Australian Government

Department of Climate Change, Energy, the Environment and Water

Australia's first **Biennial Transparency Report**

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Department of Climate Change, Energy, the Environment and Water
GPO Box 3090 Canberra ACT 2601
Telephone 1800 900 090 Web dcceew.gov.au
Web dcceew.gov.au

Minister's Foreword

In presenting the first Biennial Transparency Report, I would like to acknowledge Australia's First Nations people and celebrate their elders past and present. Traditional Owners have cared for Country for thousands of generations and we humbly ask them now to help us heal it. I would like to thank them for their continuing custodianship of the lands and waters on which we live, work and depend.

This is Australia's first Biennial Transparency Report. It demonstrates the accelerating action we are taking to meet our commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. It also reaffirms our longstanding commitment to transparency in how we report our progress.

Australia has a strong track record of transparency and accountability on climate action.

We have submitted our greenhouse gas accounts under the UNFCCC every year for over 2 decades – and we fulfil all international reporting requirements. Since we enacted the *Climate Change Act 2022*, I have also submitted 3 annual statements to the Australian Parliament, reporting on policies to mitigate and adapt to climate change.

Under the Paris Agreement, our collective global goal is to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the global average temperature increase to 1.5°C above pre-industrial levels. Since Australia submitted its fifth and final Biennial Report under the former transparency arrangements almost 2 years ago, our government has continued to work tirelessly on its ambitious climate change and energy reform agenda. Australia welcomes the opportunity to reflect this in its first Biennial Transparency Report under the Paris Agreement's Enhanced Transparency Framework.

We have committed to reducing greenhouse gas emissions across the economy in line with Australia's targets, and have implemented a strong suite of policies and programs to meet them. This is the best way to prevent the worst impacts of climate change and offers new economic opportunity to transform our nation as the world decarbonises. We are making strong progress towards our target of a 43% reduction on 2005 levels by 2030.

Australia's emissions projections show that with currently implemented policies, Australia is projected to beat the 2030 target on a budget basis and be just shy of meeting the single-year point 2030 target. We are also focused on the critical decades that follow. Our Net Zero 2050 Plan and sectoral decarbonisation plans will cover all of Australia's emissions across 6 major sectors of the economy. These plans will identify the key opportunities for decarbonising sectors and provide a clear path forward for our nation.

Transitioning Australia's energy sector lays the foundations for achieving net zero emissions, supporting our domestic economy and enabling new clean energy and commodity exports. We have implemented a scheme to add 32 GW of energy capacity to our grid by 2030 to make sure we have enough renewable, reliable energy for current demand and future electrification. Similarly, we have established renewable energy agreements with Australia's states and territories to bolster this supply and transition the grid.

We have strengthened decarbonisation requirements for industry, putting the largest emitters in the mining, manufacturing, transport, oil, gas and waste sectors on a pathway to net zero by 2050. New clean industries – including renewable hydrogen and green metals – will both reduce emissions and help the global transformation. With a commitment of $22.7 billion over the next decade, the Australian Government is supporting investment in priority industries under our Future Made in Australia plan. By becoming a renewable energy superpower, Australia can maximise the economic and industrial benefits of the move to net zero. To facilitate this transition, this year we established the Net Zero Economy Authority to ensure the people and communities that have powered Australia for generations can seize the opportunities of Australia's net zero transformation.

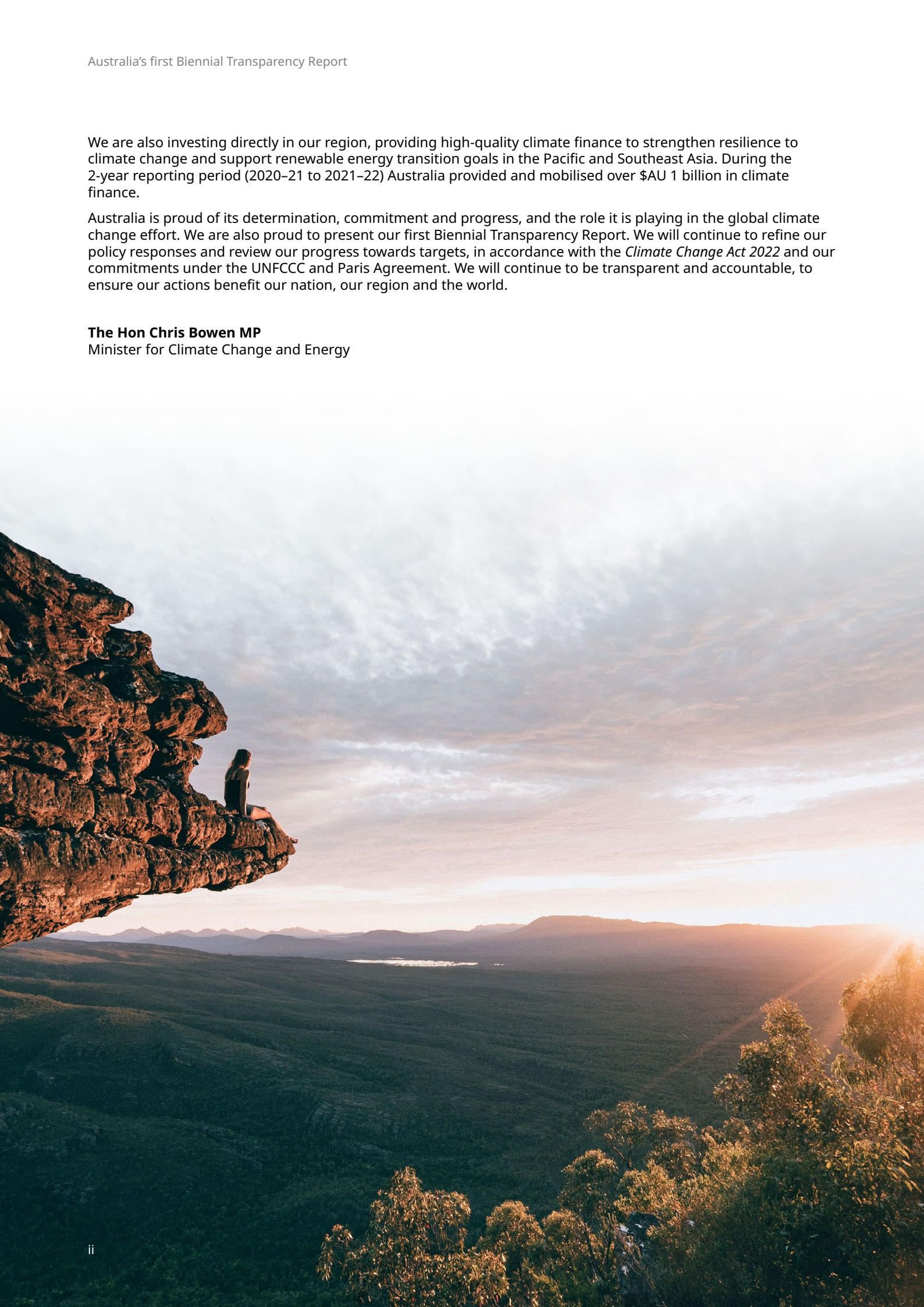
While we work to reduce emissions, we also recognise that adapting to current or expected climate changes and their effects is critical to protecting people, livelihoods and ecosystems. Australia's first National Climate Risk Assessment will help us better understand climate risks that threaten what we value most as a society. And our forthcoming National Adaptation Plan will increase our climate resilience and focus our adaptation efforts across the nation.

We have again stepped up our international cooperation to address the collective challenge of climate change. We are leading across our multilateral engagement to drive positive climate and energy outcomes for our region. We are reducing global emissions through bilateral partnerships with major powers. Australia's bid to host COP31 in close partnership with the Pacific is an opportunity to bring profile to the climate challenges of our region, accelerate global climate action, highlight the economic opportunities in the net zero transition and raise the voices of First Nations and Indigenous Peoples.

We are also investing directly in our region, providing high-quality climate finance to strengthen resilience to climate change and support renewable energy transition goals in the Pacific and Southeast Asia. During the 2-year reporting period (2020–21 to 2021–22) Australia provided and mobilised over $AU 1 billion in climate finance.

Australia is proud of its determination, commitment and progress, and the role it is playing in the global climate change effort. We are also proud to present our first Biennial Transparency Report. We will continue to refine our policy responses and review our progress towards targets, in accordance with the *Climate Change Act 2022* and our commitments under the UNFCCC and Paris Agreement. We will continue to be transparent and accountable, to ensure our actions benefit our nation, our region and the world.

The Hon Chris Bowen MP
Minister for Climate Change and Energy



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Australia's first Biennial Transparency Report demonstrates our firm commitment to reporting transparently on the actions we have taken to deliver our climate commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. This report supports tracking global progress towards the Paris Agreement goals. Australia, along with all parties to the Paris Agreement, has committed to the global goal of holding the increase in global average temperatures to well below 2°C of warming and pursuing efforts to limit the temperature increase to 1.5°C. Transparent reporting will highlight existing solutions, inform the next round of national climate plans and contribute to building mutual trust and confidence within the global community.

The Biennial Transparency Report provides information on Australia's greenhouse gas emissions and trends, national circumstances and current policies and measures. It reports on Australia's climate change impacts and approach to adaptation, and financial assistance provided to developing countries that are party to the Paris Agreement. The report also provides projections of greenhouse gas emissions. In addition, this Biennial Transparency Report shows our commitment to continuous improvement in our reporting, including by implementing recommendations from the UNFCCC Expert Review Team's assessment of Australia's 8th National Communication and 5th Biennial Report.

Australia's climate is changing

The physical impacts of climate change are becoming ever more apparent in Australia. The annual average temperature in Australia has increased by approximately 1.51±0.23°C since records began in 1910. Oceans around Australia are rising, acidifying and have warmed by an average of 1.08°C since 1900. Australia is also facing more extreme climatic events such as Cyclone Jasper, the wettest tropical cyclone in Australian history, which hit north Queensland in December 2023 with winds of 270 km/h and torrential rain of over 2,250 mm. Cyclone Jasper had significant impacts to local communities, agriculture, animal welfare, small businesses and tourism.

Our mitigation targets and efforts

In 2022 Australia updated its Nationally Determined Contribution and legislated its emissions reduction targets, committing to:

- a single-year target to reduce greenhouse gas emissions to 43% below 2005 levels by 2030
- a multi-year emissions budget from 2021–30
- net zero emissions by 2050.

In 2021–22 Australia's net emissions were 432.6 million tonnes of carbon dioxide equivalent (Mt CO_2 e), reflecting a 29.0% reduction on 2004–05 levels. With currently implemented policies, emissions are projected to be 352 Mt CO_2-e in 2030, or 42.6% below 2005 levels, just shy of the 2030 single-year point target. Australia is projected to beat the 2030 target on a budget basis.

The Australian Government is implementing a strong climate policy agenda that is pushing down Australia's emissions trajectory. This agenda includes a commitment to increase renewable electricity generation on-grid to 82% by 2030 as Australia's energy system transitions away from fossil fuels.

In the last 2 years the government has taken further action to support this shift, including through the Rewiring the Nation program, which will support the modernisation of the electricity grid and deliver new and upgraded transmission infrastructure, and the Capacity Investment Scheme, a national framework to encourage greater investment in renewables. In addition, since establishing the Offshore Electricity Infrastructure Framework, the government has identified 6 priority areas for offshore wind and granted 12 feasibility licences for proposed offshore wind projects totalling 25 GW of potential generation.

In 2023–24 renewables accounted for 38% of total electricity generation within the National Electricity Market (NEM), Australia's largest electricity grid. This is an increase from 21% just 5 years ago. The rising share of renewables is driving down fossil fuel use in the electricity sector, the key contributor to Australia's emissions. Since 2005, emissions from the NEM have fallen by nearly 30% (51 Mt CO_2-e). The capacity of Australia's wind and solar assets has also increased by around 40% since May 2022.

The government is driving investment in clean energy industries under the Future Made in Australia plan. This will direct support to new industries aligned with the net zero transition, including green metals, renewable hydrogen and low carbon liquid fuels. The 2024 National Hydrogen Strategy sets out a pathway to develop the

Australian hydrogen industry to support the decarbonisation of manufacturing industries, such as green metals and chemicals, and to position Australia as a global hydrogen leader.

The government has also reformed the Safeguard Mechanism, putting the largest emitters in the mining, manufacturing, transport, oil, gas and waste sectors on a pathway to net zero by 2050. These reforms entered into force on 1 July 2023. Another key initiative, the Powering the Regions Fund, is helping decarbonise trade-exposed industrial facilities covered by the Safeguard Mechanism and bringing forward investments to reduce emissions at existing industrial facilities in regional Australia.

To increase the supply of more energy efficient vehicles, including electric vehicles, to the Australian market, the Australian Parliament has legislated a New Vehicle Efficiency Standard which will commence on 1 January 2025.

Emissions projections

These policy actions build on longer-term trends to reduce Australia's emissions. Emission estimates presented in this report are provided on an Australian financial year basis (July to June) rather than on a calendar year basis (January to December) because key data sources for Australia's national greenhouse gas inventory are published on this basis. For example, the Australian financial year 1990 commences on 1 July 1989 and ends on 30 June 1990, and is commonly cited as '1989–90'.

In 2021–22 emissions from all sectors were 432.6 Mt CO_2-e; this was a decrease of 29.7% from 1989–90. With currently implemented policies ('with measures') Australia's emissions are projected to be 352 Mt CO_2-e in 2030, or 42.6% below 2005 levels, just shy of the 2030 target. Over the period from 2021 to 2030, emissions are 3% below Australia's 2021–30 emissions budget. This means the 2030 target is more than met when assessed on a budget basis. Emissions are projected to further decline to 271 Mt CO_2-e by 2040, which is 56% below 2005 levels.

Under the 'with additional measures' scenario Australia's emissions are projected to be 351 Mt CO_2-e in 2030, or 42.7% below 2005 levels in 2030. Over the period 2021 to 2030, Australia's position remains at 3% below the emissions budget, despite the emergence of new hydrogen and critical minerals industries. In the 'with additional measures' scenario Australia's emissions are projected to be 271 Mt CO_2-e in 2040, which is 56% below 2005 levels.

Adaptation efforts and managing climate risk

Australia's adaptation actions reflect our commitment to the Paris Agreement global goal to enhance adaptive capacity, strengthen resilience and reduce vulnerability to climate change. The Australian, state and territory, and local governments have different but complementary responsibilities for adaptation, and there is significant work happening across all levels of government to improve the resilience and adaptive capacity of businesses, communities and the environment.

The Australian Government's responsibilities for adaptation include providing national leadership on climate adaptation, ensuring the availability of nationally authoritative climate science and information, and managing climate risks to government assets and services. It is strengthening policies across all areas of responsibility.

The government is developing the National Climate Risk Assessment to identify and prioritise the things that Australians value the most that are at risk from climate change. The government is also developing a National Adaptation Plan, which will establish a framework for addressing the priority climate risks identified in the Risk Assessment. The Risk Assessment will provide vital input into the development of the Adaptation Plan and support adaptation by other levels of government, business and the community.

In response to the diversity of climate change impacts, action is occurring across all sectors. The National Health and Climate Strategy is driving national action for mitigation and adaptation in the health sector, while the Commonwealth Climate Disclosure initiative will drive climate risk management and disclosure in the private and public sectors. This initiative requires Commonwealth entities to publicly report on their exposure to climate risks and opportunities, as well as actions to manage them, in their annual reports. In 2024 the Australian Parliament also passed legislation requiring the mandatory disclosure of climate-related mitigation and adaptation risks for large businesses and financial institutions. These measures send clear and strong signals to the public and private sectors alike on the Australian Government's commitment to strengthening climate adaptation and managing climate change related risks. They enable these sectors to make important contributions to improve Australia's resilience to climate impacts, while encouraging them to take advantage of any opportunities they present, to the benefit of the Australian people and economy.

Climate change presents a suite of unprecedented economic, strategic, political and social challenges to Australia's national security. In support of the findings of the 2023 Defence Strategic Review, the Australian Government is exploring options to support state- and territory-led domestic crisis response efforts. It is

providing national leadership in ensuring Australia has the necessary policy, legislation and capability to manage increasingly complex cascading and concurrent national crises, including those arising from climate change.

The forthcoming National Resilience Framework is considering climate impacts and risks on national security, and will help shape policies to address critical national security vulnerabilities resulting from or exacerbated by climate change.

Recognising that investment in mitigation and resilience initiatives reduces disaster loss and damage and ensures communities are better placed for recovery, the Australian Government established the Disaster Ready Fund (DRF) in 2022. The DRF is providing up to $1 billion over 5 years from 2023 for projects that build resilience to the physical and social impacts of disasters caused by climate change and natural hazards.

In addition to this work at the national level, the Australian Government is sharing best practice approaches to adaptation with state and territory governments and the Australian Local Government Association through the Adaptation Working Group of the Energy and Climate Change Ministerial Council. All Australian state and territory governments are implementing substantial, evidence-based agendas specific to their jurisdictions. Half of Australian states and territories also have legislative obligations on adaptation policy. Local governments across Australia are at the frontline of improving climate resilience in this country. They are integrating climate change adaptation into local operations and decision making to protect health and wellbeing, property, infrastructure and livelihoods into the future.

International climate finance

In addition to implementing a strong climate policy agenda at home, Australia also delivers high-quality climate finance that responds to the needs of its development partners, is mutually agreed with its development partners and aligns with national and regional plans. Australia will continue to listen to, and be guided by, the priorities and strategies of national governments and local communities. This means prioritising grant-based funding for adaptation projects in the Pacific and increasing blended finance options to leverage additional finance for mitigation and energy transition efforts in Southeast Asia.

Australia provided and mobilised $1,043,928,425 in climate finance over the 2-year reporting period (2020–21 to 2021–22), an increase of 56% from the previous reporting period. This included:

- $609,769,734 in grants provided through bilateral, regional and other channels
- $71,111,498 in loans provided through bilateral, regional and other channels
- $236,877,193 in core contributions to multilateral channels
- $126,170,000 in mobilised private finance.

During the reporting period Australia's climate finance commitment was to provide $2 billion over 5 years, from 2020–25. Australia has now strengthened this commitment and is expecting to deliver $3 billion in climate finance by 2025. Australia has also doubled the amount of climate finance for adaptation it has provided per year: from $96 million in 2018–19 to $239 million in 2021–22 (excluding multilateral core contributions).

Working together

The net zero transformation, including the transition to renewable energy, represents a major transition for many Australian regions and communities. The Net Zero Economy Authority was established by legislation in 2024 to support Australia's regions, industries, workers and communities, including First Nations communities, to seize the opportunities of the net zero transformation. The Australian Government engages in extensive stakeholder consultation to inform consideration of how policies affect industries, natural resources and the public. This includes carrying out targeted consultation with stakeholder groups including First Nations peoples, communities, regional communities, workers, young people, women, Culturally and Linguistically Diverse (CaLD) communities, investors and industry.

All Australian state and territory governments have set their own emissions reduction targets and are implementing climate policies and measures. Reflecting Australia's federated structure and the arrangements noted above for adaptation measures, the Energy and Climate Change Ministerial Council (ECMC) is the primary ministerial-level council for intergovernmental consideration of energy and climate change issues. The National Energy Transformation Partnership agreed between the Australian Government and state and territory governments is a framework for collaboration on reforms required to transform Australia's energy system to achieve net zero by 2050.

Building on the partnership framework, bilateral Renewable Energy Transformation Agreements with state and territory governments will support the delivery of new renewable energy projects while addressing the unique needs of each jurisdiction, helping to manage an orderly transition and improve energy reliability.

Genuine engagement, collaboration and respectful partnerships with First Nations people and communities are critical parts of Australia meeting its climate change commitments. Over 50% of the Australian landmass is subject to some form of First Nations interest, legal rights under Native Title or other First Nations title. Furthermore, many First Nations communities are experiencing the impacts of climate change as well as unreliable and expensive energy supplies. The journey to net zero can be a catalyst for economic self-determination by creating opportunities for First Nations peoples' effective economic participation and leadership. By prioritising investment in the right technology in the right place, the energy transition can ensure that First Nations peoples in remote communities have access to the kind of reliable and affordable electricity that most other Australians already enjoy. The Government is providing $70 million to establish the First Nations Clean Energy Futures Implementation and Grants Programs, which will reduce barriers to accessing clean energy for First Nations communities and support new First Nations led clean energy projects.

The First Nations Clean Energy and Climate Change Advisory Committee was established to advise the Minister for Climate Change and Energy and Department of Climate Change, Energy, the Environment and Water on First Nations rights and interest in energy transition and climate change. This includes providing advice on climate change programs and policies such as the Capacity Investment Scheme, the National Adaptation Plan and the First Nations Clean Energy Strategy.

The government has been implementing reforms to the Australian Carbon Credit Units (ACCU) Scheme, which will further recognise of the importance of early engagement with First Nations people before projects are established. The Independent Review of Australian Carbon Credit Units also recommended the continuation of support for capacity and capability building of rural and remote communities, including First Nations people.

Next steps

The Australian Government, through the Future Made in Australia plan, is investing $22.7 billion over the next decade to maximise the economic and industrial benefits of the international move to net zero and secure Australia's place in a changing global economic strategic landscape. Given its critical and abundant natural endowments and skilled workforce, Australia is well positioned to strengthen priority supply chains and become an indispensable part of the net zero global economy. The Future Made in Australia plan is focused on encouraging and facilitating the private sector investment needed to make the most of this opportunity. In particular, it will foster growth in low carbon energy and materials to replace the emissions-intensive energy that Australia currently uses and exports to the world.

The Australian Government is developing a Net Zero Plan to guide Australia's transition to net zero emissions by 2050. It will set out government priorities, add to existing policies and measures to drive down emissions, and support ongoing and new investment in low emissions and renewable activities. As part of this work, the government is developing 6 sectoral decarbonisation plans, covering all major emission sources: electricity and energy, transport, industry, agriculture and land, resources and the built environment.

References (Executive Summary)

DCCEEW 2023 (Department of Climate Change, Energy, the Environment and Water) (2023) *Australian Energy Update 2023*, DCCEEW.

DCCEEW 2024 (Department of Climate Change, Energy, the Environment and Water) (2024) *Australian Energy Update 2024*, DCCEEW.

1 National Inventory Report of anthropogenic emissions by sources and removals by sinks of greenhouse gases

Australia's National Inventory Report of anthropogenic emissions by sources and removals by sinks of greenhouse gases for the period 1990 to 2022 (NIR 2022) was submitted to the UNFCCC secretariat in April 2024 as a stand-alone document, consistent with Decision 18/CMA.1 (Annex I.E, paragraph 12). It is available on the UNFCCC website: First Biennial Transparency Reports.

2 Information necessary to track progress made in implementing and achieving Nationally Determined Contributions under Article 4 of the Paris Agreement

Key Points

- The physical impacts of climate change are becoming ever more apparent in Australia.
- In 2022 Australia updated its Nationally Determined Contribution and legislated its emissions reduction targets, committing to an emissions reduction of 43% below 2005 levels by 2030 and net zero emissions by 2050.
- Australia is making progress towards both its 2030 targets. Australia's targets are based on its financial year that runs from 1 July in a given year to 30 June of the following year. So Australia's 2030 multi-year target covers the period 1 July 2020 to 30 June 2030. Similarly, its single-year 2030 and 2050 targets cover the period 1 July 2029 to 30 June 2030 and 1 July 2049 to 30 June 2050 respectively. Based on its latest National Inventory Report, in 2022 Australia's net national emissions were 29% below its single-year target's base year (2005). Cumulative net national emissions equivalent to 20% of the multiyear target's emissions budget have been generated after 20% of the commitment period has elapsed.
- Australia prepares greenhouse gas emissions projections annually. With currently implemented policies and measures, emissions are projected to be 352 Mt CO_2-e in 2030, or 42.6% below 2005 levels, just shy of the 2030 single-year point target. Australia is projected to beat the 2030 target on a budget basis. With additional policies, Australia's emissions are projected to be at 351 Mt CO_2-e or 42.7% below 2005 levels in 2030. The projections were prepared based on the latest *Quarterly Update of Australia's National Greenhouse Gas Inventory*, which includes indicative updated emissions estimates for Australia's base year (2005) emissions and 2022. Year 2005 estimates were revised from 609 Mt CO_2-e to 613 Mt CO_2-e, while year 2022 estimates were revised from 432.6 Mt CO_2-e to 438.4 Mt CO_2-e. Estimates for these years will continue to be subject to revisions consistent with Australia's commitment to continuous improvement and modalities, procedures and guidelines (MPG) requirements for time series consistency.
- Australia is decarbonising the electricity sector by switching to predominantly solar and wind. Between 2023 and 2024, renewables accounted for 38% of total electricity generation within the National Electricity Market (NEM), Australia's largest electricity grid. This is an increase from 21% just 5 years ago. The rising share of renewables is driving down emissions from the electricity sector – the largest contributor to emissions. Since 2005, emissions from the NEM have fallen by nearly 30% (51 Mt CO_2-e).
- The government is investing $22.7 billion over the next decade through its Future Made in Australia plan to maximise the economic and industrial benefits of the move to net zero and secure Australia's place in a changing global economic and strategic landscape.
- The government is developing a Net Zero Plan to guide Australia's transition to net zero emissions by 2050. As part of this work, the government is developing 6 sectoral decarbonisation plans, covering all major emission sources.
- Australia's state and territory governments have set their own emissions reduction targets and are implementing climate policy agendas specific to their jurisdictions. The Energy and Climate Change Ministerial Council, established in 2022, is the primary ministerial-level council for intergovernmental consideration of energy and climate portfolio issues.
- Chapter 2 fulfils guidelines 65–103 of the Biennial Transparency Report MPG.

Structure

This chapter commences with Australia's national circumstances and institutional arrangements. It then provides updates on the most impactful climate mitigation policies and measures that are in place and how they are impacting on long-term emissions trends, with a focus on developments since the 2022 5th Biennial Report, and how policymakers assess the economic and social impacts of the government's climate actions. Finally, the chapter summarises Australia's greenhouse gas emissions, reductions and projections, including in relation to its absolute economy-wide emission reduction targets under its Nationally Determined Contribution. Annex II, which supports this chapter, is available on the UNFCCC website: First Biennial Transparency Reports.

2.1 National circumstances and institutional arrangements

2.1.1 Government structure

Australia has a federal system of government with 3 levels: federal (the Australian Government), state and territory (Australian Capital Territory, New South Wales, Northern Territory, Queensland, South Australia, Tasmania, Victoria, Western Australia) and local government councils created by state and territory law. There are 566 local government areas across the country (ABS 2021a). Emissions reduction targets are set at the federal and state/territory levels of government. To achieve these targets, the 3 levels of government work together to develop and implement climate change mitigation and adaptation policies.

Australia's written Constitution sets out the responsibilities of the Australian Government, including foreign affairs and trade, defence and immigration. States and territories are responsible for matters not assigned to the Australian Government in the Constitution, such as health, climate change, energy and education, although in practice the 3 levels of government cooperate in many areas.

Australian Government climate change legislation is made under a range of constitutional powers, including the external affairs power (based on Australia's obligations under international agreements) and the broad corporations power (Gibson n.d.).

Australian Government, state and territory ministers also often collaborate on issues specific to their portfolio through ministerial councils, which meet regularly and provide ministers with a formal channel to progress key priorities. National Cabinet, chaired by the Prime Minister, is the overarching forum for the Prime Minister, state Premiers and territory Chief Ministers to meet and work collaboratively with ministerial councils underneath.

The Energy and Climate Change Ministerial Council (ECMC), established in 2022, is the primary ministerial-level council for intergovernmental consideration of energy and climate portfolio issues (see section 2.3.1.3). Given the cross-cutting nature of climate change, other ministerial councils including the Environment Ministers Meeting (see section 2.3.1.6) and the Infrastructure and Transport Ministers Meeting also contribute to emissions reduction policies and outcomes.

The Administrative Arrangements Order sets out policy responsibilities for Australian Government departments. The Department of Climate Change, Energy, the Environment and Water (herein after referred to as the department or DCCEEW) is primarily responsible for leading Australia's response to climate change and sustainable energy use, and protecting Australia's environment, heritage and water (see DCCEEW's website for more information).

2.1.2 Population profile

Australia's population was 26.7 million at 30 June 2023, having grown at around 1.4% a year on average over the past 3 decades (from 17.1 million at 30 June 1990) (ABS 2024a, ABS 2024b).

The population is concentrated in urban areas along the coastlines. More than two thirds (68%) of Australia's population lived in the 8 capital cities at 30 June 2023, increasing from 65% in 1990 (ABS 2023a).

The closure of international borders due to the COVID-19 pandemic led to population growth falling to 0.1% in 2020–21. Following the easing of international border restrictions in late 2021, population growth increased to 1.3% in 2021–22 and 2.5% in 2022–23, as overseas migration returned.

Australia's population growth is expected to gradually decline to 1.3% in 2027–28 and 1.2% in 2034–35, as net overseas migration returns to pre-pandemic levels.

2.1.3 Economic profile

Australia is an open economy and is highly integrated with the global economy. Like most developed economies, Australia's is dominated by its services sector. The services sector employed around 80% of the Australian workforce and accounted for 70% of gross domestic product in 2023–24 (see section 2.1.6.3.1) (ABS 2024c).

