electric vehicle chargers have the potential to double the electricity demand of a property. • Uncertainty in the scale and timing of electric vehicle uptake and the location of charging stations creates complexity and technical challenges for the electricity network. • State-level planning for the future electric vehicle charging network will help ensure the network has the capacity to manage additional loads, enable management of dynamic loads and support optimal cost recovery for the necessary investments.	26. Prepare a state-wide electric vehicle charging plan that establishes the medium and long-term approach to charging infrastructure and associated network impacts.
	• Gas will continue to play an important role in South Australia. The ability of gas to provide reliable, flexible, and relatively low-carbon energy makes it an essential component of our overall energy transition strategy. • Research indicates it is viable to use existing 8,661 kilometres of gas networks for hydrogen blends in South Australia, creating an ongoing role for our existing gas infrastructure as we transition to net zero and decarbonise the network. • Leveraging our significant investment in the existing gas infrastructure network will reduce or defer the need for new infrastructure and achieve financial, time, and environmental benefits.	27. Continue to leverage the existing gas infrastructure network while exploring options to decarbonise and utilise low or zero carbon fuels such as hydrogen.

Outcome	The case for change – In brief	Recommendation
3. **Shaping a sustainable future:** Infrastructure decisions advance climate readiness, safeguard nature and culture and promote a circular economy	• Waste to energy offers an alternative waste management and recovery option where energy and by-products are recovered in usable forms. Processes such as gasification better align with circular economy principles. • Generators powered by post-recovery waste can operate in a manner that helps to balance the intermittent nature of renewables and increase energy system stability.	28. Consider the role of waste to energy as a viable option, aligned with circular economy principles.
	• To achieve South Australia's economic aspirations and leverage our comparative advantages in a global market, we need to clearly demonstrate and verify our environmental, social, and governance credentials. • There are increasing expectations and requirements for improved sustainability performance and reporting, to enhance transparency and accountability from infrastructure projects. Improved transparency will also help us attract finance for infrastructure investments including from the growing green and sustainability bond markets. • Currently there is no guidance on sustainability standards and performance reporting for government infrastructure projects. The inclusion of sustainability outcomes in infrastructure projects and performance reporting will help drive outcomes aligned to greenhouse gas emissions reduction, climate risk management and environment protection. It will also support readiness for disclosure expectations, as they move to become mandatory reporting requirements.	29. Develop an Infrastructure Sustainability Framework that provides guidance on incorporating sustainability standards and reporting across all stages of the infrastructure lifecycle.
	• Infrastructure has positive benefits but can also impact the environment through clearance and habitat loss, pollution, or poor waste management. In recognition of the need to protect and conserve nature and biodiversity, both the Australian and South Australian Government are progressing legislative reforms that will likely require greater consistency and transparency on decision making and drive requirements for clear targets and reporting. • There is a growing need to address and account for nature and cultural values in infrastructure decision making and public reporting, which can be facilitated at the outset of infrastructure decisions through more integrated assessments in business cases.	30. Update Business Case requirements to ensure that environmental and cultural values are consistently accounted for and included in decision making.

Outcome	Overview
4. **Elevating impact:** Optimised infrastructure investments drive economic, environmental, and social value	• South Australia has an ambitious forward program of infrastructure, with infrastructure spend estimated to reach $25.6 billion over the four-year period to 2027–28. However, our program is competing with a national pipeline and demand from the energy, mining, and defence sectors. • Limited market capacity is creating competition for skills, labour, and materials. When combined with fiscal constraints, it is clear that we need to maximise the value of our existing infrastructure through strategic asset management, provide industry with improved visibility to plan further ahead, lift our productivity and prioritise our investments to get best value-for-money and deliver on the infrastructure pipeline. • With growing net debt, we also need to plan sustainably funding our infrastructure through alternative funding and financing options.

The case for change – In brief	Recommendation
• The South Australian Government's asset base is increasing in value and is estimated to reach $114 billion by 2027–28. We need to maximise the value of our existing infrastructure by taking a whole-of-lifecycle, strategic approach aligned to agreed service levels and better managing demand. • Asset management approaches are inconsistent across the South Australian Government. Mixed maturity levels mean maintenance planning is often reactive, which can reduce asset lifespans, resulting in increased expenditure over the life of an asset and diminished asset performance due to downtime. It can also lead to unplanned service disruptions for the community. • Experience from other jurisdictions indicates benefits can be achieved through improved asset management, including operational budget savings of up to 15% within 5 years, enhanced asset resilience and more informed prioritisation and decision making, including on the basis of asset capacity and risk. • Assurance of asset management plans could help improve capability and inform a whole of government view on the performance of our assets.	31. Develop a whole-of-government asset management framework focused on improving capability and accountability, consistent with modern industry standards. The framework should be integrated with the budget process, where asset management plans support informed decision making. 32. Establish an independent asset management assurance framework to periodically evaluate the asset management performance of agencies.
• In a competitive national market with a large pipeline of work, South Australia needs to provide visibility for industry to invest in the necessary skills, equipment, and technology to improve productivity to help deliver our pipeline. • The South Australian Government currently publishes information across a number of platforms. The Forward Work Plan published by the Department for Infrastructure and Transport is informative but by its nature excludes projects being completed by SA Water, SA Housing Trust and Renewal SA – worth an estimated $3.8 billion over the next four years. • A consistent, whole-of-government view that includes non-government, public infrastructure projects would provide improved visibility, and in future could include targets for infrastructure investment beyond the forward estimates period.	33. Publish a consolidated forward infrastructure investment pipeline and mature over time to expand its coverage.
• The scale and complexity of infrastructure projects is growing, with the emergence of new types of projects that do not fit neatly within the remit or expertise of existing infrastructure delivery agencies. • Given market capacity constraints and productivity challenges, South Australia needs to ensure we have the skills needed, that we apply leading practice approaches to project planning, delivery, procurement, and governance and that we leverage innovation to support improved productivity.	34. Review current project delivery models, procurement approaches and capability, to achieve optimal risk and value outcomes.

I-5 Strategic context

I-5.1 Economic setting

I-5.1.1 Global

The global economic outlook is cautiously optimistic with economic growth stabilising at around 3% through to the end of 2026.[3] This is within the context of inflationary pressures easing, improving real incomes and increasing investment and consumption.[4] Escalating geopolitical tensions and climate risks continue to challenge the global economic outlook as countries seek to address elevated public debt levels and interest rates[5], while managing the transition to net zero emissions.[6]

Technological advancements in artificial intelligence, digital transformation and the renewable energy sector will facilitate the transition to net zero and can provide potential new economic opportunities – particularly for resource-rich economies.[7]

As a relatively open, trade-exposed economy, Australia can be significantly impacted by changes that influence other countries' demand for our goods and services, including trade tensions and fluctuating global commodity prices.[8]

I-5.1.2 Australian

Economic growth in Australia has reflected global trends with modest growth in recent years. Australia's Gross Domestic Product (GDP) growth over the 2023–24 financial year was 1.5% although GDP per capita fell by 1% over that period.[9]

The outlook for Australia's economic growth suggests a modest economic cycle within the context of the Reserve Bank of Australia's forecast that inflation will reach 2.5% by late 2026.[10] Australia's labour market is expected to continue expanding with national employment projected to increase by 6.6% over the 5 years to May 2028.[11] Consumer spending and business investment is expected to improve once inflation eases and when household incomes gradually improve.[12]

Consistent with most advanced economies, Australia has experienced low productivity growth, particularly in the construction sector.[13] Strategic investments in skills, adoption of new technologies and realising opportunities from the transition to a net zero emissions economy will enable Australia's productivity to improve over the longer term.[14]

I-5.1.3 South Australian

South Australia is evolving into a resilient and strategically positioned economy. Like most states and territories, South Australia recorded a more modest 1.2% real growth in Gross State Product (GSP) in 2023–24 compared to the previous year.[15] This growth has been underpinned by the contribution of key industry sectors such as health care and social assistance, construction, and agriculture, forestry and fishing.[16] Additionally, the state's export sector has expanded significantly with export value increasing by 55% over the ten years to 2023–24. Half of the export value during that period was contributed by the agriculture, fisheries, and food sector.[17]

Looking ahead, South Australia is well positioned to capitalise on emerging global trends and challenges. The state's abundant renewable energy resources and mineral deposits place it at the forefront of the global shift towards net zero emissions, particularly in the emerging green iron and steel industries. The increasing importance of artificial intelligence and other advanced technologies will also drive the growth of knowledge-intensive industries and skilled services. This will foster innovation, job creation, and enhanced productivity growth.

I-5.2 Our population

South Australia's population has grown steadily from 1.6 million in 2011 to 1.8 million in 2022.[18] It is expected to continue to grow at an average annual growth rate of 1%, to reach 2.3 million by 2051 (medium growth scenario), as presented in Chart 2.[19] While COVID saw South Australia experience a decline in net overseas migration, this was offset by slightly positive net interstate migration growth for the first time in almost 30 years.[20] Post COVID saw overseas migration bounce back strongly, but growth is expected to settle at a slightly lower level over the next few years.[21]

The next 30 years will see our population age significantly, with the number of 'active retirees' (65 to 79 years old) projected to increase by 30%, and the older population (over 80 years old) projected to increase by 146%, as shown in Chart 3.[22]

This presents significant challenges to infrastructure and service planning, particularly for health, wellbeing and social services.

The population of the Greater Adelaide Region is expected to continue to grow strongly and increase its share of the total population, making up 86% of the state's population by 2051.[23] Population growth in the non-metropolitan regions is based on the assumptions applied to Greater Adelaide (i.e. mortality, fertility, net overseas and interstate migration), with consideration of key economic development projects, such as is planned for the Yorke Peninsula.[24] An explanation of the projections, scenarios and regions are shown in Figure 5.

Population projections

The Department for Housing and Urban Development prepares population projections for South Australia at the all-of-state and regional level to provide a common base for land use, infrastructure, and service planning.

The projections are provided for a 30-year period to 2051 and are updated every 5 years.

Given uncertainties around future size and distribution of growth, detailed projections for non-metropolitan regions are only available until 2041.

Population scenarios

The projections are calculated for high, medium, and low growth scenarios.

The Department for Housing and Urban Development adopts the high growth scenario for the purpose of land use planning to ensure adequate land is made available in the future pipeline.

The Department recommends that for the purposes of infrastructure planning, the medium growth scenario series is applied, as the most likely demographic future.

Greater Adelaide and the regions

There is a total of 7 planning regions in South Australia, which are divided up further into 19 population projection regions. These regions align with the Australian Bureau of Statistics (ABS) geography.

Greater Adelaide is made up of 10 land supply regions (with the GARP splitting Adelaide and Inner metropolitan Adelaide into two land supply regions).

Figure 5:
Population projections, scenarios, and regions[25]

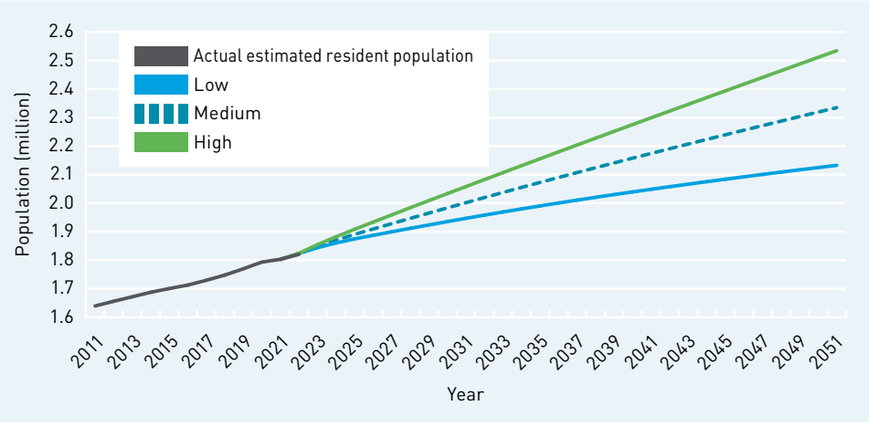


Chart 2:
South Australia's population, 2011–51[26]

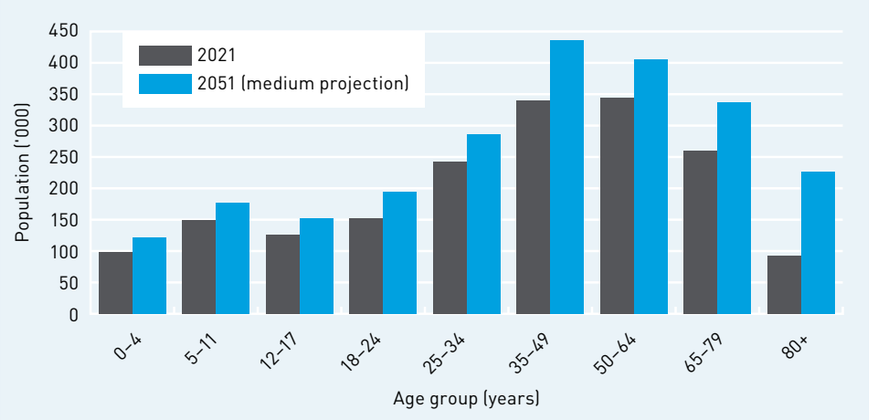


Chart 3:
South Australia's population by age, 2021 and 2051[27]

I-6 Our regions

South Australia's regions are crucial for our state's prosperity, contributing an estimated $37.5 billion or 26% to GSP in 2022–23.[28] In terms of export value, our regions represented 26% or $25 billion of South Australia's export value in 2022–23.[29] There were an estimated 206,791 jobs in regional areas outside of Greater Adelaide as at 30 June 2020[30], with the majority in agriculture, forestry and fishing; health care and social assistance; and retail trade[31].

Building on existing strengths in agriculture, resources and tourism industries, the regions play an important role in our state's future prosperity. Future opportunities in renewable energy, critical minerals and green manufacturing will also support growth through greater economic complexity and productivity. Additionally, infrastructure solutions are required to bring product to market and to support the necessary workforce in an otherwise isolated regional setting.

As South Australia enters a period of high infrastructure activity, the growing infrastructure base creates new opportunities across a range of industry sectors. Regional Development South Australia estimates a regional investment pipeline over the next five years of 928 projects, with a potential capital value of $65 billion.[32]

While a range of core infrastructure exists to support the economic success and liveability of our regions, gaps remain. Infrastructure Australia and Regional Development South Australia have identified key regional infrastructure gaps exist in relation to water security; digital connectivity; and housing availability, diversity, and affordability. Further, they recommend future investments strategically focus on optimising opportunities to increase availability, diversity, and affordability of infrastructure.[33,34] Outcome 1 discusses the opportunities in our regions and the key infrastructure needed to unlock growth.

South Australia's regions have been defined using the seven planning regions defined in the *Planning Development and Infrastructure Act 2016* (SA). These are Greater Adelaide, Yorke Peninsula and Mid North, Murray and Mallee, Limestone Coast, Eyre and Western, Kangaroo Island, and Far North (refer Figure 6 and Section I-5.2). Key economic indicators and information on existing assets for each region is summarised in Table 2.

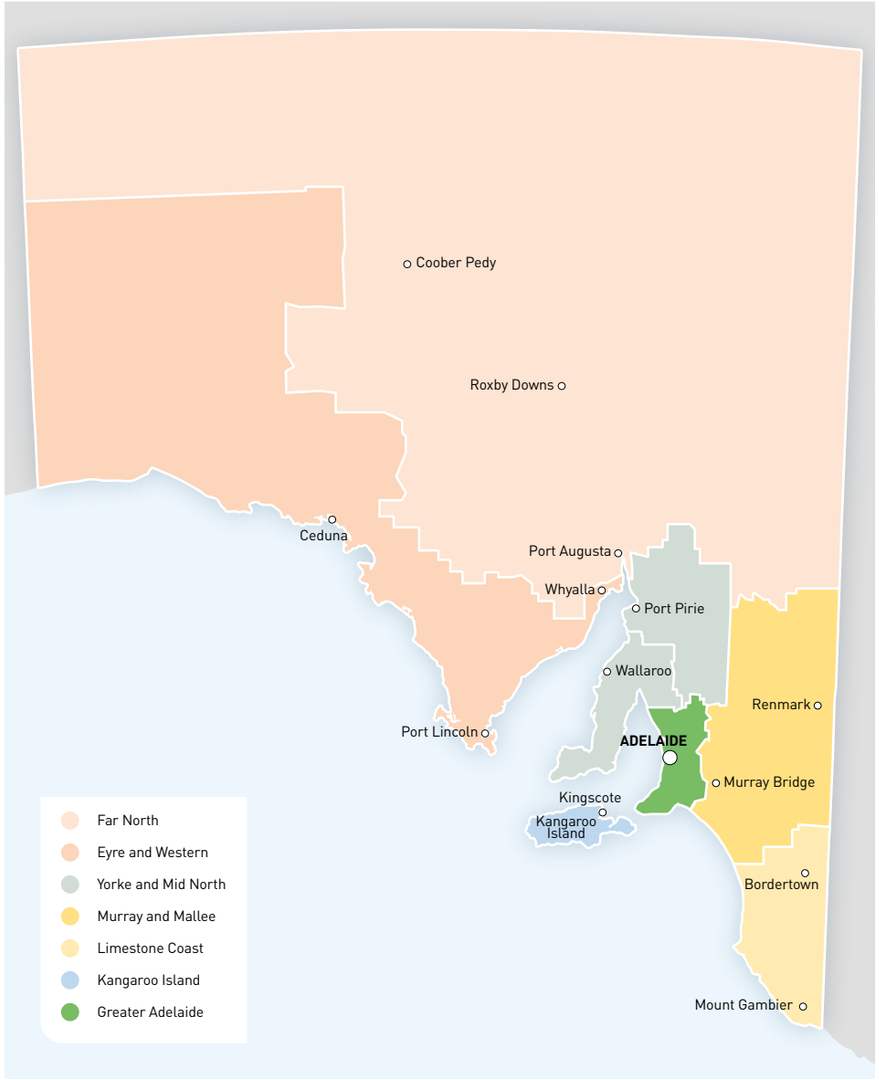


Figure 6:
Map of South Australia by Planning Regions[35]

Table 2:
Regional economic indicators and existing assets

Greater Adelaide	
Key economic indicators	**Population:** 1,515,491 in 2021, projected to grow by 32% to 2,005,404 by 2051[36] **GRP:** $110.2 billion in 2022–23[37] **Jobs:** 1,098,561 as at 30 June 2020[38] **Businesses:** 130,778 as at 30 June 2023[39] **Top industries by employment (as at 30 June 2021):** • Health care and social assistance (17%) • Retail trade (10%) • Education and training (9%)[40]
Key assets	Key existing assets identified by Infrastructure Australia which relate to the Adelaide metropolitan area* include:[41] • **Gateway ports** – Adelaide Airport provides air connectivity and Port Adelaide provides seaport import and export capacity. • **Transport** – Diverse transport systems incorporating road, bus, railways and tram networks provide valuable connections within the region and to other regions. • **Energy** – Strong uptake of rooftop solar for private residences. • **Defence** – Significant defence infrastructure including Edinburgh Royal Australian Air Force (RAAF) Base. • **Water security** – Various water and wastewater treatment plants, recycled water schemes, pipelines and reservoirs aid in building water security. • **Education and research institutions** – Multiple education institutions including early learning centres, primary and secondary schools, universities and TAFE SA. • **Community** – Arts, cultural and event spaces e.g. Art Gallery of South Australia and the Adelaide Oval. • **Health** – High quality and accessible health facilities and research institutes. *This data relates to the Adelaide metropolitan area, which is a smaller subset of the Greater Adelaide region.

Yorke Peninsula and Mid North	
Key economic indicators	**Population:** 78,166 in 2021, projected to grow by 10% to 86,073 by 2041[42] **GRP:** $4.5 billion in 2022–23[43] **Jobs:** 50,081 as at 30 June 2020[44] **Businesses:** 7,609 as at 30 June 2023[45] **Top industries by employment (as at 30 June 2021):** • Agriculture, forestry and fishing (16%) • Health care and social assistance (14%) • Retail trade (9%)[46]
Key assets	Key existing assets identified by Infrastructure Australia include:[47] • **Energy** – Hornsdale Power Reserve (South Australia's Big Battery). • **Tourism** – Thriving horticulture, viticulture, and tourism industries. • **Gateway ports** – Seaports in Port Pirie, Wallaroo, Ardrossan and Port Giles, and airports in Port Pirie, Clare, Maitland, Peterborough, and Yorketown provide regional connectivity and support. • **Natural resources** – Extensive natural commodities are extracted and exported from the region. The Nyrstar Port Pirie is one of the world's primary lead smelters.

Table 2:
Regional economic indicators and existing assets

Limestone Coast	
Key economic indicators	**Population:** 68,542 in 2021, projected to grow by 12% to 76,982 by 2041[48] **GRP:** $4.7 billion in 2022–23[49] **Jobs:** 55,091 as at 30 June 2020[50] **Businesses:** 7,766 as at 30 June 2023[51] **Top industries by employment (as at 30 June 2021):** • Agriculture, forestry, and fishing (18%) • Health care and social assistance (13%) • Manufacturing (11%)[52]
Key assets	Key existing assets identified by Infrastructure Australia include:[53] • **Transport** – Significant rail and road infrastructure provide connections to Adelaide, Geelong, and Melbourne. • **Climate and topography** – Water sources, arable land and coastal accessibility support the regions agriculture, aquaculture, fishing, and tourism sectors. • **Tourism** – Extensive coastlines, Umpherston Sinkhole, Blue Lake, and Naracoorte Caves National Park (World Heritage site), promote tourism and enhance liveability in the region.

Eyre and Western	
Key economic indicators	**Population:** 58,872 in 2021, projected to grow by 10% to 65,014 by 2041[54] **GRP:** $3.4 billion in 2022–23[55] **Jobs:** 41,216 as at 30 June 2020[56] **Businesses:** 5,039 as at 30 June 2023[57] **Top industries by employment (as at 30 June 2021):** • Health care and social assistance (14%) • Education and training (13%) • Agriculture, forestry and fishing (12%)[58]
Key assets	Key existing assets identified by Infrastructure Australia include:[59] • **Gateway ports** – Port facilities at Thevenard, Port Lincoln and Whyalla provide the primary domestic and international export hubs for regional product and commodities. • **Transport** – Airports at Port Lincoln, Whyalla and Ceduna provide regional connectivity. • **Natural environment** – Extensive coastlines, marine areas and arable lands provide amenity and support the regions aquaculture, fishing, tourism, and agriculture sectors. • **Natural resources** – Extraction of high-quality resources supports regional employment and contributes to continued investment. • **Climate and topography** – Solar and wind provide opportunities for renewable energy generation.

Table 2:
Regional economic indicators and existing assets

Murray and Mallee	
Key economic indicators	**Population:** 50,408 in 2021, projected to grow by 7% to 54,077 by 2041[60] **GRP:** $3.4 billion in 2022–23[61] **Jobs:** 39,140 as at 30 June 2020[62] **Businesses:** 5,300 as at 30 June 2023[63] **Top industries by employment (as at 30 June 2021):** • Agriculture, forestry and fishing (22%) • Health care and social assistance (12%) • Manufacturing (9%)[64]
Key assets	Key existing assets identified by Infrastructure Australia include:[65] • **Tourism** – Community infrastructure facilities, such as Monarto Zoo and The Bend Motorsport Park, provide a range of visitor experiences. • **Natural resources** – The River Murray is a natural attraction which supports local business and supplies water for many industries and communities, providing economic opportunity and enhancing liveability.

Far North	
Key economic indicators	**Population:** 26,714 in 2021, projected to grow by 1% to 26,929 by 2041[66] **GRP:** $3.2 billion in 2022–23[67] **Jobs:** 16,816 as at 30 June 2020[68] **Businesses:** 1,157 as at 30 June 2023[69] **Top industries by employment (as at 30 June 2021):** • Mining (15%) • Health care and social assistance (13%) • Education and training (9%)[70]
Key assets	Key existing assets identified by Infrastructure Australia include:[71] • **Gateway ports** – Port Augusta provides connectivity for residents, visitors and freight across major road and rail infrastructure. • **Transport** – The Stuart Highway, Joy Baluch Bridge and Adelaide-Darwin rail corridor provide intrastate and interstate connectivity to the region. • **Tourism** – Flinders Ranges and the outback are home to wildlife and First Nations culture. • **Natural resource**s – Extraction of opal, copper, uranium, iron ore, gold and silver, supports a thriving natural resource industry and offers regional employment opportunities. • **Climate and topography** – Unique climate and vast lands provide opportunities for renewable resources to be harnessed for energy generation.

Table 2:
Regional economic indicators and existing assets

Kangaroo Island	
Key economic indicators	**Population:** 4,999 in 2021, projected to grow by 20% to 6,001 by 2041[72] **GRP:** $0.3 billion in 2022–23[73] **Jobs:** 4,447 as at 30 June 2020[74] **Businesses:** 797 as at 30 June 2023[75] **Top industries by employment (as at 30 June 2021):** • Agriculture, forestry and fishing (21%) • Accommodation and food services (11%) • Health care and social assistance (9%)[76]
Key assets	Key existing infrastructure identified by Infrastructure Australia include:[77] • **Climate and topography** – Climate support high-productivity agriculture and viticulture, further enhancing visitor engagement with the region. • **Tourism** – Nine national parks provide unique nature-based experiences.

Sealink Ferry Terminal, Penneshaw, Kangaroo Island, South Australia
Image – Isaac Forman for South Australian Tourism Commission

I-7 South Australia's outlook

To develop a strategy with a future-focused time horizon, we need to envisage what a smart, sustainable, and inclusive economy could look like in 2045, supported by the right enabling infrastructure. This provided a framework for understanding how we can move from the here and now, to the future we want for South Australia.

In casting our thinking towards 2045, we recognise that the future is uncertain, and that we need to anticipate and respond to changes along the way. We developed an aspirational narrative of South Australia in 2045 that reflects our vision, responds to what we heard in our engagement and considers both local and global drivers and trends.

Razorback Lookout, Flinders Ranges and Outback, South Australia
Image – Michael Waterhouse Photography for South Australian Tourism Commission

I-8 Our vision for South Australia in 2045

In 2045 our economy is thriving

We have capitalised on the global green transition. Growth and productivity across the resource and energy sectors has boosted our prosperity, catalysing growth in other sectors. Our economy is diversified, through adding value to our rich minerals base and capitalising on our expertise and knowledge across the technology, manufacturing, and defence industries. Our supply chains are efficient, and we are a market of choice globally, further boosting our economy.

We have been able to embrace new technologies to lift productivity and use data to inform our planning, ensuring informed decision making. Technology and data are transforming our lives in positive ways.

Our communities are flourishing

South Australia is a sought-after location to live. It is recognised as liveable, fulfilling, vibrant and inclusive. Our places are green, resilient, attractive and offer cultural experiences with strong local connections. Our population is healthier than ever, supported by a focus on wellbeing and preventive health services.
Our community feels safe. Our transport options are sustainable – we drive less, walk and cycle more, and public transport is a mode of choice. We have affordable and reliable access to water, energy, and digital connectivity. Our planning is integrated, leveraging a long-term, joined-up view of infrastructure needs which drives smart investment decisions. Our developments are well located and well designed, with ease of access to services.

Accessible and affordable housing is no longer a dream but a reality for all

Unemployment is at an all-time low and we have the skills available to fill the roles we need to continue to grow our economy. We have closed the gap and Aboriginal people share the same health and well-being outcomes and opportunities to thrive. We value cultural wisdom, knowledge, and self-determination.

Our regions are forging ahead

Bolstered by the economic opportunities we have seen in the Upper Spencer Gulf and other regions around the state. We are connected to the world and have continued to build our food and wine industries, ensuring they have the enabling infrastructure to grow their global presence. We are a tourism destination of choice, capitalising on our unique natural and cultural offerings to further grow our regional economies.

Our market-leading approaches and knowledge hub of sustainability has seen us attract businesses and investors looking to demonstrate their sustainability credentials. We have embraced the circular economy and have grown a viable and strong recycling industry off the back of the transition to renewables. Households and business are embracing smart technologies, and energy efficient buildings and appliances are standard.

Our economy has decarbonised across all sectors

We export our know-how to help others achieve the same success. Globally, our expertise in hydrogen and carbon capture, utilisation and storage (CCUS) are sought after. We are well placed to meet our ambition to achieve net zero greenhouse gas emissions by 2050 and beyond. We have navigated the energy transition and maintained our status as a renewable energy superpower. We are climate ready; we know our vulnerabilities to emerging climate risks and have adaption plans in place to respond. Our asset base is well understood, managed, and maintained to achieve whole-of-life outcomes.

Our infrastructure investments are prioritised to maximise benefits and value-for-money

Harnessing digital technologies and real time data is delivering better service outcomes more efficiently. Infrastructure planning and delivery is optimised alongside our clear forward investment pipeline, meaning South Australia is a great place to do business. We are attracting funding through our strong environmental and social governance credentials. Both the private and public sectors have the confidence and appetite to continue to invest in the infrastructure needed to sustainably grow our state in a smart way, that supports an inclusive society.

1

Outcome 1

Paving the way to prosperity: Infrastructure is a catalyst for unlocking economic growth

Container ship, South Australia
Image courtesy of Flinders Port Holdings

Through the Economic Statement, the South Australian Government has set a vision for an economy fit for the future, improving the wellbeing of all South Australians. This vision is underpinned by three key values – an economy that is smart, sustainable, and inclusive. This Strategy has adopted the vision of the Economic Statement.

South Australia's economy has been performing well recently. Over the past several years, Gross State Product (GSP) growth has been above the national average and recent medium-term trends. This growth is being driven by favourable economic conditions, including good weather for agricultural industries.[78]

While South Australia has a diverse industry base and a growing population, to maintain long-term economic growth and improve living standards, we will be heavily reliant on exports and moving up the value chain in the goods that we produce. Our exports are currently concentrated, with the top seven exports accounting for almost 80% of South Australia's export value (refer Chart 4).[79]

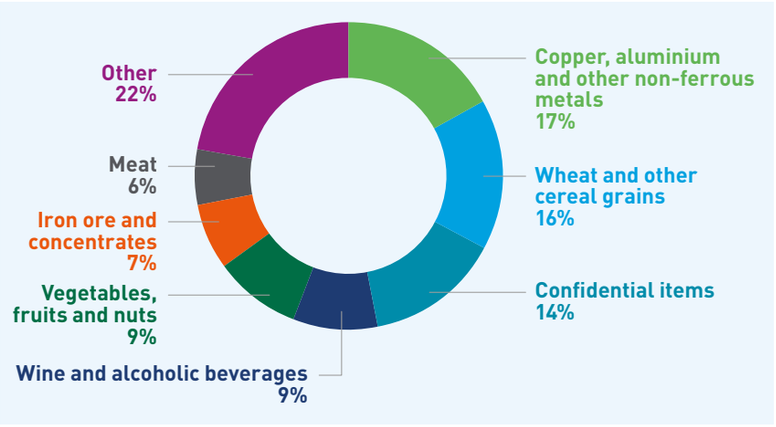


Chart 4:
South Australian overseas exports by commodity, 12 months to July 2024[80]

Underlying challenges to our continued economic growth remain, due to the cyclical nature of recent growth. Our real GSP per person, an indicator of living standards, was $76,179 in 2023–24, well below the national average of $96,591.[81] This gap has widened compared to three decades ago.[82] Declining GSP per person is a concern because it reduces the government's ability to provide public goods and services, such as the infrastructure needed to support our growing population.

GSP per person is influenced by labour productivity, or the value of what is produced per hour worked and labour utilisation, or the average number of hours worked per person in the population. Average labour productivity growth in South Australia in the decade to 2022–23 was 0.7% compared to 1.0% for Australia.[83]

Education and training are key factors that influence labour productivity, and South Australia has a lower level of educational attainment relative to the majority of other states and territories.[84] In their recent research paper, the South Australian Productivity Commission identified the need to improve our ability to generate innovations, adopt innovations from elsewhere, and improve our human capital, including through education and training.[85]

We need to shift the dial on all three aspects of the vision in the Economic Statement to lift our productivity and achieve a growing economy with improved living standards. The Statement identifies three missions to focus collective activities on the most significant opportunities for the South Australian economy:

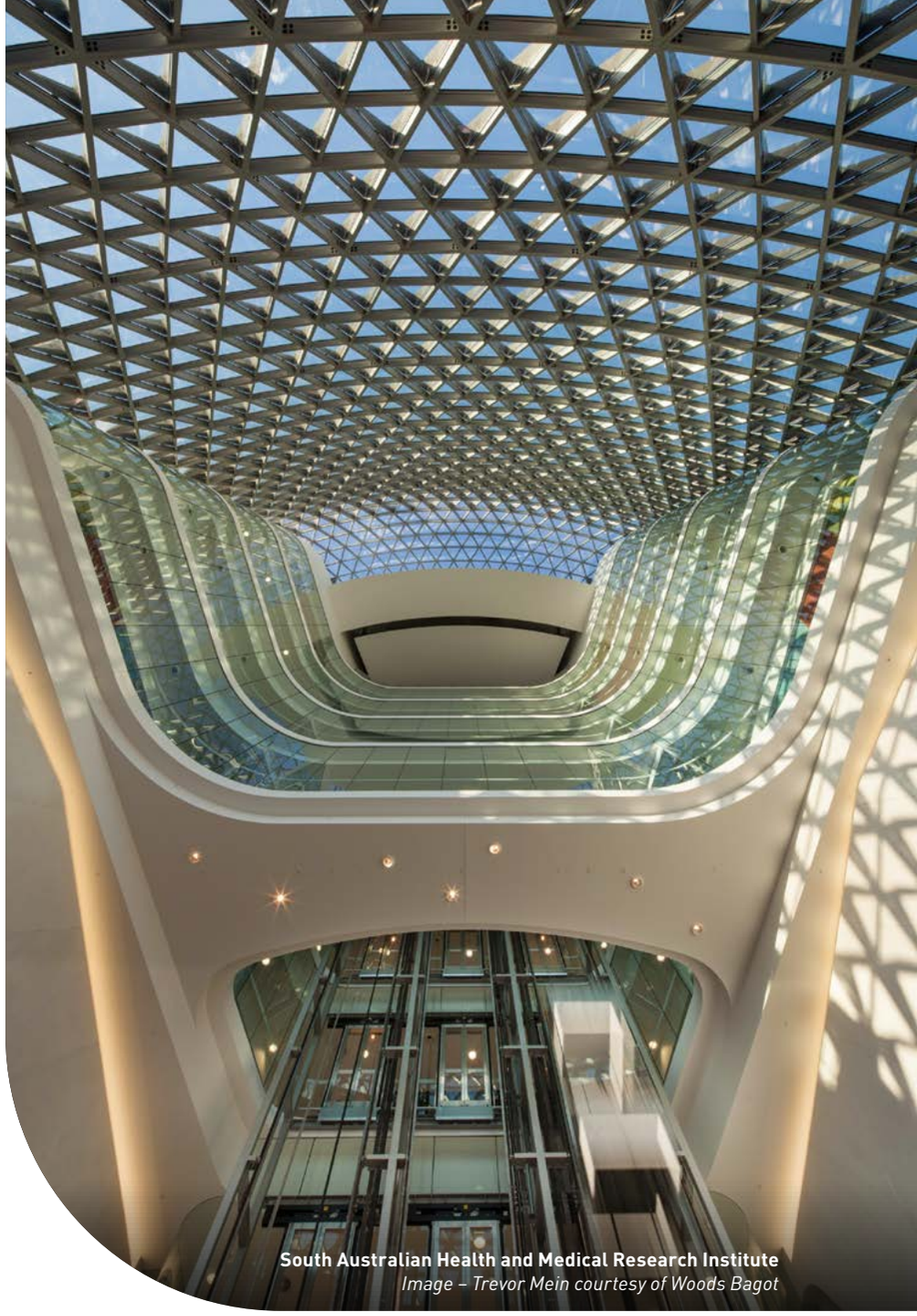
- Capitalise on the global green transition: Fostering a green transformation of the South Australian economy, capitalising on the intersection of global trends and local advantages, where the benefits are shared broadly across the state's regions and population.
- Partner of choice in an insecure world: Making the most of the Australia, United Kingdom, United States (AUKUS) opportunity including the conventionally armed nuclear submarines build and associated industries and South Australia's position as a stable and secure economy, with capabilities in critical industries.
- Build South Australia's talent: Addressing the key challenges in relation to South Australia's workforce, including the skills gap that exists now and into the future.

The provision of high-quality infrastructure is essential to our efforts to boost productivity, generate more diversity within the economy, increase our competitiveness, and attract the investment, people and skills which we need to grow. Ensuring we plan and deliver the most efficient infrastructure solutions is paramount to maintaining and improving the state's prosperity in the long term.

There are several sectors across our economy that will be key to achieving long-term growth to contribute to improving living standards and opportunities for South Australians. The defence and space sectors will see long-term investment that will generate significant direct opportunities across the supply chain that could be leveraged by other sectors including advanced manufacturing, cyber and related services. Our network of innovation precincts such as Lot 14, Tonsley Innovation Precinct, and Adelaide Biomedical City could drive these higher value products and services. The launch of an Innovation Precinct Framework is a positive development to maximise these opportunities. There are also many opportunities for growth across our traditional economic strengths in primary produce and food manufacturing, international education and tourism.

While there are many opportunities across our economy to drive growth and improve productivity and living standards, this Strategy is focussed on the strategic opportunities where infrastructure will act as a catalyst for economic growth. Many of these opportunities are consistent with the key economic policy of the State Prosperity Project. This includes the infrastructure necessary to improve productivity generally across the economy, but will have a particular focus on:

- Utilising and leveraging existing infrastructure assets to the maximum extent possible.
- Strategic planning of infrastructure to aggregate demand to achieve the necessary scale to underwrite the investment to improve productivity, competitiveness and undertake value-adding processing to our natural resources.
- Sectors that are reliant on significant investments in infrastructure to bring their products to market.



South Australian Health and Medical Research Institute
Image – Trevor Mein courtesy of Woods Bagot

1.1 Capitalise on natural resources potential

South Australia's exports are dominated by natural resources of mineral and agricultural commodities[86], followed by manufacturing industries.[87] In addition to copper, uranium, zircon and magnetite iron ore, South Australia also produces gold, silver, industrial minerals, extractive materials, and critical minerals such as graphite and rare earth elements.[88] To increase our economic complexity, and improve the resilience of our economy, opportunities to explore further value-add processing of our natural resources must be considered.

Natural resources are predominately located in our regions, and due to the nature of our geography, these are often remote and can be isolated from the significant infrastructure needed to access the resources and better compete in the market. Water, energy, and freight are the most significant infrastructure recognised to support our industries and unlock future growth.

With increasing global commitments to achieve net zero by 2050, there is a need to decarbonise the global economy. The energy sector is currently the main source of global greenhouse gas emissions,[89] and the South Australian Government, through the State Prosperity Project, has identified key opportunities to leverage our natural resources to capture the opportunities provided.

The State Prosperity Project highlights significant opportunities for South Australia to supply some of the key minerals and metals needed for the world to decarbonise, including copper, green iron and graphite, as demonstrated in Figure 7.

1.1.1 South Australia's copper

Copper is an essential mineral for clean energy. It is used for wind and solar technology, electrical equipment, batteries, and transmission infrastructure.[91] Renewable energy requires up to five times more copper than non-renewables[92], resulting in a forecast doubling of annual global copper demand by 2035, to 49 million tonnes.[93]

South Australia has some of the most prominent copper assets in the world[94], accounting for 69% of Australia's economic resources of copper which currently produces around 30% of Australia's mined copper.[95] South Australia is home to Australia's largest copper mine, Olympic Dam. Currently, BHP is working with the South Australian Government to expand its smelter and refinery capacity, with expectations to double its current production.[96]

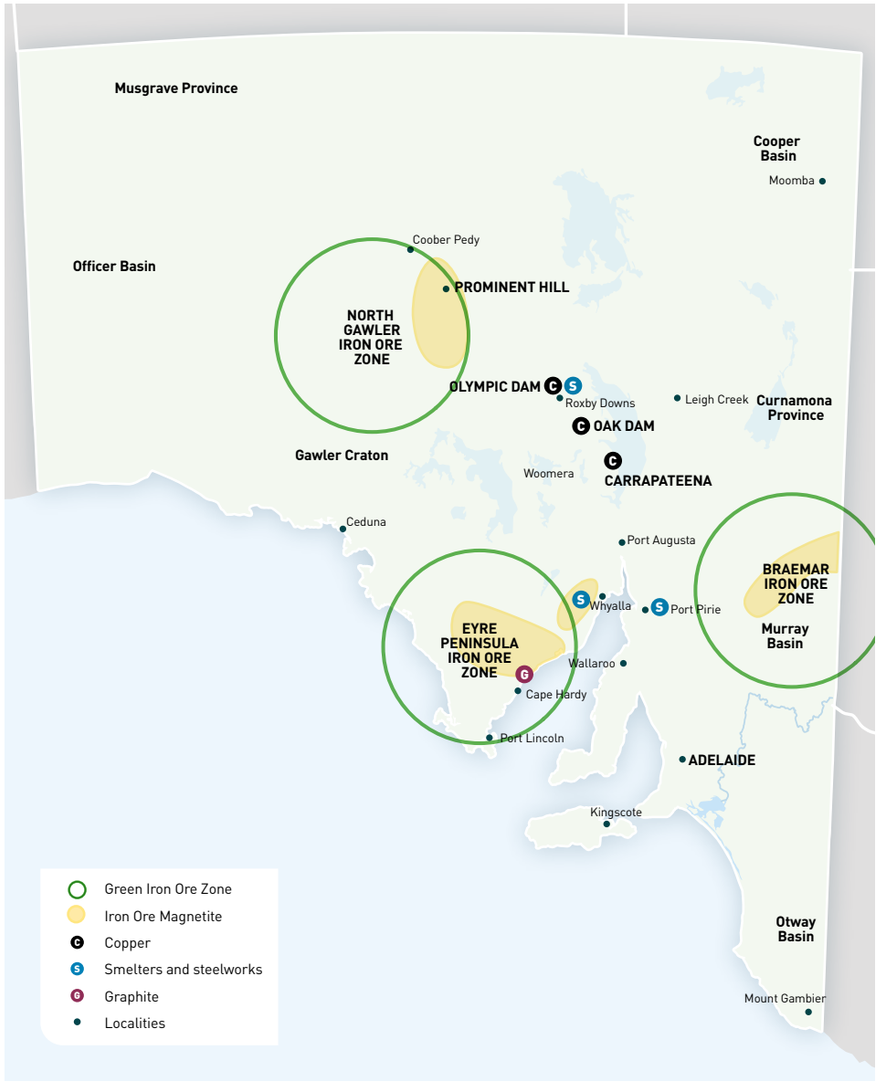


Figure 7:
South Australia's natural resources (adapted from State Prosperity Project, Government of South Australia)[90]

1.1.2 South Australia's green iron

In 2024, the South Australian Government released South Australia's Green Iron Opportunity to create global interest in utilising our comparative advantage in producing green iron and green steel.

South Australia holds 7.4[97] billion tonnes of economically demonstrated iron ore, with 94% being magnetite ore[98], which is well suited to be beneficiated to a 67%[99] or higher iron content concentrate, necessary for the direct reduced iron (DRI) process.

The iron and steel industry are currently one of the largest sources of greenhouse gas emissions. Traditional blast furnace technology releases around two tonnes of carbon dioxide for each tonne of steel produced[100], creating around 24% of all global industrial greenhouse gas emissions[101].

One pathway to decarbonise the steel industry is to produce green iron through a DRI process where potentially hydrogen is used as the reductant (instead of coking coal) in the traditional blast furnace process, as illustrated in Figure 8. If the iron is then processed via an electric arc furnace powered by renewables, greenhouse gas emissions can be reduced by 95%.[102] Alternatively, if natural gas is used instead of coal, greenhouse gas emissions can be reduced by around 30%.[103]

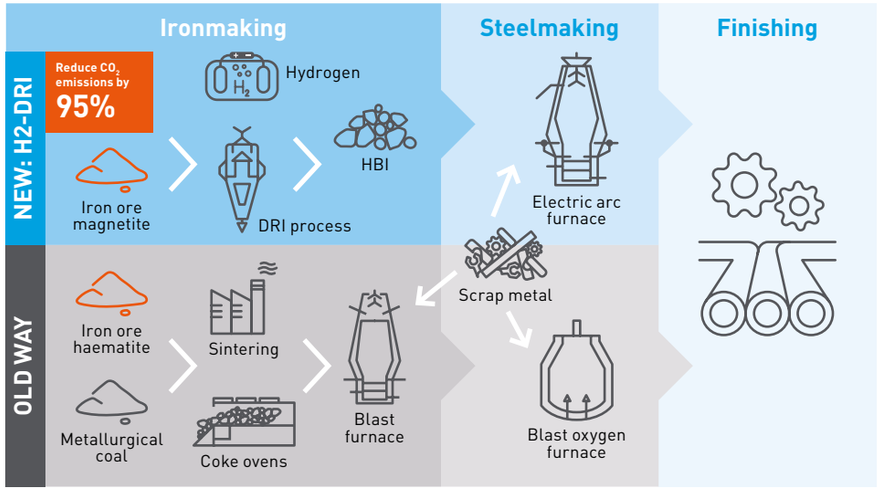


Figure 8:
Producing green iron – Hydrogen vs fossil-based process[104]

Bulk ore ship, Whyalla Port, South Australia
Image – Gary Chapman, 2024/Austockphoto

The recent Green Iron Supply Chain Study identified a 21% cost advantage of green iron produced in South Australia compared to green iron produced in Germany, demonstrating the competitiveness of South Australia in the global market.[105] The Green iron and steel strategy predicts that one 2.5 million tonnes per annum DRI plant in South Australia is forecast to create 2,500 jobs during construction, 800 ongoing operational jobs and would provide $3 billion per year to the state's GSP.[106] While the green iron opportunity has strong potential as a source of economic growth in South Australia, we currently lack the scale needed to ensure operations are economically viable.

Currently, the Pilbara ports located in Western Australia (Port Hedland and Dampier) are leading the country in iron ore trade, handling 80% of national trade and 43% of global trade.[107] These two ports exported around 702 million tonnes of iron ore in financial year 2023–24.[108,1] In contrast, South Australia exported nine million tonnes of iron ore in the same period.[109]

The current challenge in South Australia is the need to aggregate demand to sufficient scale to underwrite the necessary upfront costs. In aggregating demand, South Australia can achieve the necessary scale, whilst providing efficiencies in planning and building utilities, workforce planning, supporting infrastructure and services and achieve other related agglomeration benefits, by concentrating activity in hubs.

1 Volumes are based on haematite and magnetite direct shipping ore.

1.1.3 Common-user infrastructure

Successful implementation of common-user infrastructure will require an effective economic model and charging regime that is appropriate for users. It may also require trade-offs from individual parties in balancing a design optimised for their project, compared to one that provides efficiencies of scale, greater certainty and potentially requires less upfront capital.

Common-user infrastructure can be an effective way to achieve more efficient outcomes than, for example, has occurred with the duplication of rail and port infrastructure in the Pilbara, liquified natural gas trains at Gladstone, in Queensland, or duplication of high voltage electricity infrastructure to the north of South Australia.

Beyond monetary investment, government can play an important role in facilitating common-user infrastructure to unlock resources, aggregate demand, and avoid inefficient duplication of infrastructure. An example is the Northern Water project, where the South Australian Government undertook a key role by bringing together stakeholders, aggregating the demand from BHP, SA Water, Department of Defence, and several potential private proponents. In addition to leading the business case and planning work, the government was able to secure funding from private sector partners towards the planning work required to achieve a final investment decision.

Other examples where government can play a facilitation role without monetary investment are through governance or policy actions. During early planning stages, release areas can be identified, such as in the *Hydrogen and Renewable Energy Act 2023* (SA) or the Water for Infrastructure Corridors Initiative, funded through the Economic and Business Growth Fund.[110]

If government is to invest in infrastructure, it should be subject to a robust business case that establishes the economic benefits, associated risks, and overall long-term benefits. There is public benefit in facilitating the infrastructure where appropriate, alongside exit plans that maximise value for the taxpayer. To realise the full value of our resources we need to provide infrastructure at scale, with strong collaboration and leadership to de-risk and optimise infrastructure outcomes and consider innovative funding approaches to unlock private capital (refer to Outcome 4).

The opportunities identified in the State Prosperity Project will require significant investment in infrastructure. This will be in the form of water, energy, and freight infrastructure needed for market access and the necessary processing infrastructure. Infrastructure investments that support these opportunities can benefit other sectors in the economy and communities, such as large-scale processing of agricultural commodities or large industrial hubs. Where appropriate, government should seek to facilitate common-user infrastructure solutions to maximise efficiencies and public benefit.

The case for change – In brief

South Australia has the minerals, processing and industrial capabilities, and renewable resources the world needs to decarbonise. However, many of our resources are remote and lack the scale required to underwrite the significant investment in infrastructure needed to bring products to market.

We have Australia's largest operating copper mine and reserves, with global copper demand forecast to double by 2035.

With over seven billion tonnes of economically demonstrated magnetite ore, the potential for the green iron and green steel industry is immense, with a 2.5 million tonnes per annum direct reduced iron plant forecast to create 800 permanent jobs and $3 billion gross state product per annum over 25 years.

The SA Government is introducing legislation to establish an Office of the Coordinator General who will have the ability to coordinate diverse needs for common user infrastructure, noting this will also require a collaborative, whole of government effort from key agencies. Infrastructure SA has been allocated implementation responsibility until the Office is established.

1. Recommendation:

Prioritise common-user infrastructure where possible to aggregate demand and provide more efficient infrastructure solutions to realise the value of our natural resources.

Lead agency: Infrastructure SA, transitioning to the Office of the Coordinator General when established

Timeframe: Policy 0 to 5 years

1.2 Water and energy to enable growth

1.2.1 Water

Water is a fundamental element of our economy. Access to a reliable and secure water supply underpins economic growth across South Australia's mining, manufacturing, energy, and agriculture sectors. As shown in Chart 5, South Australia's water originates from a range of sources, with the majority from the River Murray[111] and groundwater aquifers, such as the Great Artesian Basin[112]. These sources are not only critical to supporting our economy but also in supporting the liveability of communities, and to our environment.[113] Climate change impacts are presenting further challenges to the sustainability and security of these existing water supplies.[114]

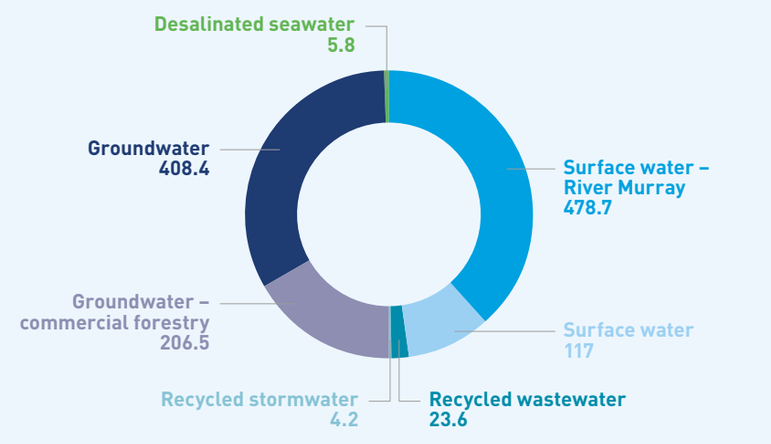


Chart 5:
Average annual volume of water used (gigalitres) in South Australia, by resource type 2022–23[115]

Water is transported and distributed through extensive networks of pipelines, pumps, and storages as seen in Figure 9 for River Murray distribution. This includes over $14 billion of SA Water assets, which services around 1.8 million South Australians[116], alongside extensive infrastructure for irrigation trusts and other private networks.

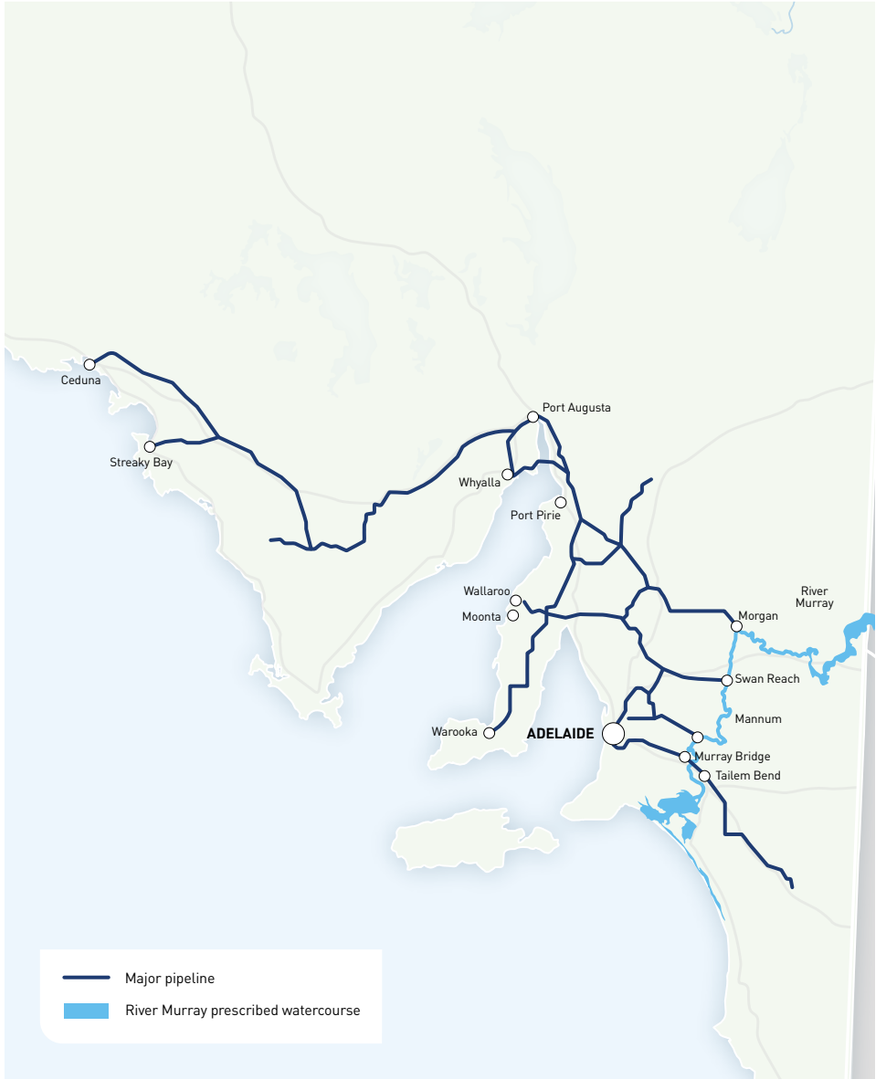
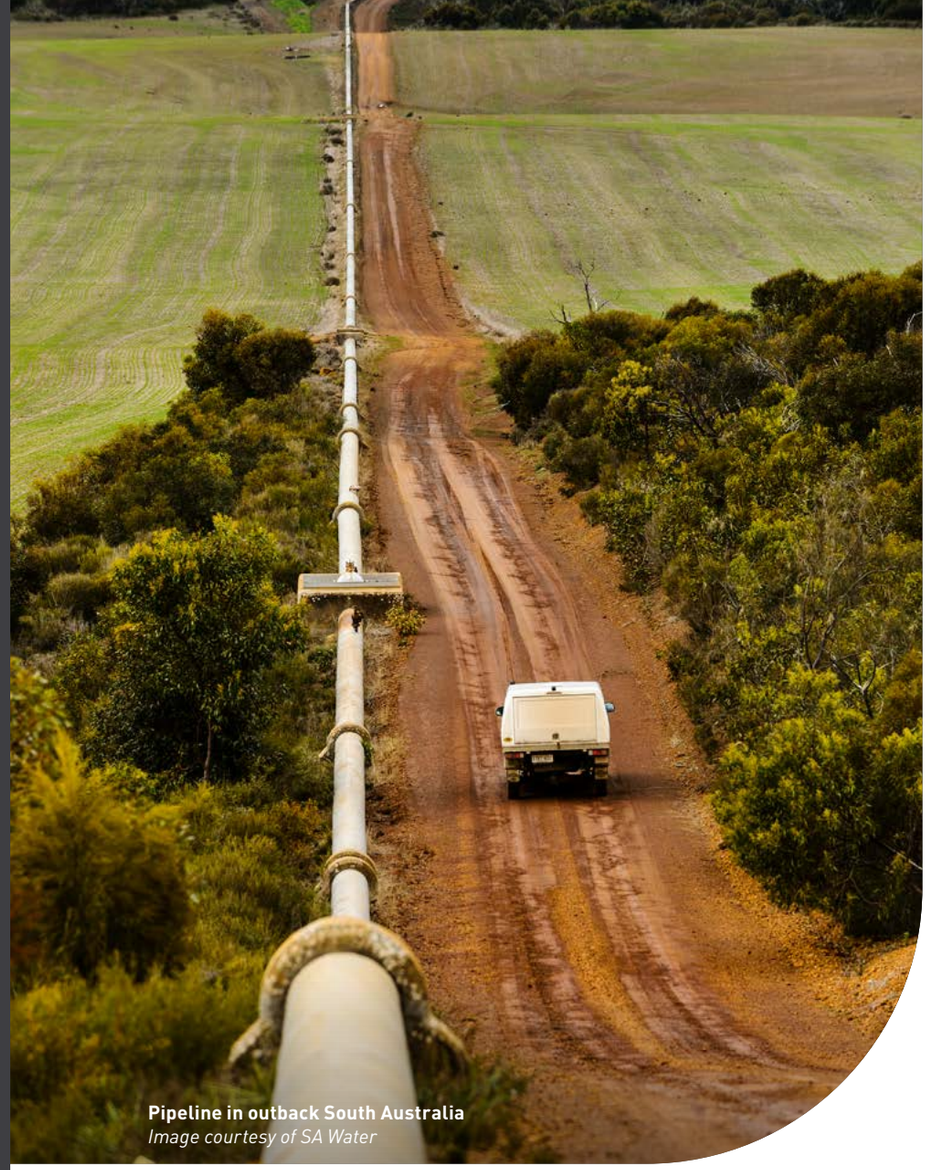


Figure 9:
Major pipelines distributing River Murray water[117]



Pipeline in outback South Australia
Image courtesy of SA Water

While agriculture remains the largest consumptive use of water[118], it is a critical input to several of the key industries related to the State Prosperity Project. Currently, approximately 110 gigalitres per year is used in the mining and energy sectors alone in South Australia.[119] The water usage in magnetite mining can be quite significant, for example, large volumes of water are needed for flotation processes, dust suppression, and cooling machinery.

Emerging industries, such as hydrogen generation, also require large volumes of water as part of its production. Demand requirements vary based on technology and process adopted, with quoted demands ranging from 9 to 80 litres per kilogram of hydrogen produced.[120] Unlocking the potential of new and expanded resources will require new and increased water sources.

Around our state, each region has its own unique water supply considerations based on the characteristics of the region's water resources and existing and future water needs. Water resource planning needs to enable growth as well as cater for community and existing industry needs, environmental requirements, and ensuring First Nations water interests are accounted for.[121] The South Australian Government's Water Security Statement 2022 identifies that development of our regions will require water solutions that can demonstrate adverse impacts on water resources and the environment are avoided, minimised, or mitigated.[122]

Inadequate water security, the cost of water, and lack of distribution infrastructure are cited as key inhibitors to industry investment and growth. This view was reinforced in consultation feedback received as part of the development of this Strategy.[123]

The 2020 Strategy included a priority to develop a sustainable water resources framework and identified the need for a transparent process for developing appropriate infrastructure to unlock economic projects that would otherwise be constrained.[124] The importance of transparency was also highlighted in a recent review by the Essential Services Commission of South Australia, which suggested that SA Water publish current and forward projections of the capacity and utilisation of water and sewerage infrastructure, to provide improved visibility for planning.[125]

The Water Security Statement 2022 sets out 10 whole-of-government strategic priorities for water security.[126] It includes actions to progress the development of targeted water security strategies and actions to assess current and future demand where there is evidence that a lack of water will limit industry or community growth.[127] Since the 2020 Strategy, the targeted water security strategies and initiatives shown in Table 3 have been undertaken or are in progress.

Table 3:
Key state water strategies and initiatives progressed since 2020 Strategy

Strategy and policy	• Water Security Statement 2022 • Urban Water Directions Statement • Annual Water Security Update 2024 • First Nations water policy*
Targeted water security initiative	• Resilient Water Futures* • Barossa Water Security Strategy • McLaren Vale Regional Water Security Strategy* • Water and Infrastructure Corridors Initiative*
Priority water security project	• Northern Water* • Barossa New Water* • Clare Valley Water Project* • Stocktake and water security assessment for self-supplied remote communities

*In development

Addressing the needs identified in these strategies and initiatives will have implications that will inform future infrastructure planning. Additionally, all solutions should be subject to rigorous business cases that consider water sources and delivery options. Solutions will likely be capital intensive, with an additional and significant component to the cost of water. Solutions must be optimised for efficiency, by providing sufficient supplies for growth, whilst avoiding over-investing where demand does not eventuate, especially for remote regions.

Research and planning must identify fit-for-purpose solutions, such as onsite water processes, centralised processing hubs, or treatment and supply infrastructure. Research studies and planning can be significant and typically take eight to ten years from concept through planning and approvals to delivery.

Laying pipeline works, South Australia
Image courtesy of SA Water

1.2.1.1 The Far North, Upper Spencer Gulf and eastern Eyre Peninsula regions

The Far North, Upper Spencer Gulf and eastern Eyre Peninsula regions of South Australia are currently facing constraints in water supply. A sustainable water supply is required in these regions to support the emerging green hydrogen and green iron industries and help capitalise on the growing demand for strategic and critical minerals, such as copper.

As mentioned previously, the South Australian Government has been leading development of the Northern Water project, which aims to provide a new, climate-independent water source for the region, enabling industry to reduce reliance on constrained water resources such as the Great Artesian Basin and River Murray. The project will address the current water security issues to enable the growth of industries crucial to achieving net zero goals.

The Northern Water project involves the construction and operation of a large seawater desalination plant in the Spencer Gulf and up to 600 kilometres (km) of pipeline to transport water to offtakers in northern South Australia. It is currently undergoing assessment and approval phases to progress towards a final investment decision.

Preliminary capital costs for the project are estimated to be in excess of $5 billion.[128] Pre-construction funding support has been received from the South Australian Government and Australian Government and the private sector.

The nature of the industrial demand for water enables a commercial model to be developed to support financing the project and minimise the financial impact to the state. Aggregating demand from multiple users for common-user infrastructure supports a solution that is more capital and environmentally efficient, resulting in competitive water prices which can make the broader environmental, social, and economic objectives feasible. Subject to the project progressing beyond final investment decision, it is intended that water users will enter into long-term payment structures to underpin the project. Revenue generated will enable the Northern Water project to be financed at low risk.

When complete, the project will provide critical enabling infrastructure to unlock significant and broad economic growth. Economic modelling undertaken by Deloitte Access Economics forecasts that the project will contribute an additional average $5.2 billion to GSP and additional average employment of over 4,200 full-time-equivalent staff each year, to the end of the economic assessment period.[129]

The case for change – In brief

Access to secure, reliable, and affordable water is needed to unlock the state's economic priorities and support our communities.

Water supply constraints are currently being experienced in the Far North, Upper Spencer Gulf, and eastern Eyre Peninsula regions of South Australia, which are reliant on constrained resources such as the Great Artesian Basin and the River Murray.

A climate-independent water source is required to unlock economic growth in the emerging green iron industry to capitalise on the growing demand for minerals critical to global decarbonisation, such as copper.

As a response, the South Australian Government is leading the Northern Water project, which involves a commercial model that aggregates demand from multiple users, minimising the financial risk to the state.

Economic modelling forecasts that the Northern Water project will contribute an additional average $5.2 billion to gross state product and employment of over 4,200 full-time-equivalent staff each year.

2. Recommendation:

Prioritise achieving a final investment decision for the Northern Water project at the earliest opportunity.

Lead agency: Department for Energy and Mining

Timeframe: Delivery 0 to 5 years

1.2.1.2 The Braemar Province

The Braemar Province is an area rich with magnetite deposits that spans the border between eastern South Australia and western New South Wales. The province has over seven billion tonnes of defined mineral resources and the potential to significantly contribute to the state's Green Iron and Steel Strategy.[130] In 2013, South Australia and New South Wales governments signed a memorandum of understanding setting the intent to jointly exploit the province.[131] However, despite numerous studies being undertaken, due to its remoteness and lack of sustainable, affordable, and reliable water infrastructure, the province remains unexploited, specifically in South Australia.

Traditional magnetite processing methods typically require substantial water, although consumption rates can vary widely depending on the scale of the operation. The South Australia Strategic Hydrogeological Framework – Braemar Province identified that, for a low demand scenario, 10 gigalitres per year is required to enable the production of 5 million tonnes per annum of magnetite concentrates.[132] Additional studies acknowledge the lack of permanent surface water features and limited availability of fresh groundwater.[133]

Given the economic and strategic opportunity presented by the Braemar Province, targeting water solutions to unlock these opportunities should be prioritised. Optimising any future supply will require a joint approach to identify sources, infrastructure requirements, and an efficient corridor that benefits both existing and potential new users of water. Studies on the trade-offs should also consider the location of water intensive processing stages, seeking to understand the economics on whether it is better to supply the water to the mine inland or take the material to another location, such as an export facility, with a readily accessible and sustainable water supply. Further work is required to establish the timing, processes, and final water demand and supply options. The nature of the Braemar Province, with several tenement holders, means a common-user infrastructure solution should be explored.

The case for change – In brief

The Braemar Province has enormous potential to contribute to green iron industry, with over seven billion tonnes of defined magnetite resources across different tenement holders.

The lack of access to a sustainable, economical, and reliable bulk water supply is a major constraint to growth of the province and the state's ability to improve productivity through value-add activities.

Numerous studies have been undertaken with no viable solution confirmed.

Its relative remoteness means providing infrastructure to the Braemar Province will be capital intensive, with a risk that proponents may develop individual project solutions that do not deliver the most efficient outcome to unlock the province.

3. Recommendation:

Undertake feasibility planning to identify an economic water supply solution to unlock the Braemar Province.

Lead agency: Department for Energy and Mining

Timeframe: Delivery 0 to 5 years

1.2.2 Energy

Ensuring energy is affordable, reliable and secure is paramount to our continued economic growth. The world class renewable energy resources in South Australia are a competitive strength to attract global, energy-intensive businesses looking to decarbonise.

While oil and gas are still a significant part of the current energy mix, particularly in South Australia, as shown in Table 4, the trend is towards electrification. There is an increase in sales of electric vehicles, electrification of homes and some industrial processes where it is economic, as well as new demands such as data processing for artificial intelligence.

Table 4:
Energy consumption by source, South Australia and Australia, 2022–23[134]

Energy source	South Australia (%)	Australia (%)
Coal	7.5	25.9
Oil	49.2	38.9
Gas	25.4	25.8
Renewables	18.0	9.4

This trend towards electrification is a significant part of our decarbonisation goals and will see an increasing consumption of electricity. The Australian Energy Market Operator (AEMO) produces the Integrated System Plan (ISP) for the National Electricity Market (NEM), which forecasts future energy demand scenarios. The NEM includes Queensland, New South Wales, the Australian Capital Territory, Victoria and South Australia. Western Australia and the Northern Territory are not connected to the NEM.

Wind farm in outback South Australia
Image – Rosalie Dibben, 2020/Austockphoto

The Step Change Scenario includes a forecast increase in electricity consumption from renewable energy sources occurring over the coming decades, as shown in Chart 6, helping contribute to Australia's greenhouse gas emission reduction commitments.[135]

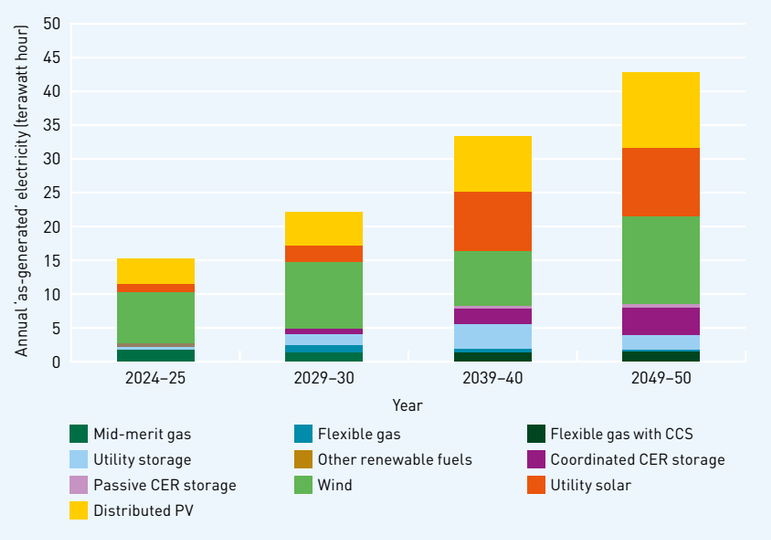


Chart 6:
Generation mix: South Australia, 2024–50, Step Change Scenario[136]

South Australia's ambition is to leverage our competitive advantages in renewables to build energy-intensive industries that can be supplied green power to produce the minerals, metals and products the world needs to decarbonise. These industries would have requirements for electricity that are multiples of the total existing demand on our grid. As an indication of the scale and demonstration of uncertainty in demand, ElectraNet forecasts a potential five-fold increase in maximum demand by 2030 in its Transmission Annual Planning Report 2023[137], compared to AEMO's 2024 forecast of a doubling in demand by 2030–31[138].

Given the significant opportunity for the state around utilising its world class renewable energy to supply green power, it is critical that we have the infrastructure to enable energy to be supplied in a way that is affordable, reliable and secure.

1.2.2.1 Electricity system

The NEM was established in the 1990s when the electricity system was very different. At the time, the system was dominated by state-owned utilities with a predominance of cheap baseload coal supported by a fleet of more expensive peaker plants that only operated at times of peak demand. This model was effective in sending price signals to incentivise investment in capacity when needed and was able to manage incremental growth in a relatively stable system in an economically efficient way.

Unfortunately, the system is not as well designed to manage an orderly transition where there could be step changes in investment and growth in capacity and transmission infrastructure. When the intermittent supply of energy is no longer responsive to demand or is uncontrolled (as is the case for rooftop solar), net negative demand may result, indicating a need to update the design and management of the system. Periods of policy uncertainty at the federal level and several interventions at the state level across the country have also inadvertently compromised the economic efficiency of the model.

1.2.2.1.1 South Australia's renewables

South Australia has been at the forefront of the energy transition with our electricity mix rapidly developing from 1% of renewables in 2007, to 74% of renewables in 2023.[139] For 289 days in 2023 renewables met all our electricity consumption needs for part of the day, and on 31 December 2023 rooftop solar met all of our state demand.[140] The State Government has a target for our electricity generation to be sourced from 100% renewables by 2027.[141]

The profile of the energy mix within South Australia tends to follow seasonal trends of when solar and wind are strongest, although this can vary considerably as shown in Chart 7.

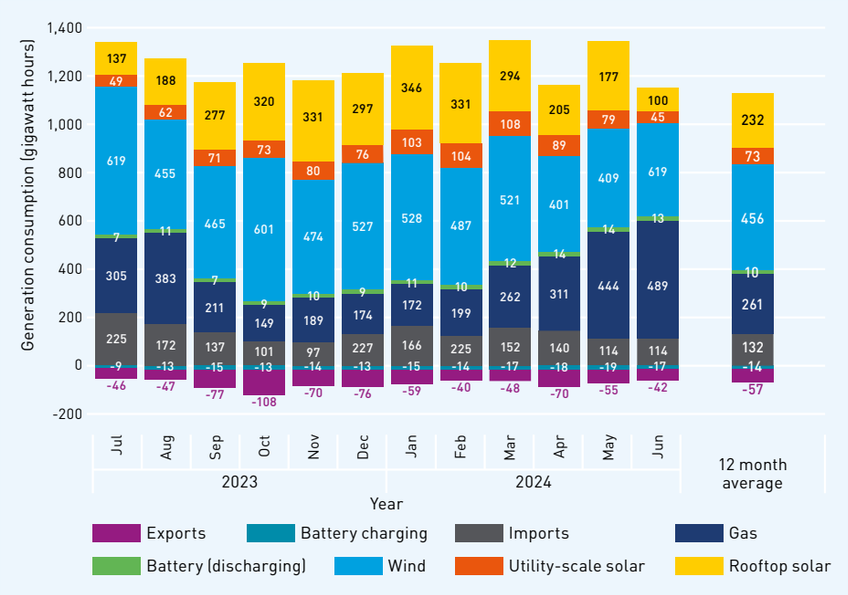


Chart 7:
South Australia's total and average generation consumption by source (gigawatt hours), 2023–24[142]

The cost of energy impacts all businesses in South Australia and is key to maintaining our competitiveness. While renewable energy has the lowest levelised cost of energy in Australia[143], South Australia has yet to see the benefit of lower costs for electricity, despite the high level of renewables in our energy mix.

This is in part because the electricity system is incredibly complex. It needs to be able to constantly match supply with demand and ensure that the electricity is always provided within strict technical parameters for frequency and voltage, to maintain system strength. The system also requires transmission and distribution infrastructure to bring the electricity from the generator to meet demand from end users. All these aspects require investment in different plant and equipment which contribute to the cost of electricity. South Australia had the highest electricity prices in 2020–21, as shown in Chart 8, noting the actual cost of generating electricity is only a component of the retail cost.

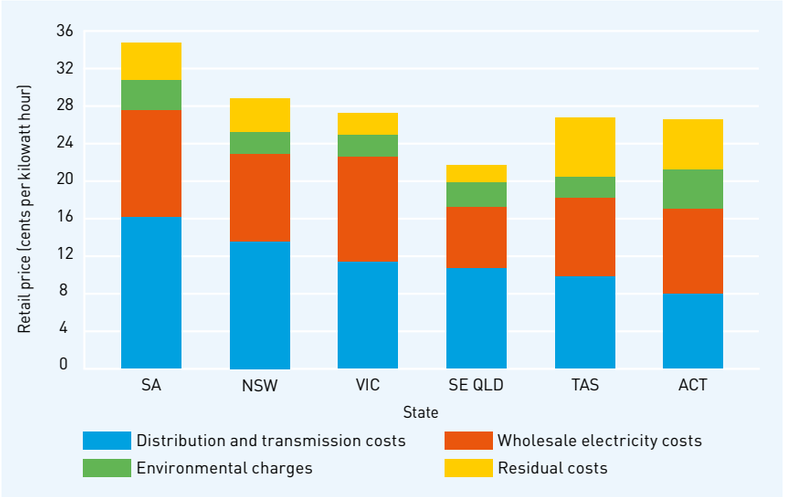


Chart 8:
National Electricity Market: Components of retail electricity prices excluding supply charges, 2020–21[144]

A key challenge of managing a system with high amounts of intermittent renewable energy is that the supply of electricity needs to simultaneously match demand. Being able to meet demand with adequate supply is referred to as reliability. As South Australia has already transitioned out of coal, our reliability measures (represented as expected unserved energy) tend to be better than New South Wales and Victoria, who still have to replace existing coal plants which are due to retire. Chart 9 demonstrates this point, where the spikes of expected unserved energy in 2026–27 related to the scheduled retirement of the Torrens Island Power Station B and Osborne Power Station are shown. The large spike in 2032–33 relates to the retirement of coal plants interstate which are linked to South Australia through interconnectors.

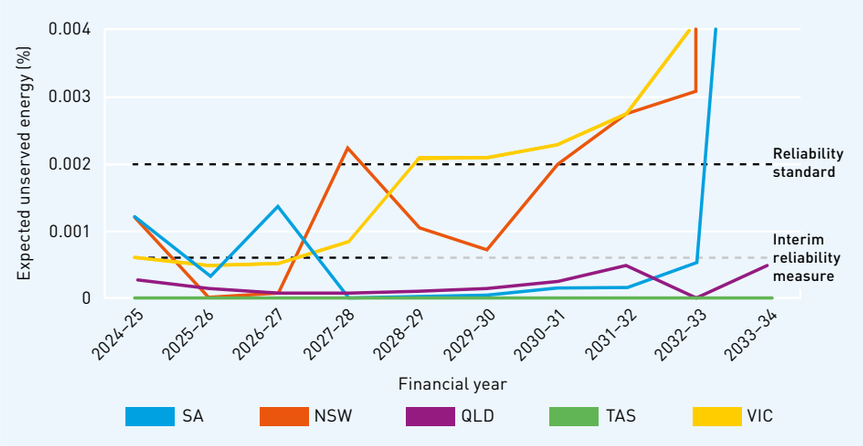


Chart 9:
National Electricity Market: Expected USE, Committed and Anticipated Investments sensitivity, the reliability forecast and indicative reliability forecast, 2024–34[145]

1.2.2.1.2 System reliability

To improve reliability, the system requires investment, however that investment needs to make a return, which subsequently contributes to keeping electricity prices higher. Opportunities to improve South Australia's reliability include the following considerations:

- Building more renewable capacity in South Australia would increase supply but the state would still be exposed to the intermittent nature of when that supply is available.
- Increasing interconnection could improve transfer capacity between NEM regions. However, Chart 9 shows that New South Wales and Victoria have potentially worse reliability than South Australia, with their ageing coal fleet having more reliability issues and pending retirements.
- Additional capacity in other states could be imported to South Australia to meet demand, but it will only be available if there is surplus energy in that state at the time there is an undersupply in South Australia.
- Reliability in South Australia will improve with an increased amount of battery storage, with Australian Government modelling assuming six new battery storage projects in Victoria and South Australia, with a combined capacity of 3,626 megawatts.[146] However, current battery technology tends to be limited to approximately four hours of storage. With technological advancements, this may increase to eight hours[147], but it will not be able to meet the needs of an extended wind or solar drought.
- There is an absence of suitable sites for large scale pumped hydro in South Australia so there is limited capacity for pumped hydro to support reliability in South Australia.

Considering these challenges, ensuring there are firming mechanisms in place to address the intermittency risks associated with renewable energy sources is the key to maintaining grid reliability. Until other technologies such as concentrated solar, geothermal, or nuclear are able to demonstrate that they are commercially viable, gas peaker capacity is likely the most economical way to firm the renewable capacity in South Australia. Over time the gas generation may be decarbonised through use of hydrogen, bio-fuels or e-methane or carbon capture and storage. However, in this firming role, the gas generation would not be expected to operate for large amounts of time, and the carbon footprint would be materially lower than traditional fossil fuel baseload generation.

1.2.2.1.3 System strength

System reliability is always having supply meet demand, while system strength is maintaining the system within set technical parameters to keep the system stable. Both are required to have an uninterrupted supply of electricity. Maintaining a secure grid and affordable energy supply presents a challenge in a system that has high variable renewable energy penetration.

In the past, the synchronous nature of traditional thermal generation provided much of the ancillary services, such as inertia, needed to maintain system strength. With decreasing amounts of synchronous generation in the system, further investment has been made to maintain strength. This includes ElectraNet spending $190 million[148] on synchronous condensers to maintain a sufficient level of inertia in the system. Without this inertia and other mechanisms, AEMO is required to issue directions for synchronous plant to operate to keep the system stable. Case Study 1 showcases the impact of directions in the state.

High voltage power lines on Garden Island, South Australia
Image – iStock.com/BeyondImages

Case Study 1

Impact of AEMO security directions in South Australia[149]

The South Australian market was under directions for 86% of the time in the fourth quarter of 2021.[150] Subsequently, four synchronous condensers were commissioned by ElectraNet, which resulted in the immediate reduction of system security directions, as shown in Chart 10.

However, South Australia's directions remain high, especially when compared to the other states in the NEM. There is an ongoing need to keep at least two large synchronous condensers online at all times, with substantial ongoing costs. These costs are ultimately passed on to consumers.

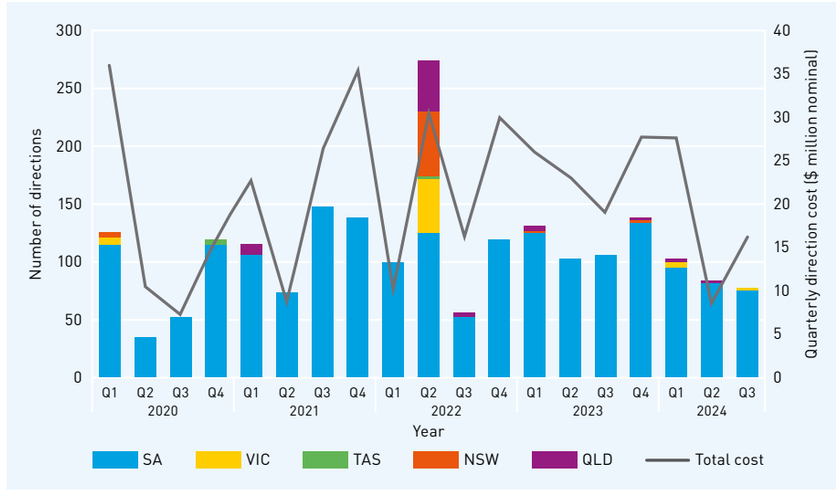


Chart 10:
AEMO number and cost of quarterly security directions in NEM states, Q1 2020 – Q3 2024[151]

Batteries have proven to be very effective as a fast response to maintain frequency. Technology is also advancing with grid forming inverters that can provide synthetic inertia. However, without a consistent and sufficient presence of synchronous generators in the system it is likely that investment will be needed in other mechanisms to maintain system strength. Modern high precision industrial users require high levels of system security and quality, such as highly stable frequency, to operate.

The volatility resulting from the intermittent supply of renewable energy elevates risks and adversely affects the necessary investments for the energy transition, ultimately impacting retail prices in order to maintain grid stability during the transition.

At times of high renewable generation, the supply of energy can exceed the demand in the market. In an energy-only market, such as the NEM, this results in periods of negative pricing where generators actually need to pay to supply energy. To illustrate this point, periods with negative prices in recent years are shown in Chart 11.

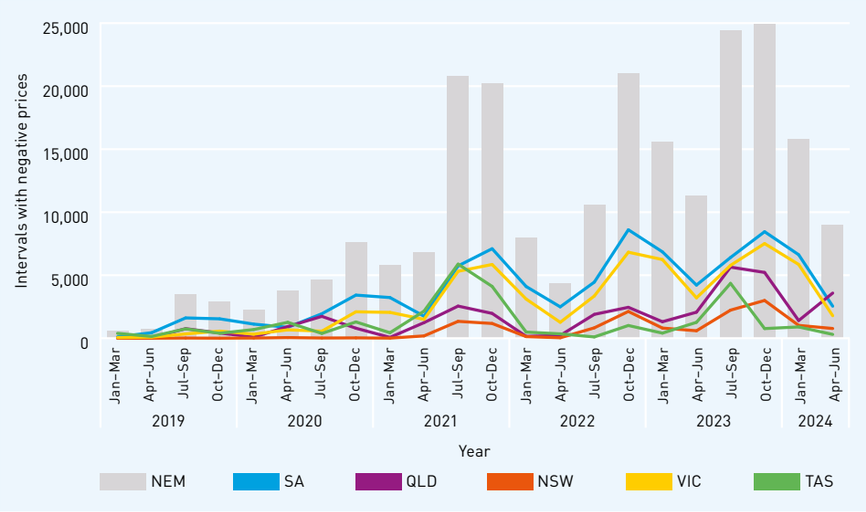


Chart 11:
National Electricity Market: Intervals with negative prices, 2019–24[152]

Conversely, at times of low renewable generation, more expensive forms of generation are required to meet demand where the wholesale cost of energy can be above $300 per megawatt hour[153] and up to the cap of $17,500 per megawatt hour[154] as shown in Chart 12.

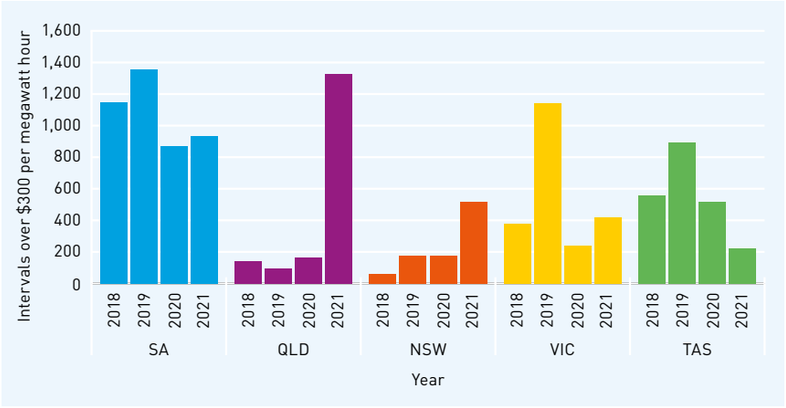


Chart 12:
National Electricity Market: Intervals over $300 per megawatt hour, 2018–21[155]

Having periods of very low or negative wholesale pricing may sound beneficial to consumers, but it erodes the economics of traditional baseload generation that can ramp down but often cannot switch off. This results in extended periods where this type of plant would operate at a loss. It also means that as the amount of renewables in the system increases, especially if supported by storage, the amount of time that a peaking plant is able to operate decreases. This compromises the investment case for new, more flexible, and efficient peaking plants to support renewables.

These periods of oversupply of renewable energy can also compromise the investment case for more renewable generation, particularly grid-scale solar. This is because the times that they generate are strongly correlated with the times that there is high penetration of uncontrolled rooftop solar. As a result, despite having a lower levelised cost of energy, the actual revenue generated from selling that energy can be significantly lower than the average wholesale electricity price. It can also mean that to balance supply and demand and manage the necessary system strength, the market operator is at times required to curtail supply from grid-scale operators.

South Australia has seen periods of curtailment where generation is not utilised, as shown in Chart 13. This may, in part, be managed by grid-scale projects incorporating batteries behind the meter to utilise the excess energy.

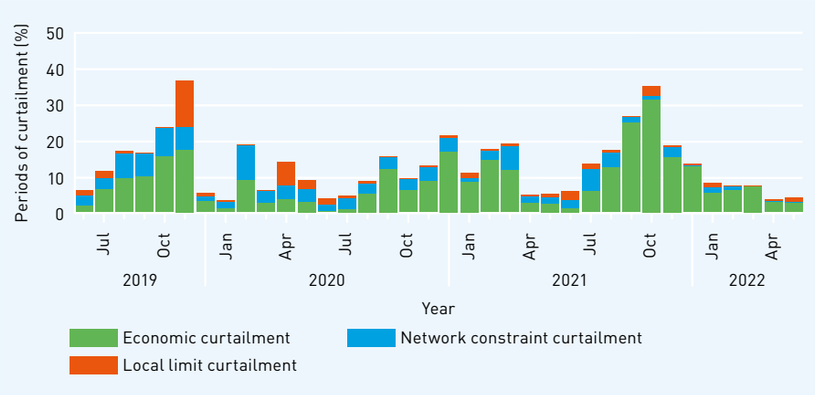


Chart 13:
Curtailment in South Australia, 2019–22[156]

The volatility in the wholesale prices in South Australia also negatively impacts retail prices. Typically, a retailer would look to hedge their exposure to excessively high wholesale prices through products such as cap contracts or swaps that can be traded on the Australian Stock Exchange. These contracts are provided by dispatchable generators that can guarantee supply at a certain price. Within the NEM, the volume of these contracts that are traded far outweigh the amount of energy provided.

With the small number of dispatchable generators in the South Australian market there is very limited liquidity, which flows through to the retailer facing higher hedging costs that get passed on to consumers directly through their retail tariffs, or the risk is priced-in to the retail tariff. While South Australia frequently has a lower average quarterly wholesale prices than New South Wales, as demonstrated in Chart 14, the cost of electricity charged to retail customers is consistently higher in South Australia.

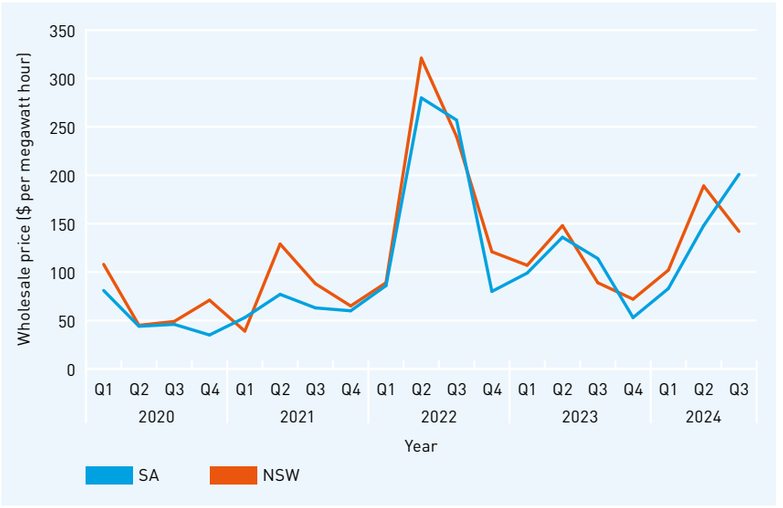


Chart 14:
National Electricity Market: Average quarterly wholesale prices, 2020–24[157]

The ability to minimise these challenges is enhanced when we can more dynamically manage system loads, such as the following response measures:

- Encouraging more flexible loads, such as hydrogen electrolysers that are able to ramp up and down in response to energy prices. The Australian Energy Market Commission is reviewing the Wholesale Demand Response Mechanism in late 2024, which may provide a market mechanism to encourage this.
- New residential Time-of-Use tariffs were introduced in July 2020 for residential customers with smart meters. These tariffs encourage more consumption of electricity during the middle of the day, to take better advantage of surplus solar generation. This 'solar sponge' tariff is offered between 10 am to 3 pm and is around a quarter of the price of the normal network tariff.
- Automated measures to ensure that supply and demand from consumer energy resources, such as solar panels and home battery storage, operate to maximise efficiency in the system. For example, the recent Smarter Homes regulatory changes allow for remote operation to limit the export of excess rooftop solar energy from application systems.
- Further consideration and planning for the forecast increase in demand from electric vehicles. The impact may be partially offset by utilising bi-directional chargers and demand management strategies through smart chargers, which will help smooth demand peaks and possibly benefit consumers through more efficient use of the distribution network.[158]
- Use of virtual power plants (VPPs) where rooftop solar and home batteries can be coordinated to manage the impact of consumer energy resources to benefit the system. South Australia has the largest VPP in Australia in partnership with Tesla[159], which has demonstrated the ability to support the network through frequency response.
- Coordinating consumer energy resources to benefit both consumers and the network, such as the Mitcham Council Community Renewables program.[160]

These dynamic response measures are enabled by accurate real time data. Improved transparency in the market will make this process more efficient.

Bungala Solar Farm, South Australia
Image courtesy of Department for Energy and Mining

1.2.2.1.4 Renewables opportunities

If the ongoing challenges in managing the transition to a 100% net zero electricity network can be resolved, there is an opportunity to capitalise on the global green transition and leverage our renewable resources to supply new industries with significant amounts of renewable energy.

The latest AEMO ISP forecasts that, allowing for continued growth in energy efficiency, overall electricity consumption across the NEM will rise from 180 to over 410 terawatt hours by 2049–50.[161] As discussed, South Australia has potential opportunities in the production of green hydrogen to process green iron and green steel, expansion in copper production and other energy intensive industries. South Australia is well placed to capture these opportunities as we have already made significant strides in decarbonising our grid, ahead of other mainland states. It also means that more of the investment in additional renewables capacity can go towards supplying growth opportunities, instead of replacing retiring coal assets.

The government has facilitated this through the first release areas under the *Hydrogen and Renewable Energy Act 2023* (SA). A rapid expansion of demand will require significant investment in both electricity generation capacity and transmission infrastructure. To the extent that additional demand can be placed on existing network assets, it should improve the utilisation of those assets and could reduce the unit cost for accessing the network.

South Australia has also been very successful in building almost 1,000 km of transmission infrastructure in the last five years[162], while other states have experienced significant social license issues that have delayed projects. Maintaining this social license to provide certainty to projects is an important investment attraction tool.

For South Australia to continue to demonstrate to the world that we are the partner of choice in the green economy, we need to realise the necessary efficient infrastructure solutions, and limit duplication. To do this we will need to coordinate solutions to:

- Design and manage NEM frameworks to provide certainty to support investment in transmission infrastructure, ahead of having a commercial level of certainty in demand.
- Provide certainty for subsequent downstream investment in projects that need access to electricity.
- Coordinate investment outside the NEM, focussing on the behind-the-meter solutions.

The case for change – In brief

The design of the National Electricity Market in the 1990s is not well suited to the current needs of the market which is in rapid transition, with a potential step change in demand and intermittent generation capacity.

The current national frameworks mean the reliability and security of our network is exposed to decisions and events that happen interstate.

The step change in demand and required investment in generation and transmission will need to be tied to industry policy in South Australia.

The energy transition will require significant investment and future energy prices will be influenced by the required return on those investments. Ensuring that investment is as efficient, and derisked as much as possible, will keep downward pressure on pricing.

4. Recommendation:

The State Government form and maintain its own view on network forecasts and requirements to develop policies that encourage and provide certainty for efficient investment in the electricity network.

Lead agency: Department for Energy and Mining

Timeframe: Delivery 0 to 5 years

Neoen Australia wind farm and high voltage power lines, South Australia
Image courtesy of Department for Energy and Mining

The case for change – In brief

South Australia has seen a rapid expansion of renewable energy sources with renewables contributing 74% of the electricity mix in 2023. The State Government has a target that electricity generation will be sourced from net 100% renewables by 2027.

The decarbonisation of our electricity network is a competitive strength for South Australia, but electricity needs to be affordable, reliable, and secure to maintain this competitiveness.

To achieve this, our mix of renewables needs a sufficient supply of flexible firming generation capacity. While batteries are likely to play an important frequency and grid stability role, for the foreseeable future the network is likely to require gas peaking plants to play this role.

Firming capacity achieved through gas peaking plants will maintain reliability in the system through extended wind and solar droughts, help maintain system strength and should reduce some of the volatility in retail prices.

5. Recommendation:

Identify the amount of flexible firming capacity required to support the South Australian electricity network and explore policy initiatives that could encourage the necessary investment (likely to be gas in the short term).

Lead agency: Department for Energy and Mining

Timeframe: Delivery 0 to 5 years

1.2.2.2 Gas and liquid fuels

As previously discussed, the majority of South Australia's total energy use remains in oil or gas, which will remain a key part of our energy mix over the period of the Strategy. The key challenge will be how can we decarbonise these fuels without compromising supply or our competitiveness.

1.2.2.2.1 Repurposing existing infrastructure

There is substantial infrastructure that has been established to receive, process, transport and distribute these energy sources. This includes the receiving facilities at Port Adelaide and Port Bonython and processing facilities at Moomba and Port Bonython. It also includes the extensive gas networks including the 1,184 km Moomba to Adelaide gas pipeline which comprises a mainline and two major lateral pipelines[163] (smaller pipelines that branch off from a main pipeline), the 680 km SEAgas pipeline to Victoria[164], and 7,500 km of the Australian Gas Networks distribution network[165]. There are many depots and service stations that provide access to these energy sources to businesses and the community. This infrastructure is critical to supporting businesses and to keep products moving.

As industry transitions to more low carbon fuels such as hydrogen, bio-fuels, e-methane or other sustainable fuels this infrastructure may need to be augmented or duplicated. To maximise efficiency, it would be preferable to use 'drop-in' fuels that are able to be used in existing infrastructure. Australian Gas Networks' mains replacement program to upgrade to a polyethylene network is set to be completed by 2026, equipping their network to deliver hydrogen and/or methane (fossil gas or biomethane) but some equipment may need to be replaced to use hydrogen.

Gas transmission infrastructure at Cavan, South Australia
Image courtesy of SEA Gas

1.2.2.2.2 Low carbon fuels

Oil remains the largest source of energy in South Australia.[166] This is primarily for transportation with some use for diesel generators and plant and equipment.

Electrification of vehicles is a significant part of decarbonising transport but is not anticipated to resolve all modes of transport. Liquid fuels, due to their high energy density, will still be needed for uses such as aviation, long-haul travel, and many agricultural purposes.

South Australia has no refining capacity and so is reliant on imports of processed oil. To the extent South Australia is able to produce low carbon fuels, it will increase its energy independence.

1.2.2.2.3 Natural gas in the energy transition

South Australia consumes approximately 75 petajoules of natural gas per year, which was approximately 25% of our overall energy usage in 2022–23.[167] Gas demand is largely driven by gas-powered generation, which accounts for half of the consumption, as shown in Chart 15, followed by industry at 26%.[168] These figures highlight the importance of natural gas in the South Australian economy and its ongoing role into the future.

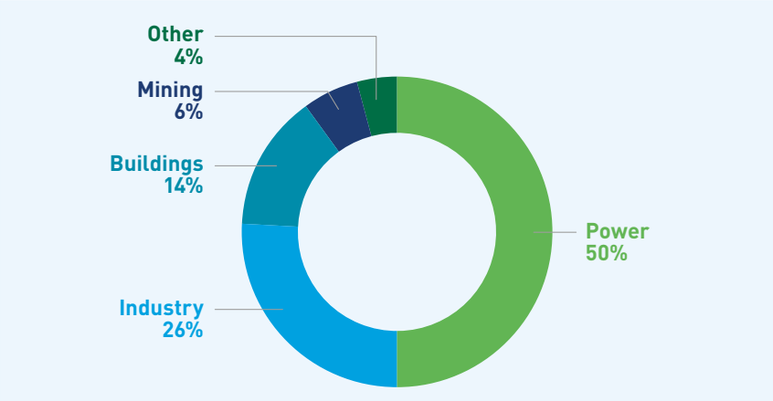


Chart 15:
South Australia's natural gas consumption by sector, 2021–22[169]

Gas will play an important ongoing role in South Australia throughout the energy transition. However, this role is complicated by forecast shortage of gas supplies across the east coast gas market. AEMO has flagged potential gas shortfalls for southern regions from 2028, with the anticipated supply gaps expected to grow as production from Bass Strait continues to decline.[170]

This shortfall will continue to grow until at least 2043 under AEMO's step change scenario, based on existing, committed, and anticipated developments, as shown in Chart 16. This supply gap presents a material risk to energy security, with gas generators increasingly struggling to secure supply and relying upon diesel fuel as a back-up.

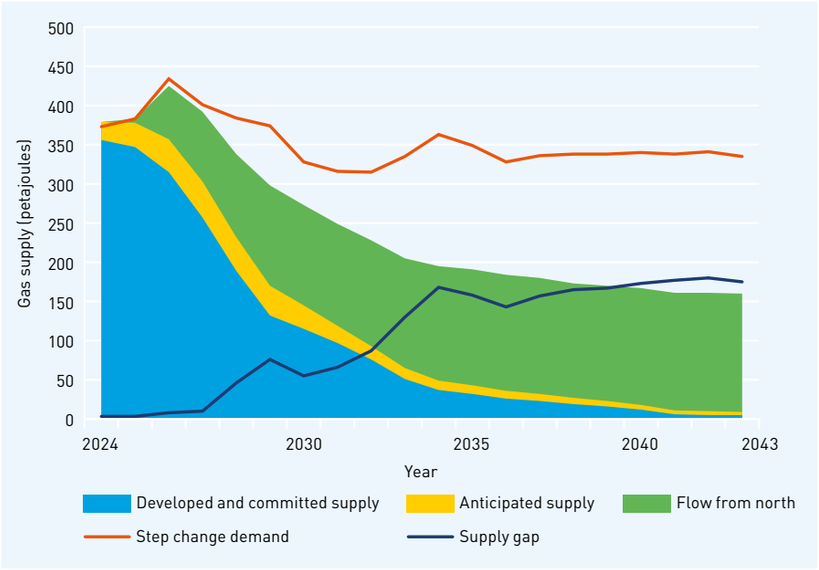


Chart 16:
Projected gas supply gap for southern regions, 2024–43[171]

Relative to the other states, South Australia has the largest proportion of gas-powered generation in its energy mix, as shown in Chart 17. Currently we rely on large, more efficient combined-cycle gas turbines, such as Torrens Island Power Station, which provides a consistent baseload power generation.