Australia's economy has more than doubled over the past 30 years, driven by productivity growth initially and growth in the working-age population more recently. Between 1993 and 2023, Australia's average annual economic growth was 3.1%, compared with an OECD average of 2.2%. Australia's strong economic growth has boosted living standards and household consumption. Economic growth was 1.4% in 2023–24, as a result of a combination of elevated inflation, higher interest rates and global economic uncertainty (ABS 2024d).

Global challenges, including Russia's illegal and immoral invasion of Ukraine, COVID-19 economic shocks and policy responses, and adverse weather events contributed to a sharp pick-up in domestic inflation over 2021 and 2022. Inflation has moderated substantially, with annual headline inflation returning to within the Reserve Bank of Australia's target band in the September quarter of 2024. However, underlying inflation remains above the target band. Global challenges continue to generate uncertainty over the domestic and global economic outlook, including the possibility of renewed trade or geopolitical tensions. A further escalation in conflict in the Middle East could add to energy costs, further disrupt international trade and slow global growth.

In this current integrated global market Australia has specialised in areas of comparative trade advantage, such as resources and energy, which account for around 63% of Australia's exports by value, and agriculture, which accounts for around 11% of exports by value in 2023.

Looking to a net zero global economy, the Future Made in Australia plan aims to maximise the economic and industrial benefits of the move to net zero and secure Australia's place in a changing global economic and strategic landscape, as per the Australian Government Budget 2024. A Future Made in Australia is about attracting and enabling investment, and making Australia a renewable energy superpower, as Australia's generation mix continues to shift from fossil fuel sources to renewables.

As the global economy moves to net zero, the Future Made in Australia plan aims to maximise the economic and industrial benefits from this significant shift and secure Australia's place in a changing global economic and strategic landscape (Australian Government Budget 2024). The Future Made in Australia plan is about attracting and enabling investment and leveraging Australia's abundant natural endowments and skilled workforce to support the world's net zero goals and become a renewable energy superpower.

2.1.3.1 Labour force and skills in a net zero economy

Australia's labour force consists of almost 14.5 million employed people, reflecting a participation rate of around 67% (ABS 2024e). The largest industries of employment, by share of workforce, include:

- health care and social assistance (16.1%)
- retail trade (10%)
- education and training (8.6%)
- professional, scientific and technical services (8.4%)
- construction (8.3%) (Jobs and Skills Australia 2024a).

Reaching net zero by 2050 requires a substantial transformation as new skills, qualifications, training pathways, technologies and industries will emerge. The clean energy workforce includes workers involved in energy infrastructure, energy service delivery and clean energy technology (Jobs and Skills Australia 2023). Jobs and Skills Australia analysis indicates the clean energy workforce will need to grow from 53,000 to 84,000 workers by 2050, with strong growth likely in solar, wind and hydroelectricity. Strong growth in demand for electricians, tradespeople, technicians, machine operators and project managers is expected. Construction is also expected to grow, as much of the activity to build and replace transmission infrastructure is in the civil construction sector.

The major industry groups currently operating in the clean energy workforce are hydroelectricity generation and other electricity generation such as wind and solar. In 2018–19 annual direct full-time employment in renewable energy activities in Australia was estimated at 26,850 jobs with around half of this employment in roof-top solar, an increase of 120% over 10 years (ABS 2020a).

Based on the 2021 Australian Census, around 1.1% of Australia's workforce is in transitioning sectors (such as coal-fired power and coal mining), with a higher proportion in regional areas. The Net Zero Economy Authority will support workers impacted by the net zero transition, particularly those in coal-fired power stations and dependent mines, to transition to new opportunities (see section 2.3.5.3).

The transitioning energy sector, particularly coal mining (3.4%), has been a major employer of First Nations people. However, their representation in the clean energy workforce is low (1.9%). Despite being critical to Australia's workforce, First Nations people continue to experience barriers to employment. In seeking to address

these barriers, the 2023 Jobs and Skills Australia Clean Energy Capacity Study recommends enhancing support for First Nations people to facilitate their entry into education and training pathways. Further, the study made several recommendations, including:

- Consider expanding the Indigenous Ranger and Caring for Country programs to all states and territories without existing equivalents.
- Explore employment, training and educational targets for clean energy initiatives on lands governed by Aboriginal Land Rights, Native Title and other stewardship arrangements, in consultation with local Traditional Owners.
- Investigate opportunities to enhance the uptake of the Commonwealth Indigenous Procurement Policy targets, including Mandatory Minimum Indigenous Participation Requirements, specifically within clean energy supply chains (Jobs and Skills Australia 2023).

To support the growth of the clean energy workforce, women's participation across the construction, trades and broader energy workforce needs to increase. The construction industry and the electricity, gas, water and waste services industry are highly gender segregated with women making up 14% and 27% of workers respectively (Jobs and Skills Australia 2024b). The Australian Government is committed to advancing women's workforce participation, as outlined in its report *Working for Women: A Strategy for Gender Equality*, which outlines the government's vision for gender equality. It is also committed to Equal by 30, for equal pay, equal leadership and equal opportunities for women in the clean energy sector by 2030.

2.1.4 Geographic profile

Australia is the sixth largest country in the world, with a land area of 7.7 million km^2, according to Geoscience Australia (GA 2014).

Australia's marine jurisdiction is the third largest in the world, with an exclusive economic zone covering 10 million km^2 (GA 2022).

Australia is the driest inhabited continent, with 70% of the land either arid (average rainfall of 250 mm or less) or semi-arid (average rainfall of between 250 and 350 mm). Rainfall and temperature also vary considerably across the country and from year to year.

2.1.5 Climate profile

Australia's temperature and rainfall patterns are shifting and extreme events continue to increase in their frequency and intensity amidst an already highly variable climate.

The Australian continent covers a large range of climate zones, from the tropics in the north to the arid interior and temperate regions in the south. Climate change is affecting all regions.

2.1.5.1 Temperature

Australia's climate has warmed by an average of 1.51±0.23°C since national records began in 1910 (BOM and CSIRO 2024).

Australia's national area-averaged mean temperature for winter in 2024 was 1.48°C above the 1961–1990 average, the second warmest winter on record since national observations began in 1910. An unseasonal warm period affected most of Australia in the second half of August 2024, with both daytime and night-time temperatures more than 10°C above the August average for large parts of the country, according to the Bureau of Meteorology (BoM 2024a).

Australia is projected to experience continued increase in air temperatures, more heat extremes and fewer cold extremes.

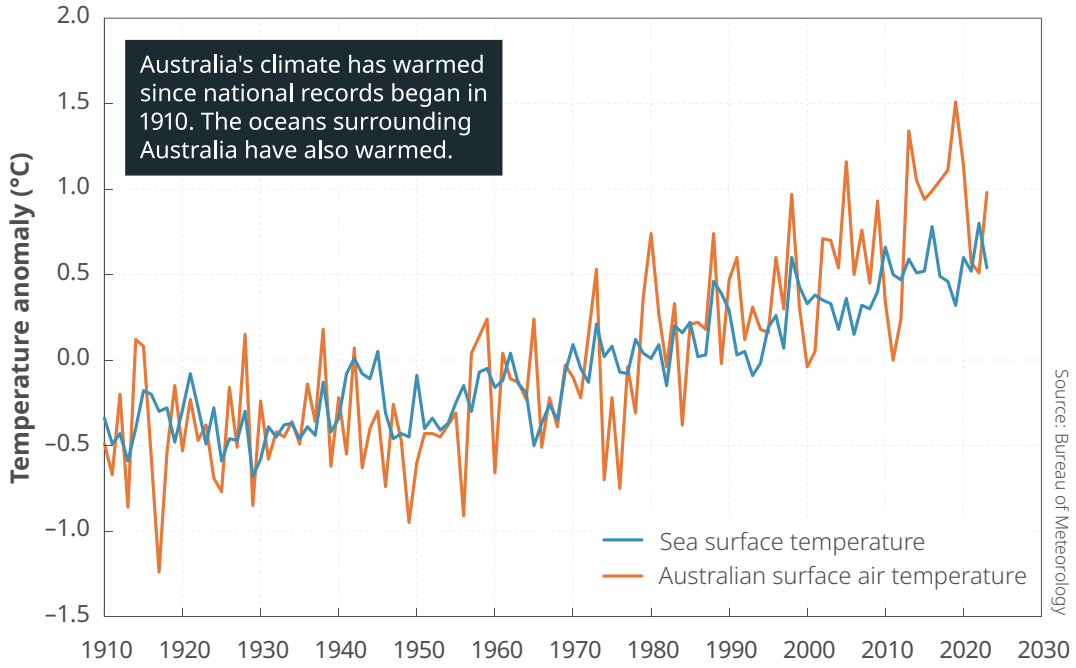

Figure 2.1 Temperature anomalies in Australia 1910 to 2023

Note: Anomalies (departures from the mean for the 1961–1990 standard averaging period) in annual mean sea surface temperature, and temperature over land, in the Australian region. Sea surface temperature values (data source: ERSST v5, www.esrl.noaa.gov/psd are provided for a region around Australia (4–46 °S and 94–174 °E).

Source: Bureau of Meteorology, State of the Climate 2024

2.1.5.1.1 Ocean

Oceans around Australia are acidifying and have warmed by more than 1°C since 1900, contributing to longer and more frequent marine heatwaves (DCCEEW 2024a). Figure 2.1 shows ocean warming is accelerating. Australia is projected to experience further sea level rise and continued warming and acidification of the oceans around Australia.

2.1.5.2 Rainfall

Despite large natural variability, longer-term trends are evident in Australia's rainfall records. A shift towards drier conditions across the south-west and south-east is occurring, with increasingly frequent years of below-average rainfall, especially for the cool season months of April to October. Conversely, northern Australia has seen a shift towards wetter conditions across all seasons, especially in the north-west during the northern wet season (October to April). Figure 2.2 shows that in recent decades rainfall during the northern wet season was above average across much of Australia and rainfall during the cooler months has been very low, particularly in southern Australia.

In recent decades, the intensity of short-duration (hourly) extreme rainfall events has also increased by around 10% or more in some regions. These trends were illustrated over late 2023 and early 2024.

The August–October 2023 period was the driest on record nationally. However, this was followed by a very wet November–January nationally, including record extreme rainfall in the north-east due to Cyclone Jasper.

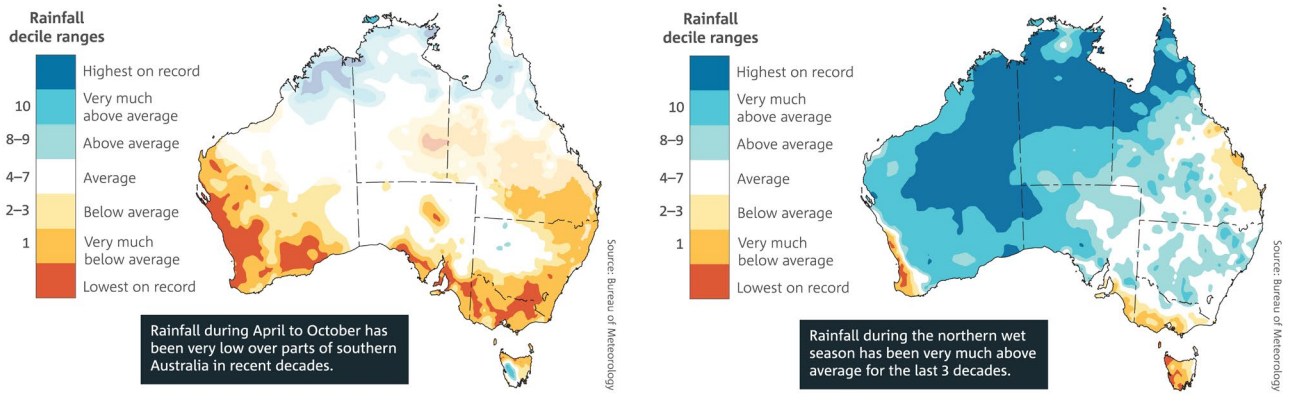

Figure 2.2 Rainfall in Australia during dry and wet seasons

Left: April to October rainfall deciles for the 30 years from 1994 to 2023. A decile map shows where rainfall is above average, average, or below average for this period compared to all years from 1990 (when reliable national rainfall records began) to 1993. Areas across northern and central Australia that receive less than 40% of their annual rainfall from April to October are faded.

Right: Northern wet season (October–April) rainfall deciles for the past 30 years (1994–2024). A decile map shows where rainfall is above average, average or below average for this period compared to all years from 1900 to 1993.

Source: Bureau of Meteorology, State of the Climate 2024

As the climate warms, heavy rainfall is expected to become more intense. Australia is projected to experience continued reductions, on average, in cool season rainfall across many regions of southern and eastern Australia, which will likely lead to more time in drought, but with ongoing climate variability that will give rise to short-duration heavy-rainfall events at a range of timescales.

2.1.5.3 Extreme events

Long-term climate records show changes in both frequency and intensity of extreme weather events including:

- increased frequency of large-scale heatwaves and record-high temperatures
- longer fire seasons with more extreme fire danger days
- reduced average rainfall and longer droughts in southern Australia
- increased heavy rainfall and increased frequency of coastal storm surge inundation and erosion
- reduced tropical cyclones with increased intensity and associated rainfall.

Australia is projected to continue to see an increase in the frequency and intensity of extreme events (DCCEEW 2024a). See Chapter 3 for further detail on climate change impacts and the National Climate Risk Assessment.

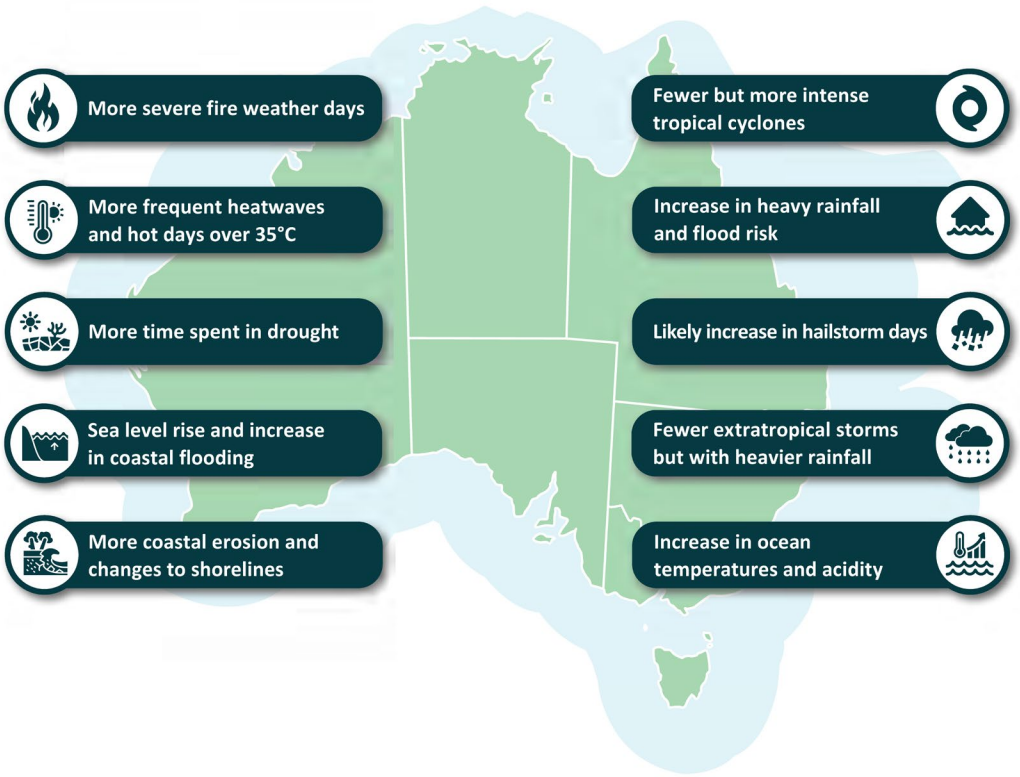

Figure 2.3 Overview of Australia's climate hazards

Source: National Climate Risk Assessment – First pass assessment report

2.1.5.3.1 Extreme heat

The most pronounced trend is increasing record-breaking heat. Extreme and extensive heatwaves occurred in many parts of Australia in recent summers, exceeding historical records (BOM 2024b). Climate change is expected to continue to increase the frequency and intensity of heat events, with longer heatwaves, more frequent extreme hot days and temperatures above the historical record. Figure 2.4, comparing 2 historical time periods, demonstrates that there has been an increased number of days with dangerous weather conditions for bushfires.

2.1.5.3.1.1 Fire seasons

The duration of fire seasons has increased, along with the frequency of dangerous fire weather days (BOM 2023). In 2023–24, 61 million hectares of the Northern Territory were burnt. During the 2019–20 Black Summer bushfires 24 million hectares of southern Australia burnt.

Australia is projected to experience a longer fire season for the south and east, and an increase in the number of dangerous fire weather days. A warmer and drier climate increases fire risk and will likely result in changes to bushfire fuel loads, structure and type.

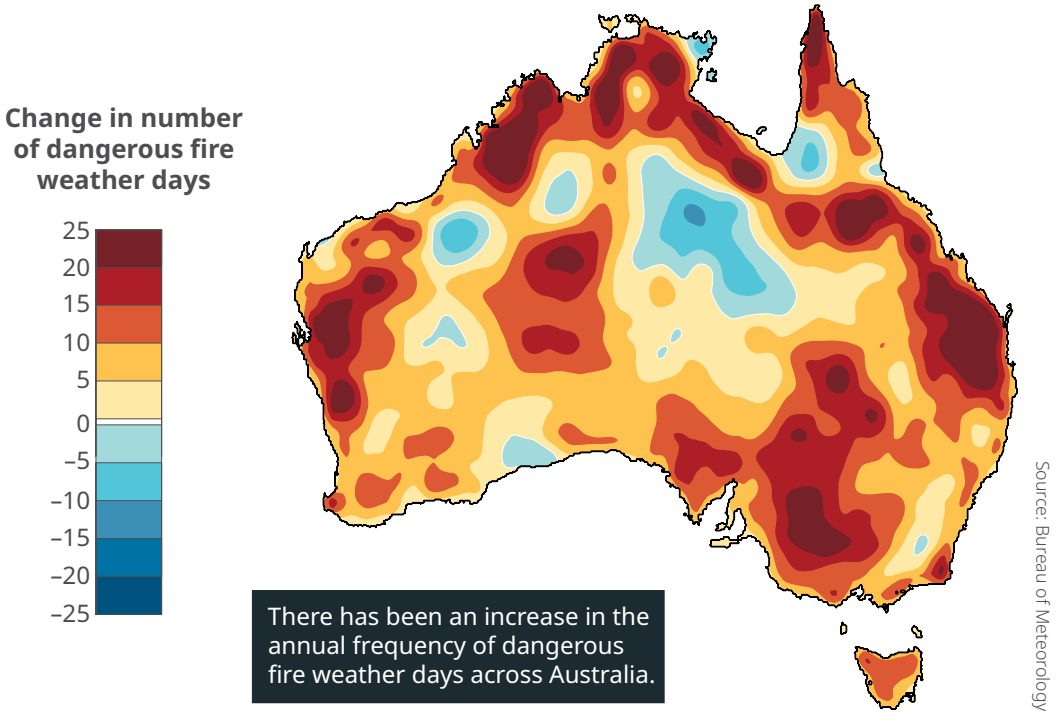

Figure 2.4 Dangerous fire days in Australia

Note: There has been an increase in the number of days with dangerous weather conditions for bushfires. The map shows the change in the number of days per year (July to June) that the FFDI exceeds its 90th percentile of conditions observed from 1950–2024, between two periods: July 1950 to June 1987 and July 1987 to June 2024. The FFDI is an indicator of dangerous fire weather conditions for a given location.

Source: Bureau of Meteorology, State of the Climate 2024

2.1.6 Major sectors

Australia is decarbonising all major economic sectors of the economy to achieve its goal of net zero by 2050. The pathways and policies to achieve net zero will be communicated in the forthcoming Net Zero Plan and its underpinning sectoral plans (see section 2.6.2.1).

Under the Future Made in Australia plan (see section 2.6.1) the government is investing in priority industries aligned with the needs of a net zero world, including renewable hydrogen, clean energy manufacturing, low carbon liquid fuels (LCLF), green metals and critical minerals processing.

This section describes Australia's current national circumstances for each of the following sectors: energy, transport, industry, waste, buildings, agriculture and forestry.

2.1.6.1 Energy

The energy sector is Australia's largest source of emissions, contributing 91.7% (396.7 Mt CO_2-e) of Australia's net emissions (or 76.1% excluding Land Use, Land Use Change and Forestry (LULUCF)) in 2021–22 (see section 2.10.2.5). Most emissions are a result of carbon dioxide from fuel combustion activities such as electricity generation and transportation.

The largest increase in greenhouse gas emissions since 1989–90 was from stationary energy, which increased 195.6 Mt CO_2-e (32.3%) to 258.9 Mt CO_2-e in 2021–22. (This covers the Australian financial year from 1 July 1989 to 30 June 1990 – all other references to emission estimates for time periods cited as 'year–year' also reflect Australian financial years). Stationary energy means the emissions from the combustion of fuels to generate steam, heat or pressure, other than for transport. This increase was driven in part by increasing population and household incomes as well as export increases from the resource sector. Decreases in recent years have been largely driven by the continuing decrease in the emissions intensity of electricity generation, as well as ongoing COVID-19 pandemic impacts. Efforts to decarbonise the energy sector are starting to show results, as outlined in the sections below.

2.1.6.1.1 Electricity generation

Decarbonising the energy sector, including the electricity market, is a critical priority for the Australian Government. The 82% renewable electricity target by 2030 is essential to reaching Australia's targets of 43% emissions reduction below 2005 levels by 2030, and net zero by 2050 (see section 2.6.4.1). This transformation involves accelerating renewable energy deployment and replacing ageing emissions-intensive electricity generation.

The electricity sector is Australia's largest source of energy emissions. In 2021–22 electricity sector emissions contributed 36.2% (156.8 Mt CO_2-e) of Australia's net emissions, as reported in the NIR 2022 – CRT Table 1. Electricity emissions peaked in 2008–09 at 211.6 Mt CO_2-e (DCCEEW 2024b). The decline in electricity emissions since the peak is driven by a significant scale up of renewable generation sources, the ongoing displacement of coal as a fuel source and system-wide energy efficiency improvements (see section 2.10.2) (DCCEEW 2024c).

In the 2023 calendar year total electricity generation in Australia was 273 terawatt hours or a 0.1% increase over the previous year, reflecting increased electricity demand associated with warmer and cooler conditions across the country throughout the year (DCCEEW 2024d). Coal remained the biggest fuel source for electricity generation, contributing 46% of total generation, despite steady declines in recent years (see Figure 2.5). Natural gas–fired generation has fallen since 2022 and now accounts for 17.1% of electricity generation. Oil products contributed 1.8% mostly in off-grid applications such as mining (DCCEEW 2024f).

Renewable electricity generation has risen from 10% of Australia's total generation in 1989–90 to 35% of total generation in 2023 (DCCEEW 2024f). Solar was the largest source of renewable electricity generation, accounting for 16% of the total, followed by wind at 12%, hydro at 6% and bioenergy at 1% (see section 2.1.6.1.3.1) (DCCEEW 2024e).

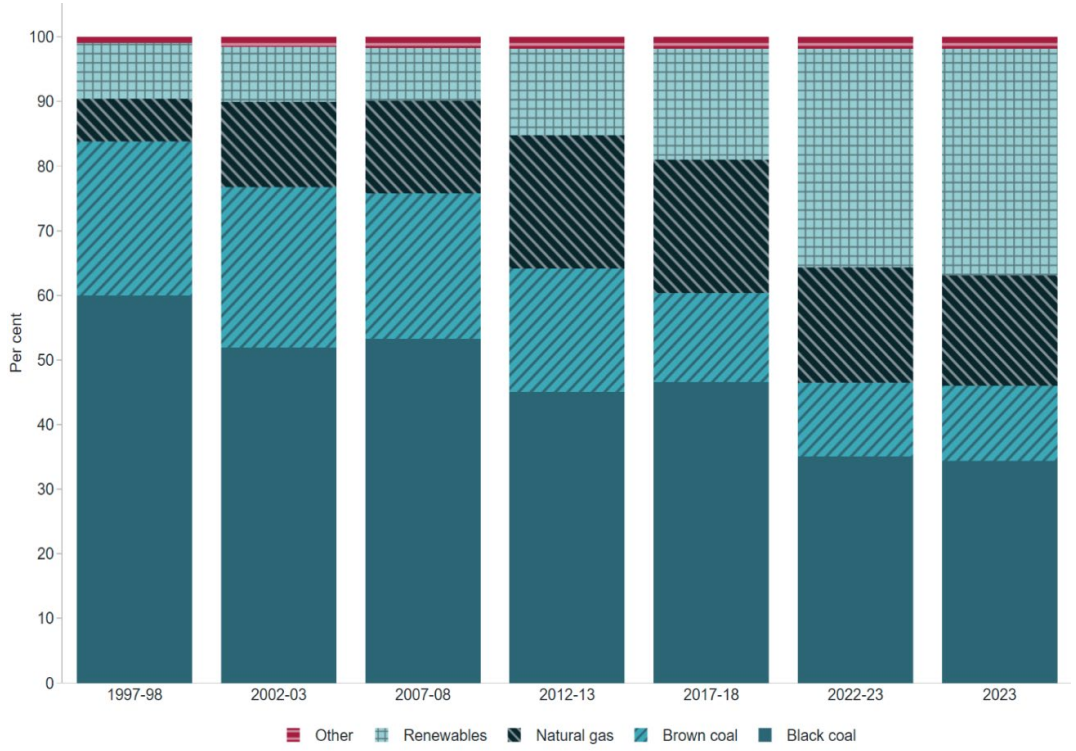

Figure 2.5 Australian electricity generation fuel mix over time

Source: DCCEEW (2024f)

2.1.6.1.1.1 Energy market structure

Although the Australian, state and territory governments each maintain their own energy policies, the cross-cutting nature of the energy sector requires governments to work together to ensure the safety, security, stability and reliability of Australia's energy systems. In eastern Australia, which accounts for the majority of Australia's economic activity, the interconnected nature of electricity and gas networks led governments to apply a regulatory framework with 3 overarching laws known as the National Electricity Law (NEL), National Gas Law (NGL) and National Energy Retail Law (NERL).

The NEL underpins an interconnected electricity market known as the National Electricity Market (NEM). The remaining large-scale systems and some other smaller regions are not connected to the NEM and have their own separate regulatory arrangements and markets.

The NGL applies to gas supply hubs in Queensland and South Australia, short-term trading markets in South Australia, Queensland and New South Wales, and the declared wholesale gas market in Victoria. While some gas interconnection does exist between the Northern Territory and eastern states, Western Australia and the Northern Territory largely operate their own separate gas systems.

The governance of Australia's east coast energy system and markets involves 4 bodies:

- The Australian Energy Market Commission (AEMC) makes rules for the NEM, elements of the gas market and related retail markets, and provides strategic and operational advice to the energy minister.
- The Australian Energy Regulator (AER) is the economic regulator of the wholesale electricity and gas markets in eastern Australia, and enforces rules established by the AEMC.
  - The Economic Regulatory Authority (ERA) plays a similar role in Western Australia. In the Northern Territory, the equivalent body is the Utilities Commission, although the AER has taken on some of the economic regulatory functions of the Utilities Commission in terms of energy.
- The Australian Energy Market Operator (AEMO) manages the day-to-day system operation of the wholesale and retail energy markets, including the NEM, the Victorian Declared Wholesale Gas Market, the Short Term Trading Market and the Gas Supply Hub.
- The Energy Advisory Panel comprises heads of the AEMO, the AEMC, the AER – and the Australian Competition and Consumer Commission (ACCC) Energy Commissioner as an observer. It provides oversight and advice to energy ministers on energy security, reliability and affordability of Australia's east coast energy system.

Each of these agencies is guided by the National Electricity Objective, National Gas Objective and National Energy Retail Objective contained in the NEL, NGL and NERL respectively. The national objectives focus on promoting the long-term interests of consumers through efficient investment, operation and use of energy services with respect to price, quality, safety, reliability and security of supply, as well as the achievement of emissions reduction targets. Energy market bodies also report to the ECMC through Australian Government, state and territory ministers (see section 2.3.1.3).

2.1.6.1.1.2 Australian electricity market

The Australian electricity market is largely made up of 4 separate large-scale systems: the NEM, which covers eastern and southeastern Australia, Western Australia's North West Interconnected System (NWIS), South West Interconnected System (SWIS) and the Northern Territory's Darwin–Katherine Interconnected System (DKIS). The NEM is the largest market, supplying around 80% of Australia's electricity consumption. Other markets are separated because of their geographical isolation. Figure 2.6 shows the location and extent of each of these markets, as well as some other smaller electricity transmission systems, alongside gas pipelines.