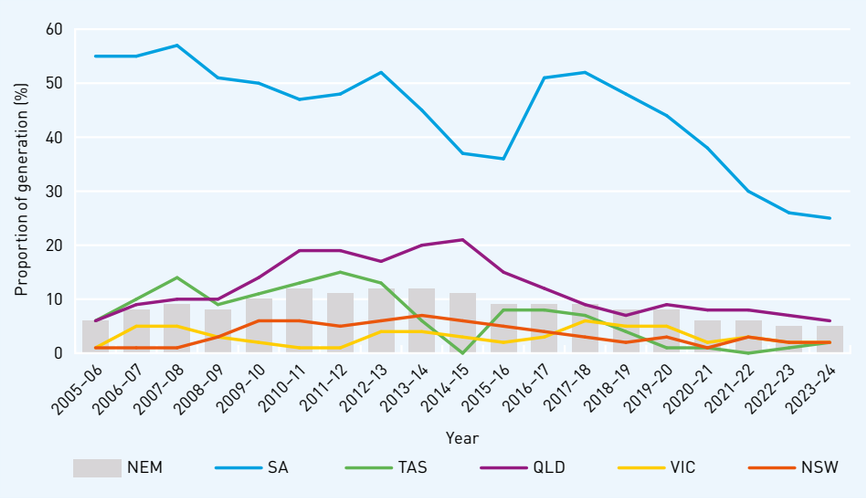


Chart 17:
National Electricity Market: Gas as a proportion of generation, 2005–24[172]

The transition towards renewable energy will need to be supported by gas-powered generation, due to its flexibility and fast response. As acknowledged by AEMO CEO Daniel Westerman, gas will continue to serve as a backstop, to ensure reliability of the NEM when wind and solar are unable to deliver consistent power.[173] The changing profile of use of gas in power generation, where it is less consistent, but has higher peaks, is shown in Chart 18.

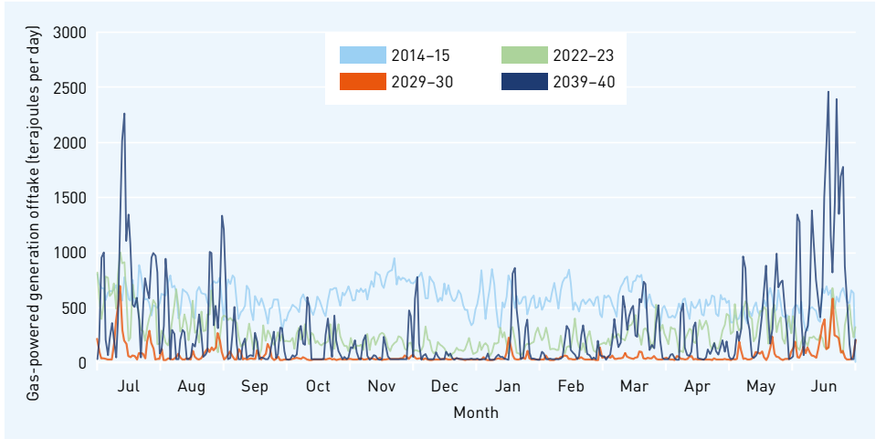


Chart 18:
National Electricity Market: Gas powered generation offtake, Step Change Scenario, 2014-40[174]

This transition will require different business and investment models. The requirement for additional storage infrastructure will need to be investigated. The existing reliance on 'linepack' or gas already in the gas pipelines, and the day-ahead trading of gas, may not provide the optimum flexibility for competition in gas peakers and may contribute to the limited liquidity in the electricity cap contract market.

South Australia is well connected to existing gas assets in the Cooper Basin and the Otway Basin (Figure 7). South Australia has a strong reputation for progressive regulation in the oil and gas sector and supporting the industry through initiatives such as the oil and gas roundtable and Plan for Accelerating Exploration gas exploration grants. The government should continue to support exploration, as a consistent and economic source of gas is critical to maintaining affordable, reliable, and secure electricity.

To supplement the supply of natural gas the state should explore the opportunity to produce its own low carbon gas. This could be by scaling the production of hydrogen once the economics are proven, producing e-methane through the combination of carbon dioxide and hydrogen, or bio-methane at scale. The South Australian Government has created the Bioenergy Industry Development Program to promote development of bioenergy. These alternatives are all in development and not yet fully commercial at scale, but with appropriate strategies in place could play an important role in our energy security over the next 20 years.

One sector that has a need for gas and has significant potential for South Australia is green iron. As discussed previously, the State Government launched a Green Iron Expression of Interest process to attract global interest in developing this sector, through processing our abundant magnetite iron resources by a DRI process, to process green iron. The Green Iron and Steel Strategy forecasts that a 2.5 million tonnes per annum plant would provide $3 billion a year to GSP.

Hydrogen power
Image – iStock image/audioundwerbung

The long-term goal for the green iron industry is to use hydrogen produced through 100% green energy as the reductant in the DRI process. However, until sufficient volumes of hydrogen can be produced at an economic price, natural gas can serve as the reductant. If the scale of the industry ramps up, then an increased demand for natural gas will occur. Case Study 2 demonstrates the current challenges faced by industry.

Case Study 2

BlueScope DRI, Project IronFlame[175]

BlueScope has undertaken an Australian DRI Options Study, referred to as Project IronFlame, exploring technology pathways for decarbonising the iron and steelmaking processes in Australia. These technologies are recognised as key to accelerating the global decarbonisation of steelmaking.

The Port Kembla Steelworks, located in NSW, has an annual production capacity of over three million tonnes of crude steel per year. Based on BlueScope analysis, a DRI facility with an output similar to Port Kembla Steelworks would require 30 to 40 petajoules of natural gas per year. This is close to half of South Australia's total annual natural gas consumption, which was close to 75 petajoules in 2022–23[176].

Additionally, depending on technology type and operational configuration, a natural gas DRI facility would require indicatively between 1.7 to 2.6 terawatt hours per year of electricity and between 10 to 13 terawatt hours per year if it transitioned to green hydrogen. In comparison, South Australia consumed just over 11 terawatt hours in 2023–24.[177]

Significant challenges in transitioning to DRI technology are insufficient transmission and electricity capacity, as well as difficulties in securing natural gas at a competitive price due to limited domestic supply.

The plans for green iron are currently centred around the Upper Spencer Gulf, with the cities of Whyalla and Port Pirie supplied gas through the Moomba to Adelaide gas pipeline with a lateral from Whyte Yarcowie, near Port Pire, supplying Whyalla. The capacity of this infrastructure is constrained, as well as being largely contracted, meaning there is limited gas available for long-term contracts needed to supply a DRI plant and other emerging opportunities.

There is also no natural gas connection with Port Augusta, which limits commercial and industrial opportunities and fully realising the potential of the Upper Spencer Gulf. While one, 2.5 million tonnes per annum DRI plant would make a significant contribution to the South Australian economy, the potential with our magnetite resources across the state could lend itself to multiple or even larger scale plants. However, these would be constrained by the availability of gas and the infrastructure to transport the gas efficiently. Governments can help facilitate the transition to green steelmaking by investing in shared infrastructure corridors and promoting joint venture developments within the industry.

The case for change – In brief

The state will have an ongoing need for gas for power generation, industrial purposes, and liquid fuels for transport. Gas and liquid fuels presented around 75% of state total energy consumption in 2023.

Details of the transition pathway to a 100% net zero energy system by 2050 are uncertain. Economical solutions will need to be adopted as they become both technically and commercially feasible.

With gas and liquid fuels having a role over the next 20 years, the state needs to identify the pathway to decarbonise these energy sources and the infrastructure required.

Gas will be key to realising the green iron opportunity until hydrogen is able to be commercially produced at scale.

The supply of gas to Whyalla and Port Pirie is currently constrained by infrastructure capacity. Port Augusta currently has no gas network.

6. Recommendation:

Prepare a Future Net Zero Fuels Strategy and Roadmap that identifies the infrastructure investment requirements.

Lead agency: Department for Energy and Mining

Timeframe: Policy 0 to 5 years, delivery ongoing

7. Recommendation:

Undertake a feasibility study into increasing the supply of gas to the Upper Spencer Gulf to meet green iron and green steel goals at scale.

Lead agency: Department for Energy and Mining

Timeframe: Planning 0 to 5 years, delivery 5 to 10 years

1.3 Building an efficient freight network

In 2024, South Australia's Freight and Supply Chain Strategy highlighted the need for our freight networks to respond to constantly evolving global and domestic trends such as changing consumer patterns, new and emerging industries, new technologies and emission reduction targets. The state's freight task continues to grow in line with our growing economy and population, with 26% growth in national freight estimated from 2020 to 2050.[178]

The cost of freight impacts the cost of all goods with the cost of freight as a proportion of total import value in South Australia estimated at 5.3%.[179] Therefore, maintaining efficient freight and supply chains is key to our competitiveness. This is true for both our export goods that need an efficient path to market, but also our everyday goods and consumables that rely on freight and supply chains for delivery to our businesses and shops. By volume, 88% of freight is actually domestic transport of goods[180].

South Australia's existing freight network forms part of the national network. It represents a key node, sitting at the junction of both east-west and north-south movement of goods and commodities across Australia, as presented in Figure 10.

Northern Connector, South Australia
Image – James Knowler, JKTP

Figure 10:
South Australia's freight network[181]

1.3.1 Productive and efficient freight corridors

South Australia's freight task moves via a range of modes, including road, sea, rail, and air as shown in Figure 11. This movement relies upon efficient and strategic supply chains that link modes of transportation.[182]

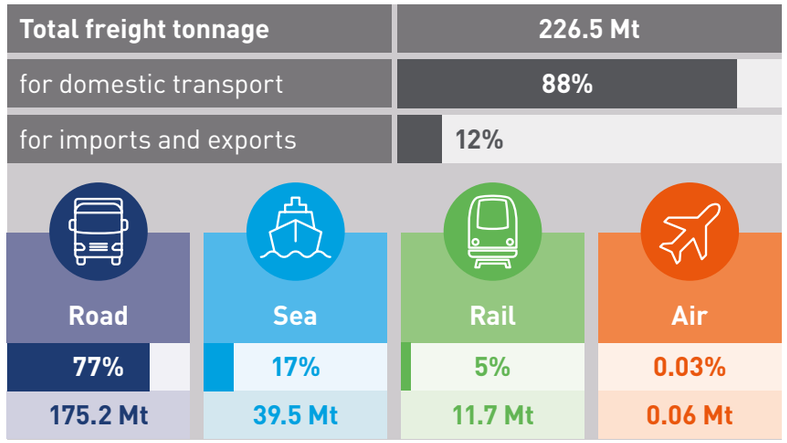


Figure 11:
South Australia proportion of freight by modes[183]

South Australia's Freight and Supply Chain Strategy lays the foundation for realising the opportunities for future prosperity and highlights that a seamless, cross-border integrated freight network and supply chain requires coordination with other jurisdictions, regulators, and industry.[184] The alignment of investment in enabling infrastructure and regulatory support will be driven by collaboration between industry stakeholders and government.[185]

South Australia needs efficient freight networks that connect the state from all our borders seamlessly and safely, to maintain our competitive position and ensure our products get to market efficiently. Due to the typically large distances required to connect the points of origin and destination, there are bottlenecks and potential points of failure in the network, which create major economic impacts.[186]

Road transport carries the majority of the freight task and is likely to continue to do so given the geography of our state and the benefits of point-to-point delivery. However, rail will still have an important role and has the potential to grow where the freight task is well suited to the efficiency and scale that rail can provide.

Ongoing investments in our main road networks continue to improve safety and efficiency through creating duplications, barriers, strengthening (bridges, culverts) and adding passing lanes. Projects such as the SA Freight Highway Upgrade Program aim to increase the reliability and safety of Australia's national freight routes, including three of South Australia's major highways.[187] The program will improve freight productivity by reducing travel times and enabling the use of higher productivity vehicles through longer configuration vehicles, as well as reducing operational costs for commercial vehicles. The use of longer configuration vehicles has been found to increase the efficiency of freight transport by reducing fuel consumption and costs to shippers by 32% and 29%, respectively.[188] Figure 12 shows vehicle configurations and lengths.

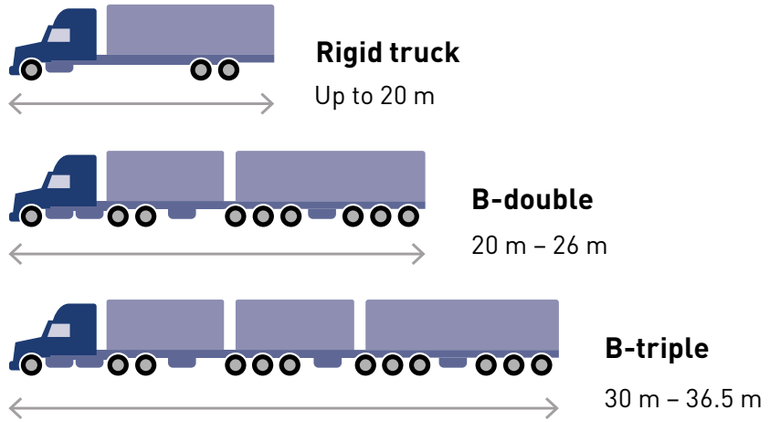


Figure 12:
Sample truck configurations (indicative)

Future investment in the freight network should be guided by an understanding of the freight task and the origin and destination of the goods. Corridors should be identified as key freight routes, and the use and design of those corridors should be priorities for freight. This could limit the potential conflicts with other road users and improve the safety of all road users on those corridors. Maximum efficiency is gained if double handling of freight can be limited, and the reliability and resilience of the corridors can be addressed. This will involve long-term planning to address possible choke points such as the bridges Swanport and Paringa, or the network of culverts through the South East Drainage Scheme. It will also involve addressing any first or last mile issues that may limit the end-to-end use of higher productivity trailer combinations.

Maintaining a safe and efficient road network for all users remains an important but costly challenge. The conflict that can occur between freight and other users is most apparent where the national network enters Greater Adelaide, particularly the South Eastern Freeway due to the long and steep descent. The National Heavy Vehicle Regulator has placed restrictions on the road vehicle type that can be used, as configurations longer than a Level 2A, or more commonly known as 'B-doubles', are not permitted to drive on the South Eastern Freeway. Configuration restrictions enacted by interstate jurisdictions can also restrict the use of longer configuration vehicles departing South Australia. Freight operators that seek to optimise their trips through leveraging the efficiencies of larger vehicles on the network must stop and break down their vehicles to use the South Eastern Freeway, or seek an alternative, longer route that avoids the Freeway.

There will always be a need for heavy freight to enter Adelaide via the South Eastern Freeway route, but creating an efficient Adelaide Hills Bypass as a route that enables larger vehicles to connect to their destinations with the option to avoid the Adelaide metropolitan area is required. Various routes have been evaluated, and a program of work aligned to Commonwealth and State priorities is in progress.

A holistic view across the transport network in and around Adelaide and the Adelaide Hills is recommended, to ensure that planning and delivery of discrete elements do not occur in isolation and are coordinated and prioritised to ensure all our existing and future freight needs are met. Industry needs the clarity to understand the trade-off in distance travelled (for example, to re-route around the Hills) versus the costs associated (for example, time and potentially fuel saved on new route).

The River Torrens to Darlington Project (T2D Project) is the final 10.5 km section of the North-South Corridor project.[189] Completion of the T2D Project by 2031 will provide significant opportunity and benefits to reinforce a 78 km continuous, traffic light-free north-south link between Gawler and Old Noarlunga.[190] This link will enable efficient freight movements across the Adelaide metropolitan area to points of destination and our major export pathways and industrial centres. Longer term planning should consider the feasibility of a southern connection to leverage the completed North-South Corridor. This would complement a northern Adelaide Hills Bypass for freight originating in or destined for the south of Adelaide.

North-South Motorway, Regency Park, South Australia
Image – James Knowler, JKTP

In the identification of key freight corridors, it should be recognised that freight and supply chains are not limited by State borders. Opportunities where strategic investment in freight corridors may enable freight that originates interstate to be processed in, or exported through, South Australia should be explored. This will increase economic activity in South Australia and could increase utilisation of the fixed investment in the networks. The investment in sealing the Strzelecki Track is an example where it was made possible for livestock to move from Queensland to be processed in South Australia. There may also be opportunities where either agricultural products, minerals or rare earths that are located in either NSW or Victoria could be freight-advantaged through South Australia. Any planning for freight corridors should be mode agnostic and consider where rail may be best suited for the freight task. Decisions should be made on the basis of rigorous business cases.

South Eastern Freeway, South Australia
Image courtesy of RAA

The case for change – In brief

South Australia needs efficient freight networks to support the complete supply chain, maintain our competitive position and support our products getting to market efficiently.

High productivity vehicles carry more freight per vehicle, resulting in fewer vehicles required to move the same freight. To maximise the benefits the network design needs to contemplate the origin and destination of key freight tasks.

The Adelaide Hills forms a barrier to efficient freight movements with restrictions on the descent. Alternative free flowing corridors would improve congestion, safety and efficiency for some freight tasks. This should consider a longer-term southern connection to the North South Corridor to leverage the completed Torrens to Darlington section.

8. Recommendation:

Identify key freight corridors and improve our competitiveness by planning for strategic investment to improve their end-to-end efficiency and resilience of these corridors.

Lead agency: Department for Infrastructure and Transport

Timeframe: Planning 0 to 5 years, delivery 5 to 20 years

1.3.2 Intermodals

Intermodal logistics hubs (intermodals) connect multi-modes of transportation, incorporating warehousing and supply chain services that enable on-site processing[191], helping to create an integrated freight network. National Intermodal, a Commonwealth business enterprise, considers intermodals as a critical enabler for modern, efficient supply chains, as presented in Case Study 3.

The Adelaide metropolitan area has existing intermodals located at Bowmans, Penfield, Gillman, and Islington[192], which support a range of economic activity and connect to the national rail network and the state's ports. Enhancing the efficiency of our intermodals, including through greater adoption of automation, and developing additional intermodals at strategic points across the state will help drive our economic vision and global competitiveness. It will also enable greater mode shift from road to rail for specific tasks.

Moorebank Intermodal Precinct, New South Wales
Image courtesy of National Intermodal

Case Study 3

Moorebank Intermodal Precinct[193]

Intermodals can reduce pressure on roads and ports, and allow seamless movement of freight between modes, to maximise efficiency and reduce greenhouse gas emissions.

The Moorebank Intermodal Precinct is Australia's largest freight transport intermodal precinct[194], located 32 km south-west of Sydney. Its strategic location enables high-capacity transportation of freight via train direct from Port Botany, connecting with significant road networks nearby including the M5 and M7 Motorways.

The development and operation of the Precinct has been facilitated by a public-private partnership between the Commonwealth Government, NSW Government and private sector investors and infrastructure managers. The initial planning, land allocation and approvals were undertaken by government, de-risking future private investments. The Precinct's significant level of automation and high-capacity freight connections are intended to drive long-term economic, community and environmental benefits including:

- An estimated $11 billion worth of economic benefits by improving freight productivity, lowering costs and achieving supply chain benefits
- Lower road congestion, improved road safety and reduced greenhouse gas emissions (up to 110,000 tonnes per annum) by removing up to 3,000 heavy freight truck movements from Sydney's roads every day
- Local employment opportunities in skilled areas including automation, robotics, and artificial intelligence.[195]

Le Fevre Peninsula, South Australia
Image courtesy of Flinders Port Holdings

Regionally there are opportunities to improve productivity and enhance the overall freight network. An intermodal has been investigated at Pimba for more than 20 years.[196] BHP's Copper SA operations nearby currently export approximately 230,000 tonnes of processed products, and imports around 500,000 tonnes of bulk sulphur, cement, fuels, compounds, and project and containerised materials, with almost all via road.[197] The quantity of these heavy mass vehicles is between 7,500 and 9,000 annually and the volumes will increase with planned growth targeting 500,000 tonnes of exports, requiring more than 1 million tonnes of inbound freight.[198] A road-rail intermodal at Pimba presents an opportunity to reduce heavy vehicle movements along more than 450 km of our highways and improve the efficiency of road-rail operations.

Further opportunities for regional intermodal development and improvements exist across our major centres of import and export activity. Monarto, like Pimba, has been considered for many years as a potential intermodal site, and is geographically well located to form part of a fully integrated solution to addressing known issues on the South Eastern Freeway and link to the proposed project outlining the Adelaide Hills Bypass. A detailed assessment of the state-wide freight origin and destination pathways is considered a critical next step in understanding the network-wide constraints and opportunities for further intermodal investigations. This assessment should consider enhanced rail access and increased mode share to Port Adelaide to improve freight efficiency. Previous investigations have indicated opportunities for intermodals exist in the South-East and Upper Spencer Gulf in particular.

As we aspire to grow our exports and seek economies of scale, there is a need to use the existing rail network and ports more. This includes further investigation on the choice of mode appropriate to the task required and potentially re-vitalising existing rail options that are either no longer being used or have been retired. There are opportunities to re-purpose these retired rail lines into operational freight networks in south eastern South Australia. For example, the rail line at Pinnaroo and further south in the Mount Gambier region. Several entities have expressed interest over the years in re-purposing these old routes, and whilst there are many constraints, continuing to remain open to options that may improve productivity and enable further economic activity is paramount.

Identifying the locations and timeframes for intermodals to meet future demand will encourage the establishment of warehousing, distribution and industrial hubs in a coordinated manner, driven through integrated land use planning and partnerships between government and the private sector.[199] Inaction may risk an ad-hoc, non-integrated approach that potentially limits the State's competitiveness.

The case for change – In brief

Intermodals connect different modes of transportation and include warehousing and supply chain services that enable on-site processing, helping to create an integrated freight network. They are a critical enabler for modern, efficient supply chains.

Enhancing the efficiency of our intermodals and developing additional intermodals at strategic points across the state will help drive our economic vision and global competitiveness.

Where rail is proven to be a more efficient mode for a particular freight task, it could help underpin a business case for investment in intermodals to improve the overall freight efficiency, while also reducing demand on our road network.

9. Recommendation:

Investigate future needs for intermodals, including a detailed origin and destination analysis.

Lead agency: Department for Infrastructure and Transport

Timeframe: Planning 0 to 5 years, delivery 5 to 20 years

1.3.3 First and last mile networks

The first and last mile within our freight networks refers to the delivery portion at either the start or end of the supply chain. Establishing strong and productive first and last mile networks that are integrated with land use planning and the broader transport network is necessary. This will help ensure we remain sustainable and can provide the essential goods and products to sustain everyday life across the state.

A network of distribution centres, retail and industrial fulfilment centres aggregate goods and materials prior to the final delivery leg in the supply chain. We need to ensure suitable industrial lands are identified for this purpose and that the transport network can adapt to meet the demands of an increasingly complex first and last mile delivery system.

For direct imports and exports, a key challenge is the movement of freight in the most efficient and productive manner within spatially-constrained port precincts. Each port has its own unique characteristics and commodities related to their region and catchment area. The common challenge is integrating a competitive and structured end-to-end logistics and supply chain across multiple stakeholders, within each location's local constraints.

An example of these challenges is at Flinders Ports' Adelaide Container Terminal at Outer Harbor. The bulk of container movements (67%) in and out of the terminal are high productivity vehicles (e.g. triple road trains).[200] These vehicles access the terminal via Victoria Road, which by 2030 is expected to increase from approximately 2,500 to 9,100 vehicles per day.[201] Further adding to the vehicle presence along Victoria Road, the AUKUS project is forecast to employ up to 4,000 workers during site infrastructure design and construction, with a further 4,000 to 5,500 direct jobs expected when the submarine build reaches its peak around 2044–54.[202]

There is an existing rail link to the Port of Adelaide that presents an opportunity to strengthen the connection to local intermodals and remove large volumes of road trains from Victoria Road.

Integrating container movements at both ends of a rail shuttle service would reduce the amount of container lifting required and seek to enable direct ship-to-train and warehouse-to-train movements for maximum efficiency. With considered planning, similar approaches and variants on this, such as potential conveyor systems instead of rail, may be appropriate for other port locations.

Additionally, the Le Fevre Peninsula and Port of Adelaide are facing significant changes that require a strategic infrastructure response. The Port of Adelaide is the state's largest port for the import and export of goods. Assets across the Le Fevre Peninsula and the Port of Adelaide are examples of constrained infrastructure that co-exists with the urban environment, major industrial and economic activity centres, maritime building precinct (AUKUS and existing Australian Submarine Corporation facilities), and major network energy generation and distribution infrastructure such as electricity and gas. A Masterplan for Le Fevre Peninsula has been identified as a gap in the strategic planning required. A Masterplan would ensure the critical infrastructure that supports all the economic activity associated with the Le Fevre Peninsula is in place to meet future needs.

Le Fevre Peninsula, South Australia
Image courtesy of Flinders Port Holdings

Aurizon freight train, Port Adelaide, South Australia
Image – iStock/BeyondImages

The case for change – In brief

The Le Fevre Peninsula and the Port of Adelaide are critical economic, social, and environmental assets for the state and are undergoing unprecedented levels of investment, largely driven by the AUKUS submarine program.

A significant increase in vehicle movements is forecast in a spatially constrained environment. Strategic planning is required to ensure the infrastructure is in place to support the economic activity and optimise the opportunity for the State.

10. Recommendation:

Complete a Masterplan and critical infrastructure study for the Le Fevre Peninsula.

Lead agency: Department of the Premier and Cabinet

Timeframe: Planning 0 to 5 years, delivery 5 to 10 years

1.3.4 Port capacity

South Australia has multiple port facilities, all with unique challenges and opportunities specific to their location and primary functions. A fundamental challenge for ports is maintaining connectivity within often congested, restricted locations with competing priorities for access and use of existing infrastructure. Continued automation, productivity investments and integration of all elements within the freight, logistics and supply chain are key to supporting growth.

The state is progressing multiple strategic initiatives, particularly in the Upper Spencer Gulf region, as well as the ongoing transformation of the electricity network, which includes significant global supply chains importing large-scale plant and equipment such as wind turbines. The forecast growth in bulk exports, continued build-out of renewable energy systems and the opportunities associated with South Australia's Economic Statement, will place significant pressure on the existing freight network. Public and private investments will be needed.

Regionally, our maritime ports are predominantly structured around the local demands of the commodities they import and export. There is also a range of potential new and/or upgraded ports under consideration across the state. To realise these state-wide ambitions and provide a coordinated response, government oversight is needed to address both existing and future demands, and to ensure investment decisions and supporting infrastructure is allocated effectively. This would include careful consideration of brownfield development of existing ports, to optimise their utilisation and the existing infrastructure.

Existing port capacity and the consideration of new, deep-water ports to enable growth in our bulk commodities sector have been proposed and investigated over many years. The six declared ports in operation[203] continue to meet our existing demands, with opportunities to increase capacity through brownfields development, according to market conditions and on a case-by-case basis. Ports have also been developed at Lucky Bay and Wallaroo[204] and a port is proposed at Playford[205], which all operate as transhipment ports.

The port of Whyalla is another existing operation that utilises transhipment to export bulk commodities to international markets (iron ore).[206] Transhipment involves the movement of product from road, rail or pipelines to shallow draft transhipment vessels, greater than 10,000 tonnes capacity, which then load ocean going vessels, greater than 100,000 tonnes capacity, at deep-water transhipment points.

This form of operation reduces the capital investment required, in a trade off with higher operating costs, and has been evaluated by Infrastructure SA as a commercially viable option for bulk exports for approximately 10,000 tonnes to 20,000 tonnes annual volumes.[207]

Several major port projects and proponents have plans for high volumes of exports requiring larger scale infrastructure, such as the proposed Cape Hardy, Port Spencer and Myponie Point proposals. These proposals involve jetties extending to deep water and thus have the capacity to load large vessels, greater than 120,000 tonnes and utilise conveyor systems direct from storage. The economics of each port and project will determine the viability of these prospective new ports, with ongoing engagement to aggregate demand and consider potential common-user infrastructure solutions.

Ensuring our high-value, time-sensitive exporters have a competitive and timely pathway to market is critical. Maintaining and enhancing access to Adelaide Airport, particularly as our population continues to grow and we complete the T2D Project, is another consideration within Adelaide's metropolitan area transport network. The key to maintaining efficient air freight includes increasing direct international passenger flights to Adelaide, as the majority of air freight is moved through passenger flights. Network upgrades, as part of the T2D Project, will provide road users with improved access to key gateways including Adelaide Airport, the wider national highway network and the Port of Adelaide.[208]

Container ship, Port Adelaide, South Australia
Image courtesy of Flinders Port Holdings

Currently, the Port of Adelaide is the state's only accredited port for Customs and Biosecurity entry into the state for international vessels.[209] With multiple large projects progressing in regional areas, this single point of entry is likely to constrain delivery and add risk and cost to projects. Considering South Australia's known large-scale project pipeline and the scale of opportunities, there is a need to investigate additional import capacity such as material (or module) offloading facilities, within the state.[210] Private development and commercial projects will determine the merit for potential new ports for the foreseeable future, with the state continuing to work with proponents and perform its obligations in progressing approvals and regulatory processes.

Taking into consideration the anticipated volumes and over-dimensional nature of these large-scale projects, the need for well-planned importation options is clear. The transport of over-sized loads to site requires permits and police escorts, which is time consuming, costly and creates disruptions for all infrastructure users.

Bulk carrier ships offloading wind turbine components, Port Adelaide, South Australia
Image – iStock/BeyondImages

The transportation required to relocate one wind turbine from port to site is presented in Table 5. Case Study 4 provides a breakdown of vehicle movements for a one gigawatt windfarm project.

Table 5:
Transport breakdown for one wind turbine from port to site[211]

Section	Items	Equipment	Support movements
Tower	4	Specialised truck per section	2 x pilots for each truck 1 x police escort for each truck
Blades	3	Specialised truck per section	2 x pilots 2 x police escorts
Gear box	1	One truck	1 x pilot
Generator	1	One truck	None
Foundations, steel cages, etc.	1	One truck	None

Case Study 4

Goyder North project[212]

The Goyder Renewables Zone is a hybrid renewable energy project proposed for the Goyder region of South Australia. The zone consists of two separate projects with staged delivery: Goyder South (Stage 1) and Goyder North (Stage 2).

The Goyder North (Stage 2) project will comprise battery energy storage systems totalling up to 900 MW / 3,600 MWh in capacity, up to 135 wind turbines totalling up to 1,000 MW in capacity and associated temporary and permanent infrastructure. Each wind turbine will have a maximum height of 240 metres, with blades and hubs measuring 90 metres and 160 metres, respectively.

It is estimated that over the 14-month construction period, around 66,000 vehicles movements will be required to transport materials to site, including 3 oversize loads per day, equalling 937 oversize loads.[213]

Bulk carrier ship, Thevenard Marine Offloading Facility, South Australia
Image – Lincoln Fowler/Alamy stock photo

Considering the size and volumes of future large-scale wind farms, and other large-scale infrastructure projects, there is a need to investigate and define the most efficient and reliable supply chains for these movements. This includes the land route to key project areas and preferred port of entry for construction contractors and equipment suppliers to deliver the infrastructure required for our pipeline of large-scale projects. The large-scale projects are predominantly in the state's north, north-east and west and can be accessed for imports through existing ports in Upper Spencer Gulf and Eyre Peninsula which should be the initial focus of investigations.

The case for change – In brief

The pipeline of renewables projects requires over-dimensional loads to be imported by ship, inspected and transported to dispersed, distant locations across South Australia.

This is creating demand for additional import facilities capable of handling the volume and large size of materials required. The associated land-side corridors, appropriate customs and biosecurity requirements, and common-user infrastructure needs will also need to be considered.

Currently, Port Adelaide is South Australia's only port accredited for customs and border security imports. As multiple large projects progress in regional areas, this single port of entry increases project delivery constraint, cost, and risk.

11. Recommendation:

Identify locations for open access material offloading facilities and associated supply chain needs to support the state's economic priorities.

Lead agency: Department for Infrastructure and Transport

Timeframe: Planning 0 to 5 years, delivery 5 to 20 years

1.4 Carbon capture, utilisation and storage – An emerging opportunity

1.4.1 Carbon capture and storage to achieve net zero

The main challenge faced by the increasing global need to decarbonise will be hard-to-abate sectors, which collectively account for one-fifth of global greenhouse gas emissions[214], and 20% of Australia's yearly greenhouse gas emissions[215]. There are various solutions and substitutions that can reduce carbon dioxide release during production or use, however, not all industries can significantly abate or reduce greenhouse gas emissions.

Carbon capture and storage (CCS) is a mature technology that has been used in the oil and gas industry since the 1970s.[216] It allows for carbon dioxide to be stored directly in geological areas where it can remain sequestered.[217] Due to the current global need to decarbonise, CCS is seeing significant investment and the technology is rapidly evolving. CCS will hold a key enabling role to the path to achieve net zero by 2050 and beyond.[218]

The Intergovernmental Panel on Climate Change modelled a Sustainable Development Pathway to limit climate change that identified CCS as a key part of the approach to limiting global warming to less than 1.5 degrees.[219] It concludes that CCS is a mature technology that is continuously improving as it evolves from its original applications within the oil and gas industry, to a global response to achieve net zero.[220] The International Energy Agency[221] and the AEMO[222] both conclude that CCS is a significant part of decarbonising the global economy. Leading bodies, including the CSIRO[223] and Net Zero Australia[224], forecast a requirement for CCS in hard-to-abate sectors.

The need to decarbonise is placing accelerating pressure and regulatory requirements on industrial facilities to reduce their greenhouse gas emissions. The level of maturity and technology readiness of CCS provides a solution to abating greenhouse gas emissions, resulting in increased interest and investment in CCS facilities. Globally, significant growth in the development and construction of CCS facilities have occurred, particularly since 2021, as shown in Chart 19, with 50 facilities in operation as of July 2024[225].

Chart 19:
Commercial CCS facilities and carbon capture capacity, 2010-24 [226]

Cement factory at Port Adelaide, South Australia
Image – iStock images/Photon-Photos

Infrastructure has an important role in unlocking this opportunity. From carbon source capture to final storage, there are various infrastructure elements involved, as illustrated in Figure 13. Establishing the optimal pathway to ensure every stage is developed in sequence is a complex undertaking and will require close collaboration between industry stakeholders and various levels of government. The parallels to, and extensive knowledge of, the existing oil and gas industry will be advantageous.

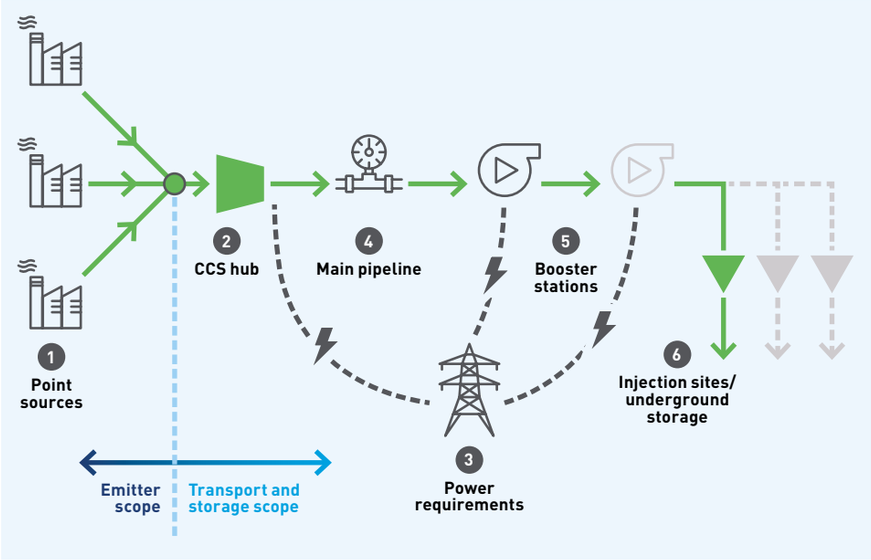


Figure 13:
CCS industry core infrastructure elements[227]

Preliminary modelling undertaken for Infrastructure SA assessed the potential domestic market for carbon dioxide point sources in 2035, based on historic emissions, committed and completed projects, and a range of industry growth factors (excluding fossil fuel based power generation).[228] Hard-to-abate industries where CCS may have an application are shown in Chart 20, with natural gas processing forecast to be the largest carbon dioxide point source, largely due to liquified natural gas processing. These industries have been selected based on historic emissions, committed and completed projects and a range of industry growth factors.[229]

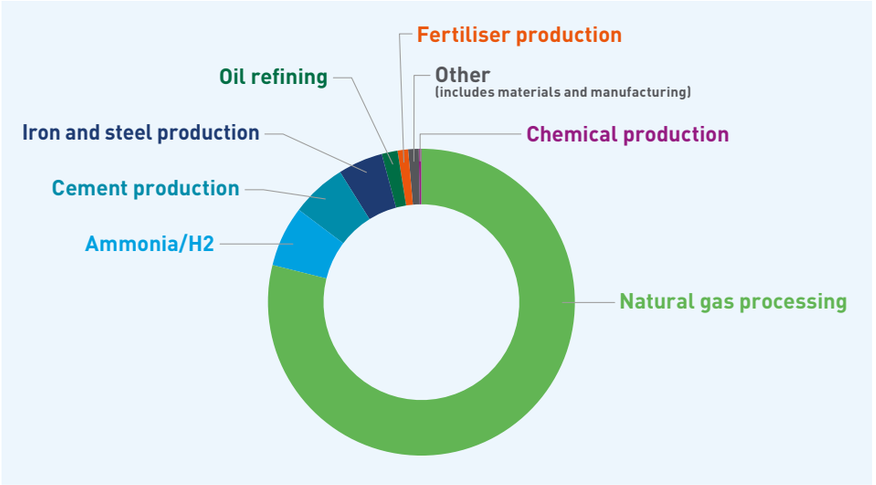


Chart 20:
Projected domestic market for CCS by industry type, 2035[230]

1.4.2 Carbon capture, utilisation and storage

A step further to CCS is carbon capture, utilisation and storage (CCUS), which finds applications for the captured carbon for purposes such as further industrial processing and value-add. Various countries are designing and implementing policies and incentivisation mechanisms to support the development of a carbon capture, utilisation and storage (CCUS) ecosystem.[231]

Globally, around 230 million tonnes of carbon dioxide are used annually by various industries, predominantly by the fertiliser, oil, and gas industries.[232] Other commercial uses include food and beverage production, metal fabrication, cooling, fire suppression, and stimulating plant growth in greenhouses. Further opportunities of carbon dioxide use are being explored, with global private funding for carbon dioxide reaching nearly US$1 billion over the last decade.[233]

New industries are emerging, with products and services accounting for future market potential. Although further research, development and demonstration is needed, fuels, chemicals, and building materials are opportunities that are scalable and commercially feasible. Some uses for carbon dioxide are:

- E-methane: a synthetic gas produced from renewable hydrogen and carbon dioxide. It can be used as replacement fuel in existing gas infrastructure and end-use applications.
- Other synthetic fuels ('e-fuels') (not including e-methane and synthetic gas), where captured carbon dioxide can be combined with green hydrogen via a number of chemical processes to produce fuels such as synthetic kerosene, gasoline, diesel, methanol, and sustainable aviation fuel.
- Mineral carbonisation: a process where carbon dioxide is combined with natural minerals to form solid carbonates.

The South Australian Government has currently signed a memorandum of understanding with Zero Petroleum, a producer of synthetic fuel, to explore the potential to develop synthetic fuels from green hydrogen.[234] The commercial-scale plant combines Zero Petroleum's technology with green hydrogen, renewable power, and carbon capture.

Japan is also planning to integrate e-methane into its gas distribution network to support decarbonisation goals, with targets of 1% of e-methane in gas supply by 2030 and to implement e-methane as its main feedstock by 2050.[235] While Japan is working on domestic production of e-methane, it will likely source e-methane from other countries in the interim, particularly those with available resources and established carbon capture infrastructure. Japan is also actively exploring partnerships for CCUS in South Australia. Santos has signed an agreement with Toho Gas, one of the largest gas utility companies, which will involve investigating the potential for producing carbon-neutral e-methane in South Australia's Cooper Basin.[236]

1.4.3 South Australia's comparative advantage

Analysis commissioned by Infrastructure SA indicates that South Australia has comparative advantages for the development of a CCUS supply chain at scale, as both a way to achieve state greenhouse gas emissions reductions, as well as expanding to meet both national and international commitments.[237]

The Cooper Basin, located in north-eastern South Australia, holds the most important onshore deposits of petroleum and natural gas in Australia. Its reserves are based upon depleted deep geological oil and gas reservoirs, which are the most suitable conditions for carbon dioxide storage.[238] Due to the exploration of the region since the 1960s, it is well monitored, with existing infrastructure and mature regulated legislation administered by the Department for Energy and Mining.

Due to its well suited geological conditions, the Cooper Basin is already being used by Santos for the Moomba CCS Project, commissioned in 2024.[239] It involves capturing carbon dioxide from the adjacent Moomba Gas Plant and injecting it into the depleted oil and gas fields within the Cooper Basin.[240] Stage 1 of the project is targeting 1.7 million tonnes per annum of injection, with Stage 2 targeting up to 20 million tonnes per annum, and a total initial reserve potential of 500 million tonnes.[241] The project has been accredited as compliant for Australian Carbon Credit Units (ACCUs)[242], adding credibility to its project as well as providing a potential revenue stream. Santos has begun its operations in the Cooper Basin, and the project is already at full injection rates[243].

Beyond its beneficial geological assets and mature regulatory framework[244], South Australia also benefits from existing infrastructure, such as gas pipelines and well-located ports for this industry. This infrastructure will help facilitate the establishment of a CCUS industry with strong growth capabilities to achieve global scale.

Moomba Carbon Capture and Storage facility, South Australia
Image courtesy of Santos

The Moomba Gas Plant in the Cooper Basin is connected to all the key east coast gas markets through established pipelines.[245] This includes a liquids pipeline from Moomba to the Santos Port Bonython export facility near Whyalla.[246] This pipeline has an established easement that could be utilised for carbon dioxide transportation, with collection from a carbon dioxide point source near Whyalla to the storage facility in the Cooper Basin.

Port Bonython in the Upper Spencer Gulf region is the location of a gas fractionation plant, diesel storage facility, and a deepwater port, with existing import and export terminal for hydrocarbons. Its overall facilities have available state-owned land for conversion into a CCUS supply chain.

Northern Lights carbon capture and storage facility, Oygarden, Norway
Image – Kjersti Nordoy © Equinor

South Australia's strong potential to support a CCUS industry offers a compelling opportunity to decarbonise hard-to-abate industries, complement the State Prosperity Project, and position the Upper Spencer Gulf as a global centre of decarbonisation. It provides opportunities for development of new heavy industries. Additionally, legislative changes to the *Energy Resources Act 2000 (SA)* updated in 2024, allows the state to collect new revenue streams associate with the use of our basins for storage.

A carbon dioxide importation opportunity could be implemented as other countries look for ways to meet decarbonisation commitments. An example of a cross-border facility is provided in Case Study 5.

Case Study 5

The Northern Lights project[247]

The Northern Lights Project is a world first example of cross-border carbon dioxide transport and storage facility. The project is a joint venture between Equinor, TotalEnergies and Shell in the North Sea, commissioned in 2024. It imports shipments of liquid carbon dioxide from industrial sources to an onshore terminal in Norway, which is later transported via pipelines to permanent storage locations.

It will allow industrial companies to transport and sequester their carbon dioxide emissions and is expected to play a role in Norway's and Europe's climate change solution. The project partners are intending to standardise and scale CCS across the European market. This involves developing a new business model that brings together technologies developed for the energy industry and will enable the creation of a large-scale value chain and transport and storage network.[248]

The project has been operational since September 2024, and Phase 1 can store up to 1.5 million tonnes of carbon dioxide per year. Due to the growing interest from various industry sectors, additional storage capacities of up to five million tonnes per year will be developed as demand increases.[249]

South Australia has the potential to capture some of these opportunities, notwithstanding, this is a globally competitive market where first movers will benefit most from securing market shares early. Figure 14 illustrates the possible importation supply chain for South Australia.

Preliminary modelling undertaken for Infrastructure SA has indicated the potential economic return to the state of a CCUS industry under various scenarios of carbon dioxide demand, as shown in Table 6. The following scenarios are conceptual.

Moomba Carbon Capture and Storage facility, South Australia
Image courtesy of Santos

Table 6:
Summary of total impact on South Australian economy by conceptual scenario phases[251]

Phase	Gross output ($ billions)	Value added ($ billions)	Employment (average annual)
1. Whyalla hub CCUS hub with SA only infrastructure and single offtake agreement (initially)	16	7	1,300
2. Global import Global importation of carbon dioxide via Port Bonython from trade partners, e.g. Japan and South Korea	41	18	3,800
3. Interstate hubs Queensland and New South Wales hubs with an interstate pipeline for transport into SA storage locations	9	4	800

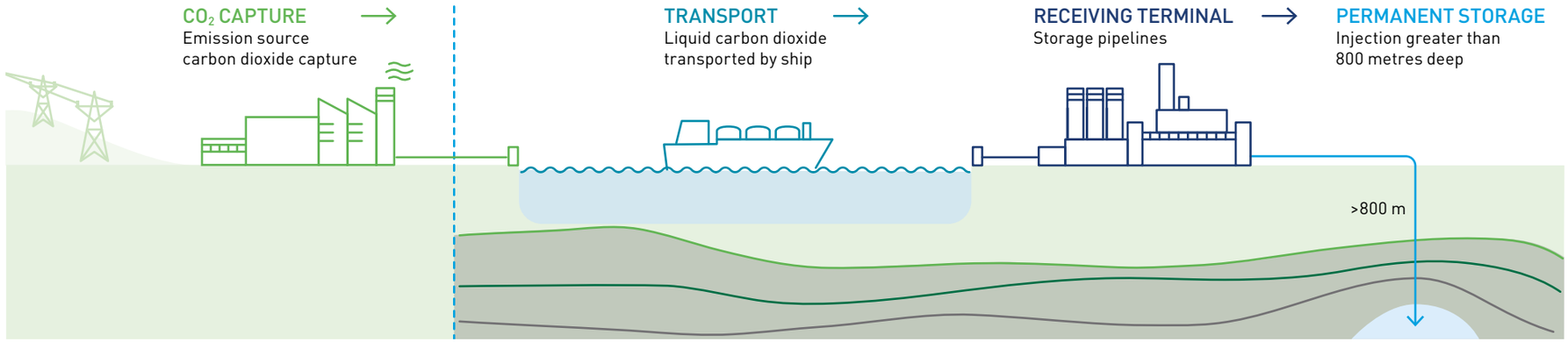


Figure 14:
Possible carbon dioxide transport supply chain for South Australia[250]

1.4.4 Pathway to building a CCUS industry

The key to building a CCUS industry is the relative cost of greenhouse gas emissions as compared to the cost to capture and store the carbon. Table 7 shows the current average cost of carbon capture by industry, based on benchmarking. This analysis suggests that the average cost of carbon capture is likely to vary significantly across industries.[252]

Table 7:
Average cost of carbon capture across industries[253]

Industry	Average cost of carbon capture (2023 real $AUD/tonne carbon dioxide)
Natural gas processing	26.1
Coal fired power generation	98.1
Gas fired power generation	134.1
Hydrogen	116.6
Ammonia	36.4
Chemical production	44.6
Iron and steel production	113.9
Cement production	145.9
Fertiliser production	114.9
Direct Air Capture (NET)	1,029.1 (initial – drops over time)

In the absence of a carbon tax in Australia, there is no definitive price for greenhouse gas emissions. However, the Safeguard Mechanism and ACCUs create an indirect price for carbon by signalling the market cost of emissions reduction for a number of key sectors, in order to incentivise abatement.[254] Effective prices are expected to increase over time and are also sensitive to policy changes at a federal level. Infrastructure Australia has also published guidance on the value of carbon to be used in business cases seeking Commonwealth Government funding.[255]

While this is not a market price, the increasing value over time is indicative of a possible increase in pricing and could be informative in how government's view greenhouse gas emissions. Another consideration in determining whether CCUS is economic is the international markets for any products where carbon pricing or cross-border adjustment mechanisms may set a default price for particular products.

Significant carbon dioxide point sources within Australia, where possible abatement via CCS has been identified are shown in Figure 15. The Cooper Basin has significant storage capacity and leveraging the existing national pipeline network that connects in proximity to major point sources of carbon dioxide, such as the decommissioned Moomba to Sydney Ethane Pipeline illustrated in Figure 15, provides an opportunity to support decarbonisation efforts nationally.