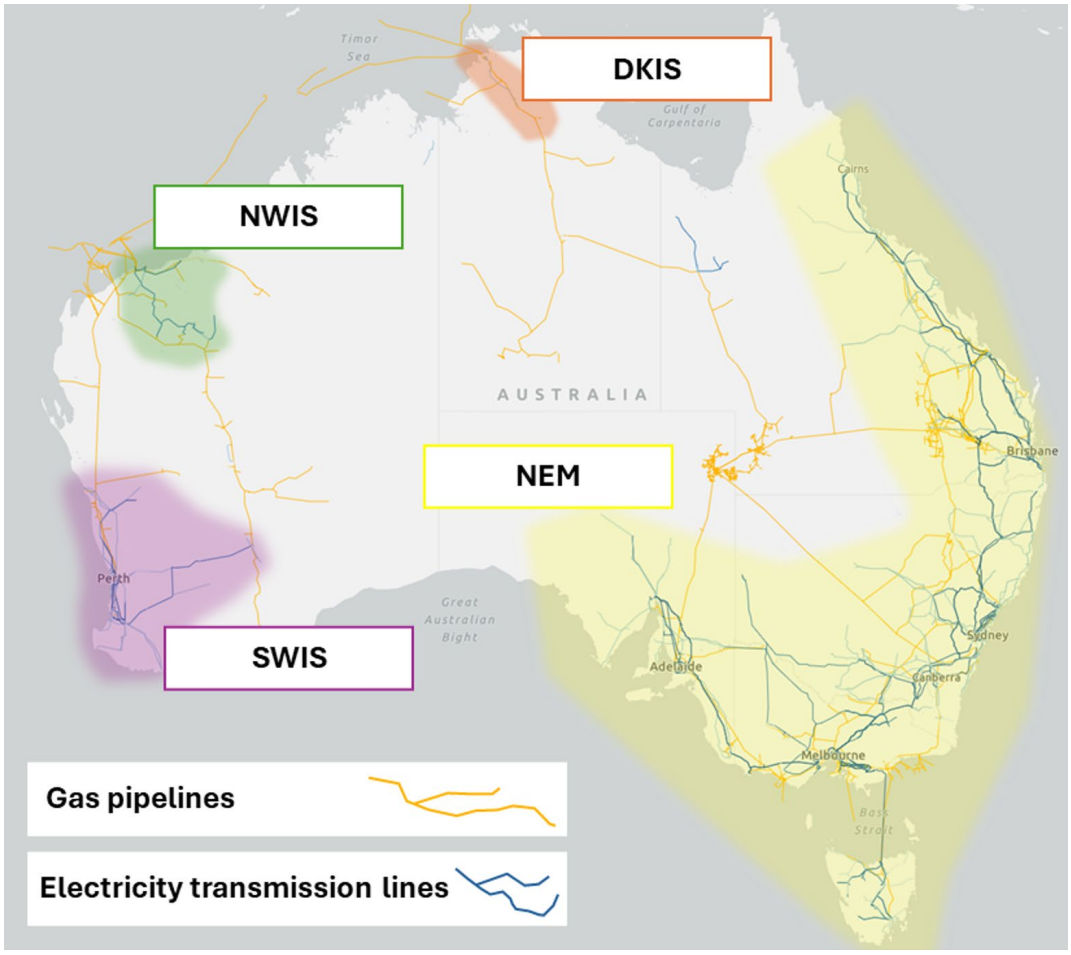

Figure 2.6 Map of Australia's electricity and gas infrastructure

DKIS: Darwin Katherine Interconnected System
NWIS: North West Interconnected System
NEM: National Electricity Market
SWIS: South West Interconnected System
Source: Australian Digital Atlas.

2.1.6.1.1.3 Prices

Electricity affordability, reliability and security are front of mind for Australians. The price that consumers pay for electricity is influenced by a range of factors, including the wholesale cost of generating electricity, the cost of transmission and distribution and other inputs.

Russia's illegal invasion of Ukraine resulted in a surge in energy prices, both in Australia and around the world. Additional upward price pressures in Australia came from outages of some ageing, unreliable coal-fired generators and relatively high electricity and gas demand in winter 2022. This combination of factors was forecast to result in substantial increases in retail electricity and gas prices. Government intervention through the Energy Price Relief Plan reduced prices compared to the levels they would have reached without intervention. These pressures and the delay in wholesale price changes flowing through to the retail market also increased the range of retail electricity prices observed in 2023. The government has delivered energy bill relief to households and small businesses, in collaboration with assistance from states and territories.

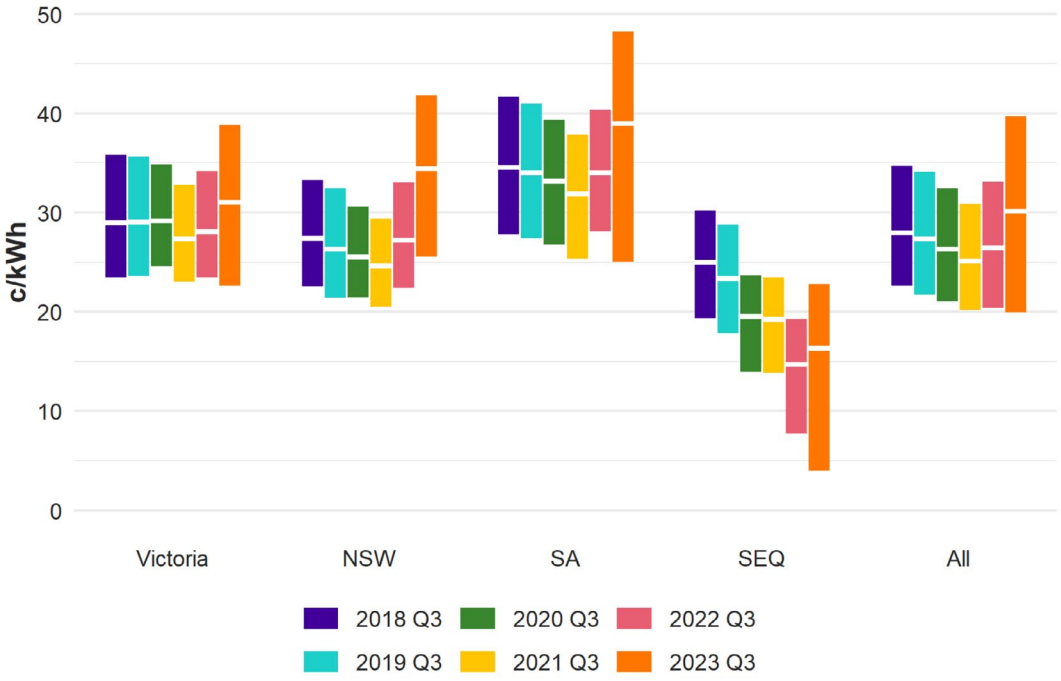

Figure 2.7 Effective electricity prices paid by residential consumers

Note: SEQ = South East Queensland
Description: Median and maximum prices in Q3 2023 were up year on year, in all 4 regions shown

Source: ACCC, 2024, Appendix E – Supplementary spreadsheet with billing data and figures – Inquiry into the National Electricity Market report – June 2024, Australian Competition and Consumer Commission, Commonwealth of Australia, Canberra

Since peaking in 2022, wholesale electricity prices have fallen substantially and these falls began flowing through to retail prices from late 2023. The easing of global energy and domestic electricity price pressures continues against a backdrop of demand spikes, including from extreme weather events and temperatures, which can increase price volatility.

Renewable generation, like wind and solar, has a lower short-run cost of energy production than fossil-fuel based generators like gas and black coal. The increasing contribution of variable renewable energy sources (rising to a share of 35% in 2023) is placing downward pressure on wholesale electricity costs, particularly in the middle of the day when solar generation peaks. In its 2023 State of the Energy Market Report, and in its quarterly reports on wholesale markets, the AER has consistently noted the impact of wind and solar on low and negative prices in the NEM during the middle of the day, particularly during the summer season.

The Australian Energy Market Commission's 10-year residential price outlook released on 28 November 2024 confirms the importance of delivering a coordinated energy transition to lower household bills, finding that residential electricity prices across the NEM could be around 13% lower in ten years' time, if renewable energy and infrastructure development proceeds as expected (AEMC 2024).

2.1.6.1.2 Energy consumption

Energy consumption grew 2% to 5,882 petajoules (PJ) in 2022–23 following 3 successive years of decline. Energy consumption is 5% below the historical peak of 6,188 petajoules reached in 2018–19, before the COVID-19 pandemic. Energy consumption measures the amount of energy used in the Australian economy. It includes energy consumed in energy conversion activities (such as electricity generation and petroleum refining) but subtracts derived or secondary fuels produced domestically (such as electricity and refined oil products) to avoid double counting.

The recent growth in energy consumption has generally remained below the rate of economic growth over the past 3 decades. This is mainly attributed to improvements in energy efficiency and a shift in the economy towards less energy-intensive sectors such as services (DCCEEW 2024e).

2.1.6.1.2.1 Consumption by fuel type

Oil accounted for the largest source of Australian energy consumption, at 39%, followed by coal and gas both at 26% (see Table 2.1).

Renewable energy accounted for the remaining 9% of Australian energy consumption in 2022–23, and includes energy used for electricity generation as well as various direct uses of renewable fuels such as firewood for residential heating, bagasse (sugar cane waste) combustion for heat in manufacturing, and solar hot water.

Table 2.1 Australian energy consumption by fuel type

	2022–23 petajoules	2022–23 share (%)	2022–23 growth/ reduction (%)	10 year average annual growth (%)
Oil	2,285.5	38.9	8.5	0.0
Coal	1,525.0	25.9	-3.9	-2.3
Gas	1,518.1	25.8	-2.6	1.0
Renewables	553.6	9.4	8.1	5.2
Total	5,882.2	100	2.0	-0.1

Source: DCCEEW 2024 Australian Energy Statistics, Table C

2.1.6.1.2.2 Consumption by sectors

At the sectoral level the electricity supply, transport and manufacturing sectors collectively accounted for over two thirds of energy consumption in 2022–23 with transport, at 28%, the largest energy-using sector (see Table 2.2).

The transport sector also saw the largest increase in energy use, 12% in 2022–23, due to diminishing effects of the pandemic restrictions on aviation and road transport. International short-term arrivals shrank to a few thousand per month in mid-2020 but by the end of 2023 air transport activity levels appeared similar to the pre-pandemic baseline for both inbound international and domestic travellers. Fuel use in the road sector also grew 5% with the end of lockdowns and border closures. Manufacturing is the third largest energy sector consumer, at 17%, closely followed by mining at 15% (DCCEEW 2024e).

Consumption in the electricity sector declined 2% despite an increase in electricity generation. Consumption of renewable energy is increasing as the electricity market continues its transition away from a reliance on fossil fuels as ageing, unreliable coal generators retire and are replaced with renewable energy and clean storage. Strong growth in renewable energy, mainly solar photovoltaic (27% of renewable total) and wind (20%), are replacing the share of fossil fuel consumption (DCCEEW 2024e).

Gas is used across a variety of sectors and has been effectively flat over the decade, growing by just 1%. The largest single use of gas in Australia is self-use by liquified natural gas (LNG) export facilities to process gas into LNG. Coal consumption, in contrast, has fallen at a rate of 2.3% over the same period, while oil has remained steady.

Table 2.2 Australian energy consumption by sector

	2022–23 PJ	2022–23 share (%)	2022–23 growth/ reduction (%)	10 year average annual growth (%)
Transport	1,622.1	27.6	12.0	0.3
Electricity supply	1,378.3	23.4	-2.0	-1.5
Manufacturing	996.3	16.9	-3.2	-2.5
Mining	883.1	15.0	2.0	5.8
Residential	484.2	8.2	-2.6	0.6
Commercial	308.1	5.2	4.1	0.4
Agriculture	105.9	1.8	-7.6	0.6
Construction	36.6	0.6	-1.5	1.6
Water and waste	16.7	0.3	-6.5	2.5
Other	51.0	0.9	-4.9	-2.8
Total	5,882.2	100.0	2.0	-0.1

Source: DCCEEW 2024 Australian Energy Statistics, Table E

2.1.6.1.3 Energy production

While the production of primary energy typically follows similar trends to its consumption, Australia is a globally significant exporter of coal and LNG, so primary energy production in Australia has much broader influences. For example, fossil fuels account for 97% of production compared with 91% of consumption.

The 'production of primary energy' is defined as the total amount of primary energy produced in the Australian economy, measured before consumption or transformation into secondary energy products. Forms of renewable energy that produce electricity directly without a thermal component – such as wind, hydro and solar PV – are also considered primary energy sources. Coal-fired electricity generation is considered secondary energy production and is not included, as the coal is already accounted for when mined (DCCEEW 2024e).

In 2022–23 energy production fell 2% to 18,710 PJ as a result of lower coal production and export. More than 80% of Australian energy production is generally exported, not including uranium.

2.1.6.1.3.1 Renewable energy

The government has committed to 82% renewable electricity by 2030 (see section 2.6.4.1). The 82% target refers to renewable generation, including household solar, on Australia's main electricity grids. In 2023–24, 38% of electricity was generated from renewable sources in Australia's largest grid, the National Electricity Market (NEM).

In 2022–23 Australia produced 554 PJ of renewable energy, with 65% of that production used for electricity generation, up from 40% a decade ago. In 2022–23, about 52% of renewable energy production was wind and solar, 37% various forms of bioenergy and waste, and 11% hydro. Solar and wind have been the primary drivers in more than doubling renewable generation over the last decade.

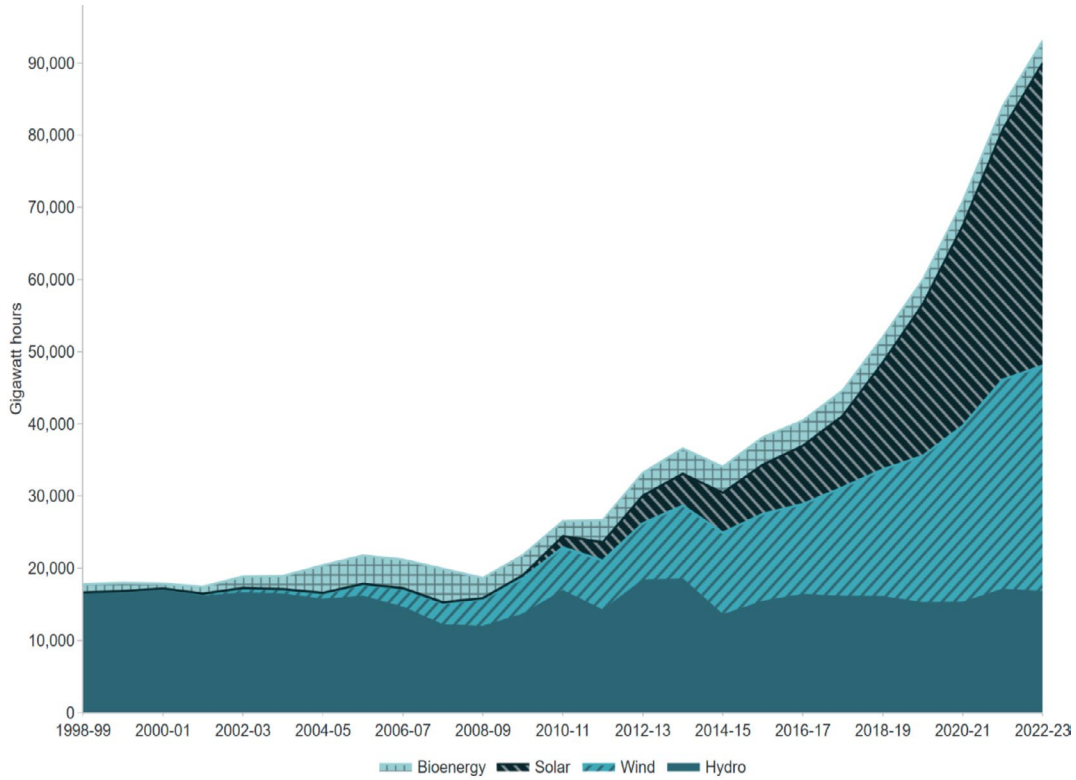

Figure 2.8 Australian electricity generation from renewable sources, by fuel

Source: DCCEEW (2024) Australian Energy Statistics, Table O

2.1.6.1.3.2 Hydrogen

Australia has extensive world-class renewable resources that will form the foundation of a renewable hydrogen industry. Hydrogen has the potential to be an important contributor to the transition to net zero through use in areas such as industry, transport, grid firming, chemicals and metals production (see DCCEEW's Australia's National Hydrogen Strategy for more information). Hydrogen is an important decarbonisation pathway for Australia, particularly for hard-to-abate sectors that are reliant on fossil fuels but cannot be easily electrified, such as iron, steel, alumina, fertilisers, heavy road freight and long-haul transport.

Australia has significant potential to become a major hydrogen producer for both domestic consumption and export. To help realise this potential, the government has identified renewable hydrogen as a priority industry under the Future Made in Australia plan and is implementing initiatives to develop the industry and scale-up production as part of the ambition to become a renewable energy superpower. Section 2.6.2.1 explains further the initiatives to achieve this, including the National Hydrogen Strategy, Hydrogen Headstart program and the Hydrogen Production Tax Incentive.

There are several pilot, demonstration and small-scale projects in various stages of operation with a combined production capacity of 8.4 kt (1 PJ) per year. In addition, there is over 11,000 kt (1,320 PJ) per year of hydrogen production in the pipeline, including from hydrogen derivatives like ammonia.

The production of low-emissions hydrogen, by either combining fossil fuel-based production with carbon capture and storage or the extraction of naturally occurring hydrogen, is also being considered by a smaller number of private companies. In 2023 the total demonstrated resource for natural hydrogen was 8 PJ but this is expected to grow as exploration for this new resource continues.

2.1.6.1.3.3 Oil

Australia has limited resources of crude oil and most known remaining oil resources are condensate and naturally occurring liquefied petroleum gas (LPG) associated with large offshore gas fields. In 2022–23 crude oil exports were 604 PJ and LPG exports were 120 PJ.

2.1.6.1.3.4 Coal

While Australia is increasingly relying on renewable energy, coal (mostly exported) remains the largest contributor to Australia's energy production. In 2022–23 Australia produced 10,784 PJ of black coal, 89% of which was exported. In the same year, brown coal production fell 3.6% to 401 PJ. Almost all brown coal produced in Australia is used for electricity generation. Brown coal production has declined across the last decade and is 53% of its peak production quantity in 2009–10 (DCCEEW 2024e).

Fugitive emissions from coal production, the transport and handling of coal, and decommissioned coal mines are Australia's second largest source of methane emissions. Fugitive emissions from coal contributed 5.9% (25.6 Mt CO_2-e) of Australia's net national emissions in 2021–22, an increase in contribution from 4.2% in 1989–90. Fugitive emissions from coal contributed 19.3% (23.7 Mt CO_2-e) of Australia's national total methane emissions.

Coal-fired power station retirement

Australia's electricity systems are undergoing a major transition as ageing and unreliable coal generators retire. In 2023 coal fired generation made up 46% of Australia's total electricity generation (DCCEEW 2024f).

Owners of all but 2 coal plants have announced retirements between now and 2051, with more than half announcing retirements by 2035. The closure of these coal generators will reduce the emissions intensity of electricity generation across Australia. The following power stations (all in the NEM, except where indicated) are planned for closure:

- Eraring in 2027
- Collie in late 2027 (power station in the WEM)
- Yallourn in 2028
- Muja D in 2029 (power station in the WEM)
- Bayswater between 2030 and 2033
- Vales Point B in 2033
- Gladstone in 2035
- Loy Yang A in 2035.

All publicly owned coal-fired power stations in Queensland are expected to begin phasing down by 2028 in line with Queensland's legislated renewable electricity and emissions reduction targets. The combined capacity of generators listed above closing in or before 2035 makes up approximately 79% of Australia's total coal-fired generation capacity.

2.1.6.1.3.5 Gas

Around one quarter of Australia's gas production is used domestically, with the remainder exported. In 2022–23 Australia's natural gas production increased 1% to 6200 PJ and exports of LNG decreased 2%, from a record level in 2021–22. Production capacity of LNG has more than doubled since 2014–15 but may begin to decline in the late 2020s as some fields begin to deplete.

Australia is a leading exporter of LNG and a minor producer of crude oil. Most emissions from this category come from the natural gas industry and emissions are dominated by venting and flaring of gas and liquids. Fugitive

emissions from oil and gas extraction, including leakage, venting and flaring, contributed 5.2% (22.5 Mt CO_2-e) of Australia's net national emissions in 2021–22, an increase in contribution from 2.4% in 1989–90.

The Future Gas Strategy was released in May 2024 and outlines the Australian Government's plan for how gas will support our economy's transition to net zero.

2.1.6.2 Transport

The transport sector is one of the strongest drivers of Australia's emissions. It includes emissions from domestic civil aviation, road transportation, marine navigation and railways. The sector contributed 20.7% (89.8 Mt CO_2-e) of Australia's net national emissions in 2021–22; this is an increase in contribution from 10% (61.4 Mt CO_2-e) in 1989–90. Except for observed decreases caused by the recent COVID19 pandemic, emissions from transport have trended consistently upward over time. This is largely attributable to population and economic growth but is partially offset by improved efficiency in the modes of transport.

The National Electric Vehicle Strategy (see section 2.6.5.2) is Australia's framework to transition road users to electric vehicles by increasing affordable supply, ensuring infrastructure and encouraging demand. The New Vehicle Efficiency Standard is the key mechanism to increase the supply of more fuelefficient, low and zero emissions cars and light commercial vehicles to the Australian market, and contribute to lower CO_2 emissions from the transport sector over time (see section 2.6.5.1).

Road transportation accounts for the majority of transport emissions in Australia. This is driven by the reliance on motor vehicles as modes of transportation for passengers and freight in Australia. Australia's road system accounted for 68% of total domestic passenger travel in 2022–23. Australia's total estimated paved road length was 427,000 km in 2022. In 2022–23 rail accounted for 3.1% of passenger travel and air accounted for 16.7%.

Transport energy use increased by 7.5% in 2022–23 on the previous year, driven by growth in the use of non-electric road vehicles and civil domestic aviation (BITRE 2023a). In 2022–23 estimates of emissions from domestic aviation and road vehicles both increased to their new highest levels, 11,784 and 106,355 in gigagrams of CO_2-e respectively (BITRE 2023a, BITRE 2023b).

Building on the initiatives outlined in the Future Made in Australia plan, further development of the low carbon liquid fuels (LCLF) industry will be important for advancing emissions reductions in sectors that are currently hard to electrify such as heavy transport, mining and agriculture (see section 2.6.2.3).

2.1.6.2.1 Movement of people

Australia's passenger transport sector relies on its network of road systems to move people around and between its major centres. Passenger rail is mostly limited to periphery urban areas, though some traffic accesses regional areas.

In 2022–23 the average rate of fuel consumption of light vehicles (i.e. passenger cars and light commercial vehicles) was 11.2 litres per 100 km (on a petrol equivalent basis) (ABS 2020b). Aggregate fuel demand continues to increase (BITRE 2023a).

Light vehicles contribute almost 60% of Australia's transport emissions (DCCEEW 2023a). Light vehicles consumed approximately 25.5 billion litres (petrol equivalent basis) in 2022–23. Australia is a cardependent society with 21.2 million registered vehicles on its roads as at 31 January 2023 – an increase of approximately 2.3% since the end of January 2022 (ABS 2020b). Passenger cars account for around 64% of total passenger kilometres (BITRE 2023b). Of the 21.2 million vehicles registered in Australia on 31 January 2023 approximately 15.3 million (72%) were registered as passenger vehicles (BITRE 2023a).

Public transport remains important in cities, accounting for around 8% of total passenger kilometres within Australia's capital cities (BITRE 2023b).

2.1.6.2.2 Movement of goods

Australia's freight task is dominated by its rail and road networks. Around 2,130 million tonne kilometres of domestic freight is moved in Australia each day.

Road transport accounts for around 31.05% of the domestic freight task. Rail accounts for around 57% (BITRE 2023b).

Rail dominates bulk commodity haulage, connecting major cities and ports, while trucks transport a large share of non-bulk commodity haulage, making use of the flexibility of the road network.

Australia's domestic freight task is expected to grow by 26% between 2020 and 2050, an average annual rate of growth of around 0.9%. This is lower than previously projected, due to slower expected growth in total rail freight volumes. However, this projection focuses on existing commodities and does not forecast for new technological opportunities (BITRE 2022a).

Other forecasts include:

- Road freight volumes are projected to grow by around 77% between 2020 and 2050 (average annual growth of 1.9% per annum), largely as a result of slower projected future domestic economic growth.
- Rail freight volumes are projected to grow by around 5.7% between 2020 and 2050 (average annual growth of approximately 0.18% per annum), largely due to projected limited future growth in iron ore and coal exports.
- Domestic coastal shipping volumes are projected to remain around 2020 levels to 2050.
- Air freight volumes are projected to grow by around 103% between 2020 and 2050 from 290 million tonne kilometres in 2020 to around 589 million tonne kilometres in 2050 (BITRE 2022a).

2.1.6.3 Industry

2.1.6.3.1 Services

The Australian economy, like most developed economies, is dominated by its services sector. The largest services industry – health care and social assistance – contributed $193 billion in gross value added in 2022–23 and employed around 2.3 million workers as of May 2024 (ABS 2023b, ABS 2024f).

Services also play an increasingly important role in Australia's international trade, making up around 14% of Australia's total exports in 2022–23. In 2022–23 education-related travel exports were worth $36.4 billion, up 75% from 2021–22, due to the relaxation of COVID-19 related travel restrictions (ABS 2023c).

2.1.6.3.2 Construction

The construction industry is the fifth largest contributor to Australia's economy, accounting for approximately 7% of Australia's gross domestic product in 2022–23 (ABS 2023b). The construction industry's share of employment and output has grown consistently since the 1990s, reflecting strong demand for mining-related construction during the mining investment boom and more recently the expansion in residential building activity.

2.1.6.3.3 Mining and critical minerals

The Australian mining sector contributed approximately 13.2% of gross domestic product in 2023–24 and has a strong comparative advantage internationally in several energy and mineral resource commodities (DISR 2024a). As a result, the mining sector is larger in Australia than in most other developed economies. In addition, resources and energy exports accounted for two thirds of Australia's export value in 2023–24 (ABS 2024h). Mining output grew by 1.2% in 2022–23 in real terms as a result of the considerable surge in energy commodity prices in 2022, mainly originating from the fallout over Russia's illegal invasion of Ukraine. Resource and energy exports reached a record $466 billion in 2022–23, with iron ore, LNG and metallurgical and thermal coal the largest exports by value. Mining output remained stable in 2023–24 from the previous year, growing by only 0.1%.

Australia's resource and energy exports are estimated to have declined to $415 billion in 2023–24. As commodity prices settle at lower levels than in 2022–23, export earnings are expected to decline.

2.1.6.3.3.1 New energy metals and minerals

Australia produced 39% of the world's lithium in 2023 with extraction forecast to grow strongly. Expected annual average growth of 16% a year will see Australian lithium spodumene production rise from (in lithium carbonate equivalent terms) 418,000 tonnes in 2023–24 to 558,000 tonnes in 2025–26. Australia is projected to ramp-up its production of battery-grade lithium hydroxide in the coming years, with 9% of Australia's spodumene production refined domestically by 2026. However, low prices have driven producers in a number of nations, including Australia, to announce cuts or closures (DISR 2024b).

Australia also has substantial nickel resources (used in batteries), with more than one fifth of the world's nickel resources. Australia exported around 160,000 tonnes (in nickel metal content) in 2023–24. Australia's nickel production is forecast to fall from 134,000 tonnes in 2023–24 to 68,000 tonnes in 2025–26. Similarly Australia's refined nickel production is forecast to fall from 91,000 tonnes in 2023–24 to 39,000 tonnes in 2025–26 (DISR 2024b).

Australia is the fourth largest producer of raw cobalt, which is a significant mineral for battery production (USGS 2024).

Over the longer term, the global energy transition is set to boost the demand for copper, due to its relatively heavy use in renewable energy technologies, battery storage and electric vehicles. In 2023, Australia was the eighth largest mined copper producer in the world and had the second largest copper reserves. Australia's copper exports are expected to grow to 926,000 tonnes by 2025–26 as production from new mines and mine expansions come online with Australia's copper export earnings projected to lift from $12.1 billion in 2023–24 to $15.6 billion in 2025–26 (DISR 2024b).

Australia is the world's top producer of rutile (titanium), the second largest producer of zircon and third largest producer globally of rare earth elements. Australia also has the world's largest reserves of rutile (titanium) and zircon (zirconium). Australia's reserves of critical minerals, including antimony, cobalt, lithium, manganese ore, niobium, tungsten and vanadium, rank in the top 5 globally (GA 2023).

2.1.6.4 Manufacturing

Nonetheless, manufacturing remains an important part of Australia's economy. In 2022–23, Australian manufacturing contributed $138 billion in gross value added. Manufacturing is the eighth largest employer in Australia, employing 905,700 people in May 2024 (ABS 2024g). The manufacturing sector is also an important source of innovation, undertaking about 25% of Australia's research and development (ABS 2023d).

The manufacturing sector is an essential part of Australian supply chains. In 2021–22, almost half of Australian manufactured goods were used by Australian businesses to perform their production activities. Australian manufacturers sourced around 80% of their inputs domestically (ABS 2024i).

The Australian Government has identified the opportunity to harness strengths in the manufacturing sector in a net zero future. Under the Future Made in Australia plan, the government is focused on opportunities to enhance economic security and contribute to strengthened global clean energy technology supply chains. The government has identified clean energy technology manufacturing (including solar PV and battery manufacturing) as a priority sector aligned with the Future Made in Australia National Interest Framework. (see section 2.6.2).

2.1.6.5 Waste

Australia's waste sector emissions mostly come from solid waste disposal, followed by wastewater treatment and discharge. Waste emissions are predominantly methane, generated from anaerobic decomposition of organic matter. Waste sector emissions accounted for 3.2% (13.9 Mt CO_2-e) of Australia's net national emissions (or 2.7% excluding LULUCF) in 2021–22 (see section 2.10.2). This is a decrease in contribution from 3.8% in 1989–90. Total estimated waste emissions have decreased since 1989–90, driven by reductions with improved methane recovery.

In 2020–21 Australia generated about 76 Mt of waste, an increase of 20% from 2006–07. Although population growth was a major contributor to the increase in waste production, on a per capita basis, waste declined by 3.3% over this timeframe from 3.05 tonnes per capita in 2006–07 to 2.8 tonnes per capita in 2020–21. Approximately 63% of the total waste produced was recycled or recovered for embodied energy, an increase of 13% from 2006–07. The total waste disposed to landfill in 2020–21 was about 28 Mt.

Australia is transitioning to a more circular economy, to reduce waste, emissions, pollution and landfill, and develop a nature-positive economy. The National Waste Policy provides a national framework for waste and resource recovery in Australia (see section 2.6.8.1).

2.1.6.5.1 Waste sources

The Australian Government publishes a biennial National Waste and Resource Recovery report that provides information on Australia's waste generation and recovery, and the fate for all waste streams and various material categories. Monitoring and reporting data is led by the states and territories and is supplemented, or replaced by, national level data. Waste sources are considered within 3 streams: municipal solid waste from households and council operations, commercial and industrial waste, and construction and demolition waste.

As reported in Australia's 8th National Communication on Climate Change and 5th Biennial Report:

- In 2020–21 about 63.8 Mt or 2.5 tonnes per capita of core waste was generated, an increase from 57.5 Mt in 2016–17. Core waste is defined as waste managed by the waste and resource recovery sector.
- In 2020–21 Australia generated 14.4 Mt of organic waste consisting primarily of food, garden organics, timber and biosolids, with 6.8 Mt (47%) of this waste recycled. The resource recovery rate of 58% includes recycled waste, biosolids applied directly to land and recovered landfill gas.
- In 2021–22, 7 million tonnes of packaging placed on the Australian market, an increase of 4% from the previous year. Of this, 3 million tonnes (44%) was disposed to landfill. It is estimated that landfilled packaging contributes an additional 3.5 million tonnes of carbon dioxide emissions, with a lost value of $900 million (at a weighted average value of $292 per tonne).

2.1.6.5.2 Waste management practices

Achieving a circular economy will require coordinated efforts from all levels of government and across all sectors of the economy (see section 2.6.3.11).

The state and territory governments have the primary policy and legislative responsibility for waste management within their jurisdictions. At the national level, the Australian Government and all state and territory governments have agreed to the National Waste Policy: Less waste, more resources (see section 2.6.8.1). Australian Government support for waste reduction and resource recovery efforts occurs when there are:

- benefits from a coordinated approach across jurisdictions
- national issues where Australian Government action is the most effective intervention
- domestic market failures
- obligations to engage internationally.

At a national level the *Recycling and Waste Reduction Act 2020* sets out the framework for product stewardship arrangements in Australia, including mandatory, co-regulatory and voluntary. Product stewardship is an approach to managing products or materials in ways that reduce environmental and human health impacts over their life cycle. The *Product Stewardship (Oil) Act 2000* creates the framework for the Product Stewardship for Oil Scheme which pays incentives to industry to encourage the environmentally sustainable management and re-refining of used and recycled oil.

2.1.6.6 Building stock and urban structure

Australia has experienced low-density urban development due to high availability of land and cars. Of the 10.8 million dwellings in Australia in 2021, the vast majority were owned outright or with a mortgage (66%). Of this housing stock, standalone houses accounted for 70% of Australian homes, with semidetached, row housing, town houses, flats and apartments jointly accounting for 29%.

In 2022–23 electricity was the main source of energy in residential buildings, meeting around 53% of energy demand. The second largest source of energy was natural gas, accounting for around a 38% share of energy demand. Wood, wood waste, diesel and LPG met the remaining energy demand in residential buildings.

For commercial buildings, electricity was the primary source of energy, providing around 85% of energy used in 2019–20. Natural gas provided almost all the remainder.

Space heating and cooling is the highest end-use energy consumption, representing around 40% of residential-sector energy demand in 2023. The balance of residential energy demand was 24% for water heating, 26% for appliances, 7% for cooking and 3% for lighting.

In the commercial buildings sector around 60–65% of electricity is consumed for heating, ventilation and cooling, with 10% for lighting and up to 15% for commercial and industrial equipment use. Most gas is used for space heating (around 80%) with around 15% used for hot water (DCCEEW 2022).

State and territory governments have responsibility for building regulations in Australia. In 2022, federal, state and territory building ministers agreed to raise the energy efficiency provisions in the 2022 edition of Australia's National Construction Code (NCC). The NCC is prepared by the Australian Building Codes Board, a joint initiative of the Australian, state and territory governments.

The energy efficiency requirements agreed in the 2022 update to the NCC began to take effect from 1 October 2023, with individual states and territories adopting the requirements on their own implementation timeframes.

The Australian Building Codes Board is preparing updates to the NCC that focus on increased energy efficiency requirements for commercial and industrial buildings. Once agreed, these are planned to be adopted in 2025 (see section 2.6.4.6).

2.1.6.7 Agriculture

The agriculture sector includes emissions from agricultural activities, including livestock and farm management. Australia's agriculture sector accounted for the second largest source of Australia's emissions, comprising 17.9% of Australia's net national emissions (or 14.9% excluding LULUCF) in 2021–22, an increase in contribution from 14.8% in 1989–90. Agriculture represents the largest contributor to methane emissions in Australia (50.5%) (see section 2.10.2.3).

Australia's agriculture industries use about 55% of Australia's total land, farming the higherrainfall coastal regions to the drier inland, according to the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) (ABARES 2024a).

In 2020–21 the estimated area of farms was 387 million hectares, owned or operated by 87,402 agricultural businesses. Grazing accounted for 332 million hectares or 86% of agricultural holdings, and cropping accounted for 32 million hectares or 8% (ABS 2022).

Agricultural production is export oriented, producing more than is required for domestic consumption. In 2020–21 the gross value of Australia's agricultural production was $72 billion (farm gate value), while the total value of agricultural exports totalled $49 billion (value at port). For 2023–24 ABARES estimated the annual gross value of production increased to $82 billion and exports to $72 billion (ABARES 2024b).

Australia's agricultural industries produce a range of crops and livestock commodities from grains, oilseeds, pulses, sugar, cotton, fruit, vegetables, nuts and wine grapes to beef cattle, sheep, lambs, poultry, pigs, wool and milk.

2.1.6.8 Forests

As of 2022 Australia has 138 million hectares of forest, covering approximately 18% of its land area (DCCEEW 2024g). Australia's forest area increased by 0.73 million hectares over the 5-year period from 2017 to 2022. This maintained the rise in total forest area that has been observed since 2008.

The average annual area of native forests harvested in Australia decreased by approximately 48% over the decade to 2022, to 29,100 hectares, while production of wood from commercial plantations increased over this period. Commercial wood harvesting in public native forests in Victoria and in Western Australia ceased from 1 January 2024 (Western Australia Government 2022).

Clearing forest land for grazing and cropping contributes to greenhouse gas emissions, reported in Australia's greenhouse gas inventory under the land use, land-use change and forestry (LULUCF) sector. In 2022, 88% of forest clearing was re-clearing of regrowth forests (for example, maintenance of pastures for grazing on existing agricultural land) which store less carbon than primary forests and produce less emissions.

Since 2015–16 the LULUCF sector has been a net sink, absorbing more carbon dioxide than is emitted, due to the expansion of native forest regeneration, growth in plantations and a decline in land clearing and native forest harvesting (see section 2.10.2).

Over the 5 years to 2021 the annual area of forest fire in Australia varied from 11 to 21 million hectares, mainly in forests across subtropical northern Australia. The annual area of fire in Australia's temperate forests is typically much lower but in the Black Summer bushfires of 2019–20 a total of 8.5 million hectares of forest burned in southern and eastern Australia (ABARES 2024c). Bushfires are the largest cause of year-to-year variability in emissions from Australian forests, although most Australian forests are fire-adapted with trees surviving and continuing to grow so that over time these emissions are balanced by forest regrowth.

2.2 Institutional arrangements in place to track progress made in implementing and achieving Australia's Nationally Determined Contribution under Article 4

Progress towards Australia's NDC (see section 2.4) is tracked as part of Australia's annual National Inventory Report to the UNFCCC and Paris Agreement (see Chapter 1).

The report is compiled in accordance with UNFCCC and Paris Agreement rules and guidelines, including Intergovernmental Panel on Climate Change (IPCC) emissions estimation guidelines. Australia's latest National Inventory Report was submitted to the UNFCCC Secretariat in April 2024 as a stand-alone document, consistent with Decision 18/CMA.1 (Annex Part E, paragraph 12) and is available at First Biennial Transparency Reports | UNFCCC.

The Department of Climate Change, Energy, the Environment and Water (the department) is responsible for the compilation of Australia's annual National Inventory Report and all aspects of the national inventory systems that underpin the report, including activity data coordination, emissions estimation, quality control, preparation of reports and their submission to the UNFCCC Secretariat on behalf of the Australian Government. These institutional arrangements have remained unchanged since the submission of Australia's 8th National Communication in 2022. See Volume 1, Chapter 1.2 of Australia's latest National Inventory Report 2024 for further information on Australia's national inventory systems.

Other arrangements which relate to progress made towards achieving Australia's targets include the *Climate Change Act 2022* (see section 2.3.1), which legislates Australia's current greenhouse gas emissions reductions targets, and the Annual Climate Change Statement (see section 2.3.3.1).

2.2.1 Australia's National Greenhouse Accounts

In addition to producing Australia's annual National Inventory Report, the department publishes a range of supporting emissions estimates that together comprise Australia's National Greenhouse Accounts (NGA). These include:

- The Quarterly Updates of Australia's National Greenhouse Gas Inventory, which provide a summary of Australia's national emissions by sector and by gas. They are compiled consistent with UNFCCC and Paris Agreement rules and guidance, based on best available information at the time of completion. While they are indicative of Australia's progress towards its Nationally Determined Contribution (NDC), Australia's annual National Inventory Report is the official basis for tracking progress towards its NDC emission reduction targets, and following conclusion of the relevant target period, assessing the achievement those of targets.
- The State and Territory Greenhouse Gas Inventories, which disaggregate the annual National Inventory Report by each Australian state and territory.
- The National Inventory by Economic Sector, which disaggregates the annual National Inventory Report by economic sector (Australia and New Zealand Standard Industry Classifications (ANZSIC)) rather than by IPCC sector.
- Australia's National Greenhouse Accounts (ANGA) online database, which provides detailed greenhouse gas emissions data from the NGA and emissions projections data; the database is available at national and state and territory levels, and by economic and IPCC sector, and can be queried through a dynamic interface and search function.
- The Full Carbon Accounting Model (FullCAM), a key digital tool in the inventory's preparation, focused on the land sector.

2.3 Legal, institutional, administrative and procedural arrangements for domestic implementation, monitoring, reporting, archiving of information and stakeholder engagement related to the implementation and achievement of its Nationally Determined Contribution under Article 4

2.3.1 Climate change policy-making responsibility

Emissions reduction targets in Australia are set at the federal and state/territory levels of government. All 3 levels of government work together to develop and implement climate change mitigation and adaptation policies to achieve these targets. (see section 2.1.1).

At the federal level the *Climate Change Act 2022* (the CC Act) provides the framework for Australia's national climate ambition and incorporates Australia's emissions reduction targets (set as both a point target and emissions budget) into law.

The CC Act ensures that Australia's emissions reduction targets are not just recorded in international settings but are clearly stated in Australia's domestic law. In addition to legislating the targets the CC Act requires the Minister for Climate Change and Energy to prepare and table an Annual Climate Change Statement (see section 2.3.3.1). The CC Act also expanded the role of the independent Climate Change Authority (the Authority) in advising the Minister for Climate Change and Energy (see section 2.3.2.2).

State and territory governments implement climate and energy legislation, mitigation policies and emissions reduction targets that are designed for the characteristics, circumstances and remit of each jurisdiction. Each state and territory has a target of net zero emissions by 2050 or earlier as outlined in Table 2.10. Most states and territories have advisory bodies, some of which are outlined in their respective climate legislation (see section 2.7).

The federal, state and territory governments maintain links to share knowledge, resolve policy issues and collaborate on industry and community engagement. Ministerial-level discussions on climate change occur regularly through the ECMC. Federal, state and territory environment ministers meet at the Environment Ministers Meeting (EMM), which considers environment policy, including its relationship to climate policy (see section 2.3.1.6).

2.3.1.1 National climate change and emissions reporting legislation

Beyond the CC Act, other federal legislation important to Australia's progress towards achieving its NDC includes the:

- *Carbon Credits (Carbon Farming Initiative) Act 2011*, which enables the Australian Carbon Credit Unit Scheme (see section 2.6.3.3).
- *National Greenhouse and Energy Reporting Act 2007*, which places emissions reporting obligations on companies and sets up the Safeguard Mechanism (see section 2.6.3.2).
- *Clean Energy Regulator Act 2011*, which establishes the Clean Energy Regulator and its role as an independent statutory authority and administers the abovementioned schemes (see section 2.3.2.3).
- *Australian Registry of Emissions Units (ANREU) Act 2011*, which enables an online system that allows emissions units established to be held, traded and cancelled.
- *Vehicle Efficiency Standard Act 2024* which established the standards for new passenger and light commercial vehicles.

The Australian Government seeks opportunities to embed Australia's emissions reduction targets under the Paris Agreement into relevant legislation and policies, including those that govern Commonwealth entities. When the CC Act was passed, Australia's targets were embedded in 14 Acts to ensure that government institutions and schemes consider how their decisions and operations can contribute to achieving Australia's emissions reduction targets (DCCEEW 2023b). This includes legislation for the Australian Renewable Energy Agency and Clean Energy Finance Corporation.

More recently amendments have been made to the *National Reconstruction Fund Corporation Act 2023* to require the National Reconstruction Fund Board to have regard to Australia's emissions reduction targets and the desirability of supporting decarbonisation in performing its functions. In addition Australia's targets have been embedded in the *Higher Education Support Act 2003,* the *New Vehicle Efficiency Standard Act 2024*, the *Future Made in Australia Act 2024* and the *Future Made in Australia (Guarantee of Origin) Act 2024*. These recent amendments were reported on in the 2024 Annual Climate Change Statement.

2.3.1.2 Net Zero Economy Committee of Cabinet

The Cabinet is the council of senior ministers that is empowered by the Australian Government to take binding decisions on its behalf (PMC 2024a). Cabinet committees provide the forum for detailed consideration and discussion of issues before full Cabinet consideration and are usually established either around a subject area, such as national security, or around a general function of government, such as expenditure and taxation (PMC 2024b). The Net Zero Economy Committee (NZEC), chaired by the Prime Minister, is a Cabinet Committee that considers policy matters that will realise the opportunities of Australia's net zero transformation, including cross-cutting economic, climate, regional and industry policy issues. The Minister for Climate Change and Energy is the Deputy Chair of NZEC.

2.3.1.3 Energy and Climate Change Ministerial Council

Federal, state and territory ministers work collaboratively on issues specific to their portfolio areas through ministerial councils, which meet on a regular basis and provide ministers with a formal channel to resolve key priorities.

The Energy and Climate Change Ministerial Council (ECMC), established in 2022, is the primary ministerial-level council for intergovernmental consideration of energy and climate portfolio issues. The ECMC is a forum for the Australian Government, states and territories governments and the New Zealand Government to work together on priority issues of national significance and key reforms in the energy and climate change sectors. One of the ECMC's priorities is to contribute to the achievement of all Australian emissions reduction targets. A range of working groups underpins the priorities of the ECMC.

The ECMC works closely with Energy Consumers Australia (an energy consumer advocacy body) and has oversight of 4 energy market institutions responsible for the operation of national energy markets:

- Energy Advisory Panel
- Australian Energy Market Commission
- Australian Energy Market Operator
- Australian Energy Regulator.

2.3.1.4 National Energy Transformation Partnership

The National Energy Transformation Partnership agreed between the federal, state and territory governments is a framework for collaboration on reforms required to transform Australia's energy system to achieve net zero by 2050. Work streams delivering work agreed under the partnership report to ECMC. Priority partnership actions include to:

- Establish a new Capacity Investment Scheme to accelerate the deployment of firmed renewable power.
- Agree Rewiring the Nation support to provide concessional finance and facilitate the timely delivery of major transmission projects, offshore wind projects and Renewable Energy Zones.
- Develop a First Nations Clean Energy Strategy in partnership with First Nations communities and organisations, to help ensure First Nations people have a say in the energy policies and programs in the transition to net zero.
- Progress a National Energy Workforce Strategy (NEWS) to help forecast the workforce capabilities and needs to deliver the energy transformation.
- Incorporate an emissions reduction objective into the national energy objectives to give greater clarity that Australia's energy market bodies are to consider emissions reduction in their work. The law changes came into effect on 21 September 2023.
- Collaborate on energy security management, including cyber security and fuel availability.

2.3.1.5 Renewable Energy Transformation Agreements

Building on the success of the partnership, the Australian Government is negotiating bilateral Renewable Energy Transformation Agreements with state and territory governments to support achieving the national target of 82% renewable electricity by 2030. Agreements will allocate additional renewable capacity to states and territories under the expanded Capacity Investment Scheme. These agreements are designed to ensure grid reliability, unlock new energy investment and address non-market barriers to investment (see section 2.6.4.3).

2.3.1.6 Environment Ministers Meeting

The Environment Ministers Meeting (EMM) comprises the Australian Government Minister for the Environment and Water and the environment minister from each Australian state and territory. The New Zealand Minister for the Environment and the President of the Australian Local Government Association are invited as observers. The forum focusses on key strategic priorities that require national cooperation, consistency and cross-border collaboration, and involve environmental policy, regulation and standard-setting functions. This group has responsibility for advancing matters such as Australia's transition to the circular economy, updating and implementing Australia's Strategy for Nature, including a national framework for terrestrial other effective area-based conservation measures (OECMs), and a national 30 by 30 roadmap (DCCEEW 2024h).

2.3.2 National portfolio arrangements

2.3.2.1 Australian Public Service

As the administrative arm of government the Australian Public Service (APS) is responsible for developing, implementing and monitoring policies and measures across all portfolios. The role of the APS is to serve the Australian Government, the Parliament and the Australian public, and to design and deliver federal policy, regulation and services (see section 2.1.1).

DCCEEW is responsible for a wide range of matters which can be found on the department's website. Under the Administrative Arrangement Orders DCCEEW is the department responsible for administering policy and legislation related to climate change mitigation and adaptation.

DCCEEW actively seeks diverse collaboration across government on a range of programs, as outlined in Appendix 1 of the 2024–25 Corporate Plan.

DCCEEW is also responsible for international climate change negotiations under the UNFCCC.

2.3.2.2 The Climate Change Authority

The Climate Change Authority (the Authority) is an independent body established under the Climate Change Authority Act 2011 to provide expert advice to the Australian Government on climate change policy. The *Climate Change Act 2022* expanded the Authority's functions. The Authority plays an important role in the governance of Australia's climate change mitigation policies (*Climate Change Act 2022* (Cth)) by providing independent advice on:

- Preparation of the Annual Climate Change Statement to Parliament.
  - From 2024 the Authority is required to provide advice as part of its Annual Progress Report on whether net and gross emissions from safeguard mechanism entities are declining sufficiently, and whether amendments to safeguard rules are needed, as amended in section 14 of the CC Act in 2023.
- Greenhouse gas emissions reduction targets to be included in new or adjusted Nationally Determined Contributions.

The Authority also undertakes reviews of:

- the Carbon Credits (Carbon Farming Initiative) Act 2011
- the *National Greenhouse and Energy Act 2007*
- other matters as requested by the minister responsible for climate change or the Australian Parliament (see section 2.3.3.2).

The Authority conducts and commissions its own independent research and analysis. All reviews include public consultation and all reports are published on the Authority's website after they have been handed to the Minister for Climate Change and Energy.

2.3.2.3 The Clean Energy Regulator

The Clean Energy Regulator (CER) is an independent statutory authority established by the *Clean Energy Regulator Act 2011*. It is responsible for administering schemes legislated by the Australian Government for measuring, managing, reducing and offsetting greenhouse gas emissions in Australia. It is also responsible for regulating Australia's new Nature Repair Market, which is expected to open in 2025 (see section 2.6.7.2).

The CER administers the following schemes, including through monitoring and enforcement:

- The National Greenhouse Energy and Reporting (NGER) Scheme is a single national framework for reporting company information about greenhouse gas emissions, energy production and energy consumption.
- The Australian Carbon Credit Unit (ACCU) Scheme encourages people and businesses across a range of sectors to run projects that reduce emissions or store carbon.
- The Renewable Energy Target is designed to reduce emissions of greenhouse gases in the electricity sector.
- The Safeguard Mechanism is designed to reduce greenhouse gas emissions from Australia's largest facilities.
- The Guarantee of Origin Scheme an internationally aligned assurance scheme being designed to track and verify emissions associated with hydrogen and renewable electricity made in Australia.
- The Nature Repair Market is a voluntary national market which encourages people and businesses to invest in projects that restore and protect the natural environment.

2.3.3 Monitoring and reporting

2.3.3.1 Annual Statement to Parliament

The *Climate Change Act 2022* requires the responsible minister to prepare an Annual Climate Change Statement to Parliament on progress towards Australia's emissions reduction targets and international developments. The statement must cover the effectiveness of the government's policies in contributing to emissions targets, the impact of policies on rural and regional Australia, and risks to Australia from climate change impacts, such as those relating to Australia's environment, biodiversity, health, infrastructure, agriculture, investment, economy and national security. The CC Act requires that the Minister for Climate Change and Energy consider advice from the Authority in preparing the Statement and provide a statement of reasons to Parliament where they have made the decision not to accept those aspects of that advice.

The CC Act also requires that the Minister for Climate Change and Energy ensure periodic independent reviews of the operation of the CC Act are conducted. The first review is to be within 5 years of commencement and then every 10 years after the completion of the first review. This will ensure the legislation remains fit for purpose as the international response to climate change evolves and Australia continues its transformation into a net zero emissions economy.

2.3.3.2 Climate Change Authority reviews

The Climate Change Authority also undertakes special reviews to assist the Minister for Climate Change and Energy if requested to do so. In 2023 the Australia Parliament requested a review of the potential technology transition and emission pathways that will best support Australia's transition to net zero emissions by 2050 across multiple sectors.

In September 2024 the Authority completed its Sectoral Pathways Review. The authority's review found there are many pathways to achieving emissions reductions with existing, mature technologies, such as solar and wind for electricity generation and batteries for energy storage getting Australia much of the way to net zero. Opportunities also exist with the rapid development of emerging low emissions technologies, such as hydrogen and engineered carbon removals.

The Authority is also developing advice on Australia's next NDC, as requested by the Minister for Climate Change and Energy. Under the CC Act the Australian Government must receive the authority's advice before submitting Australia's next emissions reduction targets. The Authority periodically undertakes reviews of the following relevant legislation:

2.3.3.2.1 Reviews of the *Carbon Credits (Carbon Farming Initiative) Act 2011*

The Authority published its most recent review of this Act in December 2023.

In the government's response to the Climate Change Authority's 2023 review in August 2024, the government agreed to 3 recommendations and agreed in principle to 12 recommendations. This highlights the government's commitment to ensuring the ACCU Scheme maintains high integrity and delivers real emissions reductions. Aspects of 12 of the 15 recommendations align strongly with the ACCU review. These are already being implemented or under development. Implementation of the remaining 3 recommendations will be considered as part of ongoing improvements to the ACCU Scheme.

2.3.3.2.2 Review of the National Greenhouse and Energy Reporting Legislation

In 2023 the Authority finalised its review of the National Greenhouse and Energy Reporting Legislation (NGER) that underpins the NGER Scheme. This includes the *National Greenhouse and Energy Reporting ('NGER') Act 2007* and associated instruments, including the Safeguard Mechanism.

The NGER Scheme is a national framework for reporting and disseminating company information about greenhouse gas emissions, energy production and energy consumption.

In the government's response to the Authority's review published in August 2024 the government agreed or agreed in principle to 24 recommendations and noted one recommendation.

The government has implemented the first phase of its response to the review, implementing changes to the NGER Scheme to phase out Method 1 for the estimation of fugitive emissions from open-cut mines covered by the Safeguard Mechanism, require publication of the methods used by Safeguard Mechanism facilities to report fugitive methane emissions, develop a new higher order methods for estimating fugitive emissions from gas flaring and introduce a market-based method for renewable liquid fuels (and announced plans to develop market methods for renewable gas).

The government will prioritise further improvements to the accuracy and transparency of Australia's fugitive methane emissions, including through:

- Establishing an expert panel to advise the government on the potential role atmospheric measurement approaches could play in further enhancing fugitive methane emissions estimation in the NGER Scheme and the Australia's National Greenhouse Accounts more broadly.
- Commissioning a scientific study to test the capability of a range of atmospheric measurement approaches to estimate a controlled release of methane in a simulated open-cut mine setting to inform the work of the expert panel.
- Reviewing Method 2 for the estimation of fugitive methane emissions from open-cut mine coal extraction to ensure the method remains fit for purpose, is based on the best available science, technologies and practices and maintains public confidence in reported emissions.

2.3.3.3 Other reviews of federal policies and programs

The government has commissioned a number of specific reviews in recent years including reviews related to the ACCU Scheme, Safeguard Mechanism and carbon leakage.

2.3.3.3.1 Independent review of Australian Carbon Credit Units

An independent panel reviewed the integrity of ACCUs. The panel delivered the report to the government on 19 December 2022, concluding that the ACCU Scheme arrangements were sound with mechanisms for regular review and improvement. The panel made 16 recommendations for further improvements, all of which were accepted in principle.

The ACCU Review reforms are being implemented in stages:

- Stage 1 implementation is largely complete, including amending the legislation to enable publication of additional project information and appointing the full-time Chair and First Nations representative to the Emissions Reduction Assurance Committee (ERAC).
- Stage 2 is well underway and includes work to establish the Carbon Abatement Integrity Committee and increase scheme transparency. Public consultation took place in 2023 which will inform legislation reforms. An interim proponent-led method development process commenced in May 2024. In October 2024 the Minister announced four prioritised methods to be developed by proponents.
- Stage 3 will progress further reforms, such as consideration of accrediting or regulating carbon service providers and agents and recognising co-benefits.

2.3.3.3.2 Carbon Leakage Review

In March 2023 the Australian Government commissioned the Carbon Leakage Review as part of the Safeguard Mechanism reforms. This formally commenced on 1 July 2023.

The Review is assessing carbon leakage risks in Australia and additional policy options to address it.

The Review published its first consultation paper in November 2023 and its second paper in November 2024. This second paper outlines the Review's preliminary findings for consultation. The Review will submit its final advice to the Government by the end of the year.

2.3.3.3.3 Australian National Audit Office audit of Climate Change Governance

In January 2024 the Australian National Audit Office (ANAO) released a report on Governance of Climate Change Commitments. The objective of this audit was to assess the effectiveness of DCCEEW's governance arrangements supporting the implementation of the Australian Government's climate change commitments.

DCCEEW's response can be found in Appendix 1 of the ANAO report. DCCEEW agreed with the ANAO audit's 5 recommendations. Implementation of the recommendations has commenced. This work will form part of the department's efforts to further improve and mature the existing governance arrangements established in relation to risk, information management, reporting and the coordination of stakeholder engagement and communication. Implementation will be overseen by the department's Audit Committee.

2.3.3.3.4 Community Engagement Review

In December 2023 the Australian Energy Infrastructure Commissioner (AEIC) completed an independent Community Engagement Review to advise the Minister for Climate Change and Energy on improving community engagement on renewable energy infrastructure developments (see section 2.3.5.1 for AEIC). The review sought input from a range of stakeholders, including landholders and community members living close to developments. The review received over 250 online survey responses and over 500 written submissions.

The review was released in February 2024 and made 9 recommendations to improve community engagement effectiveness and outcomes. The Australian Government accepted in principle all recommendations in its initial response.

DCCEEW has worked with state and territory governments to develop national guidelines for industry on community engagement and benefits for electricity transmission projects as part of its response to the review. DCCEEW is progressing similar work in relation to the offshore wind industry.

2.3.3.4 Emissions

Australia's greenhouse gas emissions reporting arrangements are set out in section 2.2. See section 2.10 for a summary of greenhouse gas emissions and removals.

2.3.3.5 Projections

The annual publication of emissions projections provides estimates of Australia's future greenhouse gas emissions and assesses how Australia is tracking against its legislated emissions reduction targets.

2.3.4 Archiving of information

The Australian Government continues to make publications and data accessible to the public through DCCEEW's website.

The National Inventory Report 2022, Volume 1 section 1.2.3, provides information on the documentation system that manages and retains data used in the estimation of Australia's greenhouse gas emissions.

2.3.5 Stakeholder engagement

Stakeholder engagement is a key component of public policy development and implementation in Australia. The net zero transformation, including the transition to renewable energy, represents a major transition for many Australian regions and communities.

DCCEEW engages in stakeholder consultation to inform consideration of how policies affect industries, natural resources and the public. This includes targeted consultation with stakeholder groups including First Nations communities, regional communities, workers, young people, women, Culturally and Linguistically Diverse (CaLD) communities, investors and industry. Open consultations can be found on the department's website.