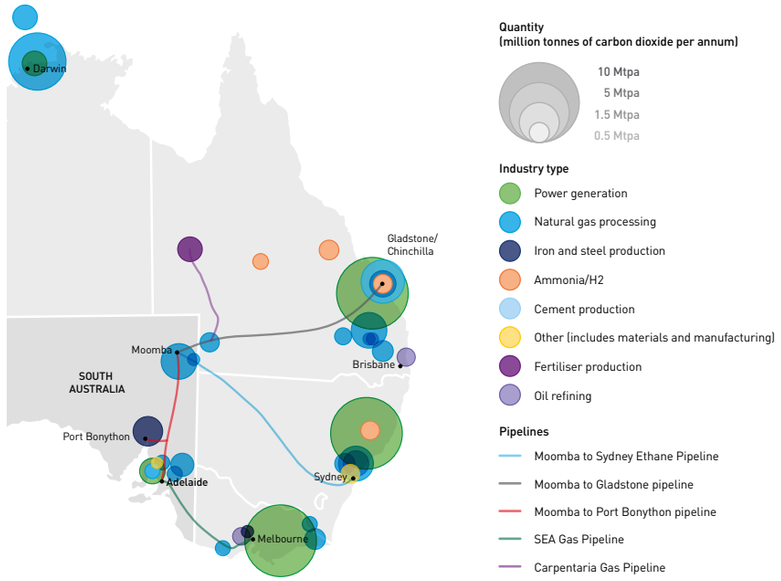


Figure 15:
Potential future domestic carbon capture point-source by selected locations[256]

Further understanding of the infrastructure requirements, potential demand (feasible sources of carbon dioxide) and staging options is required to inform the next steps required to pursue this potential new industrial opportunity for South Australia.

The case for change – In brief

Carbon capture and storage is an emerging opportunity for South Australia, which will support meeting net zero goals for hard to abate industries and complement the State Prosperity Project. We are well positioned due to our depleted oil and gas basins and a progressive regulatory framework.

South Australia has an opportunity to establish an industry that uses carbon dioxide for industrial processes including sustainable fuels, and storage in depleted oil and gas basins.

A carbon capture aggregation hub around Whyalla with a pipeline to the Cooper Basin near Moomba is a viable option.

There is a growing international market for sustainable fuel products, with Japan setting targets for e-methane to decarbonise their gas networks.

The Upper Spencer Gulf is ideally placed as the basis for an initial industry. The existence of the Port Bonython Jetty and liquid fuels export facility, connected to the Cooper Basin, with the pipeline easements means many elements of the requisite infrastructure and corridors already exist.

12. Recommendation:

Identify key carbon capture and storage infrastructure opportunities and sequencing to aggregate demand and support net zero and commercial opportunities at scale.

Lead agency: Department for Energy and Mining

Timeframe: Planning 5 to 10 years

13. Recommendation:

Identify the key opportunities for value-add use of carbon dioxide and enabling infrastructure.

Lead agency: Department of State Development

Timeframe: Planning 0 to 5 years

Moomba Carbon Capture and Storage facility, South Australia
Image courtesy of Santos

2

Outcome 2

Liveable today, flourishing tomorrow: Well-planned infrastructure creates resilient, inclusive and vibrant communities

Mixed use development in Bowden, Adelaide, South Australia
Image – James Knowler, JKTP

South Australia aspires for an economy that is smart, sustainable, and inclusive. Our people and communities drive our success now and into the future, with the health and wellbeing of the population fundamental to achieving our goals.

Our population is projected to grow to almost 2.3 million by 2051.[257] Greater Adelaide's population is expected to grow to between 490,000 (medium) and 670,000 (high), and the population in non-metropolitan regions in South Australia is expected to grow between 42,000 (medium) and 59,000 (high).[258,2] Accommodating this growing population in a sustainable manner, whilst enhancing our communities, creating employment opportunities and maintaining a positive lifestyle will require significant infrastructure planning and delivery, aligned to accepted standards.

Growing South Australia's population is an effective pathway for addressing the persistent strategic skills shortages the state is facing across a range of critical sectors including construction, healthcare, freight and logistics and early childhood education. Skills shortages are forecast in over 350 occupations and over the next five years will require close to 90,500 qualified people with vocational education and training to meet our skills needs.[259] Engineering skills also continue to be in demand.

Detailed research into the basis of what defines liveable communities and the supporting infrastructure needs has been undertaken by the National Health and Medical Research Council. Their definition states these communities are 'safe, attractive, socially cohesive and inclusive, and environmentally sustainable; with affordable diverse housing linked via convenient public transport, walking, and cycling infrastructure to employment, education, public open space, local shops, health and community services, and leisure and cultural opportunities'.[260]

Improving liveability factors, such as access to healthcare, schools, and transport will be key to growing our state and retaining people. Communities must also have access to affordable housing which is aligned with the needs of the growing workforce. This creates a virtuous cycle where a thriving, liveable community serves as a competitive advantage to attract and retain the skilled labour necessary for ongoing development and economic prosperity.

South Australia's housing market is facing considerable challenges. The resulting increased demand is not matched by the level of supply, as shown in Chart 21. Increasing the supply of homes is necessary to cater for demand and address rising housing costs. This growth inevitably places increased pressure on existing infrastructure in established areas and requires new investment in greenfield areas.

Chart 21:
Dwelling and population growth, 2013–23[261]

2 For a more detailed explanation of population projections please refer to I-5.2 Our population

Meeting the needs of a growing population requires a strategic and coordinated approach to rezoning and land release, to help balance the supply of infill development in existing suburbs and expansion into greenfield areas. It will also help ensure there is land for future industrial and commercial developments and encourage diversity of supply. To unlock new housing construction, we need to take a coordinated approach to infrastructure planning, create serviced land with allotments that are connected to core utilities and ensure there is sufficient capacity in asset networks to enable strategic infill and increase density.

The Regional Planning Program for Greater Adelaide and non-metropolitan regions will outline the government's long-term planning vision across the state.[262] The program provides details to inform and guide future development and growth within the state that is transparent, accessible and can manage the constant evolution of our built environment. The digital platform for each plan will ensure that the plans remain current, with the necessary data and information required to strategically plan and integrate our land use and infrastructure planning into the future.

Leveraging this nation-leading digital planning portal provides a unique opportunity for South Australia to better plan and integrate our strategic infrastructure requirements and deliver positive outcomes for the state. The development of the Greater Adelaide Regional Plan (GARP) has been invaluable in informing this Strategy and identifying the actions required to achieve resilient, inclusive and vibrant communities.

Tonsley mixed residential development, Adelaide, South Australia
Image – James Knowler, JKTP

2.1 Coordinating infrastructure and land development through integrated planning

The 2020 Strategy highlighted the need to break down silos through integrated planning. It recognised that infrastructure is a part of the broader social, environmental and economic systems in our state that connect us locally, nationally and internationally. It enables our communities to prosper and receive the levels of services we expect in a modern society.

As discussed earlier in Section I-3.1.4, the alignment of the state's core strategies related to the provision of infrastructure, including the GARP[263], the Transport Strategy and this Strategy, present an opportunity to deliver a truly integrated plan across the state.

Integrated planning principles lie at the heart of all infrastructure strategies, to maximise benefits when investing in physical infrastructure and to optimise those investments across their entire life cycle. Failure to align land use planning with development and the associated infrastructure can lead to delays in the construction of new housing. It can also potentially create isolated communities that have limited access to core services and are disadvantaged in comparison to other better served communities.

The importance of integrated planning is further highlighted in the State Planning Policy 1: Integrated Planning made under the *Planning, Development and Infrastructure Act 2016* (SA). This policy states 'integrated planning coordinates the strategic use of land with the necessary services and infrastructure'.[264] However, the existence of state planning policies and processes does not guarantee success. Across South Australia, there are a myriad of stakeholders involved in strategic planning who all need to work together to ensure the optimal delivery of outcomes within existing constraints.

Recent population growth has exposed poor implementation of integrated planning to deliver the infrastructure required to meet demand for new housing and employment areas. This is being experienced acutely in the Northern metropolitan Adelaide region and many regional centres such as Whyalla and Port Pirie.[265] The projected population spread geographically out to 2051 for the Greater Adelaide sub-regions, and out to 2041 for regional and remote areas, are presented in Figure 16.

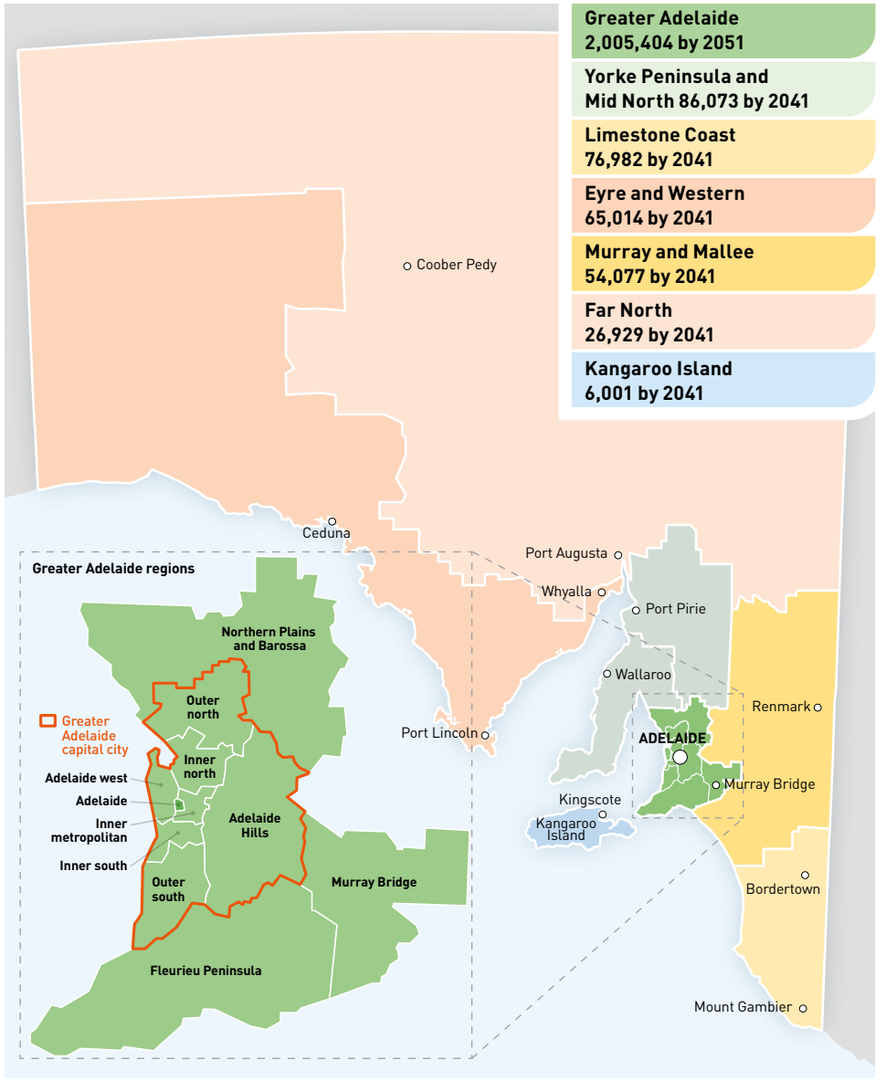


Figure 16:
Population projections by region, as at June 2023[266]

Greater Adelaide, as home to most of our population, is a prime focus area to achieve better planning and delivery outcomes for infrastructure. The Housing Roadmap is an immediate response to the current challenges and provides the foundation for longer-term optimisation of our delivery of infrastructure to meet our future housing, employment, and associated service needs. Figure 17 shows the housing growth target by Greater Adelaide sub-region. The infrastructure required to support multiple, geographically dispersed growth areas, whilst maintaining and growing the existing infrastructure networks, is a complex and challenging task.

The record amount of land identified and being rezoned to realise the Housing Roadmap ambition is highlighted in Chart 22. Consistent with the GARP, the projected housing targets are allocated across Greater Adelaide's sub-regions. To realise this vision, the pressing issue for greenfield and infill rezoning is creating serviced land, requiring allotments that are connected to core utilities with access to employment, services, and efficient transport networks.

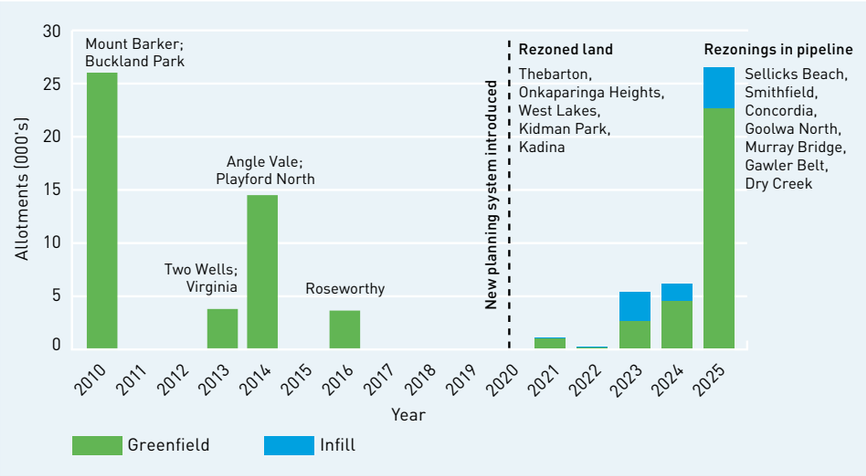


Chart 22:
Major land rezonings, 2010–25[267]

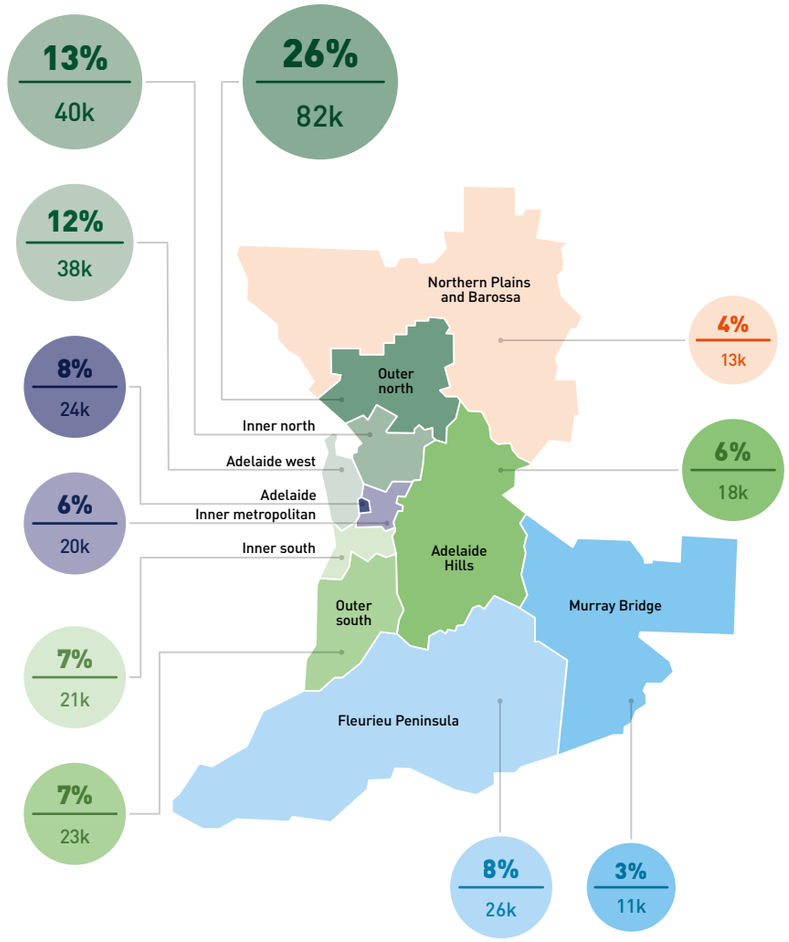


Figure 17:
Greater Adelaide land supply regions – Housing growth targets, 2021–51[268]

New greenfield areas in the outer suburbs typically lie beyond the current boundaries of established infrastructure networks. Consequently, the development and expansion of infrastructure, including transport networks, utilities, and digital infrastructure (mobile and fixed), schools, healthcare facilities and emergency services, cultural and recreation facilities, will be necessary to adequately support growing populations.

This infrastructure needs to be planned and delivered in sequence with housing. The current wastewater, water and social infrastructure coverage is sparse for outer northern Adelaide as shown in Figure 18, Figure 19 and Figure 20. This area is identified as one of the most significant population growth areas of South Australia. For example, Two Wells, Riverlea, and Roseworthy are currently outside of existing networks. Similarly, the current transport corridors in northern Adelaide do not align with future growth areas, to support transport to and within new suburbs.

Providing this enabling infrastructure across large geographically dispersed areas is capital intensive and time consuming. This translates to high up-front costs that must be funded and ultimately paid for by the beneficiaries of the infrastructure, recovered over time through the available mechanisms within our planning and development system.

Regional cities and townships experience different challenges to meet their infrastructure needs. They are typically less spatially constrained but restricted nonetheless, particularly in funding new land developments with constrained budgets and limited connections to core services such as water, communications, and electrical infrastructure. Access to social infrastructure continues to be a significant challenge in most communities as the demand increases over time, consistent with our growing and ageing population.

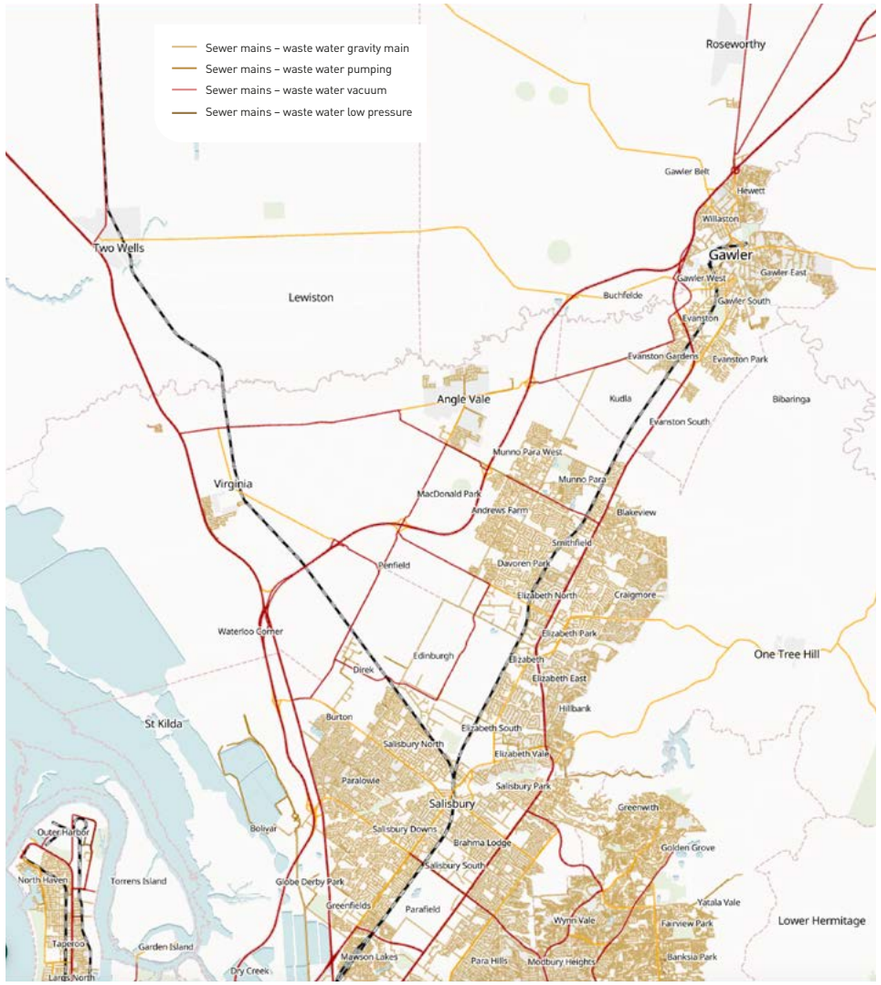


Figure 18:
Wastewater infrastructure networks, 2024
For detailed map see Greater Adelaide Regional Plan website[269] refer to Transport and Infrastructure in the top menu, with 'Integrated Wastewater Management Security and Quality' detail shown on an integrative map.

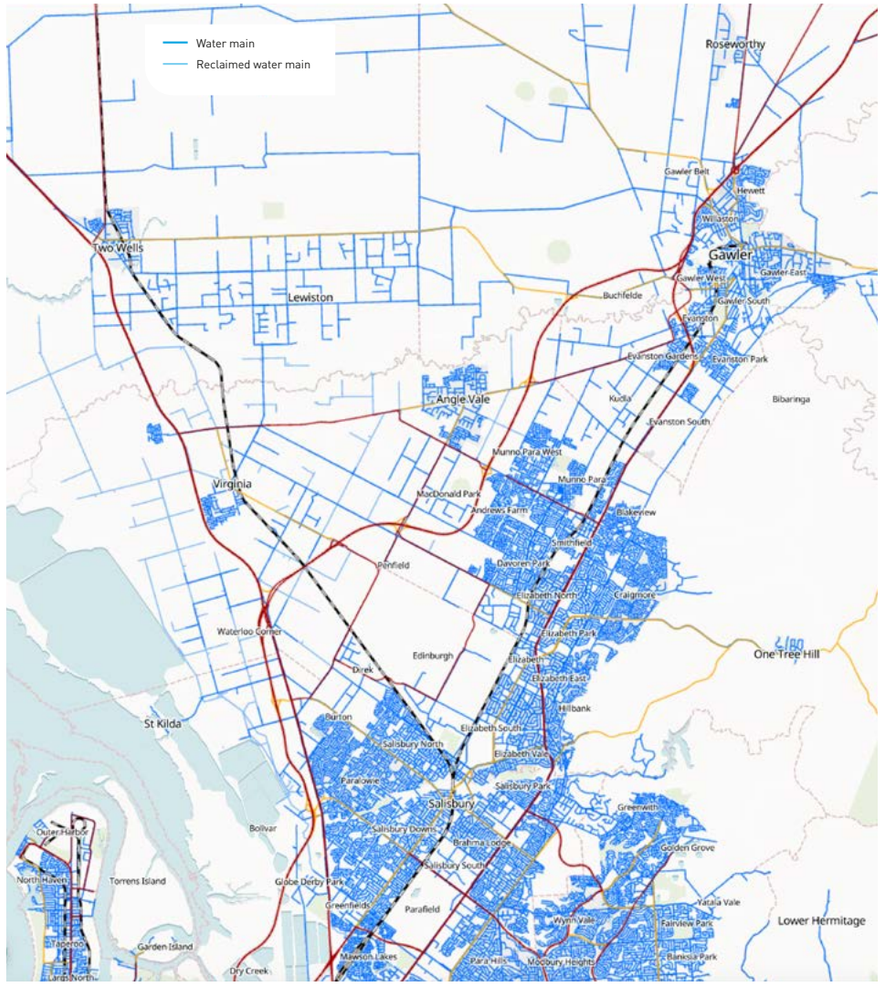


Figure 19:
Water infrastructure networks, 2024
For detailed map see Greater Adelaide Regional Plan website[270] refer to Transport and Infrastructure in the top menu, with 'Integrated Water Management Security and Quality' detail shown on an integrative map.

Figure 20:
Social infrastructure, 2024
For detailed map see Greater Adelaide Regional Plan website[271] refer to Transport and Infrastructure in the top menu, with 'Social Infrastructure' detail shown on an integrative map.

2.1.1 Coordinating integrated planning

The Housing Roadmap, in conjunction with the GARP, highlight the need to sequence land development with infrastructure provision. This is the most efficient and effective approach to achieve the best outcomes and maximise existing infrastructure. This requires strong governance and clear strategic direction from government on the locations within our infrastructure networks that are appropriate for development.

The formation of the Department for Housing and Urban Development (DHUD) in 2024, with a single Minister, creates a focussed department to drive a fully integrated approach to successfully manage growth. It puts in place the necessary accountability and governance to deliver across the lifecycle of project development and critically, to ensure that all agencies, levels of government and private sector parties are coordinated in their planning approaches.

This central role should lead to a coordinated approach to long-term planning, based upon agreed planning assumptions and timeframes. The opportunity to align capital planning processes across regulated entities with broader government agencies will support timely delivery of infrastructure.

In addition, the Infrastructure Coordination Group (ICG) has been established as part of an overall integrated planning process. The ICG is a governance mechanism chaired by DHUD that has representation from all key infrastructure providers. It has accountability for the planning, integration, and delivery of core infrastructure for housing and will help meet the objectives of the Housing Roadmap. DHUD will be able to consider consolidated data, develop integrated Structure Plans, and identify omissions or conflicts across all elements and is best placed to advise government and key stakeholders on appropriate responses. In implementing this remit, the ICG will have regard for the principles adopted in the development of the Regional Plans, which establish the foundation for the future approach to delivering infrastructure in the state, as shown in Table 8.

Table 8:
Principles established by the SA Planning Commission to guide cross-sector infrastructure coordination and delivery[272]

1. Support sustainable development of South Australian communities.
2. Deliver integrated land use and infrastructure solutions.
3. Infrastructure networks that deliver agreed levels of service. Where development delivers higher levels of service, the additional costs will be borne by the communities who receive the higher level of service.
4. Incentivise a logical sequence for integrated development and infrastructure delivery. Out of sequence development incurring additional costs should be borne by the developer/community benefiting from the development.
5. Infrastructure networks and services are flexible and responsive to changes in intensity of development and innovative infrastructure solutions.
6. Provide an equitable and transparent distribution of costs between government, private sector, and landowners reflective of financial and community benefit.
7. Deliver logical, effective, and transparent infrastructure funding arrangements for government and the private sector.
8. Administer efficient and effective planning processes and charging mechanisms whether fixed (flat rate) or variable.
9. Provide a transparent program for infrastructure planning and delivery that is aligned with growth.

Aligning this complex stakeholder environment, including key regulated utilities, to strategically plan in a fully integrated manner requires clear direction and adoption of common planning assumptions, as defined in Box 2. It also requires an understanding of the trade-offs and consequences for discrete investment decisions. To support forward planning, the GARP specifies that State infrastructure agencies, utility providers and local governments will be expected to adopt common planning assumptions and evaluate current and future infrastructure capacity.

Individual entities will still be able to apply their own assumptions and methods specific to their functions. However, through adopting unified data and assumptions related to infrastructure, the ability to sequence and prioritise investments will be significantly improved.

Box 2. Common planning assumptions

Common planning assumptions are foundational estimates or projections used to guide decision-making, particularly in infrastructure development. These assumptions provide a framework for understanding future demand, resource needs, and community development, helping to ensure that infrastructure planning is efficient, sustainable, and meets the needs of the population.

Common planning assumptions include projections for population size, distribution, demographics, economic indicators, social and environmental data, and transport and utilities use.

New mixed use development in Tonsley, Adelaide, South Australia
Image – James Knowler, JKTP

2.1.2 Planning and sequencing land use and infrastructure

The GARP and non-metropolitan regional plans establish a clear vision and strategic direction for where growth is to occur for greenfield, infill and associated land uses. Initial investigations across a range of infrastructure classes have been undertaken to support the anticipated residential growth. These plans will continue to be developed and updated to reflect the best available data, as discussed previously.

Strategic trigger measures apply population thresholds and other, evidence-based measures to provide an early indication of the infrastructure requirements for new urban infill and growth area developments. Trigger measures can facilitate early identification of the type of infrastructure needed, timeframe, and indicative costs. A summary of the anticipated trigger measures across key infrastructure classes is shown in Table 9. These will be further refined and developed by DHUD and Infrastructure SA to inform strategic planning. These trigger measures will need to be regularly updated over time to reflect, for example, population growth, demands on utilities and land use changes.

The application of trigger measures does not negate the need for all levels of government and the private sector to undertake specific, detailed investigations to determine the optimal infrastructure solutions. The trigger measures outlined in Table 9 demonstrate the need for network capacity data (availability, constraints, and key nodes) to be maintained and shared transparently, to inform strategic planning.

The digitalisation of the GARP will enable progressive updates and geospatial presentation of the data to provide transparent, unified assumptions and planning data. This will enable an adaptive planning approach across all infrastructure providers, to respond to changing long-term planning forecasts.

Table 9:
Outline of infrastructure classes and trigger measures

Infrastructure class	Trigger measure
Education	Population and network capacity
Health	Population and network capacity
Emergency services (Metropolitan Fire Service, SA Police, SA Ambulance Service)	Population and response times
Water and wastewater	Population, connections and network capacity
Stormwater	Population and network capacity
Electricity	Network capacity
Communications (NBN and network coverage)	Telecommunications in new developments (TIND) policy[273]
Gas	Network capacity
Community facilities	Population and capacity
Transport (roads, public and active transport)	Network capacity

At a macro planning level, Infrastructure SA has applied benchmarks and identified trigger measures to inform potential future infrastructure requirements to accommodate a growing population. This approach is not intended to define actual infrastructure projects, but rather contextualises the forecast population growth of over 600,000 people over the next 30 years (high growth scenario). This will require structured, considered strategic planning across all infrastructure providers to ensure shorter-term planning activities retain a longer-term view of the trends and forecasts, and the need to remain adaptive and responsive over time.

Infrastructure agencies will perform more detailed planning activities in line with their strategic planning and service provision requirements as the planning horizons shorten, assumptions are clarified, and the evidence is collated to inform future investment decisions. This includes adopting system-wide approaches that aim to utilise existing networks and infrastructure better and adopt non-infrastructure approaches that avoid or defer the need for new infrastructure as appropriate.

An example of this approach has been shown in Figure 21. Health and education are used as examples of large-scale infrastructure with long-term planning horizons. The type of infrastructure and demand will be impacted by demographics and population growth across large geographic areas, requiring significant investment decisions in a timely manner.

If Greater Adelaide achieves the forecast high population growth over the next 30 years, we will need to plan and deliver additional capacity for around 1,500 new hospital beds (equivalent to almost two new Royal Adelaide Hospitals) and sufficient school capacity for up to 35,000 to 40,000 students (or 21 new R-12 schools, almost one new school per year).

It is important to note that a growing population will also support a growing economy and hence provide enhanced capacity to invest and deliver the necessary infrastructure over time. The capital-intensive nature of these investments and other assets required to support growth, still require discipline to better integrate and sequence our infrastructure planning and provision, to ensure optimal efficiency is achieved in a financially sustainable manner.

Darlington Upgrade and Flinders Link, Adelaide, South Australia
Image – James Knowler, JKTP

Indicative only

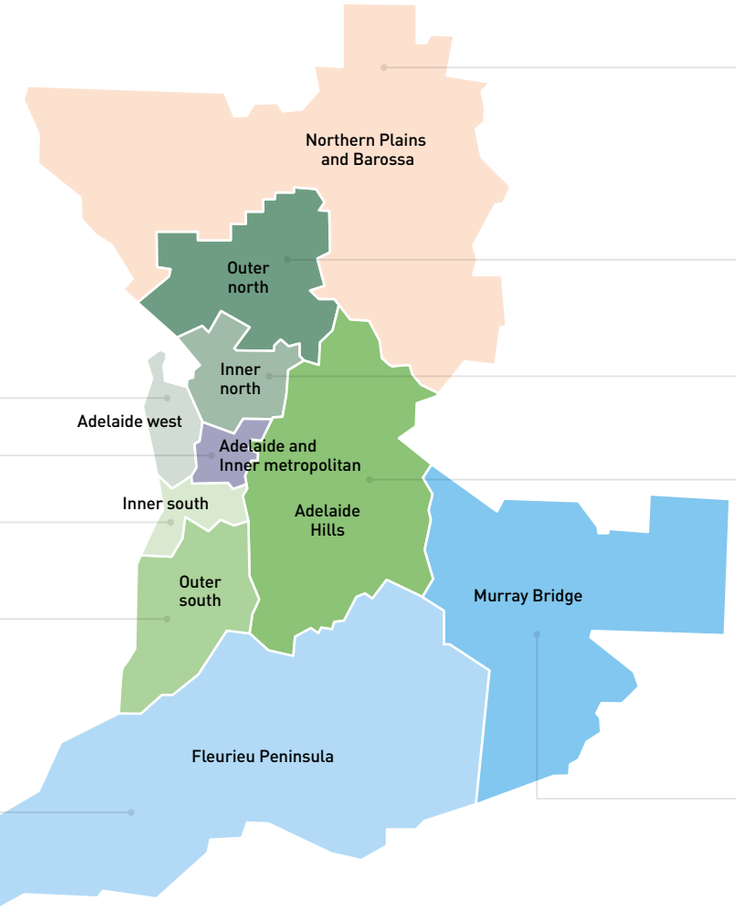
Adelaide west: + 58,000 people by 2041
Health: Around 130 hospital beds at approximately $600M
Education: Around 2 schools at approximately $420M

Adelaide and Inner metropolitan: + 57,000 people by 2041
Health: Around 130 hospital beds at approximately $600M
Education: Around 1.5 schools at approximately $410M

Inner south: + 28,000 people by 2041
Health: Around 65 hospital beds at approximately $300M
Education: Around 1 school at approximately $200M

Outer south: + 38,000 people by 2041
Health: Around 85 hospital beds at approximately $400M
Education: Around 1 school at approximately $275M

Fleurieu Peninsula: + 25,000 people by 2041
Health: Around 55 hospital beds at approximately $250M
Education: Around 1 school at approximately $180M



Northern Plains and Barossa: + 16,500 people by 2041
Health: Around 35 hospital beds at approximately $170M
Education: Around 1 school at approximately $120M

Outer north: + 120,000 people by 2041
Health: Around 275 hospital beds at approximately $1.2B
Education: Around 4 schools at approximately $865M

Inner north: + 65,000 people by 2041
Health: Around 150 hospital beds at approximately $675M
Education: Around 2 schools at approximately $475M

Adelaide Hills: + 35,000 people by 2041
Health: Around 80 hospital beds at approximately $370M
Education: Around 1 school at approximately $260M

Murray Bridge: + 12,000 people by 2041
Health: Around 25 hospital beds at approximately $130M
Education: Around 1 school at approximately $90M

Figure 21:
Analysis of trigger measures for Greater Adelaide land supply regions to 2041 – Indicative only (refer Trigger measures: Methodology and assumptions)

Note this analysis does not represent a State Government commitment to build this infrastructure.
A 'school' is a benchmarked greenfield facility for approximately 1,800 students.
A 'hospital' is a benchmarked greenfield facility, includes ancillary service allowances, excludes functional area mix.

Trigger measures: Methodology and assumptions

Trigger measures and estimated infrastructure requirements are based on the following assumptions:

- High population growth scenario.[274]
- 2.3 hospital beds per 1,000 population in the Adelaide metropolitan area (consistent with Australian Institute of Health and Welfare assumptions[275]).
- Education: 1 large Reception to Year 12 required per 30,000 people [276] (1,800 places).

Note, estimates are based on ranges established from recent project benchmarks, are indicative only and expressed in 2024 dollars.

The trigger measures, assumptions and infrastructure requirements will continue to be refined by DHUD and published in the GARP.

Evidence suggests that urban infrastructure can be provided at a comparatively lower cost for infill and redevelopment locations, because it is more cost-effective to utilise existing capacity or augment existing systems, than construct new infrastructure for greenfield sites, as shown in Chart 23.

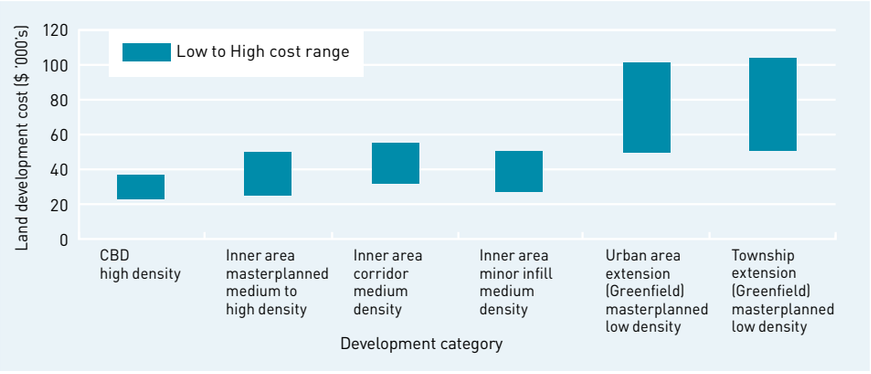


Chart 23:
Land development cost estimates by development category[277]

By releasing land in a sequenced manner that aligns with the capacity of existing infrastructure (such as roads, water, sewerage, digital and public transport), the need for costly new infrastructure investments is minimised.

The case for change – In brief

Applying trigger measures for future infrastructure requirements is the first step in strategic planning at a network level, in support of our future growth.

Trigger measures can help identify the type of infrastructure required, when it is required and indicative costs. Trigger measures should be used to inform more detailed investigations to determine optimal network system solutions, prior to decisions on infrastructure investment.

Understanding the trigger measures for additional infrastructure capacity can inform the sequencing of future land releases.

Sequencing land releases in urban development helps to ensure that growth occurs in a managed, efficient, and sustainable manner, leveraging existing infrastructure to its full potential while minimising costs and environmental impact.

14. Recommendation:

Sequence land releases to ensure that growth occurs in a managed, efficient, and sustainable manner, leveraging existing infrastructure to its full potential.

Lead agency: Department for Housing and Urban Development

Timeframe: Planning 0 to 5 years (ongoing)

2.1.3 Reservation of land for corridors and infrastructure

The land planning hierarchy in South Australia is structured across multiple levels, from broad, state-level strategies to more specific, local planning controls. This hierarchical system ensures that land use, infrastructure, and development align with the state's broader economic, environmental, and social objectives. Table 10 shows the Department for Housing and Urban Development's planning hierarchy where the level of detail is incrementally refined from the early stages of strategic planning.

Table 10:
Planning hierarchy (Department for Housing and Urban Development)[278]

Greater Adelaide Regional Plan
• Identify and prioritise land suitable for urban development (e.g. residential, employment and open space). • Establish a common planning baseline including current infrastructure and growth projections.
Integrated Structure Plan
• Implementation tool for growth areas. • Identify strategic transport and other significant trunk infrastructure requirements. • Identify opportunities for coordinated infrastructure provision including social infrastructure. • Investigate and identify features to be preserved including natural systems and cultural heritage. • Inform code amendments (specific land uses and zoning). • Provide clarity regarding the application of infrastructure delivery tools such as where a deed or an infrastructure scheme is appropriate.
Planning and Design Code Amendment and Infrastructure Agreements
• Establish infrastructure funding mechanisms. • Amend the planning rules to change the policies, rules, or mapping within the Code to implement the structure plan. • Incorporate any relevant concept plans to guide location of land uses and infrastructure at land division approval stage.

Adelaide Metro Train, South Australia
Image – iStock/BeyondImages

Implementing an integrated approach across all government agencies and infrastructure providers needs to occur at the early stages of land use planning to ensure appropriate spatial allocations are preserved for future infrastructure provision. For example, easements, corridors, land for schools, hospitals, social services, and open or green space. In the past, failure to reserve land early enough has resulted in the purchase of land at either significantly higher cost or in sub-optimal locations.

Reserving strategic infrastructure growth corridors and land at an early stage in the planning process ensures both value for money for government and supports an integrated, transparent approach to providing core infrastructure, aligned to new developments and community needs. It ensures that essential services can be provided when needed, without the complications and high costs of retrofitting existing urban areas.

The implementation of a digital regional planning system and formation of Department for Housing and Urban Development provides an opportunity to drive all infrastructure providers to undertake early identification of strategic land needs for inclusion in amendments to the Planning and Design Code, reflected in structure planning and in the digital planning portal.

The case for change – In brief

Historically, the reservation of land and corridors for future infrastructure provision has been ad-hoc, leading to a lack of value for money for government and sub-optimal outcomes.

Reserving strategic infrastructure growth corridors and land at an early stage in the planning process supports an integrated, transparent approach to providing core infrastructure aligned to new developments and community needs.

The implementation of a digital planning system, and the formation of the Department for Housing and Urban Development, provides an opportunity to drive all infrastructure providers to identify strategic land needs early.

15. Recommendation:

Reserve strategic infrastructure corridors and lands for future infrastructure needs.

Lead agency: Department for Housing and Urban Development

Timeframe: Planning 0 to 5 years (ongoing)

2.2 Planning for growth in key services

Long-term planning focuses on strategic growth and future-proofing infrastructure, whereas planning for more immediate infrastructure growth requires a clear understanding on the timing, scale and type of development planned and location. More detailed planning that avoids ad-hoc, disparate development at sub-optimal locations within our networks is a core principle within the GARP and for this Strategy.

2.2.1 Water for communities and liveability

Water is central to liveability and our economy. Access to a secure and reliable water supply supports the health and resilience of our communities and our ecosystems. Water security means having an acceptable quantity and quality of water for the environment, people, industry, and agriculture, now and into the future.[279] Access to water and wastewater services and infrastructure are also critical to support expanding and growing communities.

Water forms a core part of many aspects of our urban landscapes. The urban water system includes drinking and recycled water, wastewater services, stormwater drainage and our natural water systems.[280] It supports a secure and safe water supply, enhances urban amenity, and manages stormwater and wastewater to protect our health, safety, the environment, and it underpins economic outcomes.

Our urban water systems face a range of challenges. Climate change, population growth, an ageing infrastructure base and increasing community expectations for greener and cooler places, all increase demand and place pressure on our water security. Across South Australia, much of our water is sourced from climate-dependent resources, such as the River Murray, surface water catchments and reservoirs or groundwater.

We also face challenges with managing stormwater and wastewater. Greater urbanisation means increased hard surfaces and more stormwater runoff to manage, with climate change resulting in more frequent extreme weather events putting further pressure on stormwater infrastructure.

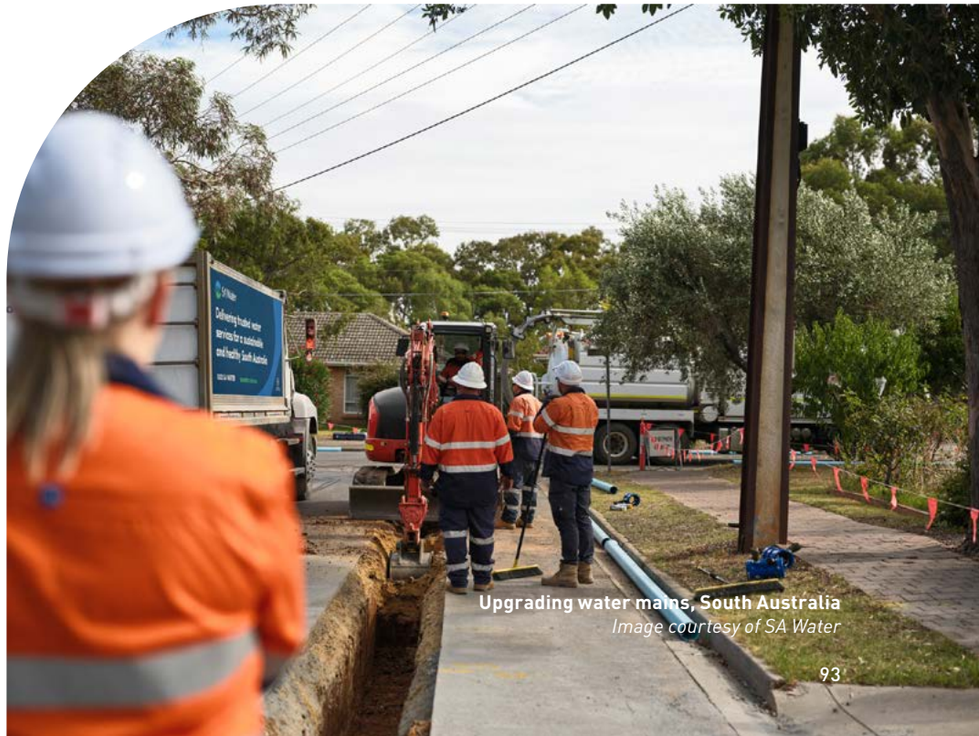
A growing population also means increased wastewater to be managed. Poor stormwater quality and incidents of uncontrolled wastewater discharges impact the health of our waterways and coasts and their dependent ecology.[281]

2.2.1.1 Integrated water management

To address these challenges and adopt a more circular approach to our water management, whilst balancing the need for future investments and affordability, a more integrated water management (IWM) approach is needed, as summarised in Box 3. This need has been recognised globally and across Australia, with Victoria, New South Wales and Western Australia all identifying integrated water management approaches in their respective state infrastructure strategies.

Box 3. Integrated water management[282]

Integrated water management (IWM) is a holistic and collaborative approach to the planning and management of all elements of the water cycle. IWM considers how the delivery of water, wastewater and stormwater services contribute to water security, public and environmental health, and urban amenity.



Upgrading water mains, South Australia
Image courtesy of SA Water

This is not without challenges. As the Water Services Association of Australia notes, whilst the concept of IWM is supported at a broad policy level, current governance arrangements in the water sector present barriers to adoption.[283] The Productivity Commission has also reviewed key impediments across policy, service delivery and regulation that affect IWM adoption and identified the need for clear and cohesive policy and clear arrangements for implementation.[284]

The 2020 Strategy included a priority for the development of a sustainable water resource framework which would include:

- An urban water directions statement for Adelaide and South Australian towns that optimises the use of all water sources to support growth and greening in a changing climate.
- Water security strategies for priority regional areas to optimise the use of all water sources to support economic growth.

An Urban Water Directions Statement was released by the South Australian Government in 2022. The Urban Water Directions Statement includes a range of priority actions, including to support a more integrated approach to managing our water resources.[285] It links to an overarching Water Security Statement and the development of targeted water security strategies for priority areas including the Barossa, Greater Adelaide, and McLaren Vale.[286]

2.2.1.2 Stormwater and flood management

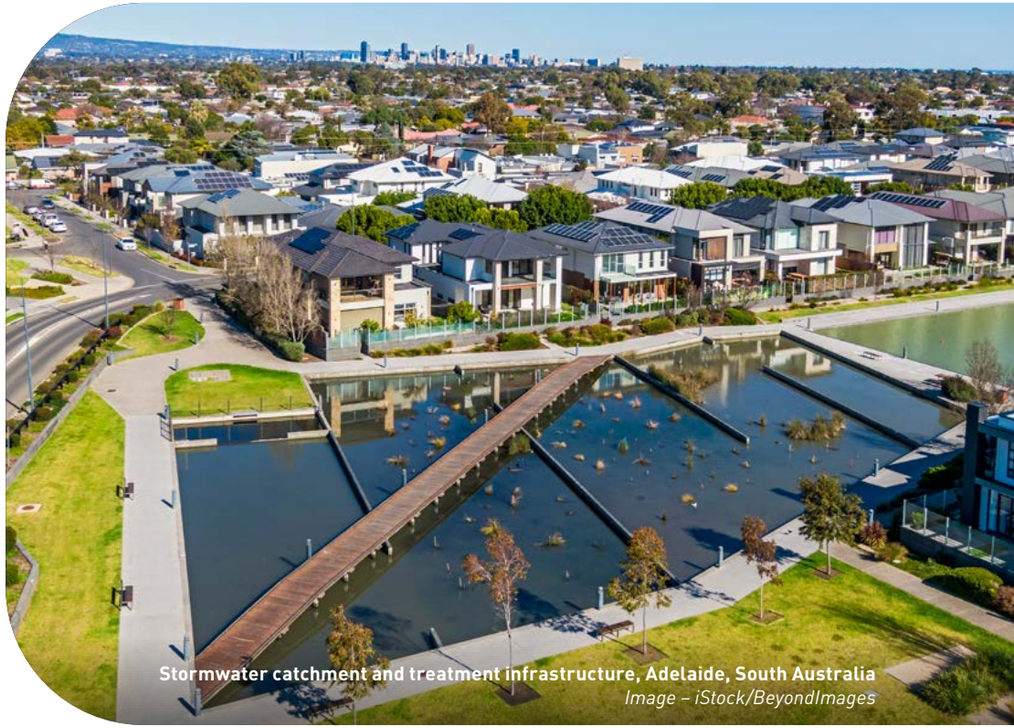
Aligned with a more integrated approach to urban water management, greater focus and emphasis on long-term stormwater and flood management is needed.

The Urban Water Directions Statement includes an action for an expert panel to make recommendations on clear responsibilities for each part of the drainage system and funding options for stormwater.[287] The review identified current levels of investment are not adequate to address stormwater management needs, particularly in the face of a changing climate and increasing urban development.[288] It noted that these challenges are further compounded by ageing infrastructure. The review also noted opportunities to improve governance that would better recognise the benefits and beneficiaries to better manage urban waterways.[289]

The Stormwater Management Authority has identified strategic priorities for stormwater management planning, including identifying priority catchments.

The Stormwater Management Authority supports local governments to develop catchment-based stormwater management plans which identify infrastructure and non-infrastructure actions over at least a 10-year period.

There is not yet full coverage of plans across Greater Adelaide or regional townships. Where they are in place, Stormwater Management Plans seek to consider stormwater and integrated water management holistically, giving consideration costs and benefits where these can be quantified. Challenges can however arise given the cross-boundary nature of catchments and scale of interventions. Construction of infrastructure alone will not achieve integrated urban water management if institutional collaboration and the supporting regulatory and governance requirements are not in place or where public acceptance is lacking.[290]



Stormwater catchment and treatment infrastructure, Adelaide, South Australia
Image – iStock/BeyondImages

2.2.1.3 Governance

To support the adoption of a truly integrated water management approach, there is a need for improved water sector governance arrangements.[291] Water systems involve a wide range of stakeholders and organisations with varying levels of input, decision making and responsibility. The Urban Water Directions Statement identifies the importance of institutional cooperation, clearly defined roles and responsibilities, underpinned by supportive enabling regulation. It also highlighted the importance of an informed and supportive community. Implementation of strategies enhancing water security arrangements require a progressive approach that establishes clear roles and responsibilities. Watertrust Australia has progressed early work to explore options for improving governance arrangements that better support IWM, for further consideration by a range of key stakeholders, including state and local governments.[292]

Good water governance also includes greater integration of First Nations voices in water planning and decision making in a meaningful way. The South Australian Government is working with First Nations and peak bodies on improving water planning processes and outcomes and co-designing a state policy for advancing First Nations' water interests. This will address water-related commitments under the National Agreement on Closing the Gap, as well as the Murray-Darling Basin Royal Commission findings and recommendations.[293]

2.2.1.4 Greater Adelaide

The water mix for Greater Adelaide includes River Murray water, desalinated seawater, reservoir water from the Mount Lofty Ranges, stormwater, and recycled water, as shown in Figure 22. Over the next fifty years, the demand for water will increase, while our drying climate will reduce available sources.[294] Based on a projection of 315,000 new houses required in Greater Adelaide by 2051[295], annual household consumption of water will increase by 61 gigalitres per annum[296].[3]
In the absence of further investment in new water supplies, under a scenario with high population growth, high impact climate change and full use of the Adelaide Desalination Plant, localised water shortfalls could occur by 2032.[297] The extent and nature of growth in the northern parts of Greater Adelaide present a key challenge. There is a need to ensure sufficient water availability and the provision of wastewater services and treatment.