The Climate Change Authority similarly strives for best practice community consultation. In May 2024 the Authority consulted the community on its preparation of advice for the Australian Government on Australia's emission reduction targets, sectoral pathways and progress towards becoming a net zero economy. The Authority has also published its Engagement Strategy 2023–25.

2.3.5.1 Community support and social license for the energy transition

Community understanding, acceptance and support will assist in building the additional renewable generation and transmission infrastructure required for the energy transformation, particularly in regional areas, where much of the infrastructure will need to be built. The Australian Government consults directly with communities and works with states, territories, energy market bodies, industry and transmission network service providers to improve community engagement for energy infrastructure projects.

For example, since 2022 the Minister for Climate Change and Energy has consulted on proposed areas for offshore renewable energy, including offshore wind, in 6 regions around Australia. Following a series of public information measures, thousands of submissions were received from members of these communities and interested stakeholders. This feedback has helped to inform the Minister for Climate Change and Energy's decisions as to whether the proposed areas are suitable for offshore wind development. Information about the final areas declared as suitable for offshore renewable energy can be found on the department's website.

The Australian Energy Infrastructure Commissioner (AEIC) is an independent role appointed by the Australian Government, reporting to the Minister for Climate Change and Energy. The commissioner's role is to receive and refer complaints from concerned community residents about wind farms, large-scale solar farms, energy storage facilities and new major transmission projects as well as promote best practices for industry and government to adopt regarding the planning and operation of these projects. In December 2023 the Commissioner completed a review on improving community engagement on renewable energy infrastructure developments (see section 2.3.3.3.4)

2.3.5.2 Partnering with First Nations people

In Australia the National Agreement on Closing the Gap (National Agreement) provides a framework for how all levels of Australian government (federal, state and local) work with First Nations people to overcome the inequality experienced by First Nations people and achieve life outcomes equal to all Australians.

The National Agreement came into effect in July 2020 and contains both socioeconomic outcomes and targets relating to areas including health, education, economic development and connection to land and seas.

First Nations people are the original custodians of Australia and hold a unique and enduring relationship with Country having occupied and cared for this continent and its land, skies, waters and seas for over 65,000 years.

First Nations people in Australia hold rights and interests in over 50% of the country's land and seas, giving them a significant stake in clean energy development (Northern Territory Government 2024), (Longden et al. 2022).

The clean energy transformation presents opportunities for Australian governments to work with First Nations people to contribute to the National Agreement's socioeconomic outcomes and targets.

The clean energy transition is a critical moment for First Nations people's economic participation and to ensure that the enduring benefits and opportunities are shared.

2.3.5.2.1 The First Nations Clean Energy and Climate Change Advisory Committee

The First Nations Clean Energy and Climate Change Advisory Committee advises the Minister for Climate Change and Energy and DCCEEW on First Nations perspectives about clean energy and climate change. This was initially established in April 2023 as the First Nations Clean Energy and Emissions Reduction Advisory Committee.

The Committee's role is to:

- provide advice on First Nations perspectives regarding clean energy and climate change priorities
- ensure First Nations perspectives are appropriately considered in the development of policy, reform and program implementation
- ensure First Nations heritage and cultural protocols are respected and protected
- identify opportunities for First Nations Peoples and communities to share in the benefits of the net zero transition.

2.3.5.2.2 The First Nations Clean Energy Strategy

The First Nations Clean Energy Strategy, a key priority of the National Energy Transformation Partnership, establishes a national framework for action to guide investment, influence policy design and improve outcomes for First Nations peoples across the broad scope of the transition. In July 2024 all Energy and Climate Ministers endorsed the national framework for action, with the strategy to be released by the end of 2024 (ECMC 2024).

The strategy will enable First Nations people to lead and benefit from Australia's clean energy transition. The strategy recognises that the clean energy transition is a critical moment for Australia's relationship with First Nations people and the journey to net zero can be a catalyst for economic self-determination by creating opportunities for First Nations peoples' effective economic participation and leadership. By prioritising investment in the right technology, in the right place, the transition can also ensure that First Nations people have access to the kind of reliable and affordable electricity that most other Australians already enjoy.

The strategy also recognises a regional approach is required to ensure effective economic participation with real benefits for First Nations people, including long-term planning, clear pathways for quality jobs and careers, and capacity support underpinned by genuine partnerships and self-determination.

2.3.5.3 National Environmental Standard for First Nations Engagement

The government is progressing a National Environmental Standard for First Nations Engagement as part of the suite of national environmental standards being developed under new Nature Positive law and new Cultural Heritage laws.

The Australian Government is working in partnership with the First Nations Heritage Protection Alliance on new cultural heritage reforms and worked with First Nations groups including the Indigenous Advisory Committee (IAC) on the standard.

The standard and the key principles developed for the Nature Positive and Cultural Heritage laws ensure consistency for First Nations engagement and certainty for industry proponents to follow a simple and clear process to meet their regulatory requirements. This means proponents developing clean energy or energy-related projects assessed under Australia's national environmental laws will have a clear standard for engaging First Nations people on their project developments.

The principles underpinning the standard are straightforward: early and genuine engagement with the relevant Traditional Owners is the best way to protect cultural heritage and identify traditional knowledge that can help look after nature.

Proponents need certainty about who to engage with and who speaks for Country, and to ensure consultation and engagement are done properly.

To help implement the standard, work is underway on a service to connect proponents with the relevant Traditional Owners following on from an approach developed by the First Nations Heritage Protection Alliance.

Proponents are looking to the government for a clear approach across government to establish a system that supports all parties to undertake good engagement, protect cultural heritage and avoid disruption to business.

2.3.5.3.1 First Nations involvement in Australia's emerging renewable hydrogen industry

Consultation with First Nations people and communities is informing development of other key policies including Hydrogen Headstart, through the First Nations Renewable Hydrogen Engagement Fund, where up to $4 million is allocated to connect communities with hydrogen project proponents and planning processes.

2.3.5.3.2 Reforms to the ACCU Scheme to improve access to its benefits by First Nations Australians

In January 2023 the government agreed in principle to the recommendations of the Independent Review of Australian Carbon Credit Units (ACCU Review).

The ACCU Review recommended the *Carbon Credits (Carbon Farming Initiative) Act 2011* (CFI Act) be amended to remove the option to conditionally register ACCU projects on Native Title lands before obtaining consent. This recognises the importance of early engagement with First Nations people before projects are established. To support participation in upfront consent negotiations for ACCU projects $11.8 million was allocated in the 2024–25 Budget to be delivered to the Native Title Representative Bodies and Service Providers and will be used to provide support to Native Title Holders in the ACCU project consent negotiations.

The review also recommended the continuation of support for capacity and capability building of rural and remote communities, including First Nations Australians. An example of this is the government's expansion of the Carbon Farming Outreach Program, which will support First Nations people to make decisions to reduce emissions and store carbon, and to participate in carbon markets. This builds on grants provided to train trusted

and independent advisors to build the capacity and capability of rural and remote communities to participate in the scheme.

2.3.5.3.3 The Australian Government is supporting a First Nations-led response to the on-ground impacts of climate change.

The Torres Strait and Northern Peninsula Area Climate Resilience Centre is being implemented as a First Nations-led, coordinated regional response to climate change impacts. The centre has been designed by regional leaders and Traditional Owners in collaboration with the government to deliver First Nations-led climate adaptation solutions, including through a Climate Resilience Officer grants program. The Centre is a $15.9 million investment over 6 years (2022–23 to 2027–28).

The Indigenous Ranger Program (IRP) and the Indigenous Protected Area (IPA) program support climate adaptation and improved resilience through use of Traditional Knowledge in the management of land and sea Country. The IRP assists First Nations people to manage Country in accordance with Traditional Owners' objectives. The Australian Government is doubling the number of First Nations rangers to 3,800 by 2030 by expanding the IRP, with a focus on increasing the representation of First Nations women to achieve gender equality. IPAs are areas of land or sea managed by First Nations groups through voluntary agreements with the Australian Government to protect and manage biodiversity and cultural heritage. In 2024 the Australian Government fulfilled its commitment to create 10 news IPAs and expand the existing IPAs (NIAA 2024).

2.3.5.4 Net Zero Economy Authority

In May 2023 the government announced the creation of a new Net Zero Economy Authority (NZEA). The NZEA will promote orderly and positive net zero economic transformation for Australia, its regions, industries, workers and communities. Its functions will include:

- investment facilitation
- worker transition
- policy coordination
- communication and engagement.

The Net Zero Economy Agency was established in July 2023 to begin the Authority's work, ahead of establishing the Authority formally through legislation. The legislation for its formation received royal assent on 17 September 2024. The Net Zero Economy Agency is consulting and collaborating with state and territory governments, local governments, industry, unions, First Nations people and communities to ensure regional areas highly affected by the transition have access to targeted support and benefit from the transformation. Its functions include to:

- Facilitate public and private sector participation and investment in greenhouse gas emissions reduction and net zero transformation initiatives in Australia, including in new industries.
- Support workers impacted by the net zero transformation to transition to new opportunities.
- Coordinate net zero efforts across government and key stakeholders, and in key regions, to facilitate the achievement of Australia's greenhouse gas emissions reduction targets and support Australia's transition to a net zero emissions economy.
- Build community understanding, confidence and engagement with the net zero transformation.

2.3.5.5 Net Zero Plan and sectoral decarbonisation plans

The government is developing a Net Zero Plan to guide Australia's transition to net zero emissions by 2050. As part of this work, the government is developing 6 sectoral decarbonisation plans, covering all major emission sources: electricity and energy, transport; industry; agriculture and land; resources, and the built environment (see section 2.6.2.1).

In developing the Net Zero Plan the government is undertaking a transparent, inclusive and coordinated approach, engaging with communities, industry, investors, academia and unions. The government is also engaging closely with state and territory governments while developing these plans. Portfolio Ministers responsible for each sectoral plan are leading engagement on their sectors, as per the Australian Government's Net Zero Plan.

Consultation activity to date can be found on the DCCEEW website.

2.4 Description of a party's Nationally Determined Contribution under Article 4 of the Paris Agreement, including updates

In June 2022 Australia updated its Nationally Determined Contribution (NDC), committing to reduce Australia's net national greenhouse gas emissions by 43% below 2005 levels by 2030, implemented as a single-year point target and a multi-year emissions budget covering the period 2021–2030. Australia also reaffirmed its target to achieve net zero emissions by 2050. Australia is due to update its NDC in 2025.

Table 2.3 Description of Australia's Nationally Determined Contribution

Target(s) and description, including target type(s), as applicable	**43% below 2005 levels by 2030 implemented as an emissions budget covering the period 2021–2030.**	**43% below 2005 levels by 2030, implemented as a single-year point target.**	**Net zero emissions by 2050**
Target year(s) or period(s), and whether they are single-year or multi-year target(s), as applicable	Multi-year: 2021–2030	Single-year: 2030	2050
Reference point(s), level(s), baseline(s), base year(s) or starting point(s), and their respective value(s), as applicable	Emissions budget for the period 2021–2030 The value of the emissions budget is calculated using a straight-line trajectory which takes a linear decrease from 2020 to 2030. This trajectory begins in 2020 at Australia's 2020 target (net national emissions 5% below 2000 levels) and finishes at net national emissions 43% below 2005 levels in 2030. The area under the trajectory for the period 2021–2030 is the emissions budget for the 2030 target. Values for 2000 and 2005 are as published in the National Inventory Report annually.	Base year: 2005 The value of the base year is net national greenhouse gas emissions for the year 2005, as published in the National Inventory Report annually.	Australia's net emissions for the most recent year published in the annual National Inventory Report
Time frame(s) and/or periods for implementation, as applicable	2021–2030	2021–2030	2021–2050
Scope and coverage, including, as relevant, sectors, categories, activities, sources and sinks, pools and gases, as applicable	Absolute economy-wide emissions reduction. Carbon dioxide (CO_2); Methane (CH_4); Nitrous oxide (N_2O); Hydrofluorocarbons (HFCs); Perfluorocarbons (PFCs); Sulphur hexafluoride (SF_6); Nitrogen trifluoride (NF_3). All sectors, categories and carbon pools, as defined by the Intergovernmental Panel on Climate Change (IPCC) 2006 guidelines, and additional sources reported in the annual National Inventory Report.		
Intention to use cooperative approaches that involve the use of Internationally Transferred Mitigation Outcomes (ITMOs) under Article 6 towards NDCs under Article 4 of the Paris Agreement, as applicable	Australia has not taken a decision to engage in cooperative approaches that involve the use of ITMOs under Article 6. Should Australia decide to use cooperative approaches under Article 6 of the Paris Agreement towards achievement of its NDC or to authorise the use of ITMOs towards the NDCs of other Parties, it would report on such use or authorisation through subsequent Biennial Transparency Reports and consistent with guidance adopted under Article 6.		

Target(s) and description, including target type(s), as applicable	43% below 2005 levels by 2030 implemented as an emissions budget covering the period 2021–2030.	43% below 2005 levels by 2030, implemented as a single-year point target.	Net zero emissions by 2050
Any updates or clarifications of previously reported information, as applicable	To avoid doubt Australia's targets are based on its financial year that runs from 1 July in a given year to 30 June of the following year. So Australia's 2030 multi-year target covers the period 1 July 2020 to 30 June 2030. This approach reflects the data sources that underpin the target: Australia's annual National Inventory Report to the Paris Agreement, which are reported on financial years because their key data inputs are reported on that basis.	To avoid doubt Australia's targets are based on its financial year that runs from 1 July in a given year to 30 June of the following year. So achievement of Australia's 2030 single-year target concerns the period 1 July 2029 to 30 June 2030. This approach reflects the data sources that underpin the target: Australia's annual National Inventory Report to the Paris Agreement, which are reported on financial years because their key data inputs are reported on that basis.	To avoid doubt Australia's targets are based on its financial year that runs from 1 July in a given year to 30 June of the following year. So achievement of Australia's 2050 net zero target concerns the period 1 July 2049 to 30 June 2050. This approach reflects the data sources that underpin the target: Australia's annual National Inventory Report to the Paris Agreement, which are reported on financial years because their key data inputs are reported on that basis.

2.5 Information necessary to track progress made in implementing and achieving Nationally Determined Contributions under Article 4 of the Paris Agreement

2.5.1 Australia's progress towards its 2030 and 2050 NDC targets

Australia is making good progress towards its single- and multi-year 2030 targets and single-year 2050 NDC target communicated in Australia's Nationally Determined Contribution (NDC). This progress is summarised below. Additional information is set out in Common Tabular Formats 1–4.

2.5.2 Australia's 2030 multi-year target

Australia's 2030 multi-year target is an absolute economy-wide emissions reduction commitment to reduce net national emissions to 43% below 2005 levels over 10 years from 2021 to 2030, implemented as an emissions budget. Cumulative net national greenhouse gas emissions based on Australia's latest National Inventory Report are the indicator for this target, while the emissions budget is both the reference indicator and target level. Australia's NDC targets are based on its financial year that runs from 1 July in a given year to 30 June of the following year. So Australia's 2030 multi-year target covers the period 1 July 2020 to 30 June 2030.

As illustrated in Figure 2.9 the emission budget is calculated using a straight-line trajectory which takes a linear decline from 2020 to 2030, beginning in 2020 at Australia's Cancun Agreement 2020 target (net national greenhouse gas emissions 5% below 2000 levels) and finishing at net national emissions 43% below 2005 levels in 2030. The area under the trajectory for the period 2021 to 2030 is the emissions budget.

Achievement of the target will be assessed by comparing cumulative net national emissions for the target period 2021 to 2030 to the emissions budget, based on net national emissions data reported in Australia's National Inventory Report 2030. Until that time, progress towards the target is assessed by comparing cumulative net national emissions for the target period 2021 to 2030 to the emissions budget, based on net national emissions data reported in Australia's latest annual National Inventory Report to the Paris Agreement.

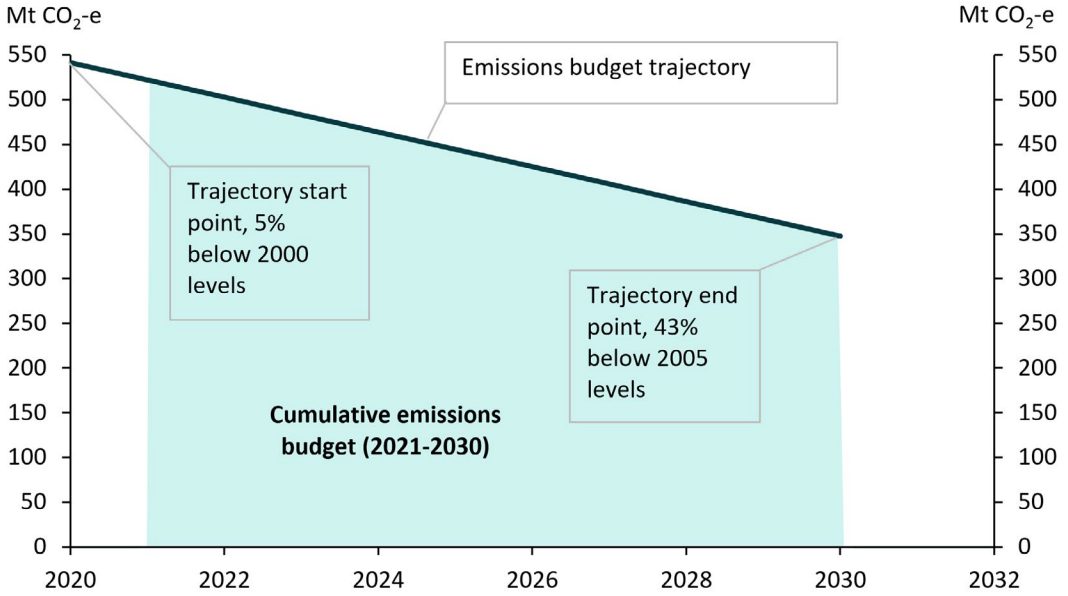

Figure 2.9 Calculation of Australia's 2030 multi-year target reference indicator (emissions budget)

Table 2.4 presents Australia's net national emissions for the first 2 years of the 10-year target period (2021 and 2022). It also presents the base years of the straight-line trajectory start and end points used to calculate emissions budget (2000 and 2005 respectively). These data are sourced from Australia's latest National Inventory Report 2022 (NIR 2022) submitted to the Paris Agreement in April 2024.

Table 2.4 Net greenhouse gas emissions by sector, Australia (Mt CO_2-e)

UNFCCC classification sector and subsector	Net emissions (Mt CO_2-e)			
	2000	2005	2021	2022
1 Energy (combustion and fugitive)	368.52	403.72	404.33	396.71
2 Industrial processes and product use	25.77	30.13	32.88	32.97
3 Agriculture	87.60	84.92	76.62	77.45
4 Land use, land use change and forestry	69.37	74.97	-88.53	-88.37
5 Waste	18.57	15.71	13.45	13.86
Total net emissions	569.83	609.45	438.75	432.62

Source: Australia's National Inventory Report 2022 (DCCEEW 2024g). Data in table subject to rounding.

As set out in Table 2.5 Australia's cumulative net national emissions for the first 2 years of the target period (2021 and 2022) were 871.37 Mt CO_2-e, equivalent to 20% of the target's emissions budget of 4,377.00 Mt CO_2-e. This means that Australia is 20% of the way through its 2030 multi-year target commitment period and has generated emissions equivalent to 20% of that target's emissions budget. Australia has approximately 3,505.63 Mt CO_2-e of its emissions budget remaining.

Table 2.5 Indicator values for Australia's progress towards its 2030 multi-year target

	Value	Data source
1. Emissions budget covering the target period [(a)]	4,377.00 Mt CO_2-e	National Inventory Report 2022
2. Target period	2021–2030	
3. Target level[(a)]	4,377.00 Mt CO_2-e	Emissions Budget
4. Cumulative actual net national emissions over the target to date (2021 and 2022)	871.37 Mt CO_2-e	Item 4a + Item 4b
4a. 2021	438.75 Mt CO_2-e	National Inventory Report 2022
4b. 2022	432.62 Mt CO_2-e	National Inventory Report 2022
5. Progress: Remaining emissions budget[(a)]	3,505.63 Mt CO_2-e	Item 1 – Item 4

Note: (a) These values will be updated over the target period to reflect inventory improvements implemented in Australia's annual National Inventory Report that result in recalculations to previously reported years to maintain time-series consistency in accordance with IPCC guidelines. Values in table are subject to rounding.

2.5.3 Australia's single-year 2030 target

Australia's 2030 single-year or point target is an absolute economy-wide emission reduction commitment to reduce net national emissions in 2030 to 43% below 2005 levels. It relates to the period 1 July 2029 to 30 June 2030. The value of the target derived through this calculation is hereinafter referred to as the 'target level'. Net national greenhouse gas emissions, as reported in Australia's latest National Inventory Report, are the indicator for this target while net national emissions for the year 2005 in that report are the reference indicator (base year).

Achievement of the target will be determined by comparing net national emissions reported for 2030 in Australia's National Inventory Report 2030 with the target level based on net national emissions for 2005 published in that Report. Until that time, progress towards the target will be assessed by comparing net national emissions for the last year reported in Australia's latest National Inventory Report with a target level based on net national emissions for 2005 in that latest Report.

Table 2.6 presents Australia's net national emissions for the reference indicator (2005), and net national emissions for 2022, as reported in Australia's latest National Inventory Report (NIR 2022). Based on these data, in 2022 Australia's net national emissions were 29% below 2005 levels. Australia's emissions need to fall by a further 14 percentage points to meet the single year 2030 target. Australia's 2022 net national emissions represent a 1.4% reduction on the previous year 2021.

Table 2.6 Indicator values for Australia's progress towards its 2030 single-year point target

	Value	Data source
1. Base year: 2005 net national emissions[(a)]	609.45 Mt CO_2-e	National Inventory Report 2022
2. Target year	2030	NDC
3. Target level (43% below 2005 levels)[(a)]	347.38 Mt CO_2-e	Item 1 x (1-0.43)
4. Net national emissions for latest year reported in annual National Inventory Report: 2022	432.62 Mt CO_2-e	National Inventory Report 2022
4a. Net national emissions for previous years (2021)	438.75 Mt CO_2-e	National Inventory Report 2022
5. Progress: Net national emissions for 2022 compared to 2005 levels	29% below 2005 levels	(Item 1 – Item 3)/Item 1 x 100

Note: (a) These values will be updated over the target period to reflect inventory improvements implemented in Australia's annual National Inventory Report that result in recalculations to previously reported years to maintain time-series consistency in accordance with IPCC guidelines.

2.5.4 Australia's net zero by 2050 target

Australia's single year or point target for 2050 is an absolute economy-wide emissions reduction commitment to achieve net zero emissions in that year. It relates to the period 1 July 2049 to 30 June 2050. Net national greenhouse gas emissions as reported in Australia's latest National Inventory Report are the indicator for this target, while net zero emissions in 2050 is the target level.

Achievement of the target will be determined based on Australia's net national emissions reported for 2050 in Australia's National Inventory Report 2050 submitted to the Paris Agreement. Until that time, progress towards the target will be based on net national emissions published for the last year reported in Australia's latest National Inventory Report (reference indicator).

As set out in Table 2.7 Australia's latest National Inventory Report submitted in April 2024 (NIR 2022) reported the reference indicator's value as 432.62 Mt CO_2-e net national emissions for 2022. This is a 1.4% reduction on the previous year 2021 (438.75 Mt CO_2-e).

Table 2.7 Indicator values for Australia's progress towards its 2050 single-year 2030 point target

	Value	Data source
1. Net national emissions for latest year reported in annual National Inventory Report: year 2022	432.62 Mt CO_2-e	National Inventory Report 2022
1a. Net national emissions for previous years: year 2021	438.75 Mt CO_2-e	National Inventory Report 2022
2. Target year	2050	NDC
3. Target level	Net zero emissions	NDC
4. Progress: Net national emissions above net zero	432.62 Mt CO_2-e	(Item 1 – Item 3)

2.5.5 Methodological and accounting approaches

Methodological and accounting approaches used to track each of these targets are summarised in Table 2.8 below. These approaches are unchanged from the approaches included in Australia's communication of its NDC in June 2022 (as set out in Table 2.3).

Table 2.8 Methodological and accounting approaches underpinning Australia's targets

Methodological and accounting approaches	Target		
	Net national emissions reduced to 43% below 2005 levels by 2030 implemented as an emissions budget covering the period 2021–2030.	**Net national emissions reduced to 43% below 2005 levels by 2030, implemented as a single-year point target.**	**Net national emissions reach net zero by 2050.**
Key parameters, assumptions, definitions, data sources and models used	The definitions, data sources and models used to estimate net national emissions are those described in Australia's annual National Inventory Report.		
IPCC guidelines used	The estimates of emissions and removals used in accounting for the targets on the basis of net national emissions are those reported in Australia's annual National Inventory Report to the Paris Agreement, which applies the IPCC 2006 Guidelines and nationally appropriate methods consistent with that guidance and informed inter alia by the IPCC 2019 Refinement and IPCC 2013 Wetlands Supplement.		
Metrics used	100-year Global Warming Potential values as contained in Paris Agreement inventory reporting guidelines, currently IPCC Fifth Assessment Report 100-year GWP values.		

Methodological and accounting approaches	Target		
	Net national emissions reduced to 43% below 2005 levels by 2030 implemented as an emissions budget covering the period 2021–2030.	**Net national emissions reduced to 43% below 2005 levels by 2030, implemented as a single-year point target.**	**Net national emissions reach net zero by 2050.**
Sector-, category- or activity-specific assumptions, methodologies and approaches consistent with IPCC guidance			
Natural disturbances	Australia addresses emissions and subsequent removals from natural disturbances in accounting for its NDC. The carbon stock changes from natural disturbances are included in the national emissions totals, as described in Australia's NIR 2022 (April 2024, Volume 1 Table 2.1 and Chapter 6 refers) consistent with approaches set out in the IPCC 2006 Guidelines and the IPCC 2019 Refinement. Australia will continue to provide information on its approach to addressing emissions and subsequent removals from natural disturbances in its annual National Inventory Report.		
Harvested wood products	Australia uses a stock-change approach consistent with the IPCC 2006 Guidelines to estimate emissions from harvested wood products, consistent with the 2006 IPCC Guidelines and paragraph 56 of the Annex to decision 18/CMA.1. The methodology is described in detail in Australia's annual National Inventory Report, including the NIR 2022 (Volume 1 Chapter 6.10 refers).		
Effects of age-class structure in forests	NA		
Other assumptions and methodological approaches			
Construction of the reference indicators	Emissions budget for the target period 2021–2030. The reference indicator is calculated using a straight-line trajectory which takes a linear decrease from 2020 to 2030. This trajectory begins in 2020 at Australia's Cancun Agreement 2020 target (net national emissions 5% below 2000 levels) and finishes at net national emissions 43% below 2005 levels in 2030. The area under the trajectory for the period 2021–2030 is the emissions budget for the target. The reference indicator is quantified based on net national emissions reported for the years 2000 and 2005 in Australia's annual National Inventory Report. For this Biennial Transparency Report, the net national emissions from the National Inventory Report 2022 were applied.	Net national emissions in 2005. The reference indicator is quantified based on net national emissions reported for the year 2005 in Australia's annual National Inventory Report. For this Biennial Transparency Report, the net national emissions from the National Inventory Report 2022 were applied.	Net national emissions. The reference indicator is quantified based on net national emissions reported for the last year reported in Australia's annual National Inventory Report. For this Biennial Transparency Report, the net national emissions from the National Inventory Report 2022 were applied.
Target level	The reference indicator quantified as set out above in million tonnes carbon dioxide equivalent ($Mt\ CO_2$-e).	Net national emissions 43% below the reference indicator quantified as set out above in $Mt\ CO_2$-e.	Net zero national emissions in $Mt\ CO_2$-e.

Methodological and accounting approaches	Target		
	Net national emissions reduced to 43% below 2005 levels by 2030 implemented as an emissions budget covering the period 2021–2030.	**Net national emissions reduced to 43% below 2005 levels by 2030, implemented as a single-year point target.**	**Net national emissions reach net zero by 2050.**
Technical updates to reference indicators and target levels	The value of the reference and target value indicators are updated to reflect inventory improvements implemented in Australia's NIR 2022 that result in recalculations to previously reported years to maintain time-series consistency in accordance with IPCC guidelines. Information on improvements applied in the National Inventory Report 2022, submitted in April 2024, are summarised in Volume 1 section ES.6 and set out in detail in chapters 3–7.		The value of the reference indicator is updated to reflect inventory improvements implemented in Australia's latest NIR 2022 in accordance with IPCC guidelines. Information on improvements applied in the National Inventory Report 2022, submitted in April 2024, are summarised in Volume 1 section ES.6 and set out in detail in chapters 3–7.
Accounting towards targets	Cumulative net national emissions as reported in Australia's latest National Inventory Report are the basis for accounting towards the target. Progress towards the target is assessed by comparing cumulative net national emissions for the target period 2021–2030 as reported in Australia's latest National Inventory Report to the target's emissions budget (reference indicator).	Net national emissions as reported in Australia's latest National Inventory Report are the basis for accounting towards the target. Progress towards the target is assessed by comparing net national emissions for the last year reported in Australia's latest National Inventory Report to the target level based on net national emissions reported for 2005 (reference indicator) in that report.	Net national emissions as reported in Australia's latest National Inventory Report are the basis for accounting towards the target. Progress towards the target is assessed by comparing net national emissions published for the last year reported in Australia's latest National Inventory Report (reference indicator) with net zero emissions (target level).
Scope and coverage	All targets are absolute economy-wide emission reduction targets covering: Carbon dioxide (CO_2); Methane (CH_4); Nitrous oxide (N_2O); Hydrofluorocarbons (HFCs); Perfluorocarbons (PFCs); Sulphur hexafluoride (SF_6); Nitrogen trifluoride (NF_3). All sectors, categories and carbon pools, as defined by the IPCC 2006 guidelines, and additional sources reported in the annual National Inventory Report. No source, sink or activity that was included in Australia's Cancun Agreement 2020 target under the UN Framework Convention on Climate Change has been excluded from these targets.		
Avoidance of double counting of emissions	Australia has not taken a decision to engage in cooperative approaches that involve the use of ITMOs under Article 6 of the Paris Agreement. Should Australia decide to use cooperative approaches under Article 6 towards achievement of its NDC or to authorise the use of internationally transferred mitigation outcomes towards the NDCs of other Parties, it would report on such use or authorisation through subsequent Biennial Transparency Reports and consistent with guidance adopted under Article 6. The estimates of emissions and removals used in accounting for the targets are those reported in Australia's annual National Inventory Report to the Paris Agreement and therefore apply IPCC 2006 Guidelines' methodologies for the avoidance of double counting.		