Mount Bold Reservoir, South Australia
Image courtesy of SA Water

Significant investments will be needed to address these challenges. A long-term water security strategy is being developed for the Greater Adelaide region. The strategy sets out an adaptive approach to planning for future actions and investments founded on integrated water management, over a 50-year time horizon.

The strategy identifies a suite of short-listed options to meet Greater Adelaide's future water needs. These include options ranging from demand management, new climate-independent water supplies (such as desalination and purified recycled water for drinking), and increased use of treated stormwater to address identified water shortfalls in the mid and longer term. It proposes an adaptive pathway approach to target investments at the right time.

In recognition that large-scale water supply options can take eight to ten years to plan, develop and deliver, there is a need to proactively plan and invest in readiness for supporting identified future needs. Some supply options represent more barriers to overcome, including gaining widespread community acceptance.

3 Calculation based on an average residential water consumption per household of 195 kilolitres in 2023–24 multiplied by an additional 315,000 houses across the Greater Adelaide region by 2051, i.e. the total increase in household consumption is 61.425 gigalitres per annum by 2051.

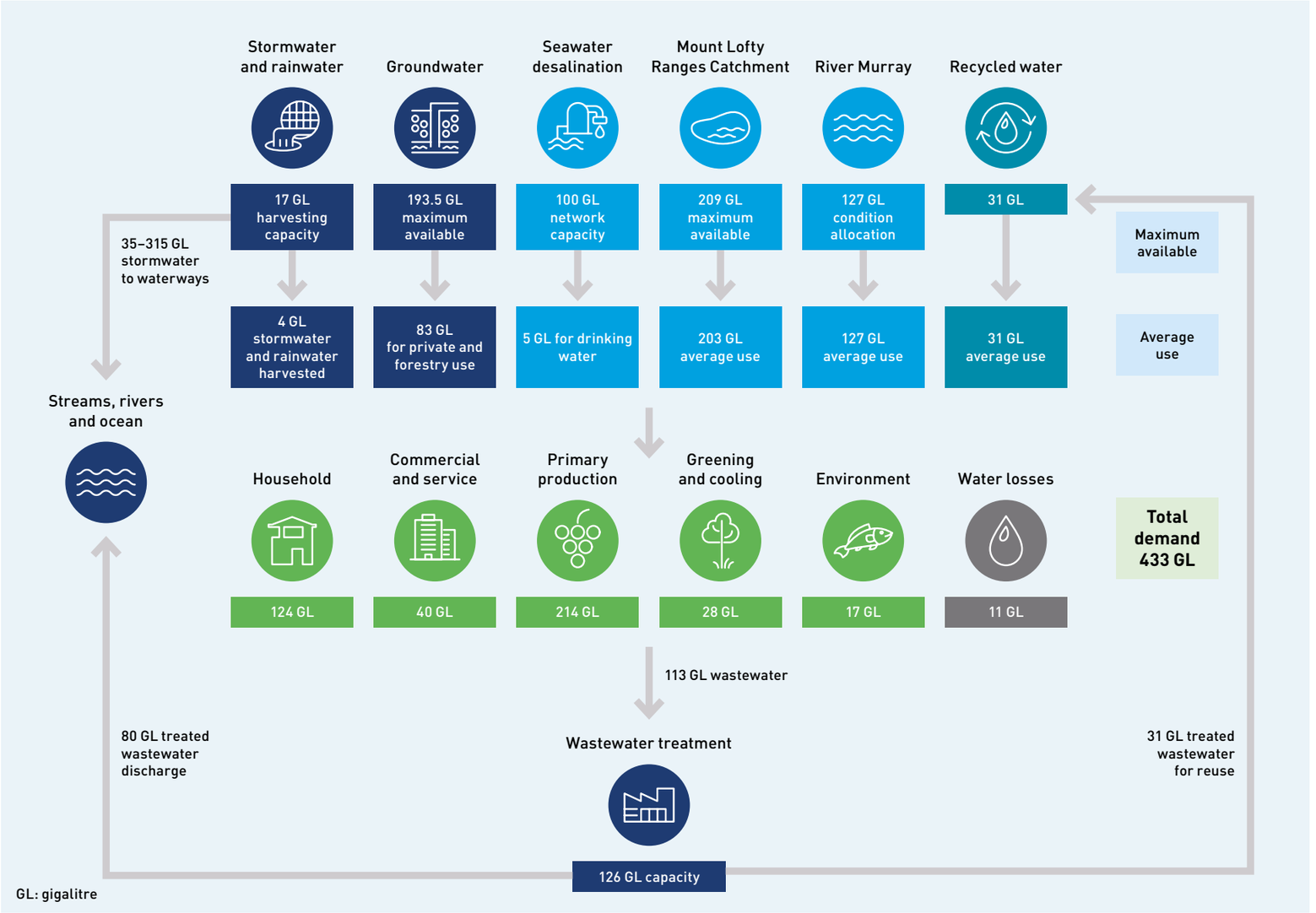


Figure 22:
Greater Adelaide urban water mix[298]

2.2.1.5 Urban centres

Across the state, our urban and regional centres have different water supply mixes, though many still rely on climate-dependent sources, including the River Murray or groundwater. Figure 23 illustrates SA Water's current supply areas. These systems face similar challenges to Greater Adelaide, with increasing demand and/or reducing reliability in the face of climate change. Water security and affordability are cited as inhibitors to growth for a number of regions.[299]

Investments in climate-independent desalination are being progressed or have recently been completed to improve the sustainability and security of water supplies to several key centres, including on Kangaroo Island and Eyre Peninsula. In the face of a drying climate, the need for new climate-independent sources for other regions will grow, with further investments needed to secure supplies expected over the next 20 years and beyond.

Desalination plant, Kangaroo Island, South Australia
Image courtesy of SA Water

Figure 23:
South Australian water supply areas (including major pipelines)[300]

Many larger centres also face challenges with stormwater management and flooding risk, which are being exacerbated by development and climate-driven risks. For these systems, an even greater focus on opportunities associated with water-sensitive urban design and an integrated adaptive approach is warranted.

There is a need to build on the water security work and the adaptive integrated approach that has been undertaken for Greater Adelaide and develop long-term water security plans for key regional areas, with a focus on those that will grow to support our broader economic drivers. Preliminary work to develop regional water security strategies is being progressed by SA Water and the Department for Environment and Water.

2.2.1.6 Remote centres

Remote communities typically face even greater challenges in terms of water supply and security. Poor or variable source water quality and diversity, the high cost of service provision and infrastructure maintenance, and extreme climate conditions can all impact water quantity, quality, reliability and affordability. Remote and regional water challenges are further exacerbated by limited operational scale, geographical span and various mixes of institutional arrangements for supplying and maintaining water systems.

Solar powered desalination plant at Kaltjiti, South Australia
Image courtesy of SA Water

The State Government is progressing work to better understand the status, risks, and opportunities of securing water supplies in remote communities. This included completing a stocktake of 19 self-supplied remote communities to assess their water requirements, available water sources and evaluate their risk of water insecurity over a 10-year period.[301] In response to the findings, measures are in progress, including seeking funding and developing proposals to address the high-risk communities.

The case for change – In brief

Across South Australia, much of our water is sourced from climate-dependent resources, such as the River Murray, surface water catchments, reservoirs, or groundwater.

Climate change, ageing infrastructure and increasing expectations for greening our communities all compound the pressure that population growth places on our infrastructure.

A more integrated, circular approach to water is needed to maximise all sources of water and ensure investment in new infrastructure is efficient.

Governance and responsibilities across the water cycle is disjointed and is a barrier to truly integrated water management.

16. Recommendation:

Establish a governance model that supports water security through adaptive integrated water management.

Lead agency: Department for Environment and Water

Timeframe: Policy 0 to 5 years

The case for change – In brief

Access to a secure and reliable water supply supports the health and resilience of our communities and ecosystems and is central to urban amenity and liveability.

Projections for Greater Adelaide have shown that in the absence of further investment in new water supplies, under a scenario with high population growth, high impact climate change and full use of the Adelaide Desalination plant, localised water shortfalls could occur by 2032.

Population growth in the Northern metropolitan Adelaide region, and its location on the edge of the existing network presents a key challenge, with a need to undertake planning now to ensure sufficient water availability, given new water supplies take many years to plan and deliver.

17. Recommendation:

Undertake investment readiness activities for a new climate-independent water supply solution for the Northern metropolitan Adelaide region.

Lead agency: SA Water

Timeframe: Planning 0 to 5 years

2.2.1.7 Wastewater services

Access to reliable wastewater services and infrastructure is an important contributor to liveability, protecting public health and the environment. It is also key enabling infrastructure to support growing communities.

Our municipal wastewater systems include the network of pipes, pumps, and associated infrastructure used to collect and convey wastewater from its source to a point of treatment at a wastewater treatment plant, for disposal or reuse.

Given increasing demand, combined with the age profile of this infrastructure and regulatory expectations, sound long-term planning is necessary to identify investment needs and requirements. Ensuring integrated planning approaches are supported by common planning assumptions will improve planning and optimisation of investment needs.

Residential and business-related growth places pressure on both the capacity of the wastewater network and ultimately the receiving wastewater treatment plant. SA Water, who provides wastewater services for almost 90% of the State's population across Adelaide and major towns, reports that growth attributed to increases from urban infill and densification has been gradually absorbing wastewater network capacity.[302] Growth in new wastewater connections is projected to continue over coming years, as can be seen in Table 11.

Table 11:
Projected number of wastewater customers forecast, 2024–25 to 2027–28[303]

Wastewater customer accounts	2024–25	2025–26	2026–27	2027–28
Residential	614,770	620,918	627,127	633,399
Non-residential	32,760	32,924	33,089	33,254

The significant growth experienced across Greater Adelaide, particularly the expansion of greenfield developments in the Northern metropolitan Adelaide region, presents a particular challenge. Many of these developments are located on the edge of existing wastewater networks, necessitating large investments in new infrastructure to service these areas. Based on a projection of 315,000 new houses required in Greater Adelaide by 2051[304], annual household collection of wastewater will increase by 65 gigalitres per annum[305,4]. Over the four years 2024–28, SA Water will be investing $1.2 billion in new wastewater and water infrastructure for these areas.[306]

The level of growth projected will also continue to place pressure on the capacity of the Bolivar Wastewater Treatment Plant that services this area. The Bolivar Wastewater Treatment Plant is South Australia's largest wastewater treatment plant. Whilst it has undergone a number of upgrades to increase capacity since originally being commissioned in 1966, SA Water identifies that it is operating close to capacity, with projected growth-driven inflows expected to increase beyond the plant's capacity, as shown in Chart 24.[307]

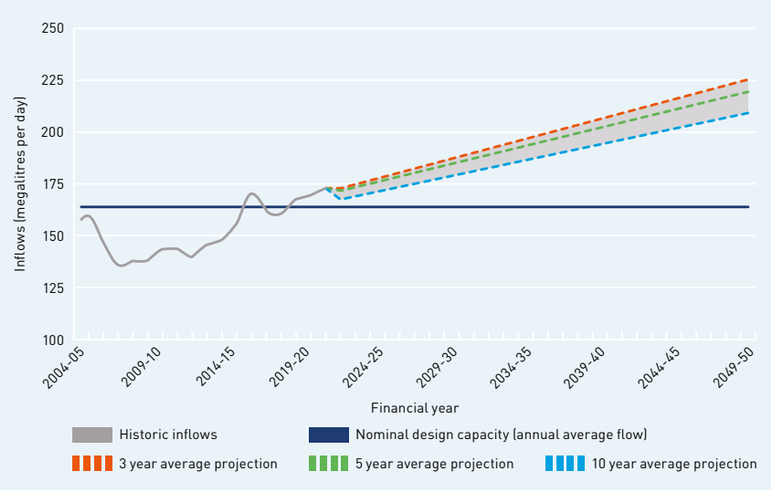


Chart 24:
Historic and projected inflows at Bolivar Waste Water Treatment Plant, 2004–50[308]

4 Calculation based on an average residential collection of wastewater per household of 206 kilolitres in 2023–24 multiplied by an additional 315,000 houses across the Greater Adelaide region by 2051, i.e. the total increase in wastewater collected will be 64.89 gigalitres per annum by 2051.

Given the continued growth across the Northern metropolitan Adelaide region, a system-wide review of both network and wastewater treatment plant capacity is needed, to identify a long-term solution that caters for growth and optimises the infrastructure investments required. This could include further augmentation of capacity at the Bolivar Wastewater Treatment Plant or alternative decentralised wastewater treatment options.[309] Opportunities for integrated water management approaches and maximising reuse should be considered as part of these investigations.

As referenced in Outcome 1, a recent review by the Essential Services Commission of South Australia noted that publishing current and forward projections of the capacity and utilisation of water and sewerage infrastructure would provide improved visibility for planning.[310] Publication of the system-wide review would inform future planning and sequencing of land releases and provide transparency for planners and developers.

The case for change – In brief

Access to reliable wastewater services and infrastructure is essential to supporting growing communities.

Unprecedented residential growth in Greater Adelaide and in particular, greenfield developments in the Northern metropolitan Adelaide region are challenging the provision of wastewater services. These new developments are occurring beyond the extent of existing networks and increasing overall network demand, which is forecast to exceed available capacity.

There is a need to undertake long-term planning to identify optimal infrastructure investments that meet future wastewater treatment capacity needs across the network.

18. Recommendation:

Undertake and publish a system-wide review of both the network and wastewater treatment plant capacity to identify a long-term solution that caters for growth in northern Adelaide.

Lead agency: SA Water

Timeframe: Planning 0 to 5 years

2.2.2 Social services

Planning for growth also needs to consider social infrastructure facilities including health, education, early childhood, cultural activities, sports and recreation, parks, and emergency services. This infrastructure plays a pivotal role in fostering social cohesion, developing social capital, maintaining quality of life, and building strong, resilient communities.

In particular, careful and considered planning is needed for health, education and passenger transport infrastructure. These sectors have assets that typically require large land holdings, are expensive to construct and are significant consumers of energy, water, and other services, in addition to providing employment and delivering critical community services.

2.2.2.1 Education

Education is a fundamental pillar of a well-functioning society. Schools not only prepare individuals for personal success but also contribute to the overall economic, social, and cultural development of communities. Evidence suggests that high-quality infrastructure facilitates better instruction and improves student outcomes, among other benefits.[311]

Over the next 20 years the number of school-aged children in South Australia will increase by over 18,000[312], creating the need to progressively expand the number of places in public schools to accommodate the demand. Private schools will also absorb some of the demand for additional school places.

Stanley Street Reserve playground, Adelaide, South Australia
Image – James Knowler, JKTP

Projected school enrolments are based on a number of factors such as population growth, new housing developments, expanded urban infill capacity and changing demographics. The capacity for primary and secondary schools to cater for this future demand varies across the Greater Adelaide school network. The largest projected enrolment increases by 2041 are expected to occur in the northern Adelaide, Inner metropolitan and Mount Barker areas.[313] However, modelling across the Greater Adelaide network, based on high growth scenario, indicate that by 2041, or in some instances earlier, most government metropolitan secondary sites would have reached capacity, as shown in Figure 24. It should be noted that this modelling assumes that students will attend their closest government secondary school. While this may not reflect how enrolment behaviour will eventuate, it is illustrative of the impact of increasing enrolments across the metropolitan education network.

Where new school capacity will be required in greenfield growth areas, land for future school sites should be identified and preserved in advance, as part of the integrated planning process (refer to Section 2.1).

Growth in established areas requires a more nuanced approach. Building new schools in existing suburbs can be challenging, as suitable sites are limited, and a significant proportion of the cost is in identifying and purchasing parcels of land. There has been a tendency to expand facilities at schools that were at, or are over capacity, to cater for growth in demand. Ultimately, this resulted in a significant proportion of investment at schools with a positive reputation, that attracted parent preference for enrolments, leading to an imbalance in the investment profile across the state.

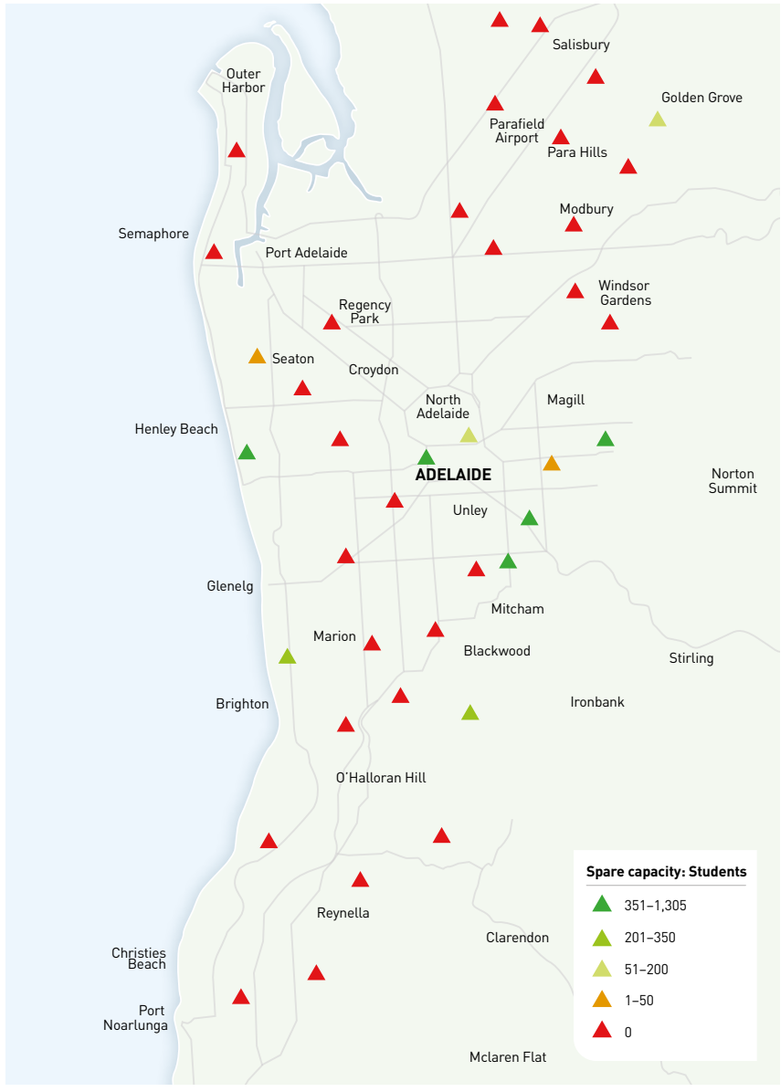
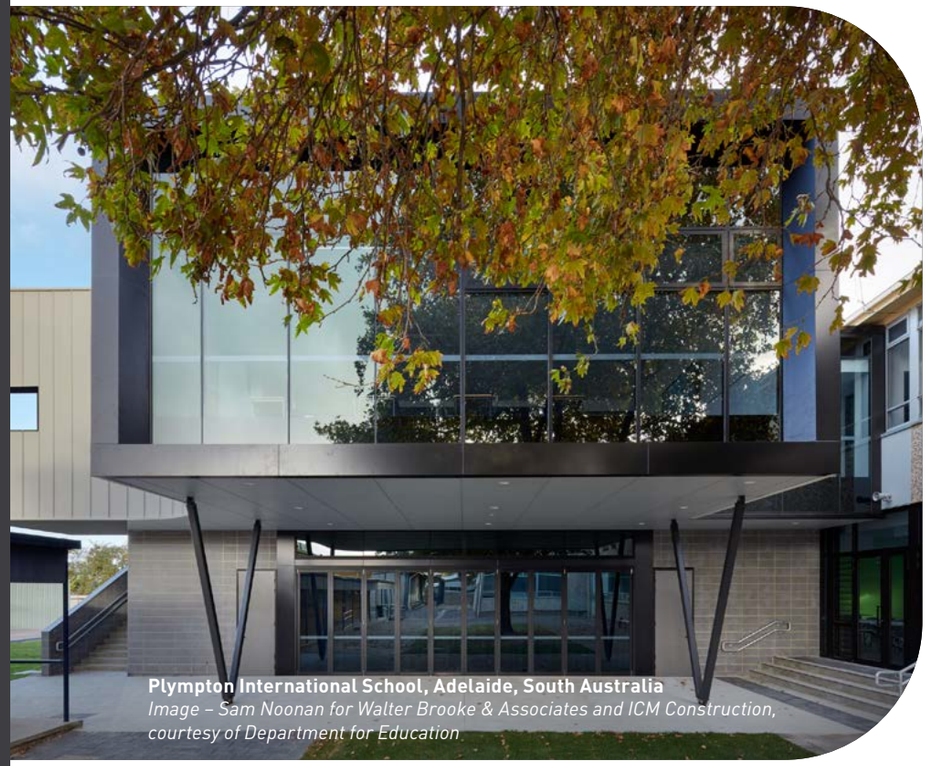


Figure 24:
Government secondary school capacity modelling based on population projections, to 2041[314]

The Department for Education's 20-Year Infrastructure Plan for South Australian Public Education and Care outlines an ambition to make every school a great school. As part of this plan, Department for Education responds to enrolment growth by first seeking to optimise existing resources within the local school network.

This approach considers opportunities to improve the profile of schools that have enrolment capacity by taking an integrated approach through targeted investments to improve or expand existing infrastructure. Other interventions may also be applied, such as special interest or specialist programming. It aims to improve the offering and appeal of these schools to local families, to balance student numbers across the network. Further details are outlined in Case Study 6.



Plympton International School, Adelaide, South Australia
Image – Sam Noonan for Walter Brooke & Associates and ICM Construction, courtesy of Department for Education

Case Study 6

Plympton International College

Plympton International College commenced in 1990 under the name William Light Reception to Year 12 (R-12) School, the first R–12 school in South Australia. In 2016, with only 400 enrolments, the school began a transition journey to increase enrolments, first changing the name to Plympton International College and then in 2017 becoming the state's first and only Chinese bilingual school, delivering 50% of lessons in Chinese, as an immersive bilingual learning experience.[315]

In 2020, the transition continued with an investment of $3.06 million in capital works for upgrades. A performing arts facility and multipurpose learning areas were added and the visual arts and bilingual learning areas were refurbished. A $2.25 million modular building was constructed to provide additional learning spaces and other facilities.[316]

The investment resulted in a significant improvement in the utilisation of education assets. Enrolments in the school in 2024 were at 1,014 students[317], with demand exceeding capacity. As a result, the school is now zoned to a local catchment area only.

Where space is constrained on existing sites, constructing multi-storey vertical school buildings may be required to maximise limited available land. The Adelaide Botanic High School is currently the only example in South Australia, with the school's multi-storey building being duplicated in a new building on adjacent land in 2023, to create additional capacity to meet demand.[318]

Utilising rooftops for playgrounds, sports facilities, or green spaces to compensate for limited ground-level outdoor areas can also free-up space for new buildings. Partnering with community organisations, libraries, or recreational centres to share facilities is another way of freeing-up space. The Adelaide Botanic High School expansion features a rooftop sports field, as does Christian Brothers College.

An alternative to expanding existing school sites in established suburbs is adaptive reuse of existing buildings. This could involve repurposing under-utilised or abandoned buildings, such as warehouses, office buildings, or retail spaces, into school facilities. For example, the Warriappendi School, which is being relocated from Richmond to accommodate the North-South Corridor road project, will move to the refurbished former TechInSA building at Thebarton.[319]

Adelaide Botanic High School, South Australia
Image courtesy of Department for Education

The case for change – In brief

South Australia's population is growing, and the number of school-aged children will increase by over 18,000 over the next 20 years. The capacity for existing primary and secondary schools to cater for this demand varies across Greater Adelaide.

While land needs to be identified and provisioned for new schools in greenfield growth areas, addressing demand is more challenging in existing metropolitan areas where sites are limited, and land is more expensive.

Maximising capacity in existing schools will be required to absorb and support future growth, to attract additional students and smooth capacity enrolments across the public-school network.

19. Recommendation:

Optimise existing education assets by adopting strategies to increase demand for schools with capacity in established areas.

Lead agency: Department for Education

Timeframe: Planning 0 to 5 year

2.2.2.2 Healthcare

Access to quality healthcare is central to community health and wellbeing and is essential to liveability. A healthy population participates in social and economic activity resulting in a more inclusive and productive economy. The Australian Productivity Commission estimates that Gross Domestic Product (GDP) in Australia could be increased by $4 billion per annum if the health of people in fair or poor health was improved.[320] Furthermore, research estimates that the consequences of poor health, such as premature deaths and lost productive potential, reduces global GDP by about 15% per annum.[321]

The South Australian public health system encompasses a large and complex network of hospitals, health services and community-based care across the state. A significant share of the South Australian Government's expenses are allocated to the health portfolio, at just over 23% in 2022–23.[322] In 2024–25 the estimated program net cost of health services is $5.3 billion and the capital investment program is $864 billion.[323]

Like other jurisdictions, the health system in South Australia is facing significant challenges with increased demand, high utilisation of hospital services and growing health care costs.[324] This is despite a real average annual growth rate of 2.5% in health expenditure in South Australia over the decade to 2021–22.[325]

2.2.2.2.1 Health system demand determinants

Health system demand and expenditure are driven by a range of factors including:

- Demographic aspects – Population growth, socio-economic status of the population, proportion and location of population groups with greater health needs (e.g. state-wide ageing profile)
- Non-demographic aspects – System utilisation, health price inflation, increase in chronic disease rates and increased consumer expectations for healthcare services.[326]

South Australians generally have good health[327], although the demographic profile and geography of South Australia can affect the ability to access and use health services and facilities, which has implications for health outcomes. On average, those living in rural and remote areas have poorer health outcomes compared with people living in the Adelaide metropolitan area[328] and Aboriginal South Australians who live in remote areas, experience a higher rate of disease and shorter life expectancies[329].

Kangkanthi Building, The Queen Elizabeth Hospital, Adelaide
Image courtesy of SA Health

South Australia's population is growing and getting older, as shown in Figure 25. This has implications on demand, with older people both presenting more often and with more complex and chronic needs. Over 50% of those aged 65 and above have at least two chronic health conditions compared to less than 17% of those aged below 65 years.[330]

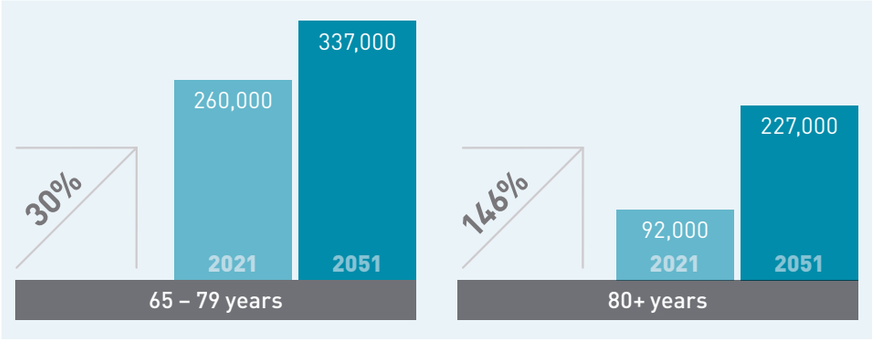


Figure 25:
South Australia's aging population, 2021 and 2051[331]

Despite interventions, the prevalence of chronic disease and associated health risk factors is increasing, and this is not just associated with age driven factors. The proportion of people living with one or more chronic conditions in Australia has increased from 42.2% in 2007–08 to 47.7% in 2022.[332] In South Australia, the proportion in 2022 is slightly higher at nearly 54%.[333] In remote and regional areas, people experience even more chronic health conditions and higher risk of poor health outcomes.[334]

Demand for emergency department services and hospital services is increasing. The Department for Health and Wellbeing estimates future demand for emergency department presentations will increase such that the maximum daily emergency department level in 2019–20, will become the average daily level in 2026–27.[335] Similarly, forecasts for hospital beds anticipate demand will continue to exceed capacity across South Australia, with bed occupancy rates exceeding hospital occupancy capacity rates.[336] This increase is unsustainable and stresses the need for a fundamental change in approach. Greatest areas of increased need include the Northern metropolitan Adelaide region growth areas.[337]

Emergency ambulance, South Australia
Image – iStock/chameleonseye

The high occupancy rates and demand in our hospitals includes a cohort of patients that clinically do not need to be in a hospital facility. In September 2024, approximately 236 beds across metropolitan hospitals[338] were reported to be occupied by patients clinically ready for discharge but unable to be discharged because of a lack of suitable facilities, alternative care options, accommodation or placement options.[339]

Another example of this challenge is reports of National Disability Insurance Scheme (NDIS) eligible patients being unable to be discharged, with 136 patients occupying beds due to a lack of step-down options[340], or independent living sites. Of these 69 had their discharges delayed by more than 100 days.[341]

Data from the Australian Government Productivity Commission highlights that South Australia has the highest proportion nationally of older persons in public hospitals waiting for admission to residential aged care or home care assistance.[342] Demand for maintenance care beds to support patients with ongoing needs, but that do not require hospital admission, are projected to increase by 63%, based on a 2020–21 baseline, equivalent to 280 more beds by 2036–37.[343]

Further compounding the problem, South Australia also utilises emergency departments for mental health related presentations at a higher rate than the national average, at 5% compared to the average of 3.8%.[344] The state also admits nearly 7% more patients with mental health presentations to inpatient settings than the national average.[345]

The child and adolescent mental health system is particularly challenging, with adolescent mental health presentations to tertiary hospitals increasing by 156% between 2006 and 2019 across Australia.[346] In South Australia in the decade to 2022, annual mental health admissions to the Women's and Children's hospital doubled.[347] The Chief Psychiatrist has noted that South Australia needs to consider how existing funding can be used more effectively and that further resources may need to be allocated to mental health services[348], which could help to avoid unnecessary hospital presentations and support improved outcomes.

2.2.2.2.2 Reducing the burden on our hospital system

Meeting care needs and reducing the hospital burden requires implementation of system-wide planning to support the best use of infrastructure that rebalances the system. The healthcare system is largely designed to be reactive in responding to the treatment of illness, an approach which requires significant capital and workforce investments.[349]

Building new hospitals and adding beds to address demand can only be part of the solution. Greater exploration of integrated approaches that explore efficiencies and opportunities to combine services and programs are needed. An increased focus is needed on supporting hospital care alternatives, such as increasing access to home and community care, partnerships with non-government organisations and private hospitals, to deliver care and non-acute care in alternate settings. Measures that seek to avoid unnecessary hospital admission can improve system demand and overall capacity. There is also a need to better address the outflow of hospital patients, including through improved capacity in aged care, mental health, complex social care services and appropriate, accessible housing.

Addressing these needs will require focus on continued investments in step down and other care facilities, preventive care, innovative ways to deliver services, harnessing new technologies and finding ways to improve efficiency and health outcomes. Supporting and educating the community in how they access care services and the options available provides a key enabler to help shift demand.

2.2.2.2.3 Preventive health

A strong continued focus on preventive approaches to support improved physical, mental and social well-being and ultimately reduce the preventable burden of disease is required. An estimated 67% of the total burden of disease can be modified through better management of risk factors and early intervention.[350]

Preventive actions should be targeted towards:

- Risks that cause significant disease burden – research indicates that $6 billion in health costs could be saved by taking action on tobacco, alcohol, and unhealthy foods alone.[351]
- Screening interventions to prevent disease – in 2015–16, vaccine preventable conditions cost the hospital sector $616.7 million.[352]
- Early action for population groups who experience or are likely to experience significant long-term chronic health conditions.
- Mental wellbeing, especially in vulnerable populations, socio-economic groups, and regional areas.

Focusing investments and expenditure on measures that target preventive care offers opportunities to optimise health system efficiency, reducing the burden on primary health care infrastructure.

Identifying and quantifying health and wellbeing outcomes and benefits as part of infrastructure projects that support healthy lifestyles, such as active transport, access to open space, and recreational infrastructure enables stronger integration and consideration of health outcomes and potentially broader value and benefits for these projects.

Nurse providing care, Australia
Image – Claire Bonnor, 2022/Austockphoto

2.2.2.2.4 Innovative health care

To meet our healthcare needs we need to employ new service delivery models and leverage technology and new services. Continued use and adoption of digital health technologies such as telehealth, electronic prescribing, and mobile health applications; including in-home monitoring, offer opportunities to improve access and outcomes for healthcare users. Developing a strategic roadmap to identify the backbone and technology required to support our future health system could help facilitate the uptake of new technologies.

New and emerging technologies also offer opportunities for more targeted prevention and treatment, using data science and artificial intelligence to detect and monitor disease, as well as tech-enabled delivery to expand access and capture advances in knowledge. For example, Project Check Mate, launched in South Australian in 2023, uses artificial intelligence tools in nurse-led pop up clinics to provide free skin checks that can support early detection of skin cancers.[353]

Another innovation currently being trialled in South Australia uses artificial intelligence to detect potential issues with prescription medicine used by patients discharged from hospital. This tool is forecast to avoid over 1,300 readmissions within 28 days of discharge in South Australia annually.[354] Innovative artificial intelligence is also being used to monitor patients' vital signs post-surgery and identify when they can be safely discharged. This initiative is supporting improved patient flow management, enabling earlier discharges that free up limited beds and provide cost and time savings.[355] Critical to the implementation of these systems is ensuring that the supporting computing and networking infrastructure is compatible and available.

Robotic applications are increasingly being used in healthcare. They range from simple laboratory robots or automated guidance vehicles to distribute food, linen and hospital supplies through to highly complex robotic-assisted surgery. With many other applications under development, robotics has the potential to enable high levels of patient care, clinical productivity and safety for both patients and healthcare workers.[356]

The case for change – In brief

Increasing demand, high utilisation of hospital services, and growing health care costs are placing pressure on our health system. Our growing and ageing population are key contributors to this challenge.

Demand on hospitals is exacerbated by patients who are unable to be discharged due to a lack of suitable alternative options, particularly for National Disability Insurance Scheme and aged care patients.

Approaches are needed that better address and provide options for the outflow of patients and avoid hospital admissions. Measures include increasing access to home and community care, preventive actions to improve health and using emerging technologies such as artificial intelligence to detect and monitor disease, as well as tech-enabled delivery to expand access and capture advances in knowledge.

20. Recommendation:

Prioritise measures that optimise health system efficiency and reduce burden on hospitals by investing in alternatives to hospital and innovative service delivery models.

Lead agency: Department for Health and Wellbeing

Timeframe: Policy 0 to 5 years

2.2.3 Public and active transport

The integration and coordination of the state's strategic planning approach, via the coordinated release of the GARP, the Transport Strategy and this Strategy, presents a unique opportunity to establish a clear vision for the timely and optimal development of our transport system. This will help to ensure we maintain well-connected and functioning communities that have safe, convenient, regular and affordable options at all times. Change is inevitable as we seek to decarbonise the transport sector at the same time as accommodating growth and improvement.

The reliance upon private vehicle travel continues to constrain our potential, congest our roadways and lock in capital intensive investments that create further demand and hence negate the original benefits. It is an ongoing self-fulfilling cycle and cannot be sustained longer term. While we need continuing investment in building capacity across our road networks, we cannot build our way out of congestion due to limited space and current budget constraints. Instead, we must plan smarter and increase efficiency.

Greater Adelaide's population growth is placing increasing pressure on the transport network, with congestion impacting many of the roads in and out of the central business district (CBD) during peak periods, as shown in Figure 26.

Frome Road, Adelaide, South Australia
Image – James Knowler, JKTP

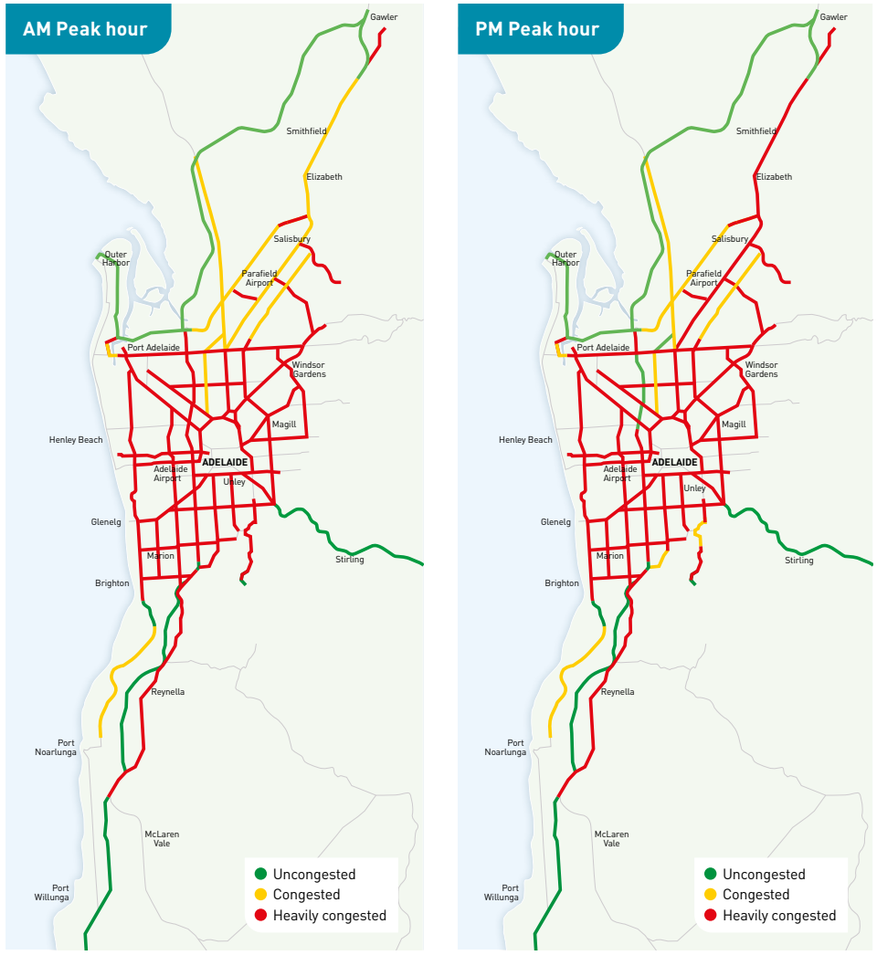


Figure 26:
Peak hour congestion intensity for Greater Adelaide, AM and PM, 2022–24[357]

Congestion negatively impacts on productivity and the liveability of Adelaide. Infrastructure Australia estimates that the annual cost of road congestion for Greater Adelaide will cost $2.6 billion by 2031.[358] Improving public transport patronage to take a greater share of demand as Adelaide grows was highlighted as a priority in the 2020 Strategy. While some gains have been made in service improvement, this remains a clear priority for the current Strategy.

Active transport is also recognised as a means to reduce congestion in the road network and decrease or delay infrastructure costs. It also reduces environmental impacts and delivers health benefits through physical activity for users. Increasingly, personal mobility devices (e-bikes and e-scooters for example) are providing additional options for users and opportunities for increased accessibility to public transport connections. Future planning needs to consider the provision of safe access and secure storage options for personal mobility devices.

Adelaide's public transport network performs well in terms of spatial coverage, with 93% of the population living within a ten-minute walk of public transport.[359] However, spatial coverage does not measure the usefulness or competitiveness of the service, particularly when compared to the current advantages of private vehicles for convenience and travel time.

The operating efficiency and productivity of Adelaide's public transport is less competitive with other similar cities and varies significantly by service and location.[360] For journeys to work by public transport, Adelaide ranked fifth across major capital cities, with 10.7% in 2016 and 8.5% in 2021, as show in Chart 25. This is significantly less than Sydney, where pre-pandemic journeys to work by public transport were 26.6% (2016), down to 12.3% in 2021.[361] While public transport patronage across Australia is recovering, it is not yet at pre-pandemic levels, with working from home a factor in the shortfall.[362]

North Terrace tram, Adelaide, South Australia
Image – Greg Balfour Evans/Alamy stock photo

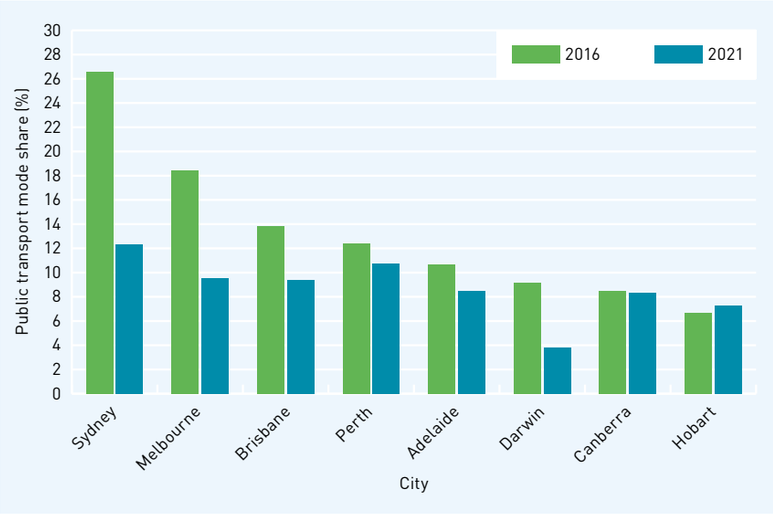


Chart 25:
Public transport mode share by city, 2016 and 2021[363]

Commuters will use public transport when the product is compelling, such as when the service is fast, frequent, and reliable. In terms of average speed and reliability, the performance of passenger rail service unsurprisingly far exceeds all other modes in Adelaide. The O-Bahn also performs well in comparison to on-street bus but is not fully immune from congestion and is still subject to reductions in speed and reliability during peak periods once outside the tracks. Overall, a critical factor to the O-Bahn success is that it is faster than private vehicles for a significant number of users due to using a dedicated corridor for a portion of the journey.

Analysis shows that, in general, more frequent routes generate more boardings per total hour of service operated.[364] Not only do high frequency routes attract more passengers, but they are also more cost efficient to operate.[365]

In this regard, passenger rail is particularly efficient in Adelaide, with the Gawler, Seaford and Outer Harbor lines generating approximately double the number of boardings per hour of service than even the most productive O-Bahn routes (whilst noting that O-Bahn demand is split across many more individual routes). As our population grows, the evidence is clear that mass transit options within dedicated corridors provide the optimal solution, supported by interconnecting bus routes to enable commuters to efficiently reach their ultimate destination as seamlessly and quickly as possible.

O-Bahn busway entrance, East Terrace, Adelaide, South Australia
Image – James Knowler, JKTP

2.2.3.1 Transport constraints and challenges

On-street bus services account for 71% of public transport journeys in Adelaide, and are the service most impacted by traffic congestion, resulting in increased travel times and variable reliability for many services.[366]

In line with the identification of growth corridors in the GARP, including infill along existing public transport corridors, planning for future provision of transport corridors and ensuring transport nodes/stations are available, will ensure users have ready access to public transport. That enables seamless and timely connection to their ultimate destination. The integration of planning for multi-mode interchanges, park-and-ride facilities, and links to key urban centres (destinations), will stimulate patronage and active and public transport use. This in turn supports private and commercial development in proximity and adjacent to the corridors identified in the GARP.

Decision making on mode of travel is also influenced by key infrastructure such as stations, stops and interchanges, relative to an individual's origin and destination. Hence it is critical to design and deliver a network that aligns with user requirements and expectations, and ultimately proves a better option than driving.

Individuals will consider not just direct travel time, but the time taken to reach the point of departure such as walking or riding to a station; waiting time for service; connectivity if multiple services are needed; and then the walk to the end destination such as a workplace or shops. The current network design is radial and has a lack of public transport services that connect metropolitan suburbs to support a diverse range of trip purposes. The network does not provide for close integration of rail, tram, and bus systems for efficient multi-modal trips.

The status of the Adelaide Railway Station as a terminus has a significant impact upon the efficiency of operations, particularly as our population grows south and north of the CBD. As a terminus station, trains must enter and exit from the same direction, which can lead to congestion, especially during peak hours. It also limits the number of trains that can be processed simultaneously and slows down turnaround times.

With the new Port Dock service commencing in 2024, the Adelaide Railway Station is now at capacity and is not able to support new or more frequent services. This limits the capacity of the entire rail network, an issue that will continue to restrict our ability to grow patronage over time and reduces the options for mass transport to service growth areas in outer suburbs.

Ultimately, there is a tipping point that will require Adelaide Railway Station to greatly increase capacity. Whilst a solution would be capital intensive, it presents an opportunity to consider the optimal approach to introducing a through-running system or link under the CBD in the longer term. This solution could connect all lines seamlessly to significantly reduce congestion, improve service frequency and provide capacity for additional services. This would enhance the rail network and Adelaide City through an integrated planning approach that aligns services with destinations, encourage broader private investment and provide a more attractive public transport service.

Services to the peri-urban and major regional centres remain challenging but also form a critical and essential source for many people. We need to maintain agreed levels of service to these areas and leverage innovative approaches and new technologies as appropriate. The government will continue to lead in partnership with business, community and private providers to establish services that are sustainable and appropriate to each community.

The Keoride service in the Adelaide Hills is an example of an on demand public transport solution that helps users reach destinations, in a growing area that may not yet have a full range of public transport services, as outlined in Case Study 7. Clear community engagement on the design and implementation of these solutions is key, including understanding how to establish a sustainable service.

Failure to address both existing constraints and issues across our network, as well as to plan, prioritise and deliver increasing services and options in future, will restrict us as a state in achieving our ambitions and making public and active transport attractive options.

Adelaide Railway Station, South Australia
Image – iStock/ai_yoshi

Keoride on-demand bus service, Mount Barker, South Australia
Image courtesy of Keolis Downer

Case Study 7

Keoride – Transport on demand

Keoride South Australia is an on-demand bus shuttle service operated by a private provider on behalf of the government. A trial service is available in Mount Barker, Nairne, and Littlehampton, in addition to a service in the Barossa Valley including Angaston, Nuriootpa, and Tanunda.[367]

Operating since December 2019, the Mount Barker service has been popular with residents. Residents can book a shuttle bus service to pick them up and drop them off at various locations within the service zone area including designated points of interest e.g. Park 'n' Ride locations, an existing regular bus stop, or in some cases their personal residence. Bookings are made via phone, online, or the Keoride app and fares align with regular Adelaide metropolitan area bus fares. The service currently operates seven days a week with longer operating hours on Monday to Friday.

The technology supporting the service enables the provider to match customers who are travelling in the same direction and calculate an optimised flexible route. The data gleaned from service use has indicated that most passengers to date have used the service to get to and from the Park 'n' Ride locations to then commute via bus to and from the city.[368]

Passenger feedback has indicated high levels of satisfaction with the on-demand service with many residents indicating that they have used public transport more than if the shuttle service had not been available.[369] A trial of a Keoride on-demand service in Sydney indicated that 96% of customers considered the service better than using their own car and 98% consider it safe and convenient.[370] Research indicates that on-demand passenger models are particularly beneficial where they complement existing mass transit routes and can provide a service that is accessible, reliable and adaptable.[371]

2.2.3.2 Operational considerations

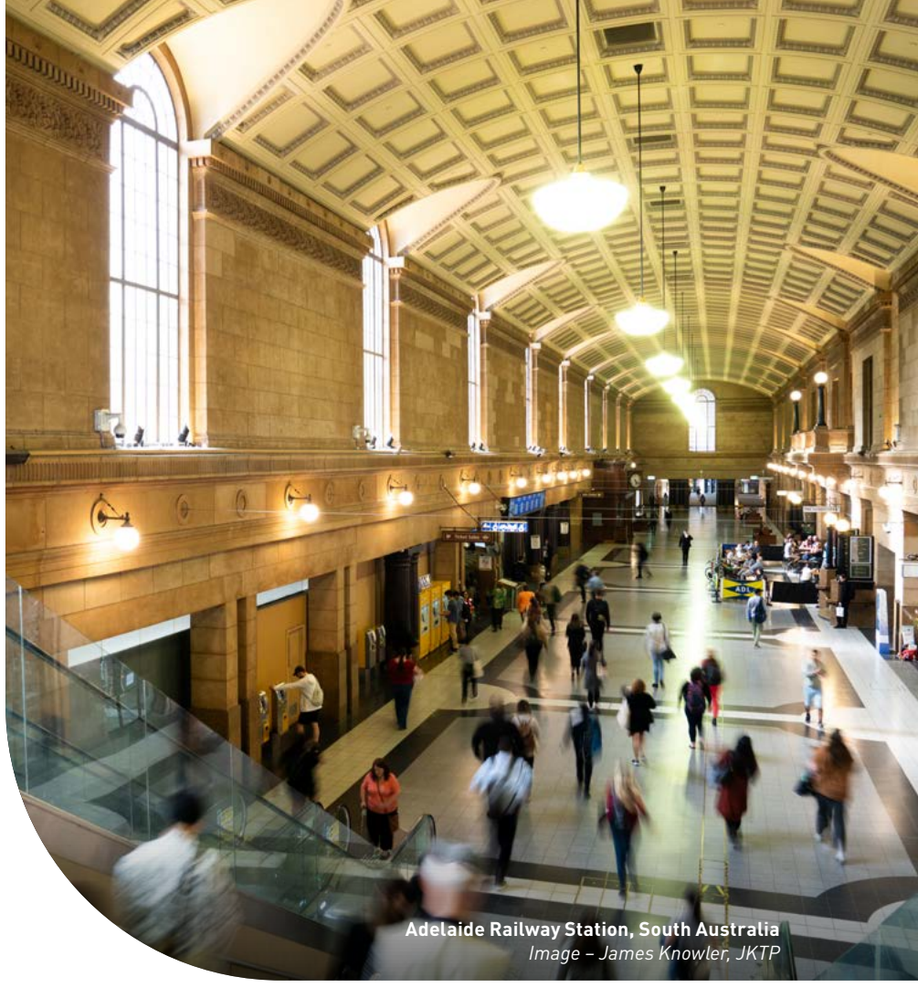
Placing public transport infrastructure investment decision making at a higher priority to that associated with private vehicle priorities is needed. This will signal to all stakeholders that there is a clear vision and plan to implement a coordinated, efficient network that will directly benefit users.