2.6 Federal Government policies and measures

Since Australia's 8th National Communication on Climate Change and 5th Biennial Report, Australia has continued to develop, implement and reform climate change policies and measures to ensure Australia achieves its emissions reduction targets.

Australia's climate mitigation policies and measures are described in section 2.6 and 2.7. This policy agenda is influencing the reduction of greenhouse gas emissions over the longer term.

2.6.1 Modifications of longer-term trends in greenhouse gas emissions and removals

With regards to paragraphs 60 and 89 of the modalities, procedures and guidelines, this section describes how Australia's national circumstances have affected greenhouse gas emissions removals over time and how its policies and measures will influence emissions into the future.

Australia's emissions are at their lowest level since 1989–90, having decreased from 615.4 to 432.6 Mt CO_2-e in 2021–22 (DCCEEW 2024g).

Historically these reductions are mostly attributed to reductions in land clearing and the conversion of the land-use sector from a source of emissions to a sink, increased landfill methane capture, technological innovation and strong growth in renewable energy generation and consumption. Significant reductions in the Land Use, Land-use Change and Forestry (LULUCF) sector have been driven by reduced land clearing and native forest harvesting, and increased forest cover. This has contributed to the sector changing from a net source of 178.3 Mt CO_2-e in 1989–90 to a net sink of -88.4 Mt CO_2-e in 2021–22 (DCCEEW 2024g).

Emissions from the public electricity and heat production sub-sector peaked in 2008–09 and have since declined by 25.9% (-54.9 Mt CO_2-e) despite continuing population and economic growth (DCCEEW 2024g). This is primarily driven by changes in the generation mix, with a declining share from coal and increased share from renewables in the National Electricity Market, with the largest increases coming from wind and solar.

Australia's National Electricity Market is one of the largest interconnected electricity systems in the world. It covers around 40,000 kms of transmission lines and cables, and interconnects the 6 eastern and southern states and territories. It delivers approximately 80% of all electricity consumption in Australia.

Australia has a comprehensive policy agenda targeting emissions across the economy. To further decarbonise the energy sector the Australian Government has introduced policies to increase the uptake of renewable energy, including the 82% renewable electricity by 2030 target (see section 2.6.4.1), the Capacity Investment Scheme (see section 2.6.4.2) and the Rewiring the Nation program.

The transformation of Australia's energy sector will facilitate the decarbonisation of other sectors. For example, renewable electricity will replace reliance on fuel needed for internal combustion engine vehicles. Recognising road transport as an essential avenue for significant emissions reduction, the New Vehicle Efficiency Standard and the National Electric Vehicle Strategy will improve the supply and affordability of cleaner vehicles and electric vehicles in the Australian market (see section 2.6.5).

Since 2022 the Australian Government has also focused on reducing greenhouse gases from the largest emitting facilities; recent reforms to the Safeguard Mechanism (see section 2.6.3.2) will see their emissions predictably decline over time.

Looking to the future, Australia is focused on leveraging its abundant renewable energy to contribute to global emissions reduction and secure Australia's place in a changing economic and strategic landscape. Under the Net Zero Transformation stream of A Future Made in Australia, the government will invest in new industries (including renewable hydrogen, low carbon liquid fuels and green metals) which help decarbonise hard-to-abate sectors in Australia and around the world.

2.6.2 A Future Made in Australia

The Australian Government is investing $22.7 billion over the next decade through its Future Made in Australia plan to make Australia an indispensable part of the global net zero transformation.

As part of this plan, the government has legislated a *Future Made in Australia Act*, which establishes a National Interest Framework that aligns economic incentives with Australia's national interests. The National Interest Framework will support public investment decision making to unlock private investment at scale in the national interest.

The framework has 2 streams:

- The Net Zero Transformation Stream relates to sectors that could have a sustained comparative advantage in a net zero global economy and public investment is likely needed for the sector to make a significant contribution to emissions reduction at an efficient cost.
- The Economic Resilience and Security Stream relates to sectors where some level of domestic capability is a necessary or an efficient way to deliver economic resilience and security, and the private sector will not deliver the necessary investment in the absence of government support.

The Australian Government has identified 3 initial priority industries that align with the principles of the Net Zero Transformation Stream: renewable hydrogen, green metals and low-carbon liquid fuels.

2.6.2.1 Renewable Hydrogen

2.6.2.1.1 Australia's National Hydrogen Strategy

The 2024 National Hydrogen Strategy is Australia's framework to guide the production, use and export of hydrogen. Clean hydrogen is an essential element of Australia's climate change and energy policies. It is an important low emission fuel and feedstock that opens decarbonisation pathways for hard-to-abate sectors like heavy industry and transport. Australian hydrogen can support its international partners' energy security as they pursue their emissions reduction targets and can underpin new value-added industries like green iron, alumina and ammonia. As such, hydrogen will play a central role in the Australian Government's Future Made in Australia plan and its renewable energy superpower aspirations.

Australia was among the first countries globally to publish a National Hydrogen Strategy in 2019 and has since taken concrete steps to lay foundations for the hydrogen industry's growth. The 2024 updated strategy embeds a refreshed vision for "*a clean, innovative, safe and competitive hydrogen industry that benefits Australia's communities and economy, enables our net zero transition, and positions us as a global hydrogen leader*". The updated strategy was informed by a comprehensive review over 2023 and 2024 led by the Australian Government, working with states and territories through the Energy and Climate Change Ministerial Council (see section 2.3.1.3).

The strategy moves beyond early industry activation measures, with a refreshed focus on accelerating industry development and scaling up production. A central element of the updated strategy is a national production target of 15 million tonnes of hydrogen by 2050, with 5 yearly milestones to track progress towards this long-term goal. The new Hydrogen Production Tax Incentive and expanded Hydrogen Headstart program represent the centrepiece of Australia's revitalised strategy. These will help bridge the commercial gap and enable the sector to achieve scale by supporting early movers and building familiarity within the hydrogen and finance sectors with large-scale projects.

These initiatives build on the already significant funds allocated by the Australian Government to building the hydrogen industry. This includes over half a billion dollars to support the development of hydrogen hubs and $300 million from the Clean Energy Finance Corporation (CEFC) through the Advancing Hydrogen Fund. The Australian Renewable Energy Agency (ARENA) has also played an important role in supporting early stage hydrogen projects, including research, development and deployment.

Australia's updated strategy will also continue to build the enabling environment for Australia's hydrogen industry. A key action is developing an internationally aligned domestic hydrogen Guarantee of Origin Scheme to provide future customers with robust and transparent information on the greenhouse gas emissions associated with hydrogen production. The scheme will track the carbon emissions associated with Australian hydrogen production, along with other characteristics such as the type of technology and energy source used in its manufacture. While the initial focus is on hydrogen and renewable electricity, Australia has committed to expand the scheme to cover green metals and low carbon liquid fuels in the future.

These initiatives and investments build on other actions taken since the inaugural strategy was published. The initiatives and investments are aimed at accelerating the commercialisation of hydrogen, reducing technical uncertainties and building Australia's supply chains and production capabilities. These have included a National Hydrogen Infrastructure Assessment, a review of regulatory frameworks relevant to hydrogen industry safety and development, and collaboration with international partners to develop markets, technologies and supply chains.

2.6.2.1.2 Hydrogen Headstart

In May 2023 the Australian Government announced it would invest up to $2 billion in a new Hydrogen Headstart Program to provide operating funding support to select large-scale hydrogen production projects. The competitive, meritbased program aims to accelerate development of Australia's hydrogen industry, catalyse clean energy industries and help Australia connect to new global hydrogen supply chains to take advantage of hydrogen's immense jobs and investment potential. A further $2 million was announced to help First Nations communities engage with hydrogen project developers (see section 2.3.5.3).

In May 2024 the government announced an additional $2 billion for the program of the program to help bridge the green premium for early mover renewable hydrogen projects, complemented by additional funding for the First Nations Renewable Hydrogen Engagement Fund.

Scaling-up production of renewable hydrogen will enable Australian industries to realise new opportunities in manufacturing and export industries while contributing to Australia's decarbonisation commitments. The program objectives are to:

- Produce renewable hydrogen at scale in Australia, facilitating an accelerated pathway to the technical and commercial viability of renewable hydrogen production and use.
- Support domestic decarbonisation, build industry capability and provide for new economic opportunities in manufacturing and export industries.
- Provide price discovery and transparency in relation to the current and projected economics for renewable hydrogen (and its derivative products) technologies.
- Reduce barriers for future deployments through developing construction expertise, skilled labour and intellectual property, and attracting key equipment manufacturers and private sector capital (debt, equity and offtake).
- Facilitate knowledge sharing throughout industry to assist with maturing the Australian renewable hydrogen industry.

The program will help build domestic production capabilities essential for positioning Australia to be an early mover in the growing global hydrogen sector, creating jobs for the future and catalysing new renewable energy industries.

2.6.2.1.3 H2Global

In September 2024 the Australian Government signed a Joint Declaration of Intent with Germany to partner on a jointly funded €400 million (approximately A$660 million) H2Global auction window. The mechanism is designed to facilitate the trade of hydrogen and its derivatives produced from renewable energy sources in Australia to Germany.

H2Global is a market-based mechanism that helps to connect hydrogen suppliers and purchasers by bridging the commercial price gap. The mechanism provides offtake certainty to supply side investors through co-funded government backed contracts, helping to de-risk investment and boost domestic production. It will support Australian producers to secure offtake for their product and open the door to a new demand market for Australia.

This mechanism will play an important role in supporting the establishment of international supply chains and achieving the export target laid out in the 2024 National Hydrogen Strategy.

2.6.2.1.4 Hydrogen Hubs

The Australian Government is investing around $500 million to support the establishment of Hydrogen Hubs in regional Australia as well as design and development studies that will support Australian industry on the initial development, feasibility and design work needed to advance Hydrogen Hubs.

Hydrogen Hubs allow producers, users and exporters of hydrogen to work side by side to share infrastructure and expertise. Hubs are an efficient and sustainable way to scale up the clean hydrogen industry, create opportunities for existing industries and support communities. The co-location of these Hydrogen Hubs will lower operational and production costs, encourage innovation and collaboration and enhance workforce capability and development.

Hydrogen Hubs have been announced in the Pilbara and Kwinana in Western Australia, the Hunter in New South Wales, Bell Bay in Tasmania, Gladstone and Townsville in Queensland, and Port Bonython in South Australia.

2.6.2.1.5 Hydrogen Production Tax Incentives

The Australian Government announced in May 2024 that it would introduce the Hydrogen Production Tax Incentive, a time-limited incentive to accelerate the growth of Australia's renewable hydrogen industry. The incentive will provide $2 per kilogram for renewable hydrogen produced between 2027-28 and 2039-40 for up to ten years per facility. Each kilogram of renewable hydrogen must be produced with an emissions intensity less than or equal to 0.6 kilograms of carbon dioxide equivalent. The incentive will be demand driven and the total value of support provided will be dependent on the amount of eligible renewable hydrogen produced. The estimated amount of support to be provided is $6.7 billion over ten years from 2024–25 (and an average of $1.1 billion per year from 2034–35 to 2040–41).

The incentive will be available to all producers who meet the eligibility criteria. The emissions intensity of the hydrogen produced will be verified by the Clean Energy Regulator through the domestic certification scheme for hydrogen and renewable energy, the Guarantee of Origin Scheme. The incentive will support renewable hydrogen

producers to bring forward project development, make renewable hydrogen available sooner and build scale to reduce production costs over time.

2.6.2.2 Critical Minerals Production Tax Incentives

The Critical Minerals Production Tax Incentive announced in the 2024-25 Budget is a time-limited and demand-driven incentive to accelerate the growth of Australia's critical mineral processing industry. The incentive will be delivered through Australia's tax system as a refundable tax offset to eligible processers of critical minerals for a maximum of 10 years between 2027-28 and 2039-40. The incentive is proposed to be set at 10% of eligible processing and refining costs.

The incentive will be available to all processors who meet the eligibility criteria. The incentive is intended to encourage and facilitate initial investment in downstream critical minerals processing, in order to move Australia "along the value chain" from these initial stages of mining and beneficiation to further processing and refinement.

2.6.2.3 Green metals

Steel, made from iron or scrap steel, and aluminium, made from alumina or recycled aluminium, are critical inputs to construction, manufacturing, infrastructure, energy, defence, and other sectors of the economy. Decarbonisation of the production of these metals will be essential to the global net zero transformation – the global iron and steel sector is responsible for around 8% of direct global energy system emissions, and 10% if indirect emissions from electricity are included. The aluminium industry accounts for around 3% of direct industrial global emissions.

Green metals have been identified as a priority industry as part of the government's Future Made in Australia plan. This is because of the important role green metals can play in Australia's net zero transformation and the potential for Australia to develop a comparative advantage in this industry to support the global transformation. The government has identified a need for public investment to align economic incentives with the national interest and unlock private investment at scale.

Australia's steel, alumina and aluminium industries are already part of Australia's economic fabric, providing direct employment for 39,100 Australians in 2022–23, with annual exports valued at $14.7 billion in 2023. Australia's natural endowments make it:

- the largest producer of iron ore, both haematite and magnetite, in the world
- the second-largest producer of bauxite in the world
- the second-largest producer and largest exporter of alumina in the world
- expected to be the world's largest producer of high purity alumina by 2025, with 49% of global output.

The development of an Australian green metals industry would leverage existing metals expertise, abundant renewable energy resources and existing access to bulk raw materials.

Policies to help support development of the green metals industry in the Future Made in Australia plan include:

- $1.7 billion Future Made in Australia Innovation Fund which will support the development and deployment of innovative technologies in green metals and other sectors.
- $18.1 million over 6 years for Green Metal Foundational Initiatives to expedite the emergence of Australia's green metals industry, enhanced industry and research collaboration and explore opportunities to improve the use of Australian scrap metal.
- An additional $32.2 million to the Guarantee of Origin Scheme – to fast track the initial phase of the scheme to measure and certify the emissions intensity of key products like hydrogen, and for expansion of the scheme to include green metals and low carbon liquid fuels.

2.6.2.4 Low carbon liquid fuels

As part of the Future Made in Australia plan the Australian Government will support the development of low carbon liquid fuels (LCLF) industry, with an initial focus on sustainable aviation fuel and renewable diesel, to support emissions reduction in fuel-reliant sectors that cannot electrify in the near term. The hard-to-abate sectors include transport (particularly aviation, heavy vehicle, rail and maritime), mining, manufacturing and agriculture.

This investment will help move liquid fuel-reliant sectors towards net zero and create new jobs and industry across Australia. It includes:

- $18.5 million over 4 years from 2024-25 to develop certification for LCLF, including sustainable aviation fuels and renewable diesel, by expanding the Guarantee of Origin Scheme.
- $1.5 million over 2 years from 2024-25 to undertake a regulatory impact analysis of the costs and benefits of introducing mandates or other demand-side measures for LCLF.

- $1.7 billion over the next decade in the Future Made in Australia Innovation Fund, to support ARENA to commercialise net zero innovations including LCLF.
- Undertaking targeted consultation in late 2024 to identify options for production incentives and demand-side measures to support the Australian LCLF industry.

2.6.2.5 National Battery Strategy

Australia's National Battery Strategy was released in May 2024 and sets out the Australian Government's plan for building a diverse and competitive Australian battery industry. The strategy draws on Australia's natural advantages in renewable energy resources, critical battery minerals, skilled workers, battery intellectual property, research and development, and a strong international trading reputation.

The strategy is underpinned by government actions, including:

- $523.2 million Battery Breakthrough initiative to support manufacturers to move up the battery value chain in Australia.
- $20.3 million Building Future Battery Capabilities measure to build future battery capabilities and strengthen national collaboration.
- Up to $100 million in funding to establish the Australian Made Battery Precinct in partnership with the Queensland Government.

The strategy and accompanying measures will help Australia support the global transition to net zero. Australia can do this in high-value areas such as manufacturing energy storage systems for renewable grids, providing battery active materials to the world, providing batteries for local heavy transport and equipment manufacturing industries, and using Australian innovation to build safer, more secure batteries.

2.6.3 Cross-cutting measures

2.6.3.1 Net Zero 2050 Plan and 2035 target

The Australian Government is developing a Net Zero Plan to guide Australia's transition to net zero emissions by 2050. It will set out government priorities, add to existing policies and measures to drive down emissions, and support ongoing and new investment in low emissions and renewable activities.

As part of this work, the government is developing 6 sectoral decarbonisation plans, covering all major emission sources: electricity and energy, transport, industry, agriculture and land, resources and the built environment. The waste sector will be included both in the industry plan and a focus on the circular economy will be a cross-cutting issue for all sectoral plans.

The government's Future Made in Australia plan will play a role in achieving the Net Zero Plan, fostering growth in low carbon energy and materials to replace the emissions-intensive inputs that Australia currently uses, and exports to the world.

The Net Zero Plan will build on Australia's strong existing emissions reduction policies including the Safeguard Mechanism, the 82% renewable electricity target, the Capacity Investment Scheme and the New Vehicle Efficiency Standard.

The government is also developing its next Nationally Determined Contribution, due for submission to the UNFCCC in 2025, alongside the Net Zero Plan.

All parts of the economy must work to reduce emissions, acknowledging that technology and trends will make that task easier for some sectors than others. The Climate Change Authority (see section 2.3.2.2) provided the government with advice on sectoral technology pathways. Under the *Climate Change Act 2022*, the Authority advises the Minister for Climate Change and Energy on emissions reduction targets.

2.6.3.2 Safeguard Mechanism reforms

The Australian Government has reformed the Safeguard Mechanism to help Australia meet its climate targets and to ensure Australia remains competitive in a decarbonising world. The reforms will reduce emissions at Australia's largest industrial facilities in the mining, manufacturing, transport, oil, gas and waste sectors predictably and gradually over time on a trajectory consistent with achieving Australia's emission reduction targets of 43% below 2005 levels by 2030 and net zero by 2050. The reformed Safeguard Mechanism commenced on 1 July 2023.

The Safeguard Mechanism requires Australia's largest industrial greenhouse gas emitters to keep their net emissions below an emissions limit, referred to as a baseline. These are facilities that emit direct, scope 1 emissions of more than 100,000 tonnes of CO_2-e in a year. There are around 219 facilities covered by the Safeguard Mechanism reforms, which account for around 30% of Australia's emissions. The standard decline

rate for facility baselines is 4.9% each year to 2030. This ensures Australia's largest industrial emitters make a proportionate contribution to meeting the national target.

Safeguard Mechanism Credits have been introduced to incentivise facilities to reduce emissions below their baseline. Safeguard facilities can generate Safeguard Mechanism Credits when their emissions are below their baseline, with the exception of landfills and facilities accessing borrowing arrangements or deemed surrender provisions. Facilities can sell these to other Safeguard facilities to meet their compliance obligations or hold them for their future use.

All new facilities, including new coal and gas facilities, will have their baselines based on international best practice adapted for an Australian context. This recognises that new facilities have the opportunity to use the latest technology and build world's best practice emissions performance into their design. In addition, new fields supplying LNG facilities will have baselines set at zero for carbon dioxide emissions from their reservoir. This reflects the existence of low carbon dioxide fields and opportunities for carbon capture and storage. Furthermore, shale gas extraction, such as by facilities operating in the Beetaloo Basin, will require net zero scope 1 emissions from when they are first covered by the scheme.

All facilities will have access to flexible compliance options to meet their emissions obligations under the Safeguard Mechanism, including measures to help ensure trade exposed industries are not competitively disadvantaged, and that emissions do not 'leak' overseas.

2.6.3.3 Australian Carbon Credit Unit Scheme

The Australian Carbon Credit Unit (ACCU) Scheme, formerly known as the Emissions Reduction Fund, is a voluntary scheme which encourages people and businesses to run projects that reduce greenhouse gas emissions or store carbon. Eligible activities include improving energy efficiency, fuel switching, capturing methane from landfill, and storing carbon in forests and soils (see Table 2.9). Participants receive one ACCU for every tonne of tonne of CO_2-e stored or avoided by their project. Defined 'methods' set out which activities are eligible to earn ACCUs and how emissions reductions are to be measured, verified and reported (see methods at section 2.6.3.3.1).

Participants can sell ACCUs to private sector buyers and governments to generate income. The Australian Government purchases ACCUs through carbon abatement contracts and will continue to do so through the Powering the Regions Fund.

The scheme has been amended in light of the reforms to the Safeguard Mechanism. Projects that solely reduce covered emissions at Safeguard facilities are no longer able to be registered. Projects that are already registered will continue to generate and sell credits for their existing crediting period. However, they are not able to enter into new contracts for Australian Government purchase of ACCUs or extend their crediting period.

The integrity of the ACCU Scheme was reviewed by an independent panel in 2022. The Independent Review of Australian Carbon Credit Units: Final Report was published in 2023 and concluded that the ACCU Scheme arrangements are sound. The Australian Government accepted in principle all recommendations from the review, and implementation is well underway (see section 2.3.3.3).

Table 2.9 Carbon crediting projects, as at 27 October 2024

Project type	Registered projects	ACCUs issued	Examples of eligible project activities
Agriculture	724	2,493,634	• Collecting and combusting methane generated from animal effluent at an emissions destruction treatment facility. • Increasing carbon in soil in the agricultural system by applying nutrients to the land in the form of a synthetic or non-synthetic fertiliser to address a material deficiency.
Energy efficiency	52	2,804,805	• Improving fuel efficiency by modifying, removing or replacing existing energy-consuming equipment. • Upgrading lighting by modifying, replacing and supplementing the lighting system of a variety of serviced areas.
Industrial facilities	2	104,424	• Reducing emissions by installing new equipment.

Project type	Registered projects	ACCUs issued	Examples of eligible project activities
Industrial fugitives	15	2,880,283	• Displacing electricity production by installing and operating electricity production devices to capture and combust the methane component of coal mine waste gas from the mine. • Expanding flaring projects by installing and operating additional flaring devices to capture and combust the methane component of coal mine waste gas from the mine.
Savanna burning	81	14,433,012	• Strategic early dry season fire management including annual planned burning of savannas in the high and low rainfall zones to reduce the size and intensity of late dry season wild fires.
Transport	11	149,139	• Reducing emissions by replacing existing vehicles, modifying existing vehicles, changing energy sources or the mix of energy sources and changing operational practices.
Vegetation	1,013	84,205,260	• Establishing permanent plantings of a mix of native tree species or mallee species on land that was predominantly clear of vegetation for at least five years prior to project commencement. • Regeneration of permanent native forests through regrowth (including from seeds, rootstock and lignotubers) resulting from changed management practices that remove suppressors to regrowth. Land must have been cleared of vegetation for at least 10 years prior to the project having commenced.
Waste	208	47,032,284	• Installing anaerobic digesters to replace deep open anaerobic lagoons that were treating industrial wastewater. The biogas that is generated from treatment of wastewater is collected by anaerobic digesters and is combusted using a flaring device. • Upgrading an existing landfill gas collection system to capture and combust gas generated at the landfill from legacy and non-legacy waste.
Carbon capture and storage	1	0	• Capturing greenhouse gases that would otherwise be released into the atmosphere, transporting them to one or more storage sites, and injecting them into underground geological formations so that they are permanently stored.
Total	2,108	154,102,841	The full list of eligible activities is available at the Clean Energy Regulator's website.

2.6.3.3.1 Methods

To be eligible to receive ACCUs, emissions reduction activities must be genuine and additional, going beyond business as usual. This is achieved by specifying eligible emissions reduction activities in legislative instruments known as 'methods'. Methods also define how the emissions reductions are to be measured, verified, reported and monitored. Methods can only be made if the independent Emissions Reduction Assurance Committee, an independent statutory committee established under the *Carbon Credits (Carbon Farming Initiative) Act 2011*, confirms compliance with legislated Offsets Integrity Standards. Additionally, the Minister for Climate Change and Energy is required by legislation to consider whether any adverse environmental, economic or social impacts are likely to arise from the activities covered by the method.

2.6.3.3.2 Other benefits

As well as reducing emissions, ACCU projects can provide important co-benefits such as improved soil health, farm productivity, biodiversity and ecosystem connection. Farmers are reinvesting revenue from projects to improve their properties. First Nations people have highlighted benefits including employment, supporting people to return and remain on their Country, transfer of knowledge to younger generations and higher standards of mental and physical health (see section 2.3.5.2).

The Nature Repair Market will allow for alignment with the ACCU Scheme, providing opportunities for improved outcomes for nature in both the carbon and biodiversity markets (see section 2.6.7.2).

2.6.3.4 Climate Action in Australian Government operations

The Australian Government has set an emissions reduction target for the Australian Public Service (with some exclusions for Defence and security agencies) to achieve net zero greenhouse gas emissions by 2030. This was communicated as part of the 2022 update to Australia's Nationally Determined Contribution. These measures include target setting, emissions reduction actions and increased transparency through emissions reporting and climate disclosure.

2.6.3.4.1 Net Zero in government operations

The Australian Government released the Net Zero in Government Operations Strategy and Roadmap in November 2023. The strategy describes the scope, activities and actions for implementing the government's commitment to achieve net zero from its operations.

The 2030 net zero target currently includes Scope 1 and Scope 2 emissions. Decisions on Scope 3 will be made in the future as further data becomes available. The estimated expected greenhouse gas emissions reductions and associated calculation methodology will be outlined in the 2023-24 Net Zero in Government Operations Annual Progress Report.

Commonwealth entities have been required to publish greenhouse gas emissions inventories in their annual reports from financial year 2022–23, and Commonwealth companies from financial year 2023–24, using the Australian Public Service Net Zero Emissions Reporting Framework. This reporting framework is designed to enable expansion, allowing for capability uplift and enhancements to data collection methodologies.

Commonwealth entities that are required to meet the 2030 target, and those entities and companies that opted in, are publishing their Emissions Reduction Plans during 2024. These plans define their priorities and actions to support the 2030 target. The 2023-24 Annual Progress Report will contain a list of Commonwealth entities and companies that have opted in to the 2030 target.

2.6.3.4.2 Commonwealth Climate Disclosure

The Commonwealth Climate Disclosure policy requires Commonwealth entities and companies to publicly report on climate risks and opportunities, and associated mitigation actions, in their annual reports. The policy provides greater transparency, accountability and credibility in how climate risks are managed across the Australian Government and supports delivery of the Australian Public Service Net Zero by 2030 target. The policy aligns with the government mandating climate-related financial disclosures for Australia's large businesses and financial institutions.

The policy architecture was released in November 2023. Departments of state and entities that voluntarily opted in reported on their climate risk management activities in financial year 2023–24 annual reports against a limited range of criteria set out in Guidance for the Pilot. The next stage of implementation will occur in financial year 2024–25 annual reports.

2.6.3.4.3 Climate Risk and Opportunity Management Program

The Australian Government has released its Climate Risk and Opportunity Management Program (CROMP) (2024–26), which aims to improve how the Australian public sector manages climate risks. The Australian Government's Approach to Climate Risk and Opportunity Management in the Public Sector sets out how the Australian Public Sector will be enabled to identify, assess, prioritise, manage and disclose climate risks and opportunities across its operations, including the policies, programs, assets and services it provides and is a key enabler for these entities to meet the Commonwealth Climate Disclosure requirements being established by the Department of Finance.

CROMP supports the uplift of climate risk management capacity and capability by providing climate risk management guidance and resources, learning and development tools, access to a climate risk support service and a climate risk digital tool to identify and manage the impacts of climate change to government policies, programs, assets and services.

2.6.3.4.4 Working together

In 2022 Australia joined the international Zero Emission Government Fleet Initiative, Net Zero Government Initiative and Greening Government Initiative, where Australia presented on employee and cultural change and its roadmap to sustainable procurement. Australia meets with New Zealand at the officer level on a bimonthly basis, and with other countries regularly, sharing knowledge and experiences in climate change initiatives that target government operations.

2.6.3.5 Climate-related financial disclosure

The Australian Government is committed to improving the quality of climate-related financial disclosure and ensuring greater transparency about an entity's exposure to material climate-related financial risks and opportunities for investors, businesses and regulators.

The Australian Government has amended the *Corporations Act 2001* and *Australian Securities and Investment Commission Act 2001* to introduce mandatory requirements for large businesses and financial institutions to disclose material climate-related risks and opportunities in an annual Sustainability Report. This will cover approximately 1,800 large companies and financial institutions at maturity.

An internationally aligned and comprehensive climate disclosure regime will support Australia's international reputation as an attractive destination for capital. Improving climate disclosures will support regulators to assess and manage systemic risks to the financial system as a result of climate change and efforts taken to mitigate its effects.

2.6.3.6 National Reconstruction Fund

The Australian Government has established the $15 billion National Reconstruction Fund (NRF) to facilitate increased flows of finance into the Australian economy through targeted investment to diversify and transform Australian industry. The NRF Corporation (NRFC) is an independent financier that operates at arm's length from government. The NRFC is governed by a board which makes independent investment decisions in accordance with its legislative framework. The NRFC is providing finance to drive investments across 7 government-identified priority areas:

1. value-add in resources
2. value-add in agriculture, forestry and fisheries
3. transport
4. medical science
5. renewables and low emission technologies
6. defence capability
7. enabling capabilities.

The government has provided clear expectations to the NRFC via its investment mandate, including that the NRFC target a funding level over the medium to long term of up to $3 billion for renewables and low emission technologies. This includes opportunities such as manufacturing components of wind turbines, producing batteries and solar panels, hydrogen electrolysers and innovative packaging solutions for waste reduction.

2.6.3.6.1 Co-investment plans

Co-investment plans are being developed across the 7 government-identified priority areas. The plans identify high-level investment opportunities that focus on Australia's strengths and target areas with economic potential that align with the government's policy objectives.

2.6.3.7 Powering the Regions Fund

The Powering the Regions Fund provides $1.4 billion in competitive grants to support the decarbonisation of existing industries, foster new clean energy industries and develop associated workforces. As at 11 November 2024 over $620 million in grant funding has been announced.

The $600 million Safeguard Transformation Stream supports trade-exposed facilities covered by the Safeguard Mechanism to reduce on-site Scope 1 emissions.

The $400 million Industrial Transformation Stream, delivered by ARENA, seeks to support industrial facilities in regional areas to reduce Scope 1 and 2 emissions.

The $400 million Critical Inputs to Clean Energy Industries program supports decarbonisation and ongoing domestic production in hard-to-abate sectors, which provide critical inputs (primary steel, cement, lime, alumina and aluminium) to the clean energy sector.

2.6.3.8 Climate Active

Climate Active is a government program that encourages business decarbonisation through certifying voluntary climate action. The program was launched in 2019, replacing the National Carbon Offset and Carbon Neutral Program Standard which was established in 2010.

To achieve certification, participating businesses must meet the requirements of the Climate Active Carbon Neutral Standard, which requires them to measure emissions, develop and maintain an emissions reduction strategy, offset remaining emissions with eligible offset units and verify and publicly report their emissions.

Australian Carbon Credit Units created under the Australia Government's ACCU Scheme, and a range of international offset units as listed in the Climate Active Carbon Neutral Standard, are eligible for use under Climate Active.

In addition to the direct emission reductions achieved by participants, more than 49 Mt CO_2-e has been offset over the life of the Climate Active program.

The Australian Government is reviewing the future direction of the program to ensure it meets community expectations for voluntary action.

2.6.3.9 Carbon management technologies

Carbon management technologies like carbon capture and storage (CCS) are part of a portfolio of approaches to reducing emissions and achieving net zero. The Australian Government's approach to carbon management technologies is focused on setting up the right regulatory framework and enabling technology development.

In Australia the responsibility for regulating CCS projects is shared between the Australian Government, which regulates offshore projects, and the state and territory jurisdictions, which regulate onshore projects. At the federal level the Australian Government in its 2023-24 Budget committed to a 3-year review of the complex environmental management regime for offshore petroleum and greenhouse gas storage activities and a review of the offshore CCS regulatory regime. This will ensure legislative frameworks support investment in CCS projects, deliver environmental outcomes and build public confidence in CCS.

The Australian Government is working towards regulating the movement of carbon dioxide across Australia's international borders for permanent offshore geological storage, which could help its trading partners decarbonise. The Regional Cooperative Initiative on Carbon Sequestration will pursue establishing the necessary regulatory frameworks and bilateral instruments to better support heavy industry to reduce emissions to meet Paris Agreement commitments, both in Australia and overseas. Industry will have the option of moving carbon dioxide to suitable and secure geological storage sites, which can, in turn, support energy security, meet obligations under Australian law and provide carbon management solutions for regional partners, consistent with obligations under international law.

The Australian Government supports development of carbon management technologies. It is focused on technologies that can provide jobs in hard-to-abate sectors and create new opportunities in Australia's industrial regions. It is also focused on engineered solutions for carbon management and permanent removal of atmospheric greenhouse gases.

The Carbon Capture Technologies program aims to accelerate the development of emerging carbon capture and carbon use technologies. It supports projects that help reduce emissions in critical hard-to-abate industries and use carbon dioxide to create new manufactured products. The program also supports the development of capabilities to remove carbon dioxide from the atmosphere – for example, through direct air capture.

The Australian Government also enables technology development through the work of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Cooperative Research Centres program which establishes collaborations between industry and the research sector including in hard-to-abate sectors. CSIRO undertakes research and technology development in carbon management technologies to quantify, reduce and capture emissions from energy, agriculture, resources and lifestyle industries.

2.6.3.10 Blue carbon conservation, restoration and accounting

Blue carbon ecosystems, such as mangroves, saltmarshes and seagrasses, capture and store carbon 30 to 50 times faster than terrestrial forests (McLeod et al. 2011). Australia is considered a global 'blue carbon hotspot' and harbours about 12% of the world's blue carbon ecosystems, which hold about 7–12% of global carbon stock (Kelleway et al. 2017). The seagrass meadows surrounding the coral reefs in the Great Barrier Reef alone host an estimated 11% of the world's seagrass blue carbon (Duarte et al. 2021). Protection and restoration of blue carbon ecosystems provide a nature-based solution to reduce greenhouse gas emissions. In addition to being large carbon sinks, coastal blue carbon ecosystems provide natural infrastructure that reduce the local impacts of climate change such as flooding, sea level rise and more frequent and severe storm surges on coastal areas. Blue

carbon ecosystems also provide habitat and nursery grounds for marine species, filter water flowing into oceans and reef systems, and support people and livelihoods.

The Australian Government is investing $9.5 million over 4 years from 2021–22 to 2024-25 to implement 5 on-ground projects to restore degraded coastal blue carbon ecosystems in Australia as part of the Blue Carbon Conservation, Restoration and Accounting Program. Internationally, this work is being implemented through the Blue Carbon Accelerator Fund, a joint initiative between the Australian Government and the International Union for Conservation of Nature.

The restoration projects will demonstrate, measure and account for the diverse benefits of restoration outcomes for climate, biodiversity and people, including carbon sequestration, climate mitigation and resilience benefits, and Indigenous values. The projects include co-design and collaboration with Traditional Owners and First Nations people. By developing a trusted and credible approach to measuring and valuing the benefits of blue carbon ecosystems, the program aims to scale up private sector investment in these ecosystems, including through carbon and environmental markets.

Of the 5 restoration projects, 4 may be eligible to register under the ACCU Scheme's blue carbon method (see section 2.6.3.3). On 5 June 2024, one of these projects became the first to be registered under the method.

2.6.3.11 Circular economy

In 2022 Australia's environment ministers committed to working with the private sector and industry to design out waste and pollution, keep materials in use and foster markets to achieve a more circular economy (see section 2.6.8). The Australian Government is developing a National Circular Economy Framework to direct Australia's circular economy transition. Achieving a circular economy will require coordinated efforts from all levels of government and across all sectors of the economy. This framework will set the strategic context, identify priorities and guide efforts to drive an integrated, Australia-wide transition to a more circular economy.

2.6.4 Energy

2.6.4.1 82% renewable electricity target

The Australian Government has committed to 82% renewable electricity by 2030. This target is a significant milestone on the pathway to net zero and is critical to Australia unlocking emissions reductions, supporting grid reliability and driving economic prosperity.

The 82% target refers to renewable generation, including household solar, on Australia's main electricity grids including the National Electricity Market, WA's South-West and North-West Interconnected Systems, the Northern Territory's Darwin–Katherine Interconnected System and Queensland's Mt Isa system.

There is significant effort underway to support achieving 82%, including the Capacity Investment Scheme, the National Energy Transformation Partnership and Renewable Energy Transformation Agreements, Rewiring the Nation and the National Consumer Energy Resources Roadmap.

2.6.4.2 Capacity Investment Scheme

The Capacity Investment Scheme (CIS) is an Australian Government program to accelerate investment in new renewable energy generation, such as wind and solar, and clean dispatchable capacity, such as battery storage. The CIS comprises a series of competitive tenders for renewable and dispatchable capacity projects, aiming to help build a more reliable, affordable and low-emissions energy system.

On 23 November 2023 the Australian Government announced expansion of the CIS to deliver 32 gigawatts (GW) of capacity by 2030, to help expected reliability gaps as ageing coal-fired power stations retire and demand grows, place downward pressure on electricity prices and to support the government's 82% renewable electricity target by 2030.

Successful projects in CIS tenders will receive a long-term (e.g. up to 15 years) revenue underwriting agreement from the Australian Government with an agreed revenue floor, ceiling and revenue cap. This will help decrease financial risks for investors and encourage investment when and where it is needed.

The CIS has completed 2 pilot tenders:

The first CIS pilot was delivered in partnership with the NSW Government and one GW of dispatchable capacity were selected in the combined tender in November 2023. In the second CIS pilot tender – in South Australia and Victoria – a further one GW of dispatchable capacity projects were selected in September 2024. These CIS pilot tenders deliver reliability benefits to the NEM and are expected to create over 1000 jobs. There are 4 CIS tenders currently underway:

- Tender 1 for new clean generation in the NEM was launched in May 2024 and targets 6 GW of renewable energy capacity across the NEM. The tender awards are expected in December 2024.
- Tender 2 for new clean dispatchable capacity in the Wholesale Electricity Market (WEM) was launched in July 2024 and targets 500 MW of 4-hour equivalent dispatchable capacity (2,000 megawatt hours) across the WEM. The tender awards are expected in March 2025.
- CIS Tender 3 for new clean dispatchable capacity in the NEM was launched in November 2024 and targets 4 GW of 4-hour equivalent dispatchable capacity (16 GWh) across the NEM. The tender awards are expected in September 2025.
- CIS Tender 4 for new clean generation in the NEM was launched in November 2024 and targets 6 GW of renewable energy capacity across the NEM. The tender awards are expected in October 2025.

CIS tenders will be held around every 6 months in the NEM and around every 12 months in Western Australia's WEM until the end of 2026.

2.6.4.3 Renewable Energy Transformation Agreements (RETAs)

The Australian Government is building on the National Energy Transformation Partnership framework (see section 2.3.1.4) by negotiating bilateral Renewable Energy Transformation Agreements with states and territories to achieve shared objectives in renewable energy transformation.

The agreements will detail how parties will work together to deliver the national target of 82% renewable electricity, ensure reliability through an orderly and timely exit of ageing coal generators, and address non-market barriers to investment, such as accelerating planning and environmental approval processes.

A portion of the expanded CIS will be allocated to states and territories through RETAs to ensure investment through the CIS complements investment under state systems.

2.6.4.4 Rewiring the Nation

The Rewiring the Nation program is delivered by DCCEEW in partnership with the CEFC. The program, via the CEFC's Rewiring the Nation fund and a special account administered by DCCEEW, makes investments to upgrade, expand and modernise electricity grids to unlock renewables and storage capacity and drive down power prices. The program also progresses key regulatory and policy reforms to remove barriers to project delivery.

As of July 2024 Letters of Intent with agreed priorities for Rewiring the Nation investment have been signed with 5 jurisdictions (New South Wales, Western Australia, Victoria, Northern Territory and Tasmania). Negotiations are underway to develop agreements between the Australian Government and the remaining jurisdictions.

Three investments were announced in May, August and September 2024. This included an investment of $490 million for the New South Wales Central West Orana Renewable Energy Zone, $140m to support VNI West New South Wales early works and $120m to support VNI West Victoria early works. These announcements followed the announcement in October 2023 of a $100 million investment in the Special Finance Vehicle.

Work is continuing on the Marinus Link project, an undersea high-voltage direct current power cable system connecting Victoria and Tasmania, which has received funding under the Rewiring the Nation program. In March 2024 the Australian, Victorian and Tasmanian governments became joint shareholders in Marinus Link Pty Ltd. In April 2024 the Australian Government underwrite of a converter engineering, procurement and construction contract was agreed and in July 2024 the underwrite of the cable contract was finalised. These underwrites will make a significant contribution to securing long lead items to ensure the project is delivered on time.

As a part of the program the Australian Government is also working on a range of supporting initiatives including strategies to overcome transmission supply chain constraints, rule changes to remove barriers to delivery of grid upgrades projects and measures to harness capacity within existing networks.

2.6.4.5 Offshore Electricity Infrastructure Framework

The Offshore Electricity Infrastructure Framework provides the regulatory framework for the development of offshore renewable energy and transmission infrastructure. The framework allows for the granting of various kinds of licences authorising offshore electricity infrastructure activities in the Australian Commonwealth offshore area (from 3 nautical miles offshore).

The framework provides the regulatory certainty needed to encourage investment in offshore renewable energy projects, such as offshore wind. The framework requires the Minister for Climate Change and Energy to consider Australia's emissions reduction targets, as set out in the *Climate Change Act 2022*, when deciding to declare areas as suitable for offshore renewable energy infrastructure.

State governments are at different stages of progressing policies on offshore wind. Victoria has adopted targets of 2 GW of offshore wind by 2032, 4 GW by 2035 and 9 GW by 2040. New South Wales has developed Renewable

Energy Zones (REZ) to manage its own planning processes and has received interest from offshore wind developers in the Illawarra and Hunter declared areas.

The Minister for Climate Change and Energy has granted 12 feasibility licences for proposed offshore wind projects totalling 25 GW of potential generation in the Gippsland declared area in Victoria and is currently progressing licence offers in other declared areas around Australia.

2.6.4.6 National Energy Performance Strategy

The Australian Government released the National Energy Performance Strategy in April 2024 to lift the role of energy demand in energy system planning and improve energy performance across the economy. The strategy provides a framework to accelerate demand-side action through energy efficiency, electrification or fuel switching and demand flexibility to ease pressure on energy bills for households, businesses and industry, improve energy reliability and reduce emissions.

The strategy takes a whole-of-economy view and considers opportunities and challenges presented by parts of the economy through a sector-specific approach. This includes the energy requirements of various sectors and the different paths they may need to take to decarbonise and improve energy performance.

The strategy is supported by detailed policy analysis and data modelling, including best practice domestic and international examples. The strategy will be adaptive and scalable over time to support further action to improve energy performance. The strategy will also be underpinned by close collaboration and coordination with state and territory governments through the National Energy Transformation Partnership (see section 2.3.1.4) to build on and support governments' energy and climate action.

2.6.4.6.1 Energy Savings Package

The Energy Savings Package delivers more than $1.7 billion for energy-saving upgrades for homes, businesses, local governments and social housing. The package supports the objectives of the National Energy Performance Strategy (see section 2.3.1.4) and includes:

- The $1.3 billion Household Energy Upgrades Fund, with:
  - $1 billion to turbocharge lending through the CEFC – working with banks and other lenders to finance upgrades for over 110,000 homes.
  - $300 million through the Social Housing Energy Performance Initiative to support social housing residents to access the benefits of improved home energy performance, co-funded and designed in partnership with states and territories.
    - This could help around 60,000 social housing properties save up to one third of their energy consumption each year.
- $36.7 million to provide households with access to better information about how to save energy, including:
  - Updating and expanding the Nationwide House Energy Rating Scheme to provide energy ratings for existing Australian homes.
  - Accelerating and including apartments in the National Framework for the Disclosure of Residential Energy Efficiency Information.
  - Updating the Your Home resource, Australia's guide to sustainable and energy efficient homes.
- $100 million for the Community Energy Upgrades Fund, to support local governments through co-funding energy efficiency and electrification upgrades.

2.6.4.6.2 E3 Program

The E3 Program is a cross-jurisdictional program through which the Australian Government, state and territory governments, and the New Zealand Government collaborate to deliver a single, integrated program on energy efficiency standards and energy labelling for equipment and appliances. The underpinning legislation for the E3 Program in Australia is the *Greenhouse and Energy Minimum Standards (GEMS) Act 2012* (the GEMS Act).

The program regulates household and other appliances and equipment by setting minimum energy performance standards and energy rating labelling requirements to products sold in Australia. The program is reviewing additional appliances to expand the number of products covered under the legislation. The program aligns to and supports the outcome of the National Energy Performance Strategy to improve the performance of appliances and equipment across all sectors.

Between the financial years 2011-12 and 2021-22, the GEMS Act:

- Saved Australian businesses and households between $12 to $18 billion in avoided energy costs.
- Saved between 45 to 67 terawatt hours of energy, which is around the same amount of electricity used by all Tasmanian, Northern Territory and South Australian homes during the same period.
- Avoided the release of between 40 to 60 Mt CO_2-e, which is around the same amount of emissions produced by Australia's entire manufacturing industry in 2021.

2.6.4.6.3 Trajectory for Low Energy Buildings

The Trajectory for Low Energy Buildings is a national plan to achieve zero energy and zero carbon buildings. It was agreed to by all Australian state and territory energy ministers in 2019. The trajectory outlines policies to deliver cost-effective energy efficiency improvements to homes and businesses with the aim of:

- lowering energy bills
- contributing to energy security and affordability
- reducing carbon emissions
- improving people's comfort and health
- reducing wastage for the wider economy
- assisting to lower peak demand.

The Australian Government is working with state and territory governments to deliver an update of the trajectory. The trajectory update will consider new drivers of change, including embodied emissions, electrification or fuel switching and resilience. It will also consider progress on existing trajectory policies and measures.

- On 26 August 2022 building ministers agreed to increase the minimum level of thermal performance for new homes under the National Construction Code from 6 stars to the equivalent of 7 stars under the Nationwide House Energy Rating Scheme (NatHERS) and introduced an energy budget covering the home's fixed appliances. The changes also made it easier for people living in apartments to make the switch to an electric vehicle, by providing base charging infrastructure at the time of construction.
- Energy use in homes is now more broadly assessed. In 2022 NatHERS was expanded beyond a thermal performance rating to provide an additional rating for whole-of-home energy use. The rating accounts for a home's major fixed appliances and any energy generated onsite.
- While NatHERS currently provides ratings for new homes and major renovations, it is expanding to offer ratings for existing homes from mid-2025. These new ratings will help Australian households better understand their home's energy performance, identify cost-effective upgrades to improve the comfort of their home and reduce their energy bills.
- A draft national framework for disclosure of energy efficiency information was agreed to by energy ministers in 2022 and Version 1 of the final Home Energy Ratings Disclosure Framework was agreed by energy ministers in November 2023. Disclosure of a home's energy performance can ensure consumers have relevant information to make more informed choices. This information may encourage improvements in the energy performance of residential dwellings, reducing energy consumption, household costs and emissions.

2.6.4.7 Clean energy innovation funding

The Australian Government supports clean energy innovation across the spectrum of research and development, demonstration and deployment. Research and development grants are provided by ARENA and the Australian Research Council. Additionally, the CEFC promotes investment in clean energy technologies and projects through the provision of debt and equity.

2.6.4.7.1 Australian Renewable Energy Agency

ARENA is a statutory authority established by the *Australian Renewable Energy Agency Act 2011* and began operations on 1 July 2012.

The agency provides research, development and deployment grant funding to improve the affordability and increase the supply of renewable energy in Australia.

As at July 2024 ARENA had committed $2.61 billion to more than 735 projects. This has been matched by $10.02 billion in co-funding, making the total project value $12.63 billion. These funds have supported projects spanning the commercialisation pathway, from research and development to demonstration and near-commercial deployment. ARENA acts as an enabler for technologies that achieve greenhouse gas reductions and does not attribute abatement directly to its projects.

Since the beginning of 2023 ARENA has been provided with the following funding:

- $2 billion for round one of the Hydrogen Headstart program
- $2 billion for round 2 of the Hydrogen Headstart program
- $1.9 billion for additional baseline funding out to 2036-37
- $1.7 billion for the Future Made in Australia Innovation Fund
- $1 billion for the Solar Sunshot program
- $523.2 million for the Battery Breakthrough Initiative.

ARENA is playing a central role in the delivery of the government's Future Made in Australia plan, which has a strong emphasis on innovation within the hydrogen, green metals, low carbon liquid fuels and clean energy manufacturing sectors. ARENA draws on independent expert advice and works collaboratively with other agencies supporting clean energy innovation.

2.6.4.7.2 Clean Energy Finance Corporation

The Clean Energy Finance Corporation (CEFC) is a statutory authority established by the *Clean Energy Finance Corporation Act 2012* (the CEFC Act), with access to $30.5 billion in capital to invest on behalf of the Australian Government. The object of the corporation is to facilitate increased flows of finance into the clean energy sector and to facilitate the achievement of Australia's greenhouse gas emissions reduction targets.

In operating within the parameters of the CEFC Act and Investment Mandate directions, the CEFC seeks to anticipate and respond to relevant market conditions. This means retreating where the private sector is operating effectively, and stepping up investment activity to fill market gaps where the private sector is absent. The CEFC also plays an important role in supporting the energy system transition, working with governments, industry, regulators, project sponsors, businesses and private sector financiers to provide the finance required.

The CEFC has invested more than $13.3 billion between its inception in 2012 and 31 March 2024. It has backed transactions with a total value of more than $54 billion and attracted more than $3 in additional investment for each $1 of CEFC capital committed. The CEFC invests with commercial rigour, aiming to deliver a positive return across its portfolio. In its 2022-23 Annual Report to the Australian Parliament, the CEFC estimated lifetime emissions abatement was expected to exceed 240 Mt CO_2-e from all CEFC investment commitments made since inception through to 30 June 2023. The CEFC does not claim that this abatement occurs independently of other policy measures, such as government grants or procurement settings, or regulatory settings such as the Renewable Energy Target.

The Australian Government has increased its capital allocation to the CEFC and issued a revised CEFC Investment Mandate. Accordingly, CEFC investment activities occur through its General Portfolio, the Rewiring the Nation Fund and 4 specialised investment funds:

- Household Energy Upgrades Fund
- Powering Australia Technology Fund
- Advancing Hydrogen Fund
- Clean Energy Innovation Fund.

The CEFC also works through banks and other financial institutions to offer financial products to encourage businesses to make sustainable purchasing choices for energy-efficient equipment, fuel efficient, electric and hybrid vehicles, and to implement small-scale behind-the-meter renewable energy projects.

The CEFC will also be the financing arm for Rewiring the Nation Program with it being allocated $19 billion primarily to support actionable projects within the Australian Energy Market Operator's Integrated System Plan. The aim is to modernise Australia's electricity grid and deliver new and upgraded transmission infrastructure, while reducing costs for consumers.

2.6.4.8 Renewable Energy Target

The Australian Government supports the uptake of renewable energy through the legislated Renewable Energy Target Scheme established under the *Renewable Energy (Electricity) Act 2000*. The scheme is helping transform Australia's electricity generation mix to cleaner and more diverse sources. It supports growth and employment in the renewable energy sector by providing financial incentives for investment in new renewable energy projects.

The scheme has 2 components – the Large-scale Renewable Energy Target and the Small-scale Renewable Energy Scheme. These schemes are estimated to have reduced emissions by a total of 48.3 $MtCO_2$-e in the 2023 calendar year. This is expected to continue to reduce emissions to 2030.

2.6.4.8.1 Large-scale Renewable Energy Target

Eligible large-scale renewable energy generators, such as solar and wind farms, hydro-electric and biomass power stations, can create certificates under the Large-scale Renewable Energy Target. Electricity retailers are legally obligated to surrender a certain number of certificates to the Clean Energy Regulator each year. This market operates as a subsidy to renewable energy generators.

The 2020 target of 33,000 gigawatt hours (GWh) of large-scale renewable electricity has been met and has since been exceeded, with over 49,600 GWh of Large-Scale Generation Certificates (LGCs) in 2023. The scheme continues until 2030. Demand for LGCs now includes a substantial and rapidly increasing voluntary component as interest from companies and governments to demonstrate renewable energy use, particularly as net zero commitments continues to increase.

2.6.4.8.2 Small-scale Renewable Energy Scheme

The Small-scale Renewable Energy Scheme assists homeowners and small businesses with upfront costs of installing small-scale (less than 100-kilowatt capacity) wind, hydro, rooftop solar and solar water heater systems. Rather than an overall target, the Small-scale Renewable Energy Scheme operates on an annual basis and continues until 2030.

Australian households continued to install rooftop solar photovoltaic systems at a rapid rate with 3.1 GW of rooftop solar photovoltaic capacity installed in 2023. Australian households lead the world in rooftop solar installations – more than one third of households now have rooftop solar – and are opting for increasingly larger systems as costs fall and payback periods remain short.

This scheme has helped Australian households to install more than 4.0 million solar photovoltaic systems and 1.8 million solar water heater systems to November 2024. Installations of associated distributed energy resources, such as household and community batteries, are also increasing.

2.6.4.9 Community solar

The Australian Government is looking at energy transformation at all levels, including in community and household projects.

2.6.4.9.1 Community batteries for household solar

The Australian Government has committed $200 million to deliver more than 400 community batteries across the country to maximise the benefits of Australia's rooftop solar transformation, put downward pressure on household electricity costs, contribute to lowering emissions, provide a net benefit to the electricity network, store solar for later use and support further solar installations.

As at November 2024, the government is on track to deliver 420 community batteries across every state and territory. A further funding round will be launched in early 2025.

2.6.4.9.2 Community solar banks

The Australian Government is investing $100 million to deploy community-scale solar, rooftop solar and clean energy technologies across the country, providing access to cheap, clean energy to over 25,000 households. The Australian Government is partnering with states and territories to deliver this program.

Many households face barriers to installing their own rooftop solar because they live in apartment buildings, rental accommodation, or they simply cannot afford it. The Community Solar Banks program is supporting these households to better access the benefits of solar, leading to a more equitable electricity system and reducing emissions.

2.6.5 Transport

2.6.5.1 New Vehicle Efficiency Standard for light vehicles

The Australian Parliament passed the *New Vehicle Efficiency Standard Act 2024* (NVES Act) in May 2024. It will increase the supply of more fuel-efficient, low and zero emissions cars and light commercial vehicles to the Australian market, and contribute to lower carbon dioxide emissions from the transport sector over time.

The NVES Act will commence on 1 January 2025, with the accumulation of units and potential and penalties starting on 1 July 2025.

The NVES Act sets an average CO_2 target for all new covered vehicles. Car suppliers must meet or beat the CO_2 target by supplying more fuel-efficient, low or zero emission vehicles, or cover a shortfall in the following 2 years by selling vehicles that are below the CO_2 target, and/or by purchasing units to offset their emissions values.

The NVES Act is expected to reduce emissions from new passenger vehicles by more than 60% by 2030 and roughly halve the emissions of new light commercial vehicles over the same period. By 2050 the NVES Act will deliver around 321 million tonnes of carbon abatement, $95 billion in fuel savings, and improved fuel security for Australia.

The 2024–25 Budget includes provision of $84.5 million over 5 years to help establish the NVES, including the regulator and its operational systems. The 2024–25 Budget also includes $60 million over 4 years to support the installation of electric vehicle charging infrastructure at automotive businesses to support the transition to selling and servicing electric vehicles.

2.6.5.2 National Electric Vehicle Strategy

The Australian Government released the country's first National Electric Vehicle Strategy in April 2023. The strategy provides a comprehensive and overarching framework to increase the supply and uptake of electric vehicles and is being delivered in collaboration with states and territories.

At the core of the strategy are 3 key objectives:

1. Increase supply of affordable and accessible electric vehicles.
2. Encourage increase in electric vehicle demand.
3. Establish the resources, systems, and infrastructure to enable rapid electric vehicle uptake.

The strategy includes a $5.2 million investment over 4 years to support:

- training for emergency service workers to respond to incidents involving an electric vehicle
- supporting electric vehicle uptake for residents of existing multi-residential buildings
- national mapping of electric vehicle charging infrastructure
- initial research on electric vehicle battery recycling.

The strategy builds on the following existing measures:

- The Electric Car Discount, which provides tax and import duty exemptions for eligible electric vehicles. The exemption from import tariffs applies from 1 July 2022 and from fringe benefits tax for fringe benefits provided from 1 July 2022.
- The Driving the Nation Fund, which invests in electric vehicle charging infrastructure and supporting investment in fleets.
- The Net Zero Government initiative, which commits the Australian Public Service to a Net Zero by 2030 target, including ensuring Commonwealth fleet new passenger vehicle purchases are 75% low emissions vehicles by 2025.
- Investment through the CEFC for electric vehicle-related financing, including green car loan schemes.

2.6.5.3 Driving the Nation Fund

The $500 million Driving the Nation Fund enables Australia's shift to electric vehicles by expanding the national rollout of light and heavy electric vehicle charging infrastructure and supporting investment in fleets.