Infrastructure SA has identified the need to undertake a comprehensive public transport redesign that addresses both the current limitations and planned future growth areas. The Transport Strategy supports public transport (mobility) strategies and establishes the vision and strategic initiatives to achieve a more effective public transport system.[372]

Independent analysis undertaken by Infrastructure SA supports this approach and highlights key opportunities in redesign, as shown in Table 12.[373]

Table 12:
Transport operational considerations

Increasing mass transit within dedicated corridors (i.e. train, tram, O-Bahn) Consolidating demand onto dedicated corridors and repurposing local services and options to connect people with efficient trunk routes.
Modal integration The ability to combine different routes and modes of transport in one trip allows more flexibility of destinations and more efficient network design, with efficient transfer opportunities currently limited.
Increasing services Inducing and capitalising on latent demand by operating more services in under-served areas, and on the highly productive dedicated corridor network.
Reducing complexity The current bus network is complex and simplifying this could allow higher overall quality of service.
Considering trip diversity Considering a more diverse range of trip purposes (in addition to commuting to the Adelaide city centre) to improve equity and allow more cross-suburban connectivity.



Adelaide Railway Station, South Australia
Image – James Knowler, JKTP

2.2.3.3 Infrastructure responses

Infrastructure investments will be required to support public transport becoming a more compelling option to private vehicles. Coupled with operational improvements, there is a convincing case to prioritise investment in public and active transport if we are to realise the benefits of increased usage, drive behavioural change and increase mode shift.

Infrastructure interventions that present opportunities for Adelaide's public transport offering have been identified as follows in Table 13.[374]

Table 13:
Transport infrastructure investments

On-road priority infrastructure Implementation of on-road priority infrastructure along high-frequency radial bus corridors where reliability and travel speeds are low.
Interchange infrastructure Supporting bus/rail interchange infrastructure at more locations across the network. This would require supporting network and service design changes to ensure passengers can safely and efficiently transfer between modes.
Better connectivity Better connectivity between the passenger rail network and the CBD's dense job core to significantly cut rail journey times for commuting trips and increase operational capacity and efficiency. Removing the terminus constraint at the railway station to open up capacity of the rail network.
Fixed corridor investment Investing in more fixed-corridor public transport, particularly focussed on the identified growth areas, allowing a greater share of Adelaide's population to benefit from the consistently positive outcomes seen around train, tram, and O-Bahn stations.

There is capacity to substantially increase residential development around existing public transport networks and infrastructure under existing planning frameworks. The GARP provides the land use strategic objectives to achieve this.[375]

As our population grows, and the need to decarbonise compels structural changes to our approaches to transport and how we move around our city, the requirement for modal shift to mass transit solutions increases. The allocation of investment for public transport and mass transit solutions on our networks will be a key driver to enable us to achieve our targets and maintain the quality of life and amenity we have come to expect. Behavioural change and providing travel options that clearly benefit the users are fundamental to achieving our ambitions.

A successful approach to improving take up of public transport should consider policy options to encourage mode shift. Adelaide CBD has high parking availability at a relatively low cost, compared to other major capital cities. The average maximum daily parking rate in Adelaide was $25 in 2024[376], compared to the cost of a full-fare return public transport trip at $8.80 in 2024–25[377], making private vehicles a relatively affordable choice for travel to the CBD. Implementing policies to better manage private vehicle parking in the CBD may mean this option is less appealing and encourage more trips by public transport.[378] This strategy would be most effective when paired with reliable, accessible, and affordable public transport options.

It is essential to ensure the public are well informed and engaged with our future planned transport network and understand the vision and benefits that will be achieved. To this end, there needs to be a significant, detailed, and sustained public consultation and engagement process led by government to inform and shape a redesigned transport system.

The case for change – In brief

Current and future growth in Greater Adelaide's population will continue to place pressure on the transport network, particularly considering our reliance on private vehicle travel.

Congestion negatively impacts our productivity and liveability and is forecast to get worse.

With limited space, budget constraints and the need to meet net zero targets, we cannot continue to build our way out of congestion.

We need to improve uptake of public transport to maintain liveability, improve access to jobs, reduce congestion and meet net zero targets, through an improved network integration.

To address these challenges, a strategic network redesign is required, with consideration to public and active transport and preservation of future mass transit corridors.

21. Recommendation:

Strategically review the public and active transport networks to ensure that they provide integrated services that are attractive to consumers.

Lead agency: Department for Infrastructure and Transport

Timeframe: Planning 0 to 5 years, delivery 5 to 20 years

22. Recommendation:

Implement public and active transport targets to drive a focus on initiatives that increase patronage.

Lead agency: Department for Infrastructure and Transport

Timeframe: Planning 0 to 5 years (ongoing)

The case for change – In brief

The Adelaide Railway Station is the central terminus of the metropolitan railway system.

With the new Port Dock service commencing in 2024, the Adelaide Railway Station is now at capacity. The lack of thoroughfare limits the ability of the passenger rail network to expand services on existing or new lines.

The significant growth forecast for the north and south of Greater Adelaide will create a need to provide mass transit options that move large numbers of people. However, Adelaide Railway Station presents a constraint.

Creating an underground link could release significant capacity within the network and connect all lines seamlessly.

23. Recommendation:

Identify the long-term solution to address the capacity constraints of Adelaide Railway Station, including the viability of an underground rail link.

Lead agency: Department for Infrastructure and Transport

Timeframe: Planning 0 to 5 years, delivery 5 to 10 years

2.3 Affordable infrastructure growth

2.3.1 Balancing infrastructure supply and demand

Balancing demand with the supply of services and the supporting infrastructure is also inherently challenging. Whilst strategic land use planning considers high growth scenarios to ensure we have the capacity to meet such a scenario, the reality is that growth occurs in constantly changing patterns according to where and how our population lives, works, and the specific needs for different segments of the population.

Infrastructure cannot always be funded, constructed, and delivered to 100% of capacity in advance of the demand to utilise this infrastructure. Individual infrastructure providers such as the regulated utilities, government agencies and private operators all need to comply with their own specific legislation and investment governance frameworks and are influenced by differing timeframes and budget cycles.

Clear identification of preferred sequencing further informs the planned levels of service achievable and the potential trade-offs in timing required to achieve long-term sustainable delivery of infrastructure. For example, major residential developments occur progressively, with individual land releases over time, driven largely by market uptake. It is uneconomical to construct the entire sewer system for a development that may take more than ten years to reach full capacity of dwellings, and the style and density of future dwellings may change over time, impacting local infrastructure needs.

It may be appropriate and unavoidable for some levels of service to be limited or initially addressed through alternative means. This could include tankering sewerage for a short duration in advance of full connection, or providing localised, on-call buses until there is sufficient demand for full transport services to a new area. Transparency, open engagement and communication with residents is key to ensuring awareness of when the necessary infrastructure will be delivered, and full levels of service implemented.

Plant 4 at Bowden, Adelaide, South Australia
Image courtesy of Renewal SA

Integrated planning also needs to encompass social infrastructure, covering a range of services and facilities such as health, education, early childhood, cultural activities, sports and recreation, parks, and emergency services. Coordinated strategic planning for social infrastructure should identify land located in the right places, with proximity to other services and transport links, and ensure it is protected to meet future community needs. This not only applies to social infrastructure provided by governments, but also the private sector, for services such as private medical centres, schools, and early learning centres.

2.3.2 Adaptive planning and sustainable funding

Providing enabling infrastructure is capital intensive, with high up-front costs, so planning is important to optimise that investment. Equitable funding mechanisms are required to unlock timely investment. Failure to deliver fully integrated infrastructure in time to meet demand typically leads to higher costs and less efficient and/or rapidly redundant infrastructure.

Conversely, strict adherence to structured long-term plans and committing to complex, capital-intensive infrastructure ahead of demand remains high risk in the event the demand is not realised, or alternative land uses evolve over time. This can result in stranded infrastructure or inappropriate infrastructure provision, or for the case of social infrastructure, poor utilisation, and inefficient and inequitable service delivery.

Adaptive planning approaches are required to successfully deliver long-term strategic infrastructure, balancing the evolving shorter-term supply and demand issues with longer-term strategies, enabling prioritised investment decisions.

The current challenges being experienced to deliver timely infrastructure to meet growth have also highlighted how regulated entities and individual government agencies often operate to different timescales, with different base assumptions, strategic planning methodologies and funding mechanisms.

Infrastructure funding is often fragmented between local, state and federal governments, utilities and developers, leading to delays and inefficiencies. A significant portion of infrastructure funding relies on government budgets, which are often constrained and have competing priorities. This will not be sustainable with the level of growth projected in coming decades.

Diversifying funding sources by incorporating private sector contributions and user or beneficiary contributions are key to a sustainable approach to funding. However, inconsistent use of cost recovery across regions or sectors creates uncertainty for developers, utilities and buyers and makes it more difficult to plan for long-term investments. In some cases, the rules for contributions or payments may not be clear, leading to disputes or delays in project delivery.

Introducing a more consistent and transparent framework for cost recovery across South Australia could help ensure that all stakeholders, including developers, utilities, and end users, are treated fairly. This could involve standardising developer contributions, levies, and user-pays systems across local governments, ensuring that rules and rates are optimal and applied uniformly to give greater certainty.

Stanley Street Reserve playground, Adelaide, South Australia
Image - James Knowler, JKTP

The case for change – In brief

Providing enabling infrastructure is capital intensive, with high up-front costs that must be funded and ultimately paid for by the beneficiaries.

Existing cost recovery mechanisms are applied inconsistently and are potentially unsustainable.

A holistic approach needs to be adopted that considers all the infrastructure required to support growth areas. It should identify the funding mechanisms that can be applied in a consistent and optimal manner to the benefit of all users.

24. Recommendation:

Identify and implement sustainable funding mechanisms for provision of infrastructure to support growth areas and new developments.

Lead agency: Department for Housing and Urban Development

Timeframe: Policy 0 to 5 years

3

Outcome 3

Shaping a sustainable future: Infrastructure decisions advance climate readiness, safeguard nature and culture and promote a circular economy

Pakapakanthi / Victoria Park Wetlands, Adelaide, South Australia
Image – James Knowler, JKTP

Infrastructure has many positive outcomes for society and the environment, but it can also have a negative impact or introduce new pressures or threats. Good infrastructure planning and decision-making balances environmental, social and economic outcomes in support of a sustainable and equitable future for generations to come.

The world is facing the interlinked threats of climate change, nature and biodiversity loss and pollution.[379] We need to take action to meet the United Nations Sustainable Development Goals to avert serious environmental, social and economic risks.

In South Australia we are becoming hotter and drier, with more frequent and intense extreme weather events, and rising sea levels will exacerbate coastal flooding and erosion.[380] In recognition of this, the South Australian Government has adopted a decarbonisation goal to reduce the state's greenhouse gas emissions to support reaching net zero (refer Box 4) by 2050, with a shorter-term goal of reducing greenhouse gas emissions by at least 60% below 2005 levels by 2030.[381]

Box 4. Net zero definition

Net zero is achieved where global greenhouse gas emissions from human activity are equal with greenhouse gas emissions reductions, resulting in a zero increase in net greenhouse gas emissions.[382]

Meeting our net zero targets requires reducing greenhouse gas emissions across all sectors of our economy, as shown in Chart 26. It is a complex task with ramifications and opportunities across regions, industries and communities. The effects of the net zero economic transformation will be experienced by all South Australians and will require trade-offs to be made.

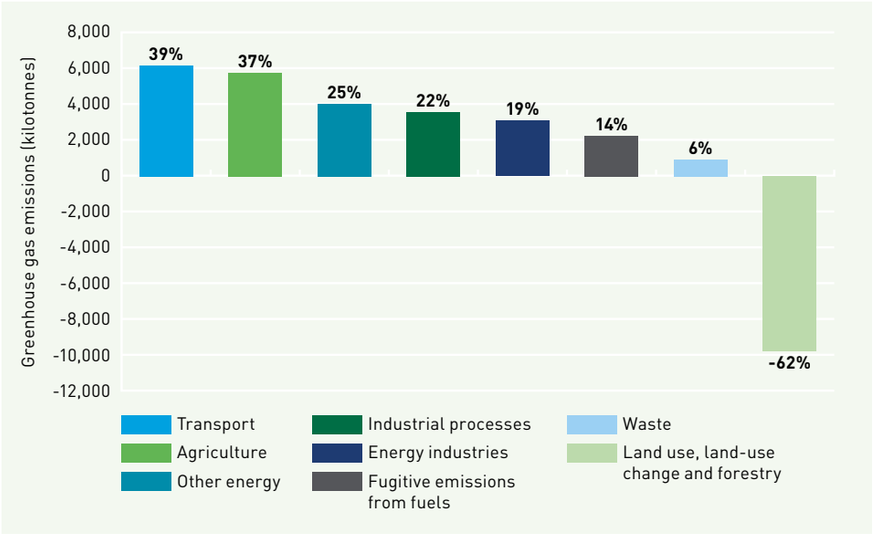


Chart 26:
South Australian greenhouse gas emissions by key economic sector, 2021–22[383]

Infrastructure has an important role to play in achieving the net zero target. Decarbonising infrastructure requires greenhouse gas emissions to be reduced across the infrastructure lifecycle. Embedding greenhouse gas emissions reduction as a core part of infrastructure planning, delivery and operation will move us closer to our targets.

The statewide transition to decarbonisation is seeing a move towards greater electrification of homes and vehicles. Whilst options to decarbonise and utilise low or zero carbon fuels are explored, leveraging our existing gas infrastructure networks will reduce or defer the need for new infrastructure, further supporting our decarbonisation targets. Electric vehicles will contribute to a reduction in greenhouse gas emissions however, a medium and long-term approach to public charging infrastructure will be required to ensure charging infrastructure and electricity networks are adequate to meet future demands.

In addition to reducing greenhouse gas emissions, it is important to ensure any negative impacts of infrastructure are understood and minimised. Infrastructure planning and decisions need to deliberately enhance the preparedness and resilience of the state's infrastructure, support moving to a more circular economy, reduce the loss of habitat and biodiversity, address pollution, protect cultural heritage and incorporate sustainability standards and reporting across all stages of the infrastructure lifecycle. We need to embrace opportunities to enhance the delivery of infrastructure projects in a transparent way that meets growing stakeholder and community expectations for positive social and environmental outcomes.

Reaching net zero requires ongoing focus and effort, prioritising activities that accelerate progress in greenhouse gas emissions reduction, doing more with less, building less and ensuring greenhouse gas emissions are accounted for in decision making.

3.1 Decarbonising infrastructure, transport and homes

3.1.1 Infrastructure

Infrastructure Australia found Australia's buildings and infrastructure are directly responsible for almost one third of total greenhouse gas emissions, and indirectly responsible for over half of all greenhouse gas emissions in 2024.[384] From 2022–23 to 2026–27, Australia's construction pipeline is projected to produce between 37 to 64 million tonnes of greenhouse gas emissions annually.[385] It has been estimated that decarbonisation strategies, such as material substitution, could help create a 23% reduction in upfront greenhouse gas emissions from Australia's construction pipeline by 2026–27.[386]

Adelaide City Council offices, Pirie Street, Adelaide, South Australia
Image – James Knowler, JKTP

The term 'whole-of-life', or 'lifecycle' greenhouse gas emissions refers to the entire amount of carbon produced over the life of the infrastructure. Infrastructure greenhouse gas emissions occur over three stages, as demonstrated in Figure 27:

- Embodied: Associated with materials and construction processes used over the life of the infrastructure. This is estimated at 10% of lifecycle greenhouse gas emissions, of which 7% is upfront.[387]
- Enabled: Associated with activities enabled by infrastructure (e.g. greenhouse gas emissions from vehicles driving on a road). This is estimated at 26% of lifecycle greenhouse gas emissions.[388]
- Operational: Associated with the operation of infrastructure. This is estimated at 21% of lifecycle greenhouse gas emissions.[389]

Greenhouse gas emissions attributed to the embodied, enabled and operational stages will vary significantly between infrastructure types and projects.

To date, much of the focus for reducing infrastructure greenhouse gas emissions in South Australia has been through reducing operational energy emissions, principally through the high penetration of renewable energy. As an example, South Australia's greenhouse gas emissions from electricity are 19%,[391] compared to Victoria at 52%[392] and New South Wales at 37%[393] who have a higher reliance on coal and gas. As a result, the embodied carbon associated with buildings and infrastructure is likely to represent a larger proportion of total state greenhouse gas emissions in South Australia. South Australia's substantial forward pipeline of public sector infrastructure investments offers an opportunity to manage our carbon footprint and enable growth to be more sustainable.

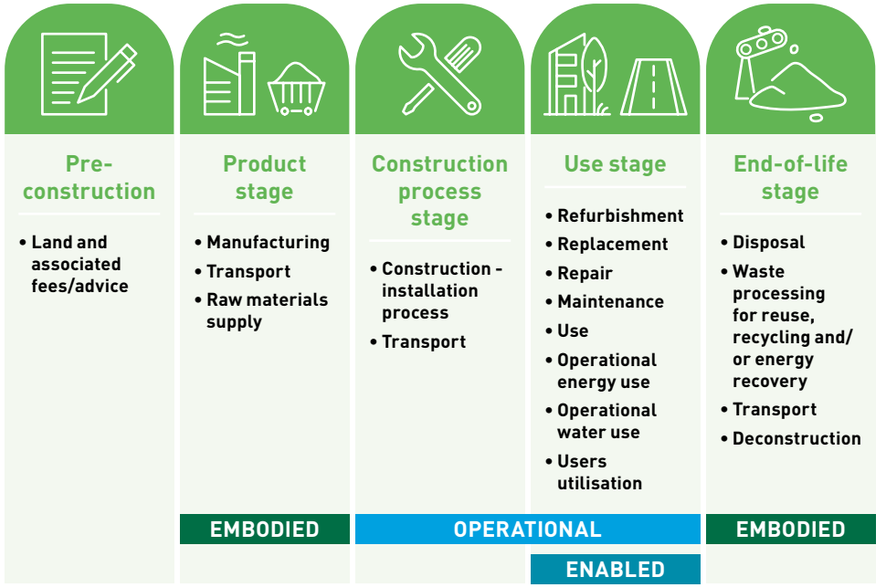


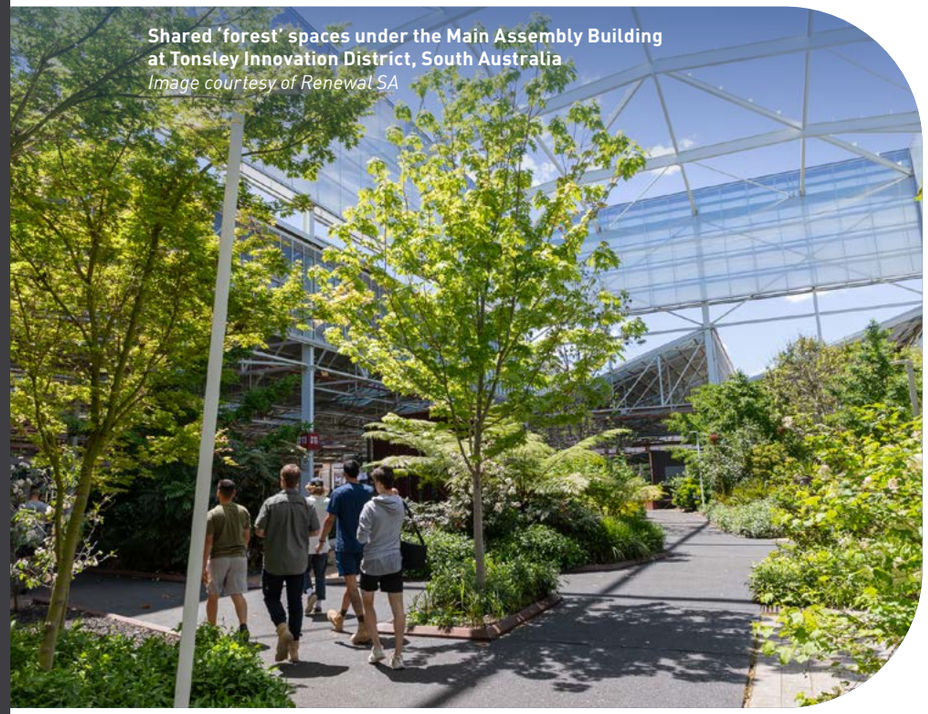
Figure 27:
Three stages of infrastructure greenhouse gas emissions (adapted from Infrastructure Australia)[390]

At present, planning for new public infrastructure builds and capital investment decisions does not consistently include an understanding of potential greenhouse gas emissions or consideration of options for carbon mitigation or management over the life of the infrastructure. In addition, there is not a clear direction or requirement to consider non-build or low build solutions in the options analysis, which would minimise new construction and typically result in a lower carbon impact across the lifecycle. Carbon reduction opportunities are often considered late in the planning process when the decision to build has already been made. Where embodied greenhouse gas emissions are considered in planning and preparation of business cases, the approach to measuring and accounting for carbon is not consistently applied across agencies. This makes it hard to prepare a reliable baseline for reduction strategies and interventions, and for setting greenhouse gas emissions reduction targets.

While there is policy direction in some areas, such as the Department for Infrastructure and Transport's Sustainability Manual, there is a need for a more coordinated and consistent effort to understand, measure, reduce and mitigate embodied carbon across the infrastructure planning and development lifecycle.

3.1.1.1 What needs to change

Decarbonising infrastructure requires a reduction of greenhouse gas emissions across the full infrastructure lifecycle, with the greatest opportunity to influence change early in planning. The implementation of strategies that align with the carbon reduction hierarchy, as shown in Figure 28, will support the incorporation of greenhouse gas emission reduction opportunities at each stage of infrastructure's life.



Shared 'forest' spaces under the Main Assembly Building at Tonsley Innovation District, South Australia
Image courtesy of Renewal SA

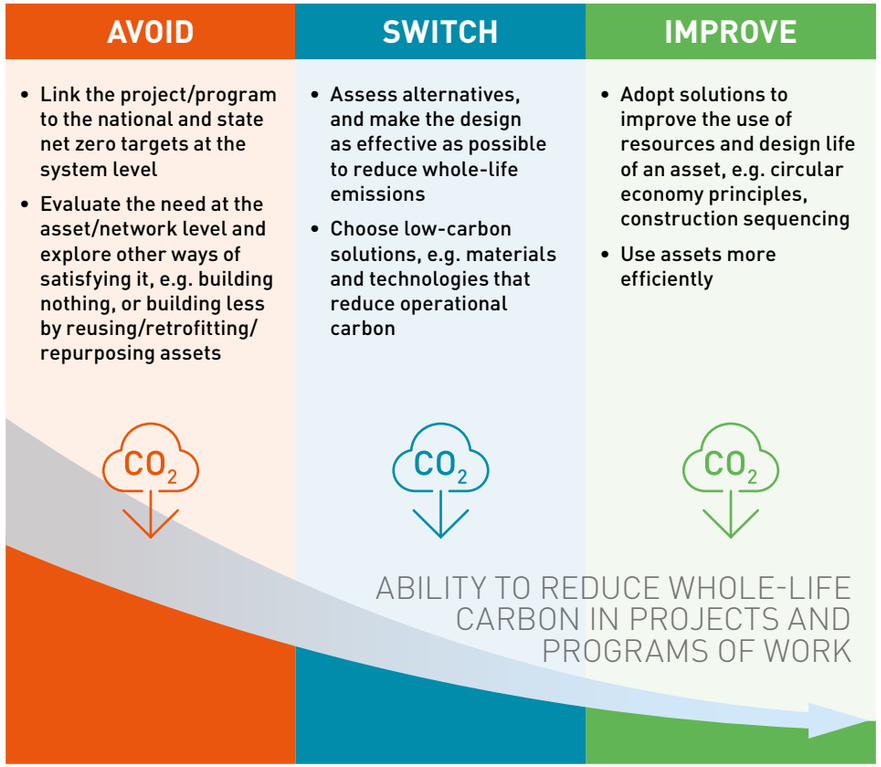


Figure 28:
Carbon reduction hierarchy, aligned to PAS 2080 Standard (adapted from Infrastructure Australia)[394]

Establishing a policy to apply across South Australian Government agencies that incorporates consideration of whole-of-life greenhouse gas emissions for infrastructure will enable informed decisions aligned with net zero directions and provide for a clear and consistent approach. In establishing the policy, adopting an approach that aligns with the industry recognised standard PAS 2080:2023 Carbon Management in Infrastructure, will provide for a consistent means to manage carbon across the infrastructure life cycle and support harmonisation with policies in other jurisdictions.

Requiring quantification and monetisation of greenhouse gas emissions (refer Box 5) using a target-consistent carbon value (aligned to South Australia's net zero targets) will ensure the carbon impacts of infrastructure projects are considered alongside other project costs and benefits, enabling informed investment decisions that align with net zero goals.

Where possible, business cases should also establish a baseline measurement of greenhouse gas emissions and consider setting project-level reduction targets that are monitored and managed at each stage of the infrastructure planning and delivery process.

Box 5. Accounting for greenhouse gas emissions

The use of carbon values in economic appraisals and business cases is the practice of assigning a monetary value to greenhouse gas emissions as part of the decision-making processes.

There are different methods and approaches for setting carbon values. A carbon value is distinct from a carbon price as it is not a direct cost to be paid as a financial transaction.

Actions in this area are being taken by governments across Australia, such as the requirement that all infrastructure proposals submitted to Infrastructure Australia must consider their impact on greenhouse gas emissions.[395] Additionally, the NSW Government's Decarbonising Infrastructure Delivery Policy and associated Embodied Carbon Measurement for Infrastructure Technical Guidance provide direction for reducing infrastructure greenhouse gas emissions.

Reducing greenhouse gas emissions in the delivery of public infrastructure should be a shared responsibility between government and industry. Industry partners bring valuable expertise and innovative solutions as part of the introduction of the policy.

Procurement frameworks and materials standards will also need to be updated to embed carbon reduction requirements and ensure that contractors prioritise low-carbon design, materials, and practices throughout the supply chain. Defined policy requirements for infrastructure decarbonisation will facilitate assessment under the Infrastructure SA Assurance Framework and provide greater transparency and accountability in infrastructure investment decisions.

This may, however, require a more sophisticated approach to understanding and assessing risks where innovative low-carbon products don't have the history of applications to demonstrate they meet technical standards to comply with tender requirements. Conversely, the need to innovate presents an opportunity to build the supply chain in South Australia to provide low carbon materials. Innovations such as Hallett's Green Cement Transformation Project at Port Augusta and Timberlink's Cross-Laminated Timber facility (NeXTimber) are examples of how industry is responding to the decarbonisation challenge.

Delivering low carbon infrastructure projects requires various techniques, technologies, and decisions taken over the lifecycle of a project that optimises the design and uses low-carbon materials, streamlines delivery approaches, and minimises the consumption of resources.

The case for change – In brief

Buildings and infrastructure-based projects are directly responsible for almost one third of Australia's total greenhouse gas emissions, and indirectly responsible for over half of all greenhouse gas emissions.

In South Australia, the greenhouse gas emissions associated with buildings and infrastructure are likely to represent a larger proportion of total state greenhouse gas emissions than in other jurisdictions, as we have made significant progress in decarbonising our energy sector.

There is currently a lack of consistency in considering potential greenhouse gas emissions from infrastructure, or options to mitigate greenhouse gas emissions. There is a need for a more coordinated and consistent approach to understand, measure, reduce, and mitigate carbon across the asset life cycle (construction, operations, and use).

25. Recommendation:
Develop a South Australian infrastructure decarbonisation policy to manage greenhouse gas emissions across the asset lifecycle.

Lead agency: Infrastructure SA

Timeframe: Policy 0 to 5 years

3.1.2 Transport

Australia's transport sector includes all modes of travel through land, air and sea to move people and goods. Transport comprises Australia's third largest source of greenhouse gas emissions at 21% in 2023.[396] Since 2005, transport greenhouse gas emissions have increased by 19% and are projected to be Australia's largest greenhouse gas emission source by 2030.[397] To achieve net zero by 2050, Australia's current transport greenhouse gas emissions will need to decrease by over 80% in less than 30 years,[398] which will require a strong and coordinated focus. In South Australia, the challenge to decarbonise transport is even greater as it is our highest greenhouse gas emissions sector, creating 39% of the state's greenhouse gas emissions as shown in Chart 26.[399]

While greenhouse gas emissions from motor vehicles are expected to decline over time, as the fleet is gradually electrified, greenhouse gas emissions from trucks and aircraft are likely to continue to grow as shown in Chart 27. Population growth, rising incomes, commodity demand and online shopping are contributing to a forecast 26% increase in Australian freight volumes by 2050.[400]

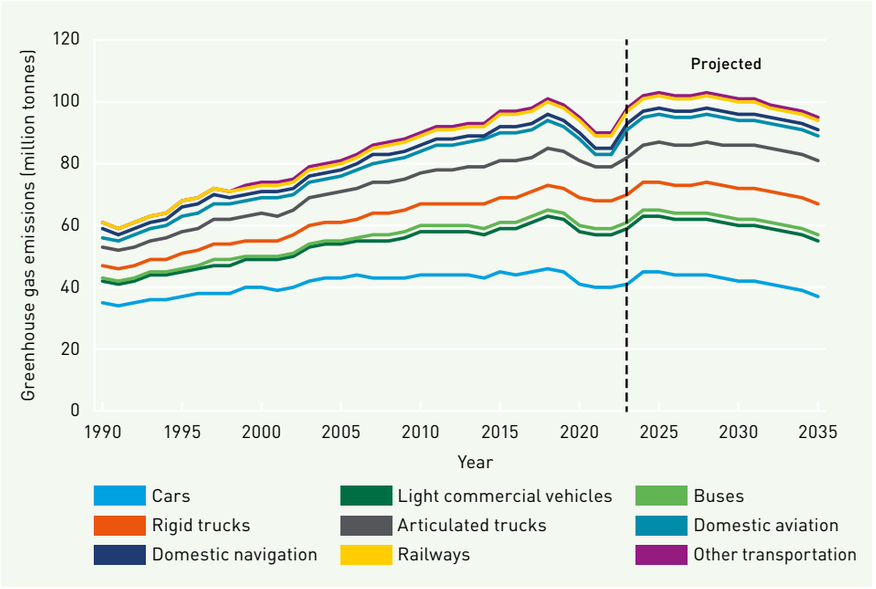


Chart 27:
Australia's greenhouse gas emissions by mode of transport, 1990–35[401]

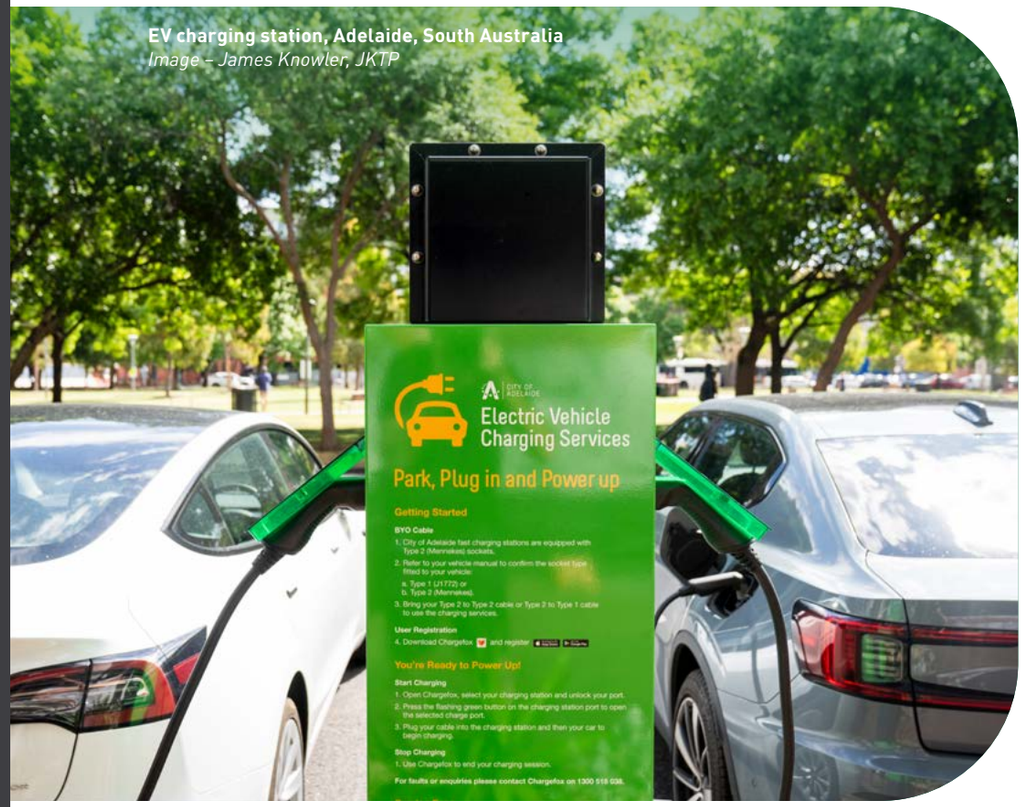
3.1.2.1 Passenger and active transport

In 2021, the average Australian passenger car and light sport utility vehicles released around 146.5 grams of greenhouse gas emissions, per kilometre.[402] In contrast, travel on public transport (metropolitan train, light rail and bus) released between 3 and 22 grams of greenhouse gas emissions per person, per kilometre.[403] Encouraging behavioural changes that support modal shifts away from the car and towards greater uptake of public and active transport will have a significant, immediate impact on reducing greenhouse gas emissions. It will also result in additional benefits such as improving air quality and avoiding road congestion.

Moving our public transport fleet towards no or low greenhouse gas emissions will further contribute to a decarbonised transport system. The Department for Infrastructure and Transport has committed to transitioning to a zero-emission public transport system by 2050.[404] Initiatives associated with this commitment are projected to result in a reduction to greenhouse gas emissions of 189 kilotonnes for buses and 123 kilotonnes of greenhouse gas emissions for rail[405] by 2035 from a 2022 base. Noting buses and rail make up a relatively low proportion of overall transport-related greenhouse gas emissions, as shown in Chart 27.

Good urban planning can play a role in reducing the need to travel by car. Urban design that provides pedestrian-friendly streetscapes and cycling infrastructure will encourage active transport. Ensuring integrated planning approaches adopt live local principles, such as locating employment and community facilities and services close to residential areas and increasing housing density around railway stations and bus stops will aid in shifting our reliance on the car and move us towards our net zero ambitions (refer to Outcome 1).

Adelaide Metro bus, South Australia
Image – James Knowler, JKTP



EV charging station, Adelaide, South Australia
Image – James Knowler, JKTP

3.1.2.2 Electric vehicles

Although active and public transport travel options will provide the lowest travel greenhouse gas emissions, the increased adoption of electric vehicles (EVs), especially when powered by renewable energy, will contribute to a reduction in greenhouse gas emissions from private transport. However, this transition is taking time, with EVs currently representing only 1% of the light vehicle fleet in Australia.[406] Forecasts indicate EVs are unlikely to dominate the road transport market for multiple decades.[407]

A range of barriers are cited as contributing to a slow uptake of EVs in Australia including upfront costs, driving range between charges, availability of charging infrastructure and charging times.[408] The issues identified with EVs are most significant for users of commercial and longer-range vehicles and lower income households; meaning that determining when and where the uptake of EVs will become widespread is uncertain.[409]

Notwithstanding the barriers, EV purchases in Australia have more than doubled in 2023, compared to 2022.[410] The introduction of the New Vehicle Efficiency Standard from 1 January 2025 is expected to increase the availability of new, cleaner, and cheaper-to-run vehicles.[411] Additionally, improvements in technology, the introduction of new models that have longer driving ranges, increasing consumer awareness of the environmental benefits of EVs and higher fuel prices are starting to drive an increased uptake of EVs.[412]

While most drivers of EVs will charge their vehicles at home for cost and convenience, greater uptake of EVs will require a roll out of charging networks across South Australia, with implications to our electricity network infrastructure. It has been estimated that whilst in use, residential EV chargers have the potential to double the electricity demand of a property.[413] From a network perspective, SA Power Networks forecast that by 2050, EVs will increase energy throughput on the distribution network by 50%.[414]

Project RAA Charge is significantly improving the availability of public EV charging stations across South Australia. RAA Charge is a collaboration between the RAA and the South Australian Government which has led to the installation of 140 public EV charging stations across the state, as shown in Figure 29.[415] The RAA Charge network consists of a number of charging stations including Destination (7 kilowatt), Rapid (150 kilowatt) and Ultra-rapid (200 kilowatt), with 75% of these charging sites located in regional areas.[416] Destination chargers can take several hours to fully charge a car, so they tend to be located at places like tourist parks and accommodation providers.[417] Rapid and Ultra-rapid chargers take between 15 to 45 minutes to fully charge and are located along major routes and in country towns.[418] In addition, the number of privately owned charging stations at shopping centres, key tourism sites, hotels, car parks, and petrol stations continues to increase.[419]

Random and fluctuating loads from rapid chargers and ultra-rapid chargers at public charging stations have the potential to pose significant impacts on power systems, compared to charging loads from workplaces and residential charging. These loads can be challenging to accommodate and are particularly a risk for regional and remote communities, which already have network capacity constraints.[421] The added challenges of electrifying farm machinery[422] and managing an influx of EVs during peak tourism periods, will increase the demand on the electricity network.

The impact of rapid and ultra-rapid chargers will need to be factored into future electricity grid infrastructure upgrades to accommodate growing EV energy demands.[423] However, in some regional and remote communities it is unlikely to be economic to upgrade the electricity network to support rapid and ultra-rapid charging, due to a low and dispersed residential population base.

Other mechanisms will need to be deployed for high tourism periods or in very remote areas to defer or circumvent the need for new electricity grid investments. This includes deploying batteries at substations to meet peak demand, with energy stored from lower-demand periods. In New South Wales, NRMA has also trialled standalone off-grid energy charging for EVs for remote areas, using a self-contained hybrid system that is substantially powered by solar, with backup generators for enhanced reliability.[424]

Figure 29:
RAA electric vehicle charging network, South Australia, as of August 2024[420]

Planning for the future EV charging network is required, to ensure the network has the capacity to cater for additional loads, enable management of dynamic loads and support optimal cost recovery for the necessary investments. A whole-of-state EV charging network plan is required, to provide clear load management, investment policies and support electricity grid stability. The EV charging network plan should also define technical standards to support interoperability across vehicles, charging systems and communication networks to reduce redundancy and improve efficiencies.

RAA EV charging station in Lyndoch, Barossa Valley, South Australia
Image – Martin Berry/Alamy stock photo

The case for change – In brief

EV charging creates an additional load on the electricity network which can have a significant impact, particularly in regional and remote communities with existing capacity constraints. Estimates indicate that residential EV chargers have the potential to double the electricity demand of a property.

Uncertainty in the scale and timing of EV uptake and the location of charging stations creates complexity and technical challenges for the electricity network.

State-level planning for the future EV charging network will help ensure the network has the capacity to manage additional loads, enable management of dynamic loads and support optimal cost recovery for the necessary investments.

26. Recommendation:

Prepare a state-wide electric vehicle charging plan that establishes the medium and long-term approach to charging infrastructure and associated network impacts.

Lead agency: Department for Energy and Mining

Timeframe: Policy 0 to 5 years

3.1.2.3 Freight and aviation

Short haul trips that cover tasks such as parcel delivery, waste-management collection, supermarket distribution and transport of materials cover approximately 51% of freight greenhouse gas emissions.[425] Logistics practices that manage supply chain movements using intelligent transport systems to identify optimal routes, scheduling deliveries at less congested times and consolidating trips can reduce the total amount of freight traffic and contribute to lowering greenhouse gas emissions.

Heavy and long-haul freight carried by rail has fewer greenhouse gas emissions than road transport. However, rail still relies heavily on diesel and services don't always align well with the path to market for commercial operations, requiring multi-modal solutions. For most non-containerised freight, road is the more cost effective and efficient path to market.

In Australia, key challenges and barriers to achieving decarbonisation of heavy and long-haul freight include long-route distances, a dispersed population and insufficient suitable charging infrastructure.[426] These factors increase the requirement for electric trucks to have a bigger battery which is costly and reduces the potential payload, providing further challenges in meeting our decarbonisation targets.[427]

The options for decarbonising the freight sector include transitioning to battery electric, hydrogen fuel cell or alternative low emission fuels. While these options are not yet commercially viable, industry is investing to improve technologies, with longer range battery and hydrogen fuel cell models becoming available.

In September 2023, the Australian Government also changed the national road vehicle standards in Australia to allow for an increase to the overall width limit from 2.50 to 2.55 metres for new trucks fitted with a number of specific safety features.[428] The move aligns Australian standards with those of major international markets. The State Government is also trialling changes to weight restrictions for low and zero emission heavy vehicles on pre-approved roads.[429]

While these initiatives are expected to accelerate the adoption of electric trucks[430] by enabling a greater choice of vehicle models, the heavier weight of these vehicles will mean there is more friction between tyres and roads, potentially resulting in a quicker deterioration of between 20% to 40% additional wear on roads.[431]

Liquid fuels are expected to remain the most commonly used fuels across the heavy freight, shipping and aviation industries due to the distances and given their high energy-density and convenience for handling and storage.[432] Newer generations of advanced biofuels and other sustainable fuels are projected to play a major role in decarbonisation of transport and can be produced from a broader range of feedstock than previous generations, including waste streams (refer to Outcome 1).[433]

Even if the fleet of road vehicles is transitioned to EVs, combustion engine vehicles will likely still be in use to 2040 or beyond, so low emission fuels can potentially play a role in decarbonising legacy vehicles during the transition toward zero-greenhouse gas emission technologies. Road transport biofuels can complement other low greenhouse gas emissions alternatives such as hydrogen and EVs. The Australian Government has an objective to establish hydrogen highways (hydrogen refuelling networks) for key freight routes that recognises the role of hydrogen in facilitating long-distance freight transport.[434]

The role of the State Government during this transition will be to continue to remain aware of private sector developments, market dynamics and emerging technologies. Collaboration with all key stakeholders, including industry and the Australian Government, will be required along with proactive planning to ensure infrastructure and regulatory regimes are available to support the transition at the right time, aligned with net zero commitments.

3.1.3 Homes

Residential buildings are responsible for more than 10% of total greenhouse gas emissions and consume around 24% of overall electricity use in Australia.[435] With more homes being built to support our growing population and a legacy of energy inefficient homes, a key pillar to achieving net zero by 2050 is minimising the energy demand and carbon footprint of housing.

3.1.3.1 Energy efficiency and technology

In 2024, the Australian Housing and Urban Research Institute found that over 70% of existing Australian homes have poor thermal performance and achieve a housing energy rating of three out of seven stars, or lower.[436] Improving energy efficiency in our homes has multiple benefits. It makes homes more comfortable, reduces energy bills and importantly, reduces greenhouse gas emissions and demands on energy infrastructure.

From 1 October 2024, all newly constructed homes in South Australia must achieve a minimum seven-star energy efficiency rating, an increase from the current six-star standard.[437] Strengthening energy efficiency requirements in a manner that is cognisant of affordability and in alignment with the national trajectory for low energy buildings[438] and changes to the National Construction Code[439] will support the transition to lower energy and carbon buildings. In tandem, encouraging low emission developments as part of the land use planning system will support lower carbon homes.

The legacy of existing homes also needs to be addressed by prioritising measures and incentives that encourage energy efficiency upgrades.[440] Policies that establish minimum energy efficiency standards for rental homes and social housing, and that mandate the disclosure of home energy ratings prior to sale warrant exploration, in alignment with national directions and frameworks.

Beyond efficiency improvements, the integration of rooftop solar, home batteries, smart meters, and demand management technologies are shifting how our homes consume and interact with energy systems. South Australia has seen a huge uptake of rooftop solar, around 411,000 small generation photovoltaic (PV) panel systems installed, as of September 2024.[441] Over the next 20 years, the continued emergence and integration of new technologies will shape how homes can optimise their energy use through managing demand and patterns of use. This will yield benefits in the home and support greater optimisation of existing energy infrastructure, reducing or deferring the need to invest in new infrastructure. South Australia's use of rooftop solar and home batteries (VPPs) is discussed in Outcome 1.

Residential rooftop solar panels, Adelaide, South Australia
Image – iStock/moissiyev

3.1.3.2 Role of gas and hydrogen

The transition to decarbonising homes is seeing a move towards greater electrification. However, as discussed in Outcome 1, the speed of transition towards electrification may vary between sectors. Labour shortages associated with electrification and renewable energy are forecast, with an estimated 85,000 additional electricians needed by 2050, with 32,000 of these required by early in the next decade.[442] It's important that alternatives, such as gas or low or zero carbon fuels, continue to be available so that households are not left behind.

Gas is currently a major energy source for South Australia, with around 56% of homes connected to the gas network[443] and residential customers account for around 40% of the state's gas consumption[444]. The ability of gas to provide reliable, affordable, flexible, and relatively low-carbon energy makes it an essential component of our overall energy transition strategy. South Australia has a significant gas infrastructure asset base comprising 8,661 km of mains.[445] Leveraging this network by continuing to use gas and transitioning to alternative low and zero greenhouse gas emissions fuels will help avoid the need for investment in new infrastructure and the associated greenhouse gas emissions.

The role of natural gas and understanding emerging opportunities such as green hydrogen, e-methane and other low or zero carbon fuels requires careful planning as part of the state's energy transition in alignment to net zero. Projects such as the Hydrogen Park South Australia are providing proof of concept for the role of hydrogen. Situated within the Tonsley Innovation District, the Hydrogen Park South Australia includes feeding a 10% hydrogen blend into the gas network, with plans underway to increase this blend in the future.[446] Overseas, researchers have been exploring green hydrogen blends of up to 20% and the viability of this for gas infrastructure and networks.[447] Locally, work undertaken to assess the feasibility of delivering 100% renewable hydrogen into South Australia's gas distribution networks shows it is technically feasible to use existing gas infrastructure for scaled hydrogen distribution.[448] Adapting existing natural gas infrastructure may reduce the need for investment in new hydrogen transmission infrastructure.[449]

The case for change – In brief

Gas will continue to play an important role in South Australia. The ability of gas to provide reliable, flexible, and relatively low-carbon energy makes it an essential component of our overall energy transition strategy.

Research indicates it is viable to use existing 8,661 km of gas networks for hydrogen blends in South Australia, creating an ongoing role for our existing gas infrastructure as we transition to net zero and decarbonise the network.

Leveraging our significant investment in the existing gas infrastructure network will reduce or defer the need for new infrastructure and achieve financial, time, and environmental benefits.

27. Recommendation:

Continue to leverage the existing gas infrastructure network while exploring options to decarbonise and utilise low or zero carbon fuels such as hydrogen.

Lead agency: Department for Energy and Mining

Timeframe: Policy 5 to 10 years

3.1.3.3 Building better

Opportunities for decarbonising homes need to extend beyond operational considerations such as energy efficiency and electrification. The use of passive design principles, low carbon materials in construction, better incorporation of circular economy principles, recycling of materials and designing with carbon footprint in mind will also contribute to greenhouse gas emissions reduction.

Ensuring land use planning and development adopts a focus on meeting net zero will also support better integration of low carbon homes and communities.

3.2 Shift to a circular economy

The transition to a circular economy will be crucial for ensuring a sustainable and prosperous future for South Australia. A study commissioned by Green Industries SA estimates that the adoption of a circular economy could create nearly 26,000 state-based jobs and reduce greenhouse gas emissions by 27%.[450] Adopting more circular approaches also presents opportunities to build South Australia's self-sufficiency, provide resilience benefits and act as a buffer against global supply chain disruptions. Capitalising on these benefits will require new innovations and infrastructure supporting circularity outcomes, such as circularity hubs and material reuse, repurposing, recycling facilities.

A more circular approach to our economy is one that shifts from a linear (make-take-dispose) approach to one that is regenerative and conserves resources by designing-out waste, keeping resources in use for as long as possible to extract maximum value, as shown in Figure 30.

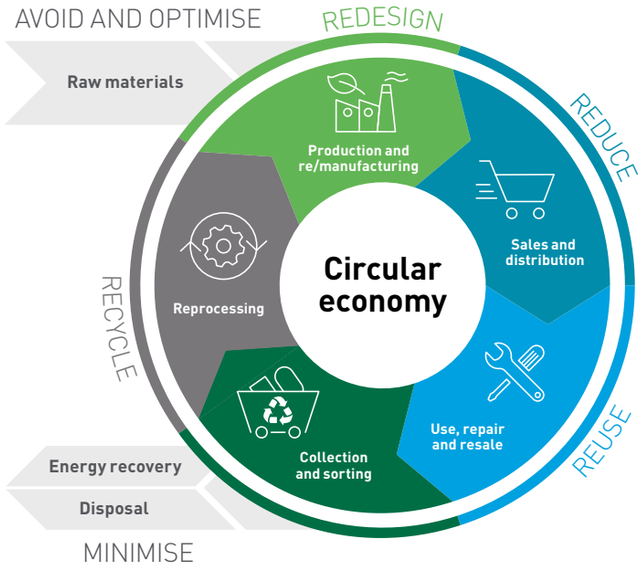


Figure 30:
Circular economy principles[451]

Recycling bins at the University of Adelaide, South Australia
Image courtesy of Motiv Brand Design

South Australia's Waste Strategy 2020–25 includes key guiding principles:

- Adopting the waste management hierarchy – avoid, reduce, reuse, recycle, recover, treat and dispose
- Applying circular economy and ecologically sustainable development principles
- No new landfills servicing the Adelaide metropolitan area and source separation of waste.[452]

South Australia has consistently led the nation in waste recovery and recycling rates, with a rate over 80% reported for 2020–21, which 92% of recovered materials were reprocessed within the state.[453] Our per capita waste generation has also decreased in recent years.[454] Whilst we have made in-roads to recovering and recycling our waste there is more to be done to move to a circular economy.

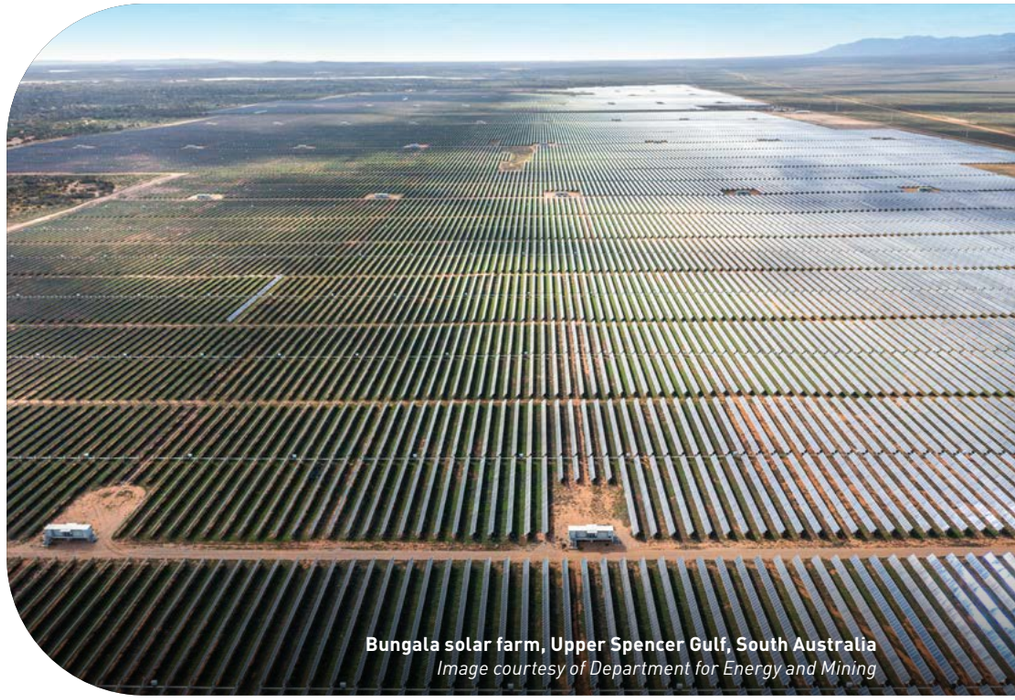
A lack of economies of scale and transport distances make waste reprocessing and recycling opportunities harder to achieve economically in regional areas. Recovery rate for kerbside waste in 2021–22 was higher for metropolitan councils (51%) than regional councils (40%).[455]

Supporting a circular economy has benefits in addition to helping meet net zero commitments, including creating new markets for recycled materials, promoting innovation in sustainable technologies and reducing dependence on scarce materials. Driving circular approaches at the outset of infrastructure planning and throughout design and delivery will better embed its consideration.

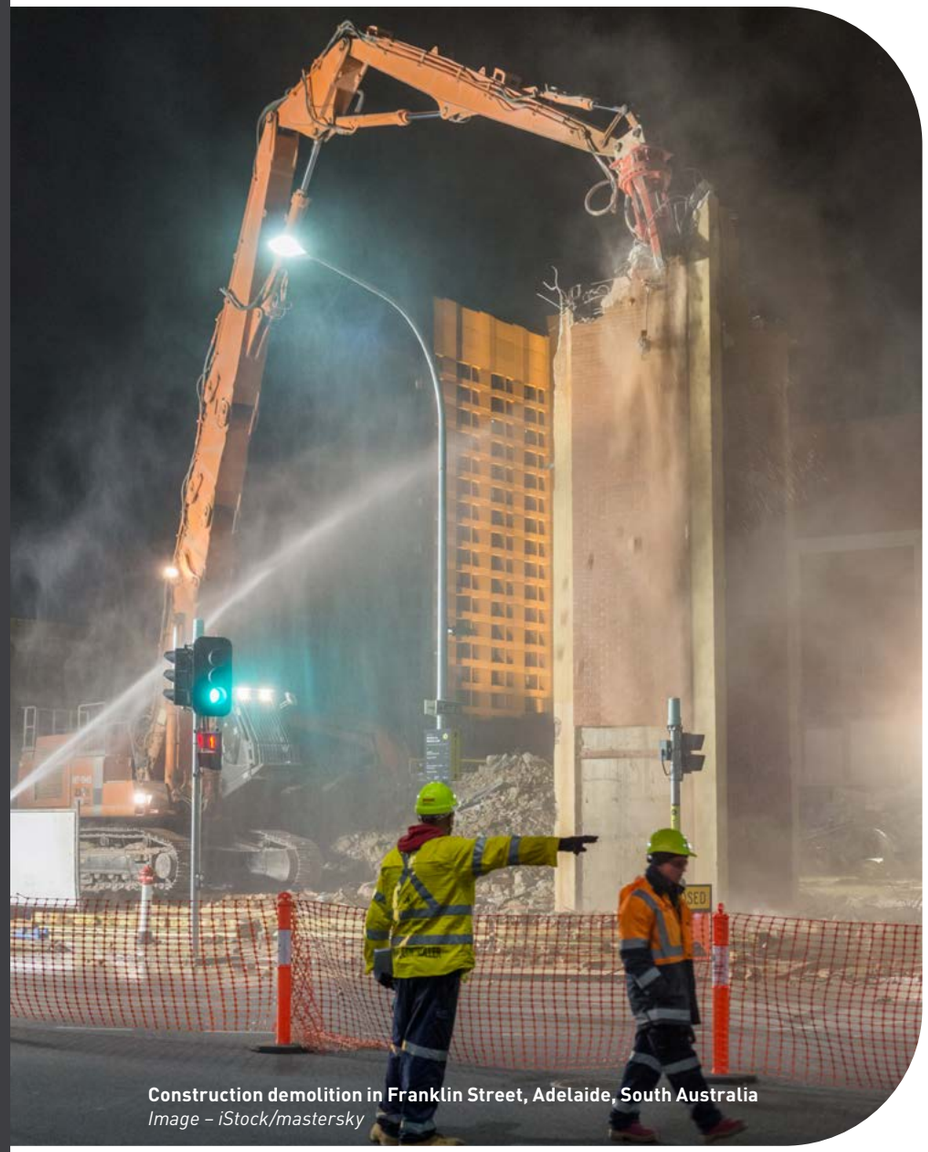
3.2.1 Renewables

The growing renewables sector is vital to a net zero future. However, Australia has only minor or zero processing capabilities for grid-scale infrastructure waste streams, which leaves a gap in managing an estimated 50,000 tonnes of solar PVs, 9,000 tonnes of wind turbines and 4,500 tonnes of battery energy storage systems per annum by 2050 in South Australia.[456] The uptake of home battery systems and EVs adds to this growing challenge, as does Australia's soaring use of lithium-ion batteries.[457] With very few examples of lithium-ion waste processing in Australia, currently only around 10% of lithium-ion batteries are recycled.[458]

Addressing the burgeoning waste challenge associated with renewables requires attention. Regulatory and policy level interventions, including stronger product stewardship at a national level are required. Actions that support the feasibility of reuse, repurposing and recycling facilities, addressing issues of scale, logistics and efficiency and that encourage end use markets will help in this regard. The establishment of release areas as part of the *Hydrogen and Renewables Energy Act 2023* (SA) offers an opportunity to strategically co-locate facilities such as industry, research, and other infrastructure to improve transport logistics, resource availability and achieve other synergies. Further work on material recovery facilities and locations to support managing the recovery and recycling of renewable waste streams is required.



Bungala solar farm, Upper Spencer Gulf, South Australia
Image courtesy of Department for Energy and Mining



Construction demolition in Franklin Street, Adelaide, South Australia
Image – iStock/mastersky

3.2.2 Infrastructure and building sectors

The infrastructure and building sectors produce significant volumes of waste, with the construction industry accounting for about 17% of Australia's total annual waste.[459] Increased focus on sustainability outcomes has driven improvements in the recycling and reuse of materials as part of delivering projects. However, industry cites barriers, including rigid technical standards and lack of incentivisation in procurement processes as hampering further innovation and uptake in this space. Where there is an economic return or incentive, high rates of recovery are being achieved, for example construction and demolition waste saw a recovery rate of 86% in 2021–22.[460]

The pillars of the circular economy are designing out waste and use of resources, designing for longevity, keeping materials in use for longer and designing to support recovery, reuse and return of materials to system at end-of-life.

For infrastructure, greater adoption of circularity principles in the planning and delivery of projects and as part of asset management practices is required. Embedding recognition of circular approaches in infrastructure business cases and as part of infrastructure design and option assessments will enable circular outcomes. Incentivising the use of recycled or alternative materials in procurement and addressing barriers as part of existing technical standards will continue to drive increased uptake, which in turn supports growth in local supply chains.

3.2.3 Waste to energy

As pathways for waste management, recycling and recovery continue to develop, waste to energy has a role to play in both our circular economy and energy future. Waste to energy offers an alternative waste management option, where wastes are collected, sorted and processed, and energy is recovered in usable forms including heat, steam or gas to generate electricity.

In 2020–21 about 308,000 tonnes of South Australian materials were estimated as recovered for energy, which represents a small proportion of total recovered volumes, at about 8%.[461] Advancements in technology and growing confidence in, and acceptance of, waste to energy, means it is likely to offer an increasingly viable option. Examples of this include SA Water using biosolids from their wastewater treatment plants to generate bio-methane that power turbines.[462]

South Australia's Department of Primary Industries and Regions' Forestry Renewables Roadmap aims to identify opportunities for capturing and processing forestry waste to generate renewable energy, as presented in the South Australian Wood Fibre and Timber Industry Master Plan. The 2021 South Australian Bioenergy Roadmap Program forecast potential bio-energy projects across the state could utilise more than 300,000 tonnes of organic material, reducing an estimated 80,000 tonnes of greenhouse gas emissions annually.[463] Case Study 8 provides further evidence for the benefits of converting forestry waste into electricity.

Tantanoola, Limestone Coast, South Australia
Image – Declan Hartley-Brown for South Australian Tourism Commission

Case Study 8

From wood waste to renewable electricity[464]

OneFortyOne, a forestry and sawmill business, is investing approximately $30 million into a renewable biomass power generation project at their Jubilee Sawmill in Mount Gambier, South Australia. The project will include the installation of a new boiler and steam turbine that will process wood waste to generate renewable electricity.

Following its expected completion in 2026, the project will generate more than enough electricity to power the entire Jubilee site. Annually, the project will generate around 44,000 megawatt hours (MWh) of renewable electricity, of which 20,000 MWh will be surplus to Jubilee site requirements. The surplus electricity will be returned to the grid or used for alternative electrification applications.

The project will assist OneFortyOne achieve reductions of approximately 50% in scope one emissions and 85% in scope two emissions (scope one and scope two emissions are from sources controlled or owned by an organisation). This will avoid the release of around 9,000 tonnes of greenhouse gas emissions, based on 2021 levels.

Generators powered by post-recovery waste can provide cost effective, low or near zero greenhouse gas emissions energy.[465] While these generators would be relatively small scale, they provide the type of energy needed to support system reliability and energy quality.[466]

There are several processes utilised for extracting energy from waste materials, such as gasification, incineration, pyrolysis, and anaerobic digestion (refer Box 6). These processes suit different waste materials and applications, produce different by-products and vary in energy generation efficiency and environmental considerations.

Box 6. Processes for extracting energy from waste

Gasification: materials are processed at 800 to 1,000°C through partial oxidation, producing combustible natural gas (or syngas), which can subsequently be burned to produce heat energy.[467,468]

Incineration: materials are processed at high temperatures with the presence of oxygen, producing heat and energy, and additional by-products.[469]

Pyrolysis: materials are processed at greater than 500°C without the presence of oxygen, producing combustible gases and bio-char, most of which can be condensed into a combustible liquid.[470]

Anaerobic digestion: microorganisms break down material in an oxygen-free environment, producing biogas high in methane, which is then used as a fuel source.[471]

Energy processes that generate useful by-products that can be further reused, better align to the desired outcomes of the waste management hierarchy and circular economy principles. For example, gasification is a waste to energy process that converts waste materials into a synthetic gas (syngas).[472] Syngas consists primarily of hydrogen and carbon monoxide, and smaller amounts of methane and carbon dioxide.[473] These gases can be further processed to produce economically valuable products such as electricity, high-quality hydrogen, hydrogen products and synthetic fuels.[474]

Future opportunities need to be consistent with circular economy principles and current South Australian Government policy, ensuring that options to avoid, reduce, reuse, and recycle have first been exhausted. In readiness, such considerations should include the policy and regulatory requirements that will drive the right outcomes and practical consideration of needs and implications such as siting and logistics. Ensuring the community is engaged in these discussions is essential.

The case for change – In brief

Waste to energy offers an alternative waste management and recovery option where energy and by-products are recovered in usable forms. Processes such as gasification better align with circular economy principles.

Generators powered by post-recovery waste can operate in a manner that helps to balance the intermittent nature of renewables and increase energy system stability.

28. Recommendation:

Consider the role of waste to energy as a viable option, aligned with circular economy principles.

Lead agency: Green Industries SA

Timeframe: Policy 5 to 10 years

3.3 Infrastructure sustainability and resilience

3.3.1 Sustainability

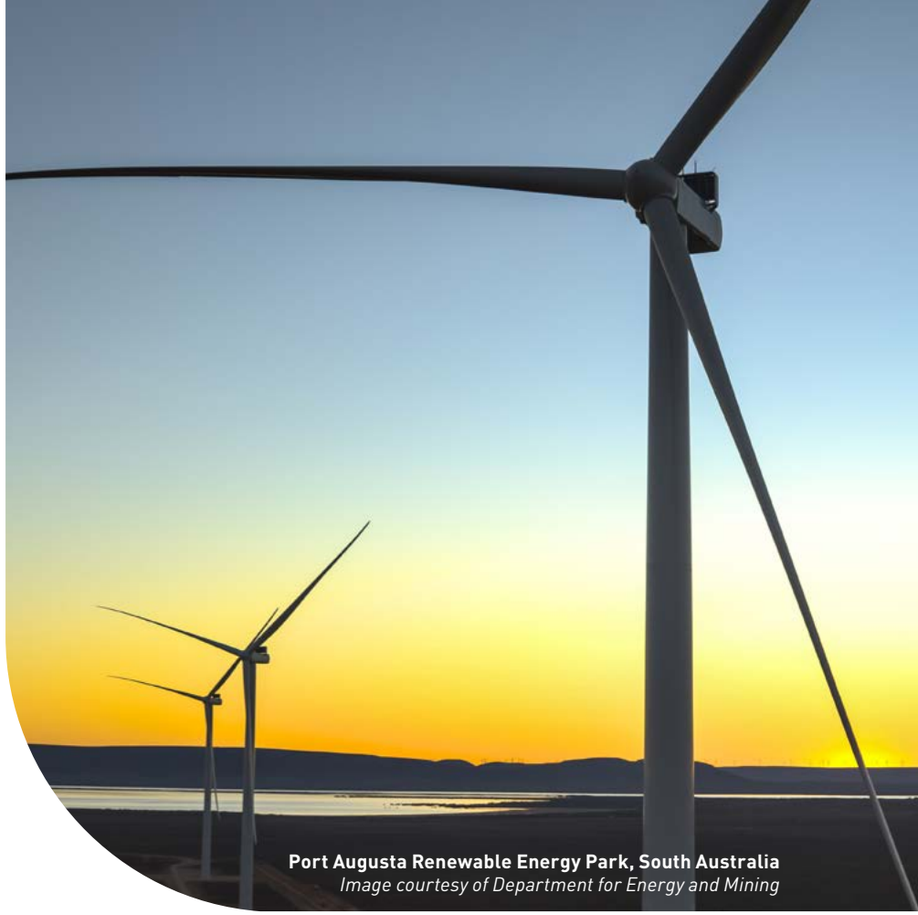
With a growing global focus on sustainability, beyond just net zero, there is an increasing expectation that infrastructure decisions incorporate approaches to mitigating climate change, protecting the environment, valuing nature, protecting culture and supporting equitable social outcomes. Demonstrating alignment with these outcomes is increasingly a focus for accessing capital, including as part of a growing green and sustainability bond market.

Addressing environment, social and governance (ESG) requirements (refer Box 7) is an evolving imperative, driven by increasing corporate responsibility requirements, stakeholder expectations and the financial risks of inaction.

Box 7. Environment, social and governance requirements

ESG is best characterised as a framework to assess and communicate to stakeholders and investors how environment, social and governance risks and opportunities are being managed with clear reporting and disclosure of performance outcomes.[475]

Sustainability is widely accepted as operating in a way that meets the environmental, social, and economic needs of the present without compromising the ability of future generations to meet their own needs.



Port Augusta Renewable Energy Park, South Australia
Image courtesy of Department for Energy and Mining

South Australia has shown leadership across a number of these fronts, including reducing greenhouse gas emissions through renewable energy generation, progressing a circular economy and taking steps to tackle biodiversity loss and pollution. Despite this, State of the Environment reporting shows trends for climate-driven impacts across several environmental indictors are worsening.[476] This signals that more needs to be done to value and protect our environment, including as part of infrastructure planning and delivery.

There are sustainability and resilience opportunities to be harnessed through improved recognition and incorporation of Aboriginal knowledge. As the original custodians of this land, First Nations people offer important insights. Embedding early and genuine engagement as part of infrastructure planning to support the exploration of more Aboriginal-led partnership opportunities will allow input into decision making, protection of heritage and culture and identify opportunities for employment and economic participation.

Banrock Station Wine and Wetland Centre, Riverland, South Australia
Image – Accolade Wines for South Australia Tourism Commission

3.3.1.1 Incorporating sustainability

There are increasing expectations to adopt comprehensive, globally-consistent sustainability disclosure and reporting standards aligned with strong ESG frameworks and systems.

For South Australia, to achieve our economic aspirations and leverage our competitive advantages, we will need to clearly demonstrate and verify our ESG credentials. The ability to attract funding and finance for infrastructure investments and to compete on the global market with our exports is requiring a stronger focus on ESG risks and opportunities and transparent disclosure of performance. Our own stakeholders and community are expecting a greater focus on sustainability and improved transparency aligned to the State Government's ESG commitments.

There is also recognition that sustainability-related claims need to be coupled with solid performance and based on strong evidence. The Australian Securities and Investment Commission has recently taken a firm stance on monitoring and penalising unsubstantiated or misleading claims, often referred to as 'greenwashing'.[477] A senate inquiry has also been launched by the Australian Government with focus on the prevalence and impact of misleading environmental and sustainability claims being made by industry.[478] In this context, ensuring strong and robust processes and frameworks are in place to verify, audit and substantiate sustainability performance are critical.

The investment scale, lifespan, and the impact of infrastructure, positive or negative, means there is a need to explicitly consider whole-of-life sustainability outcomes.[479] Incorporating ESG approaches in infrastructure decision-making adds to a holistic understanding of risks and opportunities and can improve long-term value.[480]

Managing ESG risks and leveraging opportunities across the asset lifecycle requires new ways of operating and systems, processes and capabilities to address sustainability and emerging obligations.[481] The adoption of industry-standard sustainability metrics will improve asset performance and investment attraction.[482] These systems and metrics objectively measure and enable consistent reporting of sustainability performance, driving improved outcomes across aspects like carbon and resource efficiency.[483]

Investors are increasingly following more ethical or sustainable options and a growing number of green and sustainability bonds are being issued. Both the Australian and South Australian governments have recently released Sustainability or Green Bond Frameworks, which are expected to broaden the investor base and make an important contribution to financing infrastructure in future, where sustainability is aligned to issuance requirements. Case Study 9 provides further insight on how these frameworks operate.

Increasing expectations and requirements for sustainability reporting has seen proliferation of tools and standards, including the widely adopted Global Reporting Initiative, the UN Global Compact and the Equator Principles, frequently used in project finance. There are also multiple benchmarking and rating tools, including tools with an infrastructure focus. The recent introduction of the *Treasury Laws Amendment (Financial Market Infrastructure and Other Measures) Bill 2024* means that as of 1 January 2025, Australian entities within scope are now required by law to report climate-related financial disclosures.

The South Australian Government has committed to preparing a South Australian Government Sustainability Report, to support its climate-related disclosures and provide transparent reporting of its broader ESG commitments and actions. Currently, there is no South Australian whole-of-government position or clear guidance on the application of sustainability frameworks, tools or reporting requirements for infrastructure projects to balance ESG objectives. Across public infrastructure, consistent and transparent reporting of sustainability objectives, targets and outcomes is limited. Having a clear sustainability framework will support consistent approaches for the identification of targets and reporting performance in support of broader government ESG aspirations.

In 2019, Infrastructure Australia highlighted the benefits of adopting sustainability enhancing approaches to infrastructure assets, as well as the associated risks of inaction, providing advice on how they consider sustainability in their assurance framework.[486] Requirements for implementing sustainability standards are being progressed in other jurisdictions – Infrastructure WA and Infrastructure NSW have both recommended incorporating sustainability considerations in infrastructure decision making.

Case Study 9

South Australian Government Financing Authority's Sustainability Bond Framework[484]

In November 2023, the South Australian Financing Authority issued its Sustainability Bond Framework informed by the International Capital Market Association Green Bond Principles, Social Bond Principles and Sustainability Bond Guidelines.

The framework outlines how the South Australian Government mobilises funds raised in the debt capital markets to strengthen the state's resilience and prioritise social, environmental, and human capital outcomes. It also recognises the need for transparency regarding how government finance contributes towards achieving a sustainable and equitable future. An inaugural $2 billion fixed rate Sustainability Bond was issued in March 2024 under the Framework.[485]

The framework is complemented by South Australia's Environmental, Social and Governance Commitments. These are aligned to the United Nation's Sustainable Development Goals and provide information on the government's current key policy initiatives and actions that contribute to environmental and social outcomes. Through these evolving reporting mechanisms, global stakeholder requirements continue to be met.

Around Australia, major projects are increasingly using sustainability rating tools to guide infrastructure planning and design and to address community and funding expectations. These tools provide robust processes, governance systems and frameworks to embed sustainability, drive innovation and value and provide validation of outcomes aligned to disclosure expectations.

More than ever, infrastructure planning and decision making needs to identify and balance environment, social and economic outcomes to support a sustainable and equitable future for generations to come. The inclusion of sustainability outcomes as part of whole-of-life infrastructure management will drive outcomes aligned to various state, national and international commitments including greenhouse gas emissions reduction, environment protection and advancing social outcomes in a value-for-money way. Consistently including environmental and social aspects and values in decision-making, as is beginning to occur for carbon, will ensure these matters are better addressed.

Green structures in Festival Plaza, Adelaide, South Australia
Image – James Knowler, JKTP

Embedding sustainability outcomes through a formal ESG approach and framework adds discipline and transparency and will help support improved investment attraction, asset management, resilience and broader environment protection and decarbonisation objectives with value-for-money outcomes. Adoption of governance systems and frameworks aligned to sustainability standards will support readiness for disclosure expectations as these increasingly move to become mandatory reporting requirements.

The case for change – In brief

To achieve South Australia's economic aspirations and leverage our comparative advantages in a global market, we need to clearly demonstrate and verify our environmental, social, and governance credentials.

There are increasing expectations and requirements for improved sustainability performance and reporting, to enhance transparency and accountability from infrastructure projects. Improved transparency will also help us attract finance for infrastructure investments including from the growing green and sustainability bond markets.

Currently there is no guidance on sustainability standards and performance reporting for government infrastructure projects. The inclusion of sustainability outcomes in infrastructure projects and performance reporting will help drive outcomes aligned to greenhouse gas emissions reduction, climate risk management and environment protection. It will also support readiness for disclosure expectations, as they move to become mandatory reporting requirements.

29. Recommendation:

Develop an Infrastructure Sustainability Framework that provides guidance on incorporating sustainability standards and reporting across all stages of the infrastructure lifecycle.

Lead agency: Department of Treasury and Finance

Timeframe: Policy 0 to 5 years

3.3.1.2 Valuing natural capital and culture

3.3.1.2.1 Natural capital

Natural infrastructure and systems, including the resources and services they provide, form the foundation of our economy. Our environment supports everything we need to survive, grow and prosper. Our own health and wellbeing are intrinsically linked to the health of the environment and its ecosystems.[487]

While infrastructure has many positive benefits for society and the environment, it can also impact the environment directly or indirectly through clearance and habitat loss, land-use change or practices, pollution, or poor waste management. Increasing resource use and extraction, population growth and climate change all present threats to our natural systems and biodiversity.

The outcome is that our natural systems and the functions they support are declining.[488] Across the globe, it is estimated that at least 1 million species, or 1-in-8, are now threatened with extinction.[489] In South Australia we have around 20,000 marine and terrestrial species, with over 1,100 of these species listed as threatened with extinction.[490] These losses have significant implications on the health and wellbeing of our communities, our environment, our economy and future generations.[491]

Remarkable Rocks boardwalk, Kangaroo Island, South Australia
Image – Frame for South Australian Tourism Commission

It is estimated that half of Australia's GDP, or $892.8 billion, has a moderate to very high direct dependence on nature, meaning that impairments of ecosystem services affect our economic performance and prosperity.[492] South Australia's economy is dependent on the environment, with our primary industries and resource sectors contributing almost $14 billion gross value add, or 10.4% to our GSP in 2022–23.[493]

The economic and social risks of impacts to nature are increasingly becoming a greater concern nationally and globally, requiring a renewed focus from governments. In 2022, Australia became a signatory to the Kunming-Montreal Global Biodiversity Framework, which sets out targets to be achieved by 2050, including increasing areas for conservation and reversing biodiversity loss. It sets out an ambitious pathway to reach the global vision of a world living in harmony with nature by 2050.[494]

At a national level a range of Nature Positive law reforms are underway to support better protection, conservation, repair, and regeneration of the environment.[495] In South Australia, the government is progressing the development of a new Biodiversity Act that is expected to provide clear targets and requirements for protecting and conserving nature and biodiversity.

There is a growing recognition of the need to address and account for nature in decision making and public reporting. The global Taskforce on Nature-related Financial Disclosures has developed a set of disclosure recommendations and guidance for all sectors which are structured around four pillars with metrics and targets: governance; strategy; risk; and impact management.[496] The recommendations have started to be integrated in international sustainability reporting standards.[497] Looking forward, it is likely they will be embedded in Australian legislation through Australian sustainability reporting, as has occurred for the recently legislated climate-related financial disclosures.

Balancing the benefits of renewable infrastructure whilst reducing environmental impacts needs to be considered as part of project siting, planning and delivery. For example, the deployment of large-scale solar PV and wind electricity generation infrastructure will require significant amounts of land area. On average, solar farms require approximately two to three hectares of land per one megawatt (MW) of power generation.[498] To reach 2050 decarbonisation targets, South Australia's utility solar total installed capacity will need to increase from the current 700 MW to 4,900 MW.[499] This increase to 4,200 MW will require an area equivalent up to eight times the City of Adelaide.[500] Case Study 10 provides an example of solar farm land requirements.

Case Study 10

South Australia's Robertstown East solar project[501]

The Robertstown East solar project is a 300 MW solar farm located 115 km north-east of Adelaide, which is currently seeking development approval. The project requires 630 hectares of land and once operational will transport electricity to the grid through overhead transmission lines and underground cables.

If approved, the project will supplement the previously approved Robertstown 200 MW solar farm and 1,250 MW/500 MWh battery energy storage system, which combined require 1,800 hectares of land.

In total, the three projects require approximately 2,400 hectares of land, an area equivalent to around one and a half times the City of Adelaide.[502]

It should be noted that as more desirable sites for renewable energy projects are utilised, remaining land may have reduced resource availability. For example, wind farms located on lower ground may require the turbines to be spread across a larger geographical area to produce the same energy as a more optimal site on a hill. In addition, sites further from the network may require additional land for transmission infrastructure.

Harnessing opportunities from the global green transition will also require increased extraction of resources such as copper, magnetite, and water. Greater resource extraction and processing brings environmental considerations and impacts to be managed.

Ensuring natural capital and environmental values are identified and valued at the outset of infrastructure planning is critical. Embedding these values in decision making, supported by clear targets and actions to avoid, protect and restore will contribute to better outcomes. Equally important will be measuring, prioritising, and reporting on impacts aligned with increasing requirements for disclosure of nature-related dependencies, risks, and opportunities.

3.3.1.2.2 Cultural wisdom

Aboriginal peoples' spiritual, social, cultural, and economic practices are intrinsically linked to their lands and waters.[503] Incorporating and valuing Aboriginal knowledge provides unique insights for understanding sustainable management. It also brings distinctive histories and perspectives which can improve outcomes and provide insights into more sustainable and resilient approaches.[504]

The National Agreement on Closing the Gap is underpinned by the recognition that when Aboriginal people have a genuine say in the design and delivery of policies, programs and services that affect them, better life outcomes are achieved. South Australia's Implementation Plan for the National Agreement on Closing the Gap has been developed by the South Australian Government to support the reforms needed to progress the Closing the Gap targets and outcomes.[505] It has also established the South Australian First Nations Voice to Parliament to enable more informed and inclusive decision making on matters that impact on the lives and the well-being of our Aboriginal community.

Infrastructure has an important role to play. Access to infrastructure and its associated enabled services are critical for addressing the prevailing socioeconomic, education, health, and wellbeing challenges within the South Australian Aboriginal community. Disparities with housing, healthcare, digital technology, energy, and water remain. There is a continued need to focus on improving standards, led by Aboriginal voices and engagement. Infrastructure can also connect Aboriginal people to their family, community, and support connection to Country, culture, and ancestry.

Cultural heritage places and sites provide important links to culture, community, and identity. Since colonisation, there has been a significant and ongoing loss of Aboriginal cultural knowledge and the destruction of cultural heritage sites. The impacts of colonial expansion and expropriation of land and resources continue to be felt by Aboriginal Australians.

The building and operation of infrastructure has played a part in this loss, with a profound impact on Aboriginal community identity, well-being, and connection to land. There is growing recognition on the need to protect cultural sites, not only for cultural preservation but as part of acknowledging and understanding Australia's rich history and the promotion of reconciliation efforts.

Iga Warta Tours, Northern Flinders Ranges, South Australia
Image – John Montesi for South Australian Tourism Commission

Internationally, the importance of incorporating Indigenous people's rights and interests in decision making is well recognised. International instruments such as the United Nation's Declaration on the Rights of Indigenous Peoples enshrine requirements which provide all peoples the rights for self-determination and the pursuit of economic, social, and cultural development.[506]

Clear and actionable policies and processes to mitigate the impact of infrastructure delivery and operations on culture and cultural heritage are critical. Early and genuine engagement to support Aboriginal-led input that identifies needs, opportunities and actions are required.

The development of the *Hydrogen and Renewable Act 2023* (SA) included the establishment of a dedicated forum to garner early input from Traditional Owner and Native Title group representatives, as demonstrated in Case Study 11.

South Australian Aboriginal Renewable Energy Forum[507]

Case Study 11

Development of the state's renewable energy resources will impact on Aboriginal Country and people's spiritual and cultural connections with land and waters.

To ensure that Aboriginal views and perspectives were at the forefront of planning for the new *Hydrogen and Renewable Energy Act 2023* (SA), a dedicated forum was established to ensure renewable energy projects would deliver benefits for Aboriginal people, all South Australians, and the environment.

The South Australian Aboriginal Renewable Energy Forum brought together government representatives and Aboriginal groups and representatives from across South Australia based on a shared commitment to work together early; avoid and manage impacts to Country; and identify benefits from the outset.

Infrastructure projects offer opportunities to advance the goal of self-determination for Aboriginal South Australians. Improving engagement and building stronger partnerships as part of infrastructure planning and delivery offers opportunities to deliver real and lasting benefits. Investments in employment and economic participation opportunities and exploring new ways to incorporate Aboriginal-led partnerships offer benefits aligned to the Closing the Gap outcomes.

Best practice approaches for incorporating Aboriginal culture and knowledge are those that include early and meaningful engagement, foster mutual respect through genuine partnerships and include real opportunities to influence decision making. Embedding cultural protocols and exploring opportunities for co-management and partnerships can help ensure that Aboriginal perspectives are valued and integrated into decision making over the long term.

The case for change – In brief

Infrastructure has positive benefits but can also impact the environment through clearance and habitat loss, pollution, or poor waste management. In recognition of the need to protect and conserve nature and biodiversity, both the Australian and South Australian Government are progressing legislative reforms that will likely require greater consistency and transparency on decision making and drive requirements for clear targets and reporting.

There is a growing need to address and account for nature and cultural values in infrastructure decision making and public reporting, which can be facilitated at the outset of infrastructure decisions through more integrated assessments in business cases.

30. Recommendation:

Update Business Case requirements to ensure that environmental and cultural values are consistently accounted for and included in decision making.

Lead agency: Infrastructure SA

Timeframe: Policy 0 to 5 years

3.3.2 Resilience

Disruptions to our infrastructure can have significant impacts on our community, economy, and the environment. Disruptions can arise from natural disasters, extreme weather events, pandemics, cyber or security threats or longer-term stresses including the impacts of climate change. We are already seeing the effects of climate change and increasing natural disasters. For South Australia, the total economic cost of natural disasters between 2020 and 2060 is projected to be $31 billion under a medium greenhouse gas emissions scenario.[508]

The consequences of large system failures and lack of resilience can be significant. The estimated cost to South Australia from the state-wide blackout in 2016 was in the order of $367 million.[509] In 2022, flooding in the northern parts of the state damaged key rail infrastructure and resulted in major supply chain disruptions, including a 24-day outage of key east-west routes limiting delivery of consumer goods to Western Australia. Estimated costs to the national economy were in order of $320 million.[510]

At both a national and state level, there has been a growing focus on the importance of improving resilience, with multiple activities underway to better understand risks and identify priority actions. To enhance the preparedness and resilience of the state's critical infrastructure, the South Australian Government has released the South Australian Critical Infrastructure Resilience Strategy. It has also commissioned a state-wide climate change risk assessment.[511] The outcomes include identifying risks that need action in the next five years to reduce the impacts from long-term climate change across the natural, built, economic and social domains. Identified areas of risk for the infrastructure domain requiring focus and action include transport and supply chain logistics and water resources and availability.[512]

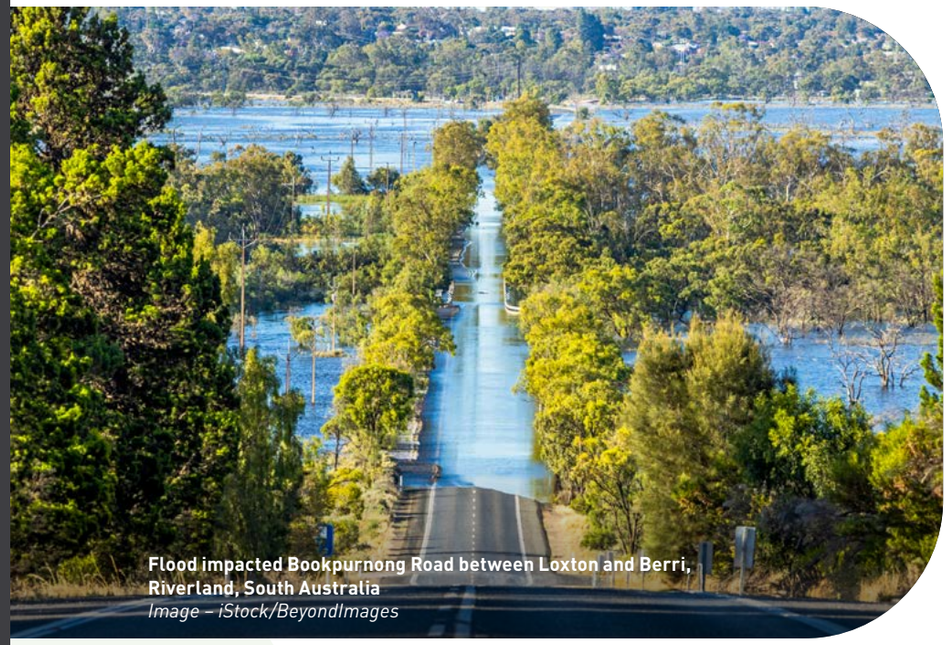
3.2.2.1 Supply chain resilience

Understanding risks and vulnerabilities associated with supply chains is an important area of focus, given the central role they play for the economy. The Australian Government's review of road and rail supply chain resilience examined the risks faced to critical road and rail freight routes, including those that transport large quantities of freight or are critical to supplying essential goods or services.[513] The review found that, while Australian road and rail supply chains have been flexible and adaptable in response to disasters, there are areas of vulnerability and areas for lifting resilience in the face of changing risks.[514] The National Freight Resilience Review highlighted the cost of disruption to South Australia was nearly $240 per tonne[515], due to the large distances freight need to be diverted in the event of disruption to our network. In comparison, the cost of disruption to New South Wales, Queensland, and Victoria ranged from $2 to $15 a tonne.[516]

Flood impacted rail line in outback South Australia
Image courtesy of Australian Rail Track Corporation (ARTC)

For South Australia, whilst many key freight routes were assessed as having a low vulnerability rating, there were also routes assessed with high or very high vulnerability ratings.[517] These routes typically had a higher likelihood of a risk occurring and higher consequences related to those risks, with less adaptability to respond to disruptions. For some routes, such as the Eyre Highway, whilst they showed very low to low impacts, the cost of detouring freight was high.[518]

The Department for Infrastructure and Transport has developed South Australia's Freight and Supply Chain Strategy which recognises resilience and redundancy as a strategic response area and includes actions for future initiatives as part of an implementation plan.[519] Implementation of the strategy will support the identification of vulnerabilities and prioritisation of improvements across the network. In assessing improvements and responses, actions that build redundancy without significant investment should be considered. Options such as enabling the use of alternate freight routes during disruptions, by having in place gazetted pre-approvals that can be enacted under special circumstances, warrant investigation with consideration of costs, safety and feasibility.



Flood impacted Bookpurnong Road between Loxton and Berri, Riverland, South Australia
Image – iStock/BeyondImages

3.3.2.2 The natural and built environments

Natural and climate change hazards have the potential to threaten key infrastructure across the state. Flooding is one of South Australia's most costly natural disasters with average annual losses exceeding $32 million.[520] As the extent and frequency of coastal flooding increases, so does the impact to buildings and infrastructure.[521] Future sea-level rise and climate modelling scenarios show much of the state's coastal areas will be inundated with coastal flooding, with the City of Port Adelaide Enfield council area widely impacted.[522]

To facilitate long-term coastal adaptation planning for South Australia, the government is proposing to assess the risks to key coastal assets, human settlements and coastal environments under a changing climate.[523] A government strategy that considers all hazards under a changing climate is proposed to be developed, to ensure our state-wide critical infrastructure is resilient to these hazards.[524]

Despite greater upfront expense, resilient infrastructure delivers long-term value.[525] A focus on preparedness, collaboration and information sharing across sectors will also contribute to better planning and improved reliability of services essential for the South Australian community. Resilience thinking and planning for new infrastructure needs to specifically consider natural hazards and climate change risks and should be explicitly embedded as part of risk management and strategic asset management, informing long-term investment needs and decision making.[526]

A recent review of climate change risk management practices across the South Australian Government found whilst agencies recognised the need to consider climate change, most were in the early stages of adopting good practice and more needed to be done to demonstrate effective climate risk management.[527] Effective resilience planning should address criticality and levels of services to support the identification and prioritisation of responses, including adaptation needs and interventions. Business cases for public infrastructure investments should articulate how resilience has been considered.

3.3.2.3 Community and planning

Building infrastructure in places that are less exposed to threats and hazards supports overall community resilience. Integrated and strategic land use planning needs to adequately address resilience risks, through appropriate zoning and policies, or ensuring that risks can be mitigated to an acceptable level, in a cost-effective way. State Planning Policy 5: Climate Change sets out that development should be avoided in hazard-prone areas. The Department for Housing and Urban Development is progressing new bushfire and flood hazard mapping work to inform better decision making.

Green and blue infrastructure, including trees, parks, gardens and waterways, together with other nature-based infrastructure, play a vital role in supporting resilience and community wellbeing. A lack of a consistent approach to valuing the benefits of green and blue infrastructure means it is often overlooked or undervalued as infrastructure and not quantified or included in decision making.[528] There is a need to better recognise the role and value of green and blue infrastructure in a more systematic way, including through incorporating consistent values in decision making and cost benefit analysis.

In our urban and built environment, initiatives such as the Urban Greening Strategy for metropolitan Adelaide provide a direction, pathway, and actions for valuing the importance of greening and tree canopy, mitigating impacts such as urban heat islands, and building resilience. Such strategies need to balance the installation of greening with achieving asset clearance and protection needs for both aboveground and underground infrastructure.

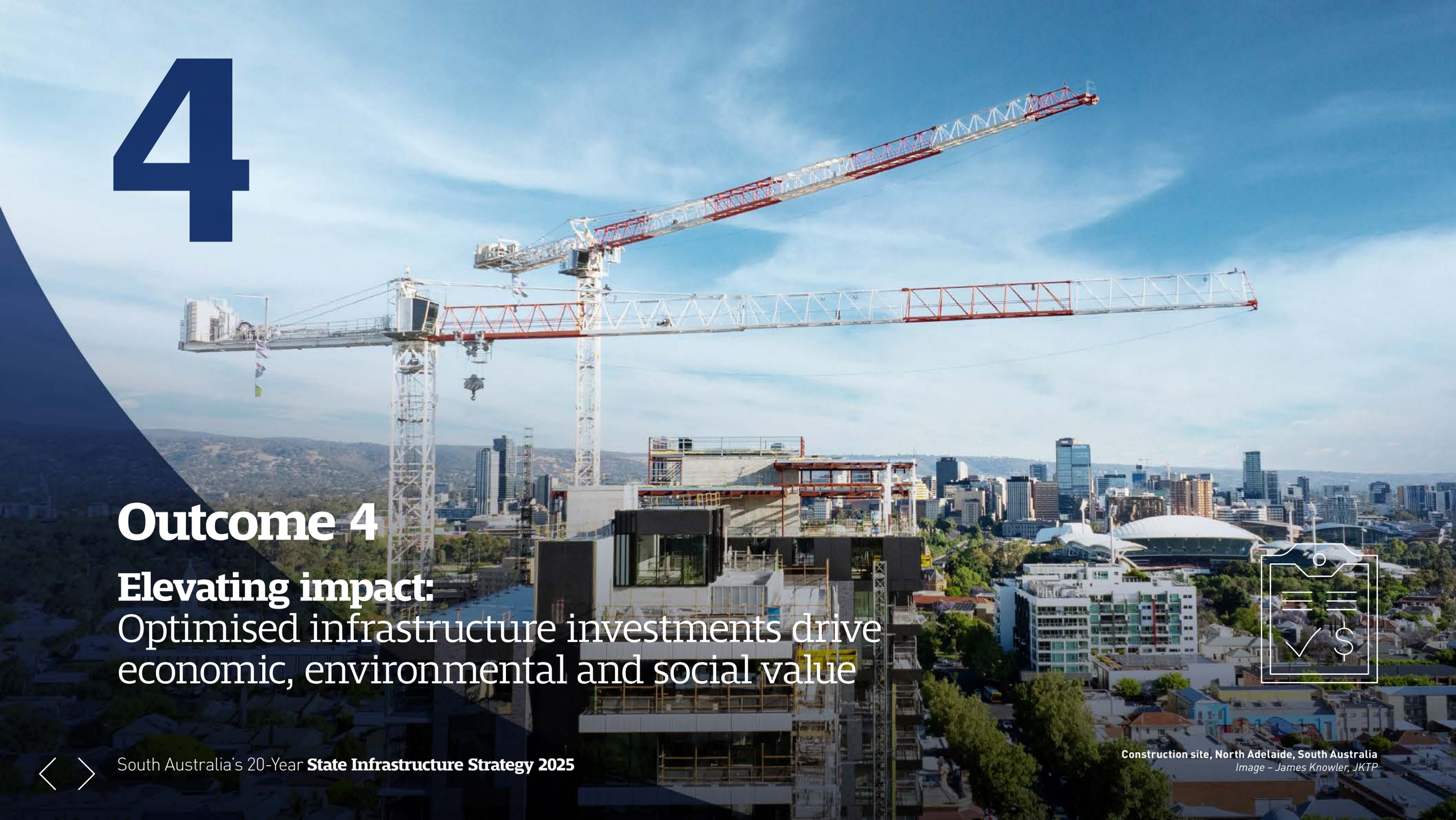
The infrastructure built now will provide services to communities for many years to come and needs to be able to respond to a changing risk landscape. Ensuring resilience is explicitly covered in whole-of-life infrastructure planning and decision making will improve the resilience of services and reduce costs over the long term.

Pakapakanthi / Victoria Park wetlands, Adelaide, South Australia
Image – James Knowler, JKTP

4

Outcome 4

Elevating impact:
Optimised infrastructure investments drive economic, environmental and social value



Construction site, North Adelaide, South Australia
Image – James Knowler, JKTP

South Australia's announced forward program of infrastructure investment is ambitious, with record levels of investment. Since the release of the 2020 Strategy in May 2020, the Government's infrastructure spend has grown by $13.7 billion[529] and is estimated to reach a total of $25.6 billion over the four-year period from 2024–25 to 2027–28[530].

Our historical investment program has averaged around $2.55 billion per annum over the last ten years to 2024–25 and is forecast to grow to an average of $5.44 billion per annum by 2027–28.[531] Additional demand created by non-government infrastructure projects from the energy, mining, and defence sectors further adds to the pipeline and creates pressure on limited resources, including labour.

To enable economic growth, support the transition to net zero, and meet the needs of a growing population, we will need to continue to invest in new infrastructure and to optimise the use of our existing infrastructure over the next 20 years. To make the most of our asset base we need to be strategic about how we manage our infrastructure, ensuring we have a clear view of the condition and performance of our assets and the ability to assess and plan for future needs from a whole-of-life perspective.

South Australia is not unique with our extensive infrastructure pipeline, with major public infrastructure spend across Australia valued at $213 billion for the period 2023–24 to 2027–28.[532] Across Australia, high levels of infrastructure investment are testing the limits of the infrastructure sector's existing capability and capacity, challenging project timeframes and driving up costs.[533] In a competitive national environment, industry will choose to respond to the opportunities that offer the greatest certainty and optimal returns on their investment of time and resources. To get the most from our infrastructure investments, South Australia needs to be a place where industry wants to do business. Key to this is strategically prioritising our investments, with robust options analysis and business cases to inform decisions, alongside consideration of optimal timing to manage risks and deliver value-for-money for the state.

Water pipe in regional South Australia
Image courtesy of SA Water

The construction industry is challenged by a declining rate of productivity, which fell almost 8% from 2001–02 to 2021–22.[534] This inhibits the sector's ability to deliver projects on time and budget[535], affects profitability and adds more fiscal pressure to state governments. In the face of continuing increases in demand for infrastructure and fewer workers, new ways to increase construction productivity will be needed.[536] The emergence of new technologies, leveraging data to aid in decision making, modern methods of construction (MMC) and greater requirements to focus on net zero and the circular economy offer opportunities to evolve the way infrastructure is planned, delivered, and operated.

Improving the visibility of our forward pipeline of infrastructure projects will support industry by allowing planning for the workforce, materials, and capability to deliver projects. Publishing a consolidated, whole-of-government pipeline that matures over time to include non-government public infrastructure projects, asset maintenance programs, and targets for spending beyond the forward estimates will help South Australia deliver the infrastructure we need to support our growth.

Globally, the infrastructure industry is facing serious labour and skills shortages.[537] Infrastructure Australia identified the labour demand for public infrastructure projects exceeds the capacity of the existing workforce, as shown in Chart 28.[538] Infrastructure workforce demand in South Australia increased by 20% in the year to October 2024. Modelling forecasts a shortage of 197,000 full-time infrastructure workers nationally will be reached by late 2024, with shortages expected in all occupational groups.[539] For South Australia, analysis by Jobs and Skills Australia identified skill shortages in eight out of ten occupations employing the majority of construction workers.[540]

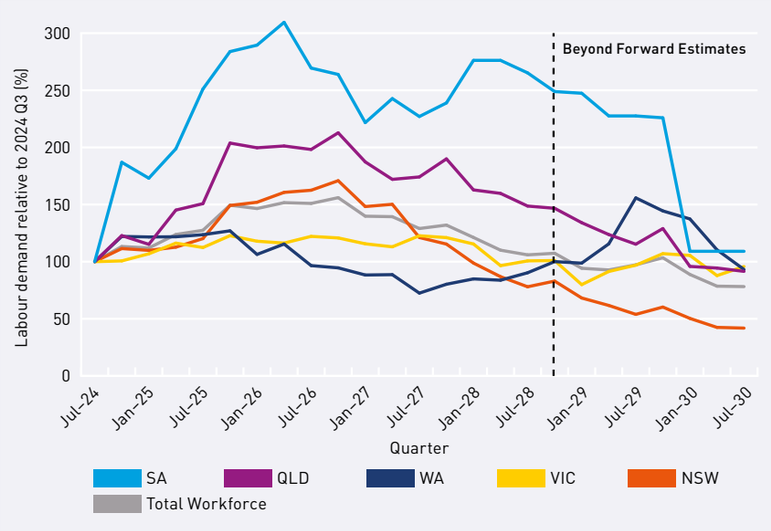


Chart 28:
Labour demand by jurisdiction, 2024–30[541]

Infrastructure construction in regional areas can be particularly challenging with increased costs, resources, capacity, and capability challenges. The renewable energy transition is expected to drive a significant increase in labour demand in regional areas for private infrastructure sector projects over the next five years. Early planning and engagement are critical to attracting and retaining skills and capability in regional areas. Planning in advance means key areas of need can be identified to target responses that increase capacity in the labour market, while supporting local and regional economies. The trend towards increasingly large and complex projects means we need expert capability and capacity across project planning and delivery. This will mean projects are established and governed to achieve optimal risk mitigation and incorporate learnings. There is an opportunity to review our current approaches to project delivery and procurement to ensure we are achieving the best outcomes and maximising value for money.

Lastly, with our net debt growing and estimated to reach $44.2 billion by 2027–28[542], there is a need to better leverage capital from the private sector and users. Considering alternative funding and financing options for our infrastructure will help to ensure our communities have access to key services, while maintaining government finances in a sustainable way.

4.1 Getting the most from our investments

The need to optimise our infrastructure investment now and in the future will be critical. This will support efficient allocation of limited capital, materials, and skilled labour resources to where they are needed the most.[543] It is also more important than ever that we maximise the value of our existing infrastructure by better managing demand and maintaining our assets strategically, aligned to agreed service levels. Opportunities to adopt low or no build solutions and harnessing innovation may help minimise, delay, or avoid investment in new infrastructure.

We must continue to support evidence-based prioritisation of infrastructure needs. New initiatives and investments must be strongly justified based on critical need and robust, evidence-based assessments that clearly demonstrate the case for change within a tightly constrained environment.

4.1.1 Managing our infrastructure strategically

The South Australian Government owns a significant asset portfolio with an estimated value of $96 billion at 30 June 2024 (non-financial public sector).[544] This asset portfolio is growing, with a predicted increase in value of around 19% in the next 4 years, to a total value of $114 billion at 30 June 2028.[545]

With research indicating that two-thirds of the total cost of an asset generally occurs after it is built or acquired[546], it is critical that our infrastructure is effectively managed (refer Box 8) to ensure best value services for the community.

Infrastructure Australia has identified that nationally, there are increasing pressures on infrastructure due to changing and growing demand, the condition of infrastructure is largely unknown and there is a mounting maintenance backlog.[547] The situation is similar in South Australia, where we have an ageing infrastructure base that has historically experienced a lack of investment in maintenance and renewal and gaps in data collection. Our forecast population growth, increasing community expectations for improved service levels, and addressing climate change risks all emphasise the requirement for robust asset management practices.

Water leak detection with acoustic logging technology, Adelaide, South Australia
Image courtesy of SA Water

Box 8. Asset management

Asset Management is defined by the International Standards Organization as the 'coordinated activity of an organisation to realise value from assets.'[548]

The Institute of Public Works Engineering Australasia outlines that 'Good asset management maintains an understanding of the cost, risk, and performance trade-offs in the short, medium, and long-term when making decisions regarding community-owned infrastructure assets.'[549]

The 2020 Strategy recognised the need to develop long-term asset management plans as a priority. While current South Australian Government circulars require agencies to effectively manage their assets, there is currently no single mechanism that encourages agencies to consistently improve asset management practices and capability, or to report on compliance. The result is variable asset management capability and practices across the South Australian Government, which evidence indicates, is in some cases, below industry standards.[550]

In conducting their annual audit of asset management practices over infrastructure, buildings, and improvements at public authorities, the South Australian Auditor-General found opportunities where improvement is required, including in asset management policies, plans and frameworks, risk management and improving measuring, monitoring, and reporting on levels of service.[551,552]

Asset management capability is being increasingly recognised as central in addressing climate change risks and improving resilience. A review of climate change risk management practices across the South Australian Government found, whilst agencies recognised the need to consider climate change, more needed to be done to implement effective climate risk management.[553] The consideration of asset lifecycle responses to climate risks and opportunities, will become increasingly important.

Infrastructure SA commissioned an independent review of current asset management practices and strategic needs for the South Australian Government. The review drew evidence from the primary South Australian Government asset-owning agencies and compared asset management performance with national and international jurisdictions and with frameworks aligned to global industry standards.

The review identified four overarching strategic challenges to be addressed to lift current asset management performance and to support the South Australian Government to realise the full benefits of its existing asset base as listed in Table 14.[554]

Table 14:
Strategic asset management challenges for the South Australian Government

1. Asset management maturity levels are mixed While there are some leading practice examples, capabilities are inconsistent and some below industry standards, preventing a whole-of-government approach to asset lifecycle capital planning and decision making, budgeting and spend management.	**2. Maintenance planning is often reactive, short-term, and insufficient** Maintenance planning often does not meet service requirements, inhibiting maintenance delivery efficiency and long-term asset lifecycle decision making. Reactive maintenance incurs higher overall maintenance spend over the life of an asset and can result in diminished asset performance.
3. Unnecessary risk exposure Limited maturity in managing assets may be exposing the South Australian Government to economic and financial risks from escalating asset lifecycle costs and service requirements which are not consistently meeting community expectations.	**4. Climate change mitigation is lacking** Asset management practice is inadequate to mitigate climate change risks in many cases, which may lead to service disruption and challenges in achieving net zero targets.

There are substantial opportunities and benefits to be realised through the implementation of an improved and more consistent approach to asset management practice that considers a whole-of-lifecycle approach. Evidence from other jurisdictions demonstrates short and longer-term financial benefits, where agencies have aligned asset management practice with international standards (ISO 55000).[555] It is estimated that, based on improved practices over a three-to-five-year period, savings of up to 15% in operating budget allocation may be achieved.[556]

Taking a risk-based, whole-of-lifecycle approach to maximising the value of existing assets may, in some cases, require an initial upfront investment to renew assets beyond their existing economic life.

Smart irrigation equipment in regional South Australia
Image courtesy of SA Water

In New South Wales, financial appraisal following introduction of their new Asset Management Policy demonstrated savings of 3 to 5% in the first 12 months from the implementation of improved asset management practices.[557] These practices included rationalising assets not deemed necessary for service objectives and targeting and prioritising maintenance based on criticality to service delivery, rather than reactive 'fix when fail' approaches.[558]

A more reactive approach to asset maintenance can result in a shorter asset lifespan (as replacement is required earlier), disruption of services for the community as maintenance or replacement is unplanned (and may need to occur during peak usage periods) and increased expenditure as assets fail more frequently.[559]

The adoption of measures that provide greater visibility and understanding of asset performance create an evidence base for prioritising maintenance and other investments in critical and underperforming asset portfolios. Improved asset management practice has been shown to support greater ability to quantify, understand, and mitigate the impacts of escalating maintenance liabilities from ageing infrastructure.

Moving away from a reliance on the term 'backlog' as the justification for additional investments is warranted, as this has consistently not provided an effective rationale for additional investment.[560] Rather, focusing on the level of service to be achieved, as aligned to government outcomes, may help improve prioritisation of limited funding for asset maintenance and renewal.[561] This is aligned with the South Australian Auditor-General's recommendation to ensure the levels of service and performance measures for assets are identified, measured, and reported to support effective prioritisation.[562]

New opportunities to improve asset management decision-making and optimise performance, productivity, and efficiency are emerging through application of digital technologies. Technologies such as smart systems, smart infrastructure, sensors, cameras, and global positioning systems coupled with new technologies like advanced analytics and artificial intelligence can provide for greater evidence-based decision-making and improve operational system performance. To capitalise on these opportunities, practices that embed better asset management and digital practice are required.

For South Australia, the incorporation of smart infrastructure technologies in the pipeline of major projects provides an opportunity to leverage these projects to improve the digital and asset management capabilities of agencies.

Implementing a new Asset Management Policy, including consistent data standards, provided the NSW Government with improved visibility over their asset base and supported informed decision making that considered risk, cost, and performance, as outlined in Case Study 12.

Victoria Square
Image – iStock/moisseyev

Infrastructure NSW, State of Infrastructure Report

Case Study 12

Following introduction of a new NSW Government Asset Management Policy for the NSW Public Sector in 2019, asset management maturity increased across a number of state agencies. The quality of information on asset portfolio performance and evidence to substantiate asset lifecycle expenditure requirements greatly improved in the first two years.[563]

Infrastructure NSW developed an annual State of Infrastructure Report for government consideration. The report is an independent, risk-based performance assessment of the state's infrastructure sectors, using available data and evidence.

The report provides a review of key risks, costs, strategic gaps, and performance benchmarking of all state infrastructure sectors (where infrastructure assets are owned or leased by the state).

The report informs advice to NSW Government on infrastructure priorities for the annual state budget, agency infrastructure plans and budget prioritisation, the State Infrastructure Strategy, and the 5-year State Infrastructure Plan.

The report was made possible after two years of improved agency asset management maturity and embedding NSW data standards as aligned with the NSW Government Asset Management Policy requirements. The Report was critical to support the development of the 2022 State Infrastructure Strategy.

A public facing version of the report is available at Infrastructure NSW website: State of Infrastructure Report.

Developing a similar report on the South Australian Government asset's base would provide decision makers with improved visibility on the current condition, capacity, and performance of assets. A report could also provide advice to government on the infrastructure investments required to deliver the government's priorities and support growth, including addressing the infrastructure gaps that are currently constraining a more efficient supply of housing.

A review of best practice learnings has identified four core success factors, to support a step-change in the robust and consistent implementation of improved asset management practice and capability, as presented in Table 15.

Table 15:
Critical success factors to implement improved asset management practice

1. **Establishment of a central mandated policy framework** aligned to global industry standards (ISO 55000) to provide the direction, mandate and governance that supports all agencies establish fit-for-purpose asset management frameworks.	2. **Central agency leadership and integration with budget planning processes**, using robust, evidence-based asset management plans to inform resource allocation assessments.
3. **Embedding accountability through an annual attestation process by agency heads** focused on building capability and improved asset management practices. This is supported by building asset management capability within and across agencies and providing forums for sharing of knowledge such as through the establishment of communities of practice.	4. **Establishing an asset management assurance framework** to provide an independent, risk-based appraisal and view to government on the state of the asset base, asset management performance and maturity and to provide support and guidance to agencies in achieving continuous improvement.

Ovingham level crossing removal, Adelaide, South Australia
Image courtesy of Department for Infrastructure and Transport

The case for change – In brief

The South Australian Government's asset base is increasing in value and is estimated to reach $114 billion by 2027–28. We need to maximise the value of our existing infrastructure by taking a whole-of-lifecycle, strategic approach aligned to agreed service levels and better managing demand.

Asset management approaches are inconsistent across the South Australian Government. Mixed maturity levels mean maintenance planning is often reactive, which can reduce asset lifespans, resulting in increased expenditure over the life of an asset and diminished asset performance due to downtime. It can also lead to unplanned service disruptions for the community.

Experience from other jurisdictions indicates benefits can be achieved through improved asset management, including operational budget savings of up to 15% within 5 years, enhanced asset resilience and more informed prioritisation and decision making, including on the basis of asset capacity and risk.

Assurance of asset management plans could help improve capability and inform a whole of government view on performance of assets.

31. Recommendation:

Develop a whole-of-government asset management framework focused on improving capability and accountability, consistent with modern industry standards. The framework should be integrated with the budget process, where asset management plans support informed decision making.

Lead agency: Department of Treasury and Finance

Timeframe: Policy 0 to 5 years

32. Recommendation:

Establish an independent asset management assurance framework to periodically evaluate the asset management performance of agencies.

Lead agency: Infrastructure SA

Timeframe: Policy 0 to 5 years

4.1.2 Prioritising our investments

Maximising outcomes and value for money in the context of a significant infrastructure pipeline and constrained market requires consideration of major project sequencing to avoid adding further market pressure and risk.

The Infrastructure SA Assurance Framework supports prioritisation of investments and is critical in a fiscally constrained environment. It stipulates proposals for investment need to include a range of options to address the service need (including non-infrastructure solutions) and demonstrate a strong evidence base to justify the expenditure. These proposals inform the Capital Intentions Statement, a five-year rolling annual plan that assists the South Australian Government to prioritise infrastructure and efficiently allocate capital through the Budget process.

In South Australia, investments on major projects have significantly increased since 2020, with forecasts showing continued high levels of expenditure. A number of major projects including the T2D Project and the New Women's and Children's Hospital will be in delivery during the same period, putting strain on market capacity to deliver both new and existing projects and programs. Already, the markets' ability to keep pace with the increased investments lagged budget forecasts for the years 2021–22 to 2023–24, as can be seen in Chart 29 (refer Actual infrastructure investment line).[564]

With a large infrastructure pipeline and limited market capacity, we need to continue to prioritise key infrastructure projects and consider the rate and sequence at which projects can optimally proceed to best manage risks, maximise benefits and deliver value-for-money for the state.

Chart 29:
South Australia's public infrastructure spend, 2020–2033[565]

Proactively taking measures to manage and align the forward pipeline to market capacity has the benefit of reducing the gap between the supply and demand for resources.[566] It also enables efficient risk management across the portfolio of government expenditure, supporting government's ability to realise the value of its infrastructure investments by strategically prioritising outcomes in the face of budget and inflationary pressures.

Market analysis considerations that address the ability for industry to respond should consider the state's ability to draw on its existing market capacity, including resources of Tier 2 and Tier 3 contractors, as well as new and emerging entrants into the market.

Continuing to strengthen Infrastructure SA's role in providing advice to inform prioritisation and sequencing of the forward program, integrated with the budget process, would provide an opportunity to better support a long-term, sustainable infrastructure program.

4.2 Lifting construction productivity

Despite strong levels of construction activity, Australian construction industry productivity has stagnated for the past three decades, particularly when compared with other industries, as demonstrated in Chart 30. Construction productivity matters because of its large value and jobs input into the economy.

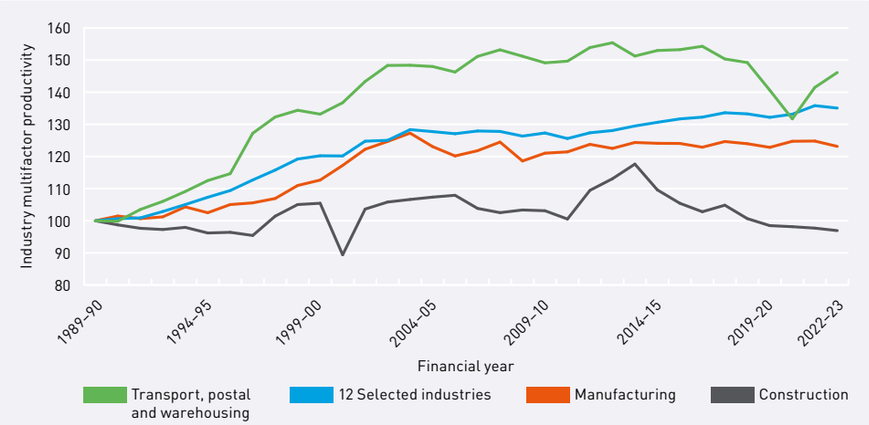


Chart 30:
Industry multifactor productivity by sector, 1989–2023[567]

With increasing demand, scale, and complexity of infrastructure projects, improvements to productivity are essential. Poor productivity in the construction sector impacts on our ability to deliver infrastructure to accommodate a growing and ageing population, new energy assets needed to meet decarbonisation commitments, and other ongoing challenges.

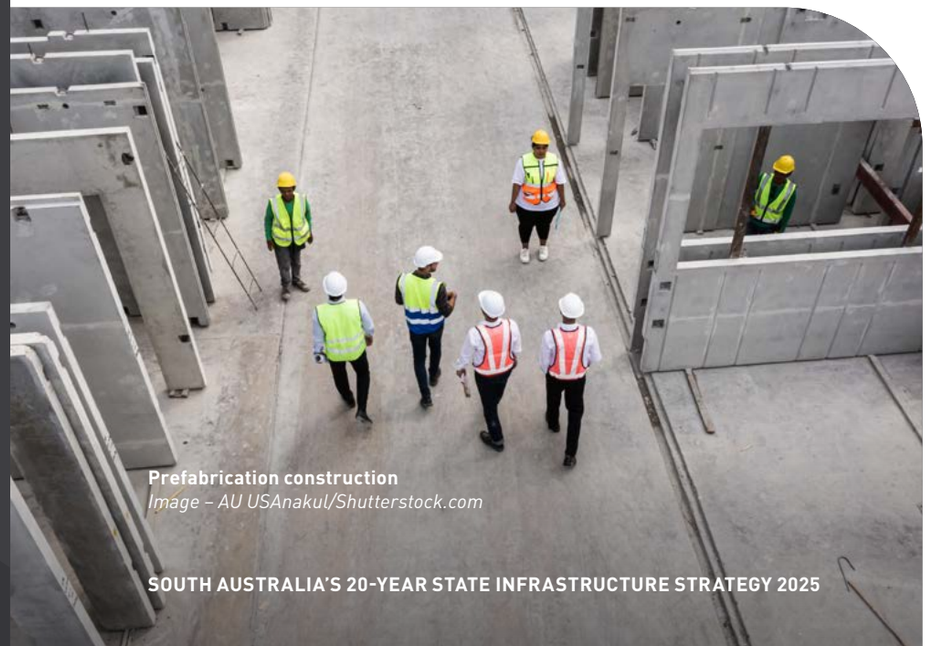
Oxford Economics Australia estimate that raising construction sector productivity to align to economy-wide average productivity could unlock an additional $56 billion in construction capacity nationally, per annum.[568] This is otherwise known as the opportunity cost of poor construction productivity, which, in South Australia, is estimated at $3.28 billion for 2021–22.[569] These costs will increase over time if construction productivity growth continues to lag that of broader industry.[570]

Drone construction technology, South Australia
Image – James Knowler, JKTP

There are a range of technologies emerging in the construction sector with the potential to deliver a step-change in efficiency and productivity improvements.[571] Increasing the use of innovative construction methods, such as MMC will help to uplift innovation in the construction sector. MMC typically refers to construction methods and processes such as design for manufacture and assembly, prefabrication, off-site manufacturing and construction (including modular building).[572] Increasingly, it is also incorporating new technologies including 3D printing, robotics and artificial intelligence under the term 'smart construction'. MMC incorporates a range of methods that can be used to plan, design, and build.[573]

In the right circumstances, MMC offer a range of opportunities, including streamlined construction processes, improved efficiencies, reduced waste and enhanced quality.[574] The application of these approaches can address challenges associated with the reduced availability and increased costs of skilled construction labour and materials, particularly in regional and remote areas. The Prefabrication Industry Roadmap 2023–33 projects that Australia could achieve $9 billion annually in benefits from 2033, driven by cost savings and improved productivity associated with the efficiency of smart building practices and prefabrication.[575]

The use of prefabricated and modular design for infrastructure that has repeatable design elements can lift efficiencies in construction, reducing costs and time for project delivery.[576] Construction of standardised components or structures in an off-site factory to be assembled on site, reduces exposure to risks associated with site work such as weather delays.[577] Greater use of MMC including standardised designs, modularisation and prefabrication offer opportunities to address delivery challenges, reducing cost and time for a range of infrastructure needs across housing, educational facilities, and other social infrastructure where repeatability and standard designs could be utilised. A number of Australian jurisdictions are now using MMC, as outlined in Case Study 13.



Prefabrication construction
Image – AU USAnakul/Shutterstock.com

Modern Methods of Construction – Examples

Case Study 13

To address government housing shortages in regional and remote areas, the Office of Queensland Government Architect is working to design and deliver modular housing. In collaboration with industry suppliers, the program involves building homes within a factory environment and then transporting and deploying them to site. Reported benefits include accessing a more stable workforce, less waste, and faster construction timeframes. By mid-2024 over 150 homes are targeted to be ready for tenancy.[578]

The NSW Government is progressing a $10 million modular housing trial in support of its Essential Housing Package. The program targets the design and delivery of social housing to demonstrate how MMC can be used to deliver quality homes faster, with less waste and reduced levels of disruption. Homes NSW is working with industry to develop architectural designs for prefabricated homes that are future proof, liveable, easy to maintain, adaptable and comfortable. Twenty of the prefabricated homes will be delivered by 2025 as part of the demonstration phase for the project.[579]

The Victorian Government has been rolling out a program of prefabricated modular classrooms across the state to meet school infrastructure needs associated with a growing population. Constructing 95% of the classrooms off-site can reduce timeframes, minimise disruptions and safety concerns and reduce waste. To date, 92% local content has been achieved.[580]

There are also opportunities emerging in the digital and technology space to use smart systems, sensors, cameras, and global positioning systems coupled with technologies like Building Information Modelling, advanced analytics and artificial intelligence to increase system performance and efficiencies.

Government has a role to lead and foster innovation to ensure that inefficient construction practices are reformed and new productivity-enhancing technologies are adopted. Including and rewarding innovation in procurement processes can help demonstrate the value and build capacity and capability, while also leveraging broader efficiency benefits. The challenge for industry and government is to find ways in which productivity can be improved, including by harnessing new technologies and processes.

4.3 Improving the visibility of our pipeline

The construction industry plays a significant role in the South Australian economy, contributing $10.5 billion gross value add, or 7%, to our GSP in 2023–24.[581] It is the third largest employer in the state, employing around 82,000 people, or 9% of the workforce in the August 2024 quarter.[582] Beyond construction itself, the industry is supported by a range of critical skills and resources including engineering and design, technical, advisory, commercial, procurement, operations and maintenance.[583]

In an environment where securing the necessary skills and resources is one of the biggest challenges facing the industry[584], collaborating and working with industry so it can position itself for success is critical. The provision of a clear and coherent whole-of-government long-term infrastructure pipeline supports both industry and government to plan the physical and human capital to meet forward project demands.

Industry cites that poor visibility and a lack of coordination across government in the release of projects to market creates challenges, including reduced market capacity to deliver, poor local-capability building, reduced regional opportunities, and reduced competition.[585] Improving cross-government coordination would help ensure that agencies can plan for future projects with an awareness of impact on the market, including competing projects being undertaken by other agencies. Infrastructure Australia highlighted that to improve productivity and innovation, access to a reliable, transparent, and consistent investment pipeline is needed.[586] This will help industry enhance planning for skills and resources.[587]

Improving the visibility of not only new investments, but also major maintenance and asset renewal programs, supports planning and can increase overall competitiveness of the industry and innovation. Leading approaches to sharing infrastructure pipeline information are shown in Figure 31.

At a national level, Infrastructure Australia publishes an Infrastructure Priority List which provides a searchable pipeline of unfunded, nationally-significant proposals. It includes proposals in key stages of project development, from Early-stage to Investment-ready proposals.

The Victorian Major Projects Pipeline is an online, searchable tool that provides information on projects over $100 million, over the next decade and beyond. Users can filter by project status (planning to completion), sector, procurement method, procurement agency and cost range.

The NSW Infrastructure Pipeline includes infrastructure projects expected to come to market in the next three to five years, with a minimum capital value of over $50 million. The Pipeline is a searchable portal that is updated every six months. It includes capital projects funded for delivery, capital projects with funds committed for planning and asset management projects funded for delivery.

New Zealand's Infrastructure Commission has established The National Infrastructure Pipeline, an interactive online tool that is updated every quarter. Users can search for projects based on location, timing, organisation, value and more. It includes projects for major upgrades.

The United Kingdom publishes a National Infrastructure and Construction Pipeline, which sets out planned and projected investment in major infrastructure over the next ten years. This includes five year investment and maintenance plans for rail and roads. The 2023 Pipeline can be found here.

Figure 31:
Leading approaches to global infrastructure pipelines

In South Australia, there are currently multiple approaches that agencies use to communicate their forward programs of work and their upcoming public infrastructure investments. Procurement SA publishes a Forward Procurement Plan on behalf of all public authorities, to inform prospective suppliers about future procurement opportunities. The plan includes the agency, indicative timing, procurement stage and an indication of the probability of activity proceeding.[588] While guidance indicates procurements that meet certain criteria should be included for the next 24 to 36 months[589], the plan may often only include projects six or seven months in advance[590].

Some individual agencies also publish their own forward programs, though these have different formats and have variable timeframes and levels of detail, with a number of agencies also hosting industry briefings to assist the sector in understanding their forward programs. The Department for Infrastructure and Transport's Forward Work Plan provides a comprehensive three year look ahead of major programs across its portfolio, identifying projects, their estimated value, project stage, and anticipated timing.[591] However, this does not cover an estimated $3.8 billion of major projects across the forward estimates, undertaken by other agencies such as SA Water, the SA Housing Trust and Renewal SA.[592] The net outcome is that, whilst information is available, sources are disparate, and spread across multiple platforms. The information provided lacks consistency and there is not a single, user friendly, one-source-of-truth that provides a whole-of-government view. This may impede the ability of industry and government to confidently plan and maximise opportunities that deliver value-for-money solutions.

The adoption of a consistent whole-of-government approach that provides for a single consolidated view of the forward pipeline would provide greater levels of transparency for industry at all levels. Over the longer-term, the pipeline could be expanded to include maintenance and renewal programs and projects from non-government infrastructure providers, such as energy network operators. Aligned with feedback from industry, the pipeline could also include infrastructure expenditure targets beyond the forward estimates period. This would indicate a longer-term commitment from government and support industry invest in the skills, equipment, and technology to improve productivity and help deliver our pipeline.

To align with leading approaches from other Australian and international jurisdictions, the pipeline should be presented as a user-friendly, searchable online platform, ideally with a view beyond the forward estimates. The pipeline should include details on size, scale, and nature of the investment, together with timing, project stage, and funding status.

The case for change – In brief

In a competitive national market with a large pipeline of work, South Australia needs to provide visibility for industry to invest in the necessary skills, equipment, and technology to improve productivity to help deliver our pipeline.

The South Australian Government currently publishes information across a number of platforms. The Forward Work Plan published by the Department for Infrastructure and Transport is informative but by its nature excludes projects being completed by SA Water, SA Housing Trust and Renewal SA – worth an estimated $3.8 billion over the next four years.

A consistent, whole-of-government view that includes non-government, public infrastructure projects would provide improved visibility, and in future could include targets for infrastructure investment beyond the forward estimates period.

33. Recommendation:

Publish a consolidated forward infrastructure investment pipeline and mature over time to expand its coverage.

Lead agency: Infrastructure SA

Timeframe: Policy 0 to 5 years

4.4 Delivering projects well

The scale and complexity of public infrastructure investments has been growing. Big projects often have greater complexity and risk with implications for schedule and cost. Their long planning horizons and complex interfaces further add to risk.[593] Analysis of time and cost overruns on Australian transport infrastructure projects showed larger projects are more likely to have a cost overrun and bigger overruns when they do.[594] This pattern is not limited to transport projects or to projects in Australia, with analysis showing no less than 92% of mega-projects go over budget or time, or both.[595]

The nature and type of public infrastructure investment is also forecast to shift over the next 20 years. Research by Infrastructure Australia points to such shifts, identifying that investments in the energy sector are expected to grow nationally, at around four times current activity levels.[596] New infrastructure will be required to leverage our competitive advantages and meet the government's economic vision and net zero aspirations, including infrastructure that enables renewable energy, carbon capture and storage and that capitalises on our copper and critical minerals resources.

This shift will see the emergence of different types of infrastructure projects, with different risk profiles and from areas within government that have not traditionally delivered large-scale or complex infrastructure projects.

Reviews of large complex project delivery have identified common underpinning success factors including the critical role of skilled project teams and a supporting organisational culture, sharing of learnings, investing in the planning phase and the importance of applying the appropriate commercial and procurement models.[597] Ensuring key project announcements, such infrastructure costs and timing, are made at the best time in a project's development are also critical in setting up the right expectations with the infrastructure industry and the community. Making commitments before scope, funding, costs and timelines are reliable and well understood can create unrealistic expectations, undermines market confidence and can introduce additional risks and pressures on costs and schedule. Having sufficient confidence in cost and delivery timeframes to provide project information to the public and as part of project approvals needs to be balanced with requirements to keep the community informed.

Construction of Seaford Railway Station
Image courtesy of Department for Infrastructure and Transport

While South Australia has a mature infrastructure industry capable of delivering complex projects, it is being challenged by skills and market capacity constraints bought on by a buoyant national pipeline, shifts in risk appetites, the desire for cost certainty, and growing expectations that large infrastructure investments should achieve broader social and environmental outcomes.

Recent work by the Australian Government Productivity Commission identified that the skills and capability of government agencies are a key determinant for adopting best practice, managing risk, and achieving project outcomes.[598] The Inquiry also cites industry concern that the adoption of best practice procurement in government practices has been weakened by the loss of in-house capability in procurement agencies.[599] With the emergence of larger and more complex projects and greater exposure to risks, increased costs and delays, there is a need to ensure sound planning and governance processes are enacted through highly capable teams.

Complex projects require highly skilled project teams to plan and deliver them. Expertise is required across all project areas and governance levels. The independent review into the Inland Rail Project found a lack of expertise in the Board and subcommittees overseeing the project were contributing factors to the significant cost and schedule overrun seen by the project.[600] Analysis of procurement reforms for Major Road Projects Victoria identified that beyond just considering procurement models; project expertise, information flow, knowledge transfer and organisational culture were all influential and vital to managing risks and delivering successful project outcomes.[601] The application of learnings from experienced project teams, particularly in the planning phase has also been identified as supporting innovation and productivity outcomes, enabling elements that can be made modular or scalable to be identified.[602]

The framework for delivering infrastructure projects in South Australia is established by the following instruments:

- Department of the Premier and Cabinet Circular PC028 – *Construction Procurement Policy Project Implementation Process* (August 2015), and the associated *Construction Procurement Policy Project Implementation Process* (January 2015) – Which outline a six-phase project implementation process for construction procurement, which in most cases is to be led by the Department for Infrastructure and Transport.
- Treasurer's Instructions 18 (TI18) – *Procurement* – Details procurement processes to be followed by public authorities, including for construction projects.

This approach is unique in that we have a centralised delivery agency in the Department for Infrastructure and Transport that remains within an operating transport agency. This means that it has full lifecycle involvement and accountability in the delivery of transport projects, but typically only steps in at procurement stage for building other projects and on a pass-through basis, where direct incentives to drive down the costs of these projects may not be present.

The ability to deliver on our infrastructure pipeline, achieve value-for-money outcomes and realise project benefits is dependent on effective and robust procurement approaches. Infrastructure projects can be procured using a variety of different approaches related to choices of contracting model, the tender process, and the criteria used to select the winning bids. Decisions on the right procurement method for a project impact value-for-money, risks, costs, and time. In the current market, relooking at procurement models that can best leverage infrastructure investment, deliver value-for-money outcomes and that support the sustainability of industry are necessary.

Procurement is frequently seen as a key lever to address these challenges. With ever-growing expectations for contractors to lift productivity, build skills and capability and incorporate innovation, government has a key role to play in ensuring successful outcomes. This includes clearly articulating requirements and evaluating contracts on this basis, rather than just on the lowest price, ensuring the commercial model is appropriate and working with industry as an active and informed client to manage risk and support desired outcomes. In addition, the use of a standard suite of contracts that reflect appropriate allocation of risk for projects may help create efficiencies.

Recent reforms in other jurisdictions across Australia including in New South Wales and Victoria have also sought to streamline and clarify processes through procurement reforms. For example, recent reforms in Victoria focus on collaborative and incentivised long-term program delivery models, where the contractor is actively involved in the project development phase to test project designs, risks and identify opportunities.[603] We have also seen shifts towards more collaborative contracts in South Australia, including for large-scale road projects.

Feedback from industry supports the use of more collaborative approaches and highlights the need for revisiting risk allocation on government projects, citing that inappropriate risk allocation has a significant impact across the industry.[604] The result is delays and increased costs that impact value-for-money for government. Models that drive fierce competition in the absence of collaboration, have been reported to drive adverse commercial and legalistic outcomes, dampen innovation, impact incentives to improve market capacity and social outcomes, and impact the viability and sustainability of the infrastructure industry.[605]

Early involvement can be achieved through procurement models and through early and regular engagement with the market. Across the infrastructure industry there has been an increasing move towards the use of collaborative or other early involvement contracting models. These models aim to reduce risk for both government and the contractor and ensure contractors can input into and understand the project, risks and delivery requirements. Collaborative delivery models promote greater co-operation, fairer sharing of risk-reward, unanimous decision-making, a no blame culture and support trust-based relationships.[606] Strengthening expertise and leveraging learnings can support a greater understanding of the best approaches to mitigate risk and maximise value-for-money outcomes.

Ensuring that government is engaging with industry to inform opportunities for improvement, both at an overall process level and in relation to securing earlier supplier input for complex or major projects will support better pricing and allocation of risks, value-for-money and better overall outcomes in infrastructure delivery.

Achieving our economic aspirations will require well planned, coordinated infrastructure planning and investment supported by expert capabilities and the right procurement approaches, enabled by reforms where appropriate. With responsibility for managing the TI18 instrument, the Department of Treasury and Finance is well placed to lead a review on current approaches and opportunities for improvement.

The emergence of complex and new types of projects that do not neatly fit within the remit or expertise of existing infrastructure delivery agencies, for example, the Hydrogen Jobs Plan and the Northern Water project, will necessitate a revised approach that supports project development and delivery to maximise value-for-money outcomes. There is also the need to ensure coordinated infrastructure planning to best support these needs through the integration of planning for infrastructure networks and corridors in a central point to provide forward investment clarity.

The case for change – In brief

The scale and complexity of infrastructure projects is growing, with the emergence of new types of projects that do not fit neatly within the remit or expertise of existing infrastructure delivery agencies.

Given market capacity constraints and productivity challenges, South Australia needs to ensure we have the skills needed, that we apply leading practice approaches to project planning, delivery, procurement, and governance and that we leverage innovation to support improved productivity.

34. Recommendation:

Review current project delivery models, procurement approaches and capability, to achieve optimal risk and value outcomes.

Lead agency: Department of Treasury and Finance

Timeframe: Policy 0 to 5 years

4.5 Leveraging capital to invest in our infrastructure

In South Australia, public infrastructure is funded by the South Australian Government through the state budget. The Australian Government also makes funding contributions, particularly for strategic and significant projects.

Box 9. Funding and financing infrastructure

Infrastructure funding refers to how investment and operational costs are repaid over time. For public infrastructure this is by users of the infrastructure through charges such as tolls, or by taxpayers.

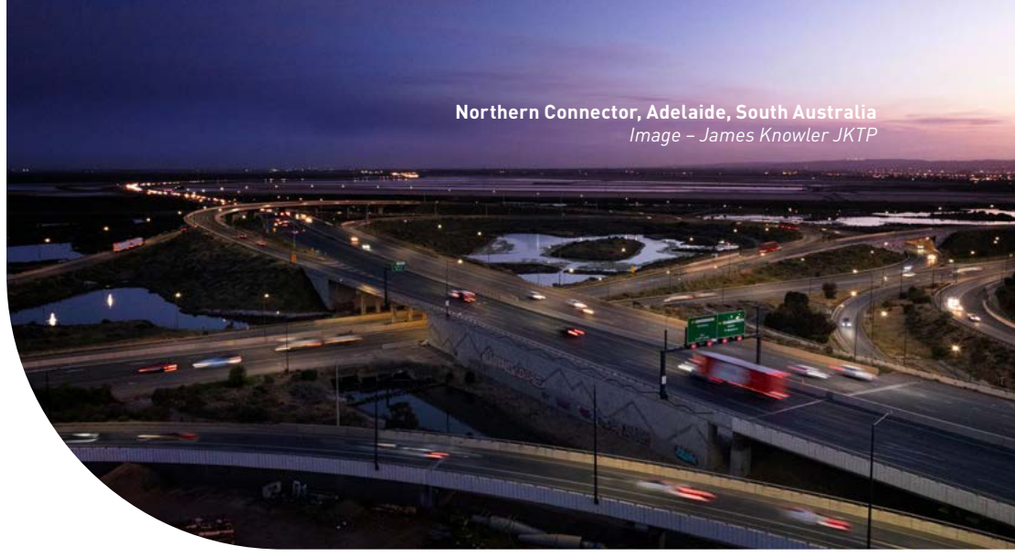
Infrastructure financing refers to the money raised upfront for the design, construction, and early operating costs of an asset, through debt or equity arrangements.[607]

The South Australian Government's investments in infrastructure are at record levels and the funding needed to support the forward pipeline is placing pressure on state and national debt. Meeting demands for a growing population, changing community expectations and increasing regulatory and environmental requirements, including decarbonisation, mean additional funding is needed for new assets and for necessary maintenance and renewals.

Given this context, there is a need to explore alternative funding and financing options to ensure government can meet its fiscal targets in a sustainable way.

4.5.1 Private sector and user contributions

User contributions are a common funding mechanism for some infrastructure sectors. The utilities, energy, and telecommunications sectors, for example, are largely funded by users. In these instances, the infrastructure required to provide services is funded by the beneficiaries of those services.



Northern Connector, Adelaide, South Australia
Image – James Knowler JKTP

Nationally, user contributions or beneficiary pay models have been more challenging for some sectors. This is particularly the case for transport and social infrastructure, which largely rely on public subsidies, with some partial contributions from landowners and developers in greenfield areas. There may be opportunities to further explore these models to support servicing growth areas.

Interstate and overseas, user contributions for transport infrastructure have provided an avenue to leverage capital from the private sector for parts of the network. This approach has not been without challenges, with risks associated with forecasted revenue aligning with actual revenue, the ability to optimise user charges to ensure they are reflective of travel time savings and commercial tensions from investors expecting a return on their investment. These challenges mean that accessing private equity is limited to circumstances where it presents an attractive commercial opportunity.

Over the longer term, alternative models and reforms will be needed to enable investments in efficient network operation that meet multimodal transport needs. Reduced revenue from fuel subsidies associated with the update of EVs is impacting existing funding for the road network. Inquiries into long-term road funding options have previously indicated the need to move towards a broader user-pays regime, with variable distance pricing for heavy and light vehicles.[608] Supplementary parking and road user charges have also been flagged as opportunities to target congestion in cities.[609] It is acknowledged that in South Australia, the current lack of bipartisan support for road user charges may limit reform in the short to medium term.

Water pipeline, Eyre Peninsula, South Australia
Image – Go Australia, Neil Sutherland/Alamy Stock Photo

Over recent decades there have been many examples where private sector investors have financed existing infrastructure including airports, seaports, motorways, telecommunications, and energy.[610] In some cases, this includes new infrastructure.[611] For example, the WestConnex road project in New South Wales was sold as a project in development and is being completed by the new asset owner.[612] Such opportunities would be subject to a commercial model that present an attractive return on investment for the private sector.

Opportunities to leverage private sector investments, particularly where there is commercial value warrant exploration. The Northern Water project proposes the construction and operation of a large seawater desalination plant and up to 600 km of pipeline to transport water to offtakers in northern South Australia. The project will provide critical enabling infrastructure to unlock significant and broad economic growth aligned to achieving net zero goals, including the emerging green hydrogen and iron industries and critical minerals. The State Government has been leading the project development, assessment, and approval phases to progress towards a final investment decision, with pre-construction funding support received from the state and federal governments and the private sector. Ultimately, the project is looking to leverage private sector funding via a commercial model that will see water users enter into long-term payment structures that underpin the project.[613] Given the project's focus on delivering a sustainable water supply, green and sustainable financing options are also being explored.

There may be other opportunities for the State Government to explore avenues for unlocking new sources of infrastructure funding over the medium and long term, using the commercial value from state-owned assets, including both physical and digital assets. Asset recycling initiatives can include the sale or lease of assets to the private sector, with funds then invested in new infrastructure. Such options can present revenue opportunities where there is no strategic imperative to retain these assets in government ownership.

Working with private industry to identify opportunities for greater collaboration in delivery of services may also unlock opportunities where there are incentives or commercial outcomes for industry. Governments already pursue this model, at both the federal and state level, such as in the provision of aged care or health services whereby the private sector has entered the market to provide both the facilities and the services whilst being subsidised to do so, with the customer funding the gap.

Further exploration of funding and financing models that can help support investments in infrastructure, particularly to meet growth needs, will be needed in the mid to long-term. With increasingly tight fiscal constraints there will continue to be a need to leverage greater private investments in public infrastructure.

4.5.1.1 Public private partnerships

Models to support infrastructure investments such as public private partnerships (PPPs) offer opportunities to attract private financing. South Australia has successfully delivered a range of social infrastructure such as police stations, justice facilities, hospitals and schools utilising such models.

Opportunities for engagement and innovation from the private sector and attracting private financing, including through PPPs, should continue to be pursued as an option where appropriate, with consideration to budget implications, debt, and market interest.

In support of this, the development of strategic guidance to support consideration of such models where they are appropriate and maximise value would assist government, as part of early project planning in business case development.

4.5.1.2 Funding infrastructure

Funding infrastructure to service population growth will be a particular challenge. There is a need to review funding models and approaches to support growth-related infrastructure and ensure equity and affordability. As discussed in Outcome 2, diversifying funding sources for infrastructure by incorporating private sector contributions and user or beneficiary contributions will be key to a sustainable approach. Application of consistent cost recovery mechanisms will support greater certainty and improved planning for long-term investments.

Aldinga Payinthi College, Fleurieu Peninsula, South Australia
Image courtesy of Department for Education

Starfish Hill Wind Farm, Cape Jervis, South Australia
Image courtesy of Department for Energy and Mining

4.5.2 Leveraging sustainability finance

Increasingly, institutional investors and financial institutions are focusing on sustainable infrastructure, where a project demonstrates alignment with, or directly supports, meeting social or environmental outcomes such as the transition to a net zero economy.[614] Accessing this capital requires the demonstration of strong ESG credentials.

Many of these opportunities are focused on the renewable energy space, but over time other areas such as water security, hydrogen and carbon capture are likely to gain interest.[615] Even with leveraging private finance for these contributions, the state will still need to continue generating revenue to make repayments.

The emergence of a growing number of green, social, and sustainability-related bonds are expected to make an important contribution to financing future infrastructure needs and to broadening the investor base, where sustainability performance can be demonstrated to be aligned to issuance requirements.[616]

In November 2023, the South Australian Government released its first Sustainability Bond Framework. This framework provided potential avenues for mobilising funds raised in the debt capital markets to fund infrastructure projects that target and prioritise social and environmental outcomes aligned to the United Nations Sustainable Development Goals. In 2023, the Australian Government has also released a Green Bond Framework and program to enable investors to back public projects that drive Australia's net zero transition and support environmental objectives.

Acronyms

TERM	DEFINITION
Aboriginal people	Aboriginal and Torres Strait Islander people
ACCU	Australian Carbon Credit Units
AEMO	Australian Energy Market Operator
AUKUS	Australia, United Kingdom, United States
B	billion
CBD	central business district
CCS	carbon capture and storage
CCUS	carbon capture, utilisation and storage
DHUD	Department for Housing and Urban Development
DRI	direct reduced iron
ESG	environment, social and governance
EV	electric vehicle
GARP	Greater Adelaide Regional Plan
GDP	Gross Domestic Product
GRP	Gross Regional Product
GSP	Gross State Product
ICG	Infrastructure Coordination Group
ISP	Integrated System Plan
IWM	integrated water management
km	kilometre
M	million
MMC	modern methods of construction
MW	megawatt
MWh	megawatt hours
NDIS	National Disability Insurance Scheme
NEM	National Electricity Market
PPP	public private partnerships
PV	photovoltaic
SA	South Australia
T2D	River Torrens to Darlington Project
US	United States
VPP	virtual power plant
$	currency in Australian dollars

Appendix A – Recommendations

Outcome	Recommendation	Lead agency	Implementation timeframe
1. **Paving the way to prosperity:** Infrastructure is a catalyst for unlocking economic growth	1. Prioritise common-user infrastructure where possible to aggregate demand and provide more efficient infrastructure solutions to realise the value of our natural resources.	Infrastructure SA, transitioning to the Office of the Coordinator General when established	Policy 0 to 5 years
	2. Prioritise achieving a final investment decision for the Northern Water project at the earliest opportunity.	Department for Energy and Mining	Delivery 0 to 5 years
	3. Undertake feasibility planning to identify an economic water supply solution to unlock the Braemar Province.	Department for Energy and Mining	Delivery 0 to 5 years
	4. The State Government form and maintain its own view on network forecasts and requirements to develop policies that encourage and provide certainty for efficient investment in the electricity network.	Department for Energy and Mining	Delivery 0 to 5 years
	5. Identify the amount of flexible firming capacity required to support the South Australian electricity network and explore policy initiatives that could encourage the necessary investment (likely to be gas in the short term).	Department for Energy and Mining	Delivery 0 to 5 years
	6. Prepare a Future Net Zero Fuels Strategy and Roadmap that identifies the infrastructure investment requirements.	Department for Energy and Mining	Policy 0 to 5 years, delivery ongoing
	7. Undertake a feasibility study into increasing the supply of gas to the Upper Spencer Gulf to meet green iron and green steel goals at scale.	Department for Energy and Mining	Planning 0 to 5 years, delivery 5 to 10 years
	8. Identify key freight corridors and improve our competitiveness by planning for strategic investment to improve their end-to-end efficiency and resilience of these corridors.	Department for Infrastructure and Transport	Planning 0 to 5 years, delivery 5 to 20 years
	9. Investigate future needs for intermodals, including a detailed origin and destination analysis.	Department for Infrastructure and Transport	Planning 0 to 5 years, delivery 5 to 20 years

Outcome	Recommendation	Lead agency	Implementation timeframe
1. **Paving the way to prosperity:** Infrastructure is a catalyst for unlocking economic growth	10. Complete a Masterplan and critical infrastructure study for the Le Fevre Peninsula.	Department of the Premier and Cabinet	Planning 0 to 5 years, delivery 5 to 10 years
	11. Identify locations for open access material offloading facilities and associated supply chain needs to support the state's economic priorities.	Department for Infrastructure and Transport	Planning 0 to 5 years, delivery 5 to 20 years
	12. Identify key carbon capture and storage infrastructure opportunities and sequencing to aggregate demand and support net zero and commercial opportunities at scale.	Department for Energy and Mining	Planning 5 to 10 years
	13. Identify the key opportunities for value-add use of carbon dioxide and enabling infrastructure.	Department of State Development	Planning 0 to 5 years
Outcome	**Recommendation**	**Lead agency**	**Implementation timeframe**
2. **Liveable today, flourishing tomorrow:** Well-planned infrastructure creates resilient, inclusive and vibrant communities	14. Sequence land releases to ensure that growth occurs in a managed, efficient, and sustainable manner, leveraging existing infrastructure to its full potential.	Department for Housing and Urban Development	Planning 0 to 5 years (ongoing)
	15. Reserve strategic infrastructure corridors and lands for future infrastructure needs.	Department for Housing and Urban Development	Planning 0 to 5 years (ongoing)
	16. Establish a governance model that supports water security through adaptive integrated water management.	Department for Environment and Water	Policy 0 to 5 years
	17. Undertake investment readiness activities for a new climate-independent water supply solution for the Northern metropolitan Adelaide region.	SA Water	Planning 0 to 5 years
	18. Undertake and publish a system-wide review of both the network and wastewater treatment plant capacity to identify a long-term solution that caters for growth in northern Adelaide.	SA Water	Planning 0 to 5 years
	19. Optimise existing education assets by adopting strategies to increase demand for schools with capacity in established areas.	Department for Education	Planning 0 to 5 years

Outcome	Recommendation	Lead agency	Implementation timeframe
2. **Liveable today, flourishing tomorrow:** Well-planned infrastructure creates resilient, inclusive and vibrant communities	20. Prioritise measures that optimise health system efficiency and reduce burden on hospitals by investing in alternatives to hospital and innovative service delivery models.	Department for Health and Wellbeing	Policy 0 to 5 years
	21. Strategically review the public and active transport networks to ensure that they provide integrated services that are attractive to consumers.	Department for Infrastructure and Transport	Planning 0 to 5 years, delivery 5 to 20 years
	22. Implement public and active transport targets to drive a focus on initiatives that increase patronage.	Department for Infrastructure and Transport	Planning 0 to 5 years (ongoing)
	23. Identify the long-term solution to address the capacity constraints of Adelaide Railway Station, including the viability of an underground rail link.	Department for Infrastructure and Transport	Planning 0 to 5 years, delivery 5 to 10 years
	24. Identify and implement sustainable funding mechanisms for provision of infrastructure to support growth areas and new developments.	Department for Housing and Urban Development	Policy 0 to 5 years
Outcome	**Recommendation**	**Lead agency**	**Implementation timeframe**
3. **Shaping a sustainable future:** Infrastructure decisions advance climate readiness, safeguard nature and culture and promote a circular economy	25. Develop a South Australian infrastructure decarbonisation policy to manage greenhouse gas emissions across the asset lifecycle.	Infrastructure SA	Policy 0 to 5 years
	26. Prepare a state-wide electric vehicle charging plan that establishes the medium and long-term approach to charging infrastructure and associated network impacts.	Department for Energy and Mining	Policy 0 to 5 years
	27. Continue to leverage the existing gas infrastructure network while exploring options to decarbonise and utilise low or zero carbon fuels such as hydrogen.	Department for Energy and Mining	Policy 5 to 10 years
	28. Consider the role of waste to energy as a viable option, aligned with circular economy principles.	Green Industries SA	Policy 5 to 10 years
	29. Develop an Infrastructure Sustainability Framework that provides guidance on incorporating sustainability standards and reporting across all stages of the infrastructure lifecycle.	Department of Treasury and Finance	Policy 0 to 5 years
	30. Update Business Case requirements to ensure that environmental and cultural values are consistently accounted for and included in decision making.	Infrastructure SA	Policy 0 to 5 years

Outcome	Recommendation	Lead agency	Implementation timeframe
4. **Elevating impact:** Optimised infrastructure investments drive economic, environmental, and social value	31. Develop a whole-of-government asset management framework focused on improving capability and accountability, consistent with modern industry standards. The framework should be integrated with the budget process, where asset management plans support informed decision making.	Department of Treasury and Finance	Policy 0 to 5 years
	32. Establish an independent asset management assurance framework to periodically evaluate the asset management performance of agencies.	Infrastructure SA	Policy 0 to 5 years
	33. Publish a consolidated forward infrastructure investment pipeline and mature over time to expand its coverage.	Infrastructure SA	Policy 0 to 5 years
	34. Review current project delivery models, procurement approaches and capability, to achieve optimal risk and value outcomes.	Department of Treasury and Finance	Policy 0 to 5 years

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