The fund supports initiatives including:

1. National Electric Vehicle Charging Network – $39.3 million to establish 117 public electric vehicle chargers at 150-kilometre intervals on key highways across Australia, partnering with the National Roads and Motorists' Association.
2. Dealership and Repairer Initiative for Vehicle Electrification Nationally Program – $60 million to support the installation of electric vehicle charging infrastructure at automotive dealerships and workshops nationwide, including in regional and remote areas.
3. Driving the Nation Program – ARENA-supported investment for decarbonising road transport, focusing on business fleets, new technologies for heavy and long-distance vehicles, public charging and smart charging.

2.6.5.4 Domestic maritime

There are currently a range of decarbonisation initiatives contributing to the reduction of maritime emissions. These actions include:

- Developing the Maritime Emissions Reduction National Action Plan (MERNAP). Informed by an industry co-design approach, MERNAP will support national emissions reduction targets and signal to global trading partners Australia's practical pathway to a zero emission maritime sector in waters and ports. The plan will seek to identify opportunities and future-proof the domestic maritime industry, ensuring it is not left behind in the global zero emissions transition.

- Investing in the development of clean hydrogen industrial hubs near ports to produce renewable hydrogen-derived fuels for domestic use and export (including for fuelling ships).
- Reviewing and developing responsive regulatory frameworks to accommodate technological advancements in the clean energy space, including developing a domestic Guarantee of Origin certification scheme to track and certify emissions from locally produced hydrogen (see section 2.6.2.1).
- Engaging in international partnerships to establish low and zero carbon fuel value chains and accelerate the deployment of low and zero carbon maritime technologies.
- Working to sustainably manage 100% of national waters by 2025, guided by a national Sustainable Ocean Plan.
- Developing a Maritime Single Window to improve port efficiency and reduce emissions.

2.6.5.5 International maritime

Australia is undertaking various steps to decarbonise the international maritime sector, consistent and in collaboration with international efforts through the International Maritime Organization (IMO) and bilateral and other multilateral initiatives. Australia signed up to the Green Shipping Challenge at COP27 in 2022, which encouraged countries, ports and shipping companies to announce actions to align the industry with the Paris Agreement temperature goal.

2.6.5.5.1 IMO new global ship energy efficiency measure

Australia is complying with its international obligations to implement the combined technical and operational global ship energy efficiency measure adopted by the IMO in June 2021. The measure aims to reduce the carbon intensity of the global fleet, for all ships of 400 gross tonnage and above, to 40% below 2008 levels by 2030. Decarbonising shipping will provide additional health benefits by reducing air pollutants, such as sulfur dioxide, nitrous oxide and particulate matter.

2.6.5.5.2 2023 International Maritime Organization Strategy on Reduction of Greenhouse Gas Emissions from Ships

The Australian Government supported adoption of the 2023 IMO Strategy and is actively engaged in progressing development of an IMO regulatory framework to achieve net zero emissions from shipping by, or around, 2050. Australia participated on the IMO Steering Committee overseeing a comprehensive impact analysis of the proposed technical and economic measures on member states. This will inform member states in deciding on the international regulations to achieve the decarbonising trajectory of the 2023 Strategy (and its checkpoints in 2030 and 2040).

2.6.5.5.3 Clydebank Declaration for green shipping corridors

Australia is one of 24 signatories to the Clydebank Declaration. Signatories are exploring actions to facilitate partnerships among all stakeholders along the value chain to establish green shipping corridors between groups of 2 or more ports. Possible options include favourable regulatory frameworks, incentives, information sharing and infrastructure investments. Clydebank signatories will facilitate coordinated action by various stakeholders along supply chains. These stakeholders include ship operators, charterers, cargo forwarders, fuel suppliers and financiers.

This is a voluntary agreement, launched at COP26 in 2021, to establish at least 6 green shipping corridors by 2025. The Global Maritime Forum, a not-for-profit organisation, has agreed to provide voluntary support to coordinate the work of signatories and establish areas of collaboration until more formal coordination arrangements are put in place.

2.6.5.5.4 Australia–Singapore Green and Digital Shipping Corridor

In March 2024 the governments of Australia and Singapore signed a Memorandum of Understanding on establishing a Green and Digital Shipping Corridor which will help decarbonise and digitalise shipping routes between Singapore and Australia.

Under the green corridor workstream, the focus is on catalysing the development and uptake of zero or near-zero greenhouse gas emission technologies, fuels and/or energy sources, with the aim of accelerating maritime decarbonisation as aligned with targets of the IMO and national efforts. Under the digital corridor workstream, the focus is on expediting the adoption of solutions and global standards to facilitate efficient port call and flow of vessels, and paperless transaction through Singapore and Australia.

2.6.5.5.5 Australia–Singapore Initiative on Low-Emission Technologies for Maritime and Port Operations

The Australia–Singapore Initiative on Low-Emission Technologies for Maritime and Port Operations was announced in June 2021. The $20 million, 5-year partnership will accelerate the development and deployment of low-emissions fuels and technologies, such as hydrogen, that aim to reduce emissions in maritime and port operations.

The initiative sits under the memorandum of understanding between Australia and Singapore for cooperation on low-emissions solutions, signed in October 2020. On 15 July 2024, a call was issued for grant applications to support applied research, pilot and demonstration projects that will contribute to reduced costs, increased safety and accelerated uptake of low emissions technologies for maritime and port operations. This action is also part of Australia's commitments under the Green Shipping Challenge and will support the work on the Green and Digital Shipping corridor.

2.6.5.5.6 Mission Innovation: Zero Emissions Shipping Mission

Australia joined the Zero Emissions Shipping Mission as a core member in 2022. The mission aims to facilitate at least 10% of the global deep-sea fleet running on zero emission fuels on a life cycle basis by 2030. Currently the mission has a portfolio of 11 projects around the 3 pillars of ships, fuels and infrastructure, which includes green corridor feasibility studies, alternative vessel design approval process streamlining, and development of a port readiness level framework.

2.6.5.6 Aviation White Paper

The Australian Government released the Aviation White Paper in August 2024, setting the long-term policies to guide the next generation of growth and innovation in the aviation sector.

The White Paper articulates the government's policies on desired aviation outcomes in relation to safety, competitiveness, sustainability and efficiency to ensure the sector is appropriately positioned to deliver aviation services for the Australian public to 2050.

The White Paper examines how to maximise the aviation sector's contribution to achieving net zero emissions, including through sustainable aviation fuel and emerging technologies.

2.6.5.7 International and domestic aviation

The Australian Government is approaching aviation decarbonisation from multiple angles including domestic and international leadership opportunities, investment in development of a sustainable aviation fuel industry and ensuring that an effective regulatory environment is ready to support aviation decarbonisation.

The Safeguard Mechanism is the government's policy for reducing emissions at Australia's largest emitting facilities (see section 2.6.3.2). Qantas and Virgin Australia make up 95% of Australia's domestic aviation market share and, under the Safeguard Mechanism, will be required to limit the net greenhouse gases they emit, declining predictably and gradually on a trajectory consistent with Australia's emission reduction targets. As such, the impact of the Safeguard Mechanism on the sector is significant.

The Aviation White Paper highlights the potential opportunities for Australia to build a sustainable aviation fuel industry, including opportunities to produce and scale production using Australian feedstocks.

A range of funding for aviation decarbonisation exists, including the ARENA Sustainable Aviation Fuel Funding Initiative, which will provide up to $30 million in grants to support development of a sustainable aviation fuel industry. Other programs are available to support aviation decarbonisation, including the Hydrogen Headstart program, the Powering the Regions Fund and the National Reconstruction Fund.

On the global stage, Australia is supporting International Civil Aviation Organization (ICAO) initiatives to reduce emissions from international aviation while still facilitating growth in the industry. ICAO has agreed a long-term aspirational goal of net zero carbon emissions for international aviation by 2050 and a collective global aspirational vision to reduce CO_2 emissions in international aviation by 5% by 2030 through the use of sustainable aviation fuels, lower carbon aviation fuels, and other aviation cleaner energies.

Australia has been participating in the ICAO Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) since it commenced in 2019, with the support of eligible Australian international airlines. The scheme requires international airlines to monitor and report their emissions, and to offset emissions that exceed a global baseline. Under CORSIA, airlines can reduce their offsetting requirements through the use of eligible sustainable aviation fuel.

2.6.5.8 National Freight and Supply Chain Strategy

The National Freight and Supply Chain Strategy is a holistic, coordinated and multi-modal approach to freight and supply chains which was agreed by all jurisdictions in 2019. It sets an agenda for government and industry action across all freight modes to 2040 and beyond.

The strategy is supported by a National Action Plan. The plan sits alongside the strategy and details key actions to be delivered by government to achieve the goals of the strategy.

The first review of the strategy was released in May 2024 and led by the Department of Infrastructure, Transport, Regional Development, Communications and the Arts. The review was conducted to ensure the strategy remains fit for purpose and continues to support Australian supply chains as the freight task continues to grow.

The department is currently refreshing the strategy and developing a new National Action Plan in line with the review's recommendations and in collaboration with state and territory governments as well as industry. The new plan will focus on a smaller number of nationally significant actions across the 4 National Priority Action Areas: productivity, resilience, decarbonisation and data. It is anticipated the refreshed strategy and new plan will be considered by infrastructure and transport ministers by the end of 2024.

2.6.5.9 National Urban Policy

The Australian Government is also developing the National Urban Policy, which will include a shared vision for sustainable urban growth, and identifies key Australian Government goals of making our urban places more liveable and equitable, productive and innovative, and sustainable and resilient.

Future active and public transport infrastructure planning may be guided by the National Urban Policy, noting the different roles and responsibilities of each level of government.

2.6.6 Industrial processes and product use

2.6.6.1 Hydrofluorocarbon emissions reduction measures

Australia is implementing its hydrofluorocarbon (HFC) phase-down through an annual import quota that is reduced every 2 years and will reach an 85% reduction from baseline by 2036. Australia's HFC phase-down started in 2018, one year ahead of the Montreal Protocol's requirement, and 25% below Australia's baseline.

The HFC phase-down is being implemented alongside the Montreal Protocol phase-out of hydrochlorofluorocarbons under the *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989*.

The Australian Government is also working to reduce emissions by managing HFCs from import, through the supply chain to use within the economy, and then at end-of-life. Australia restricts access to HFCs used in refrigeration, air-conditioning and fire protection to licensed technicians and businesses. Licensed entities are required to have trade-based qualifications and appropriate equipment and to abide by Australian Standards and Codes of Practice to minimise preventable emissions.

All HFC refrigerant importers bringing in bulk HFC or pre-charged equipment are required to be part of a product stewardship scheme to manage refrigerants at end-of-life. Technicians are required to recover used refrigerant during servicing and from end-of-life equipment and return it for disposal. Returned refrigerant must be destroyed by an approved destruction facility which meets Montreal Protocol requirements.

Australia is working closely with neighbouring countries in the Pacific to support implementation of their HCFC phase-outs and HFC phase-downs. The Australian Government provides funding from Overseas Development Assistance to help developing countries meet their Montreal Protocol obligations. Australia's contribution for the period 2024–26 is $27.9 million.

2.6.6.2 Resources Methane Abatement Fund

The Resources Methane Abatement Fund is designed to support the government's emissions reduction targets and its commitment to the Global Methane Pledge. The fund has provided over $4 million in grants to research organisations to develop and demonstrate methane abatement technologies for the coal and gas industries.

The objectives of the fund included:

- Accelerating development and deployment of methane abatement technologies.
- Reducing the cost of abatement technologies.
- Complementing the Safeguard Mechanism.
- Reducing Australia's net emissions.

The fund was open for applications in 2023 and 2 successful projects received over $2 million each and are due for completion in April 2025. Their respective objectives are to:

- Achieve a highly capable and cost-effective catalytic ventilation air methane mitigation technology ready for industrial scale-up.
- Implement a previously developed catalytic technology into a system to significantly reduce fugitive methane emissions (over 90%) while using the resulting heat to maintain self-sustaining operations.

2.6.7 Agriculture and land use, land-use change and forestry

Australia aims to protect its natural ecosystems while reaching emissions targets and supporting agricultural industries.

2.6.7.1 National arrangements to ensure land use, land-use change and forestry (LULUCF) activities contribute to biodiversity and sustainability

The ACCU Scheme makes a strong contribution to land sector abatement in Australia (see section 2.6.3.3)

The ACCU Scheme seeks to manage non-climate risks associated with carbon offset projects in several ways.

Certain types of offsets projects are excluded from the scheme because of their likely adverse environmental and social impacts, such as those involving planting of known weed species and establishment of vegetation on land that has been subject to illegal clearing of a native forest or illegal draining of a wetland.

The Minister for Climate Change and Energy must consider any adverse environmental, economic or social impacts that could arise from projects before approving a method. Participants may be required to state whether their project is consistent with any natural resource management plan that applies to the project area when registering a sequestration or area-based project.

Participants must obtain regulatory approvals required by all state, territory and federal laws relating to land use and development, the environment and water.

Rules in ACCU methods manage non-climate risks. For example, under the Plantation Forestry method, forest management plans must be prepared by a qualified, independent person. That person must identify and assess the risks of adverse impacts arising from permanent plantings including wildings, weeds, pests, floods, access, social licence, fuel accumulation and genetic pollution risks. Methods can also contain restrictions referring to other laws that manage adverse impacts on the environment or work health and safety. For example, soil carbon projects must only clear or thin woody vegetation if it complies with applicable regional natural resource management plans and relevant environmental and planning laws. Also, organic fertilisers including biochar can only be used in accordance with relevant laws to protect human health and the environment.

2.6.7.2 The Nature Repair Market

The *Nature Repair Act 2023* establishes a framework for a legislated, national, voluntary biodiversity market.

The Nature Repair Market incentivises actions to restore and protect the environment by establishing a marketplace where individuals and organisations can undertake nature repair projects that deliver improved biodiversity outcomes to generate a tradable certificate, which can be sold to generate income.

Work is underway for the market to open in 2025 and the Clean Energy Regulator (see section 2.3.2.3) is establishing systems and processes necessary for the effective operation of the market.

The Nature Repair Market will allow for alignment with the ACCU Scheme (see section 2.6.3.3). It recognises landholders who restore or manage local habitats and grants them biodiversity certificates which can be sold to other parties. Methods define the conditions that must be met for a Nature Repair Market project to be registered and for proponents to receive biodiversity certificates. Conditions include how improved biodiversity outcomes are to be monitored and verified.

2.6.7.3 Methane emissions reduction in livestock

The $29 million Methane Emissions Reductions in Livestock program commenced in 2021. It supports the development and deployment of feed additives and forage feeds to reduce livestock methane emissions.

Stage 1 of the program funded research projects to verify the emission reduction and productivity benefits of feed additives and forages (2021–25). Stage 2 funded 11 projects for early-stage development of technologies to deliver feed additives to grazing animals (2022–24). Stage 3 is funding 7 research trials to validate later-stage technologies to deliver feed additives to grazing animals (2023–27).

The Australian Government is also providing $8 million to support commercialisation of seaweed as an emissions-reducing livestock feed additive in Australia. The work program is initially focused on one species of seaweed, *Asparagopsis*, which has the potential to reduce methane emissions from cattle by up to 90%.

2.6.7.4 Carbon Farming Outreach Program

The Carbon Farming Outreach Program commenced in 2023 to help more farmers and land managers, including First Nations people, to make informed decisions about reducing emissions and storing carbon.

The program is delivering advice and support to farmers and land managers through a training package, online tools and resources launched in mid-2024. It has provided $17.5 million in grants to organisations with agriculture and land management expertise to deliver training and information to land managers across Australia. The program will be expanded to include additional information, resources and training support until 2028. This includes integration with climate-smart farming information and support for advisers.

2.6.7.5 Climate-Smart Agriculture Program under the Natural Heritage Trust

The Australian Government has allocated $302.1 million over 5 years (2023–24 to 2027–28) to the Climate-Smart Agriculture Program under the Natural Heritage Trust. The program is driving agricultural productivity, competitiveness and sustainability by supporting farmers to:

- adopt climate-smart practices that reduce emissions and build resilience to climate change
- understand and benefit from participation in carbon and biodiversity markets
- apply natural resource management practices that improve soil health and protect natural capital and biodiversity.

The program is being delivered across 9 integrated grant and procurement investment streams. It includes:

- $73 million for on-ground projects that will trial, demonstrate and implement climate-smart, sustainable agriculture practices. These streams consist of Capacity Building, Partnerships and Innovation, and Small Grants grant opportunities.
- $85.6 million for on-ground sustainable agriculture and natural resource management priority projects. This funding is being delivered to a panel of 52 Regional Delivery Partners across Australia.
- $40.7 million to support a national network of Sustainable Agriculture Facilitators, which will ensure farmers have access to trusted advice on climate-smart agriculture practices and carbon and biodiversity markets to inform critical investment decisions for their future sustainability.
- $27.6 million to focus on supporting soil health, including funding to design and deliver a new National Soil Monitoring Program. Data collection will be standardised and made publicly available on the Australian National Soil Information System. The data will support stakeholders to make evidence-based decisions to improve soil health at a range of scales.
- $8.4 million for Regional Soil Coordinators and a Soil Community of Practice to support networks for researchers, primary producers and community groups to work together, and to provide a forum for soil practitioners to share the latest soil science information and tools.
- $35.7 million to maintain the operational capacity of natural resource management delivery partners and national Landcare organisations.

2.6.7.6 The National Soil Action Plan 2023 to 2028

The National Soil Action Plan 2023 to 2028 is guiding government and non-government action on Australia's soil. Implementing the priority actions will ensure improved soil management practice and soil health, which play an important role in the agriculture sector's response to climate change through building climate resilience and supporting emissions reduction. There are 4 priority actions with commitments to deliver by 2028 across measurement, strategy, adoption and capacity.

Implementation of the action plan has been supported by $20 million bilateral partnership agreements with the states and territories to deliver locally appropriate soil-related activities that provide clear progress against the 4 priority actions.

2.6.7.7 Soil Carbon

Australian Government programs supporting soil carbon measurement contribute to progressing the National Soil Action Plan.

2.6.7.7.1 National Soil Carbon Innovation Challenge

The Australian Government established the $40 million National Soil Carbon Innovation Challenge in 2021. The challenge awarded $9.8 million in funding in its second and final round in December 2023. It fast-tracks the

development and commercial readiness of technology solutions to measure and estimate soil carbon stocks to a standard that could support greater participation in the ACCU Scheme. The grants support feasibility study, proof-of-concept, validation and early-stage commercialisation activities that aim to develop lower-cost, accurate technologies. Project teams engage and collaborate with landholders to ensure technology solutions can be used in cost-effective ways within diverse farm management operations in Australia.

2.6.7.7.2 Soil Carbon Data Program

The Soil Carbon Data Program began in 2021 to support partnerships to improve data in rapid and low-cost alternatives for measuring soil carbon. The program is compiling soil carbon data that will be made publicly accessible for use in new technologies to quantify soil carbon stock and stock change in Australian agricultural soils. The program is also supporting improvements to Australia's national greenhouse gas emissions inventory model for soil carbon (FullCAM). The program includes collection and analysis of high-quality temporal data on soil carbon stocks and stock change, representative of Australia's managed agricultural soils. This involves resurveying a targeted subset of sites included in the 2009 to 2012 Soil Carbon Research Program, led by CSIRO.

2.6.8 Waste

Diverting or avoiding waste going to landfill helps reduce emissions of carbon dioxide, methane and other greenhouse gases.

2.6.8.1 National Waste Policy

The 2018 National Waste Policy provides a national framework for waste and resource recovery in Australia. It also highlights the importance of collaborative action and outlines the roles and responsibilities for businesses, governments, communities and individuals.

The policy outlines the 5 principles that underpin waste management, recycling and resource recovery to enable Australia to transition to a circular economy:

1. Waste avoidance.
2. Improving resource recovery.
3. Increasing use of recycled material and build demand and markets for recycled products.
4. Better managing material flows to benefit human health, the environment and the economy.
5. Improving information to support innovation, guide investment and enable informed consumer decisions.

The policy is implemented through the 2019 National Waste Policy Action Plan, which aims to achieve 7 targets:

1. Ban the export of waste plastic, paper, glass and tyres, commencing in the second half of 2020.
2. Reduce total waste generated in Australia by 10% per person by 2030.
3. 80% average recovery rate from all waste streams by 2030.
4. Significantly increase the use of recycled content by governments and industry.
5. Phase out problematic and unnecessary plastics by 2025.
6. Halve the amount of organic waste sent to landfill by 2030.
7. Make comprehensive, economy-wide and timely data publicly available to support better consumer, investment and policy decisions.

This plan complements and supports the implementation of better waste management plans by state and territory governments, local government, business and industry. In October 2022 Australia's environment ministers agreed to strengthen the National Waste Policy Action Plan towards the 2030 targets. Ministers are expected to consider a revised plan at the end of 2024.

2.6.8.2 National Food Waste Strategy

The 2017 National Food Waste Strategy sets Australia's target to halve food waste by 2030. It provides a framework to support the collective action of governments, industry, business, academia, food rescue organisations and the community towards meeting the target. It also gives effect to Australia's obligations under the United Nations Framework Connection on Climate Change in helping reduce greenhouse gas emissions, primarily through the diversion of food waste from landfill.

The strategy adopts circular economy principles that seek to capture food waste as a resource so it is not sent to landfill. It preferences food waste avoidance over reuse, recycling, reprocessing, energy recovery and disposal. Four priority areas are policy support, business improvements, market development and behaviour change.

Several activities for implementing the strategy are complete, including establishment of an independent body to lead delivery (End Food Waste Australia), a voluntary commitment program for organisations to commit to actions

to reduce food waste (Australian Food Pact) and the establishment of a Nationwide Consumer Behaviour Change Campaign for Food Waste, launched 29 September 2024, funded through the Food Waste for Healthy Soils Fund. The campaign aims to help Australian households reduce the amount of food they waste, thereby reducing greenhouse emissions and combating climate change.

2.6.8.3 Food Waste for Healthy Soils Fund

The Food Waste for Healthy Soils Fund aims to divert organic waste from landfill and create consistent, safe and high-quality recycled organics products for use in improving agricultural soils. The fund supports the Australian Government's goal to halve organic waste to landfill by 2030, as set out in the National Waste Policy Action Plan.

Australian Government funding is provided on a minimum 1:1:1 basis across the Australian, state and territory governments, and industry partners. Participating state and territory governments have been awarded $39.5 million in infrastructure funding to support new and improved organic waste recycling facilities. Projects began in late 2022 with most due for completion by June 2026. Funded projects will divert almost an additional 1 Mt of organic waste from landfill annually.

Projects to progress the fund's supporting elements are well advanced, including the update of the Australian Standard 4454 for compost, soil conditioners and mulches, and the development of targeted communications in the use of recycled organic products to improve soil health.

2.7 State and territory policies

Since the 2022 Biennial Report Australian states and territories have continued to bolster their climate commitments. Each jurisdiction has a net zero by 2050 at the latest target in place and most states have interim commitments (see Table 2.10).

Table 2.10 Commonwealth, state and territory emissions reduction targets

Jurisdiction	Reference year	Emissions reduction targets	Climate change legislation
Commonwealth	2004–05	43% by 2030 Net zero by 2050	*Climate Change Act 2022*
ACT	1989–90	50–60% by 2025 65–75% by 2030 90–95% by 2040 Net zero by 2045	*Climate Change and Greenhouse Reduction Act 2010*
NSW	2004–05	50% by 2030 70% by 2035 Net zero by 2050	*Climate Change (Net Zero Future) Act 2023*
NT	N/A	Net zero by 2050	
Qld	2004–05	30% by 2030 75% by 2035 Net zero by 2050	*Clean Economy Jobs Act 2024*
SA	2004–05	60% by 2030 Net zero by 2050	*Climate Change and Greenhouse Emissions Reduction Act 2007*
Tas	N/A	Net zero or lower by 2030.	*Climate Change (State Action) Act 2008*

Jurisdiction	Reference year	Emissions reduction targets	Climate change legislation
Vic	2005	28–33% by 2025 45–50% by 2030 75–80% by 2035 Net zero by 2045	*Climate Change Act 2017*
WA	2020	Net zero by 2050	

2.7.1 Australian Capital Territory (ACT)

2.7.1.1 Cross-cutting

2.7.1.1.1 Climate Change and Greenhouse Gas Reduction Act 2010

The Australian Capital Territory (ACT) Government's *Climate Change and Greenhouse Gas Reduction Act 2010* legislates an emissions reduction target of net zero emissions by 2045. This is supported by interim targets to reduce emissions from 1989–90 levels of:

- 50–60% by 2025
- 65–75% by 2030
- 90–95% by 2040.

In addition to setting these targets, the legislation sets out the functions of the minister responsible for the management of the Act in meeting the targets and establishes the Climate Change Council as an advisory body to the minister.

2.7.1.2 Energy

2.7.1.2.1 Achieving 100% renewable electricity and phasing out fossil-fuel gas in the ACT

The ACT already meets its current electricity needs with 100% renewable electricity. By 2045 the ACT's total energy supply will be 100% renewable, with renewable electricity making up the bulk of energy use for households and businesses. Renewable gas will be explored for use in niche applications. Fossil fuels, such as fossil fuel gas, petrol and diesel, will be phased out.

The transition requires a coordinated and planned approach over the next 21 years. This will allow the ACT to maintain a secure, affordable and reliable energy supply. The first Integrated Energy Plan (IEP) was released in June 2024 and helps set the long-term pathway for the transformation of the ACT's energy system to achieve net zero emissions by 2045.

2.7.1.2.2 Sustainable Household Scheme

The Sustainable Household Scheme supports Canberrans to reduce their energy use and costs, and to live more comfortably. The scheme provides zero interest loans of between $2,000 and $15,000 to eligible households, individuals and notfor-profit community organisations to help with the costs of energy-efficient upgrades. This includes rooftop solar panels, household battery storage systems, electric heating and cooling systems, hot water heat pumps, electric stove tops, electric vehicles, electric vehicle charging infrastructure and ceiling insulation, as well as installation costs for these products.

2.7.1.2.3 Next Gen Energy Storage

Next Gen Energy Storage program has reached its target of 5,000 batteries in Canberra homes and businesses and is no longer accepting rebate applications.

2.7.1.2.4 Big Canberra Battery

Battery storage will play an increasing role in Canberra's electricity grid as the territory moves towards electrifying the city and achieving net zero emissions by 2045.

The Big Canberra Battery project will deliver an ecosystem of batteries across the ACT to ensure that the electricity grid remains stable. The project includes the installation of a large-scale battery energy storage system in Williamsdale and the installation of behind-the-meter batteries at 9 government sites. The large-scale battery storage system will deliver 250 megawatts of power, store renewable energy and support grid reliability. This is enough energy to power one third of Canberra for 2 hours during peak demand periods.

2.7.1.2.5 Low Income Household Program and Vulnerable Household Energy Support Scheme (publicly known as the Home Energy Support Program)

The Home Energy Support Scheme is a $50 million program to improve building efficiency and sustainability for social and public housing, low-income owner-occupiers and the lowest performing rental properties. This includes upgrades to government housing and financial incentives to implement minimum energy efficiency standards in rental properties.

A large portion of this program relates to ensuring the public housing properties in the ACT meet the Minimum Energy Efficiency Standards for rental properties with adequate insulation. Energy efficiency electric appliance upgrades are also a feature of this program.

This approach extends to funding similar upgrades in community housing. In May 2024 the ACT Government entered into a Federation Funding Agreement with the Commonwealth Social Housing Energy Performance Initiative (SHEPI) to further extend these social housing energy efficient upgrades with $7.2 million of federal funding.

Another stream of the scheme is the Home Energy Support Program which provides up to $5,000 in rebates for eligible homeowners to help with the costs of installing energy-efficient products.

2.7.1.2.6 Energy Efficiency Improvement Scheme

Electricity retailers are required to help households and small-to-medium businesses save energy under the *Energy Efficiency (Cost of Living) Improvement Act 2012*. The Energy Efficiency Improvement Scheme aims to encourage the efficient use of energy, reduce greenhouse gas emissions, reduce household and business energy use and costs, and increase ways for priority households to reduce energy use and costs.

There are 2 tiers of electricity retailers in the legislation. Tier 1 retailers have at least 5,000 customers and sell at least 500,000 MWh of electricity to customers in the ACT within a calendar year. Tier 2 captures all other retailers operating in the ACT.

Tier 1 retailers must meet their energy savings obligation under the scheme by delivering eligible energy savings activities (insulation, heating and cooling systems, hot water systems and so on) to households and small-to-medium businesses. A portion of this needs to be delivered to priority households.

Tier 2 retailers can choose to deliver eligible activities or pay an Energy Savings Contribution (ESC) to the ACT Government. The ESC is spent, in accordance with the Objects of the Act, on initiatives such as administration of the scheme and ACT Government-led energy efficiency programs.

2.7.1.2.7 Regulation preventing new gas network connections

The ACT Government has commenced a regulation preventing new fossil fuel gas network connections in most areas. The regulation stops new sources of emissions from fossil fuel gas use. It is part of a broader plan to phase out fossil fuel energy.

Under the *Climate Change and Greenhouse Gas Reduction Act 2010*, the regulation restricts the gas distributor, Evoenergy, from providing new fossil fuel gas (or natural gas) network connections in certain circumstances, including prevention of new gas network connections in all residential, commercial and community facility land-use zones, and all residential use buildings in non-residential zones.

2.7.1.2.8 Zero Emissions Suburbs – Suburban Land Agency Sustainability Strategy

Suburban Land Agency's (SLA) Sustainability Strategy is designed to help Canberra become a sustainable city while meeting growing housing needs at the same time. The strategy includes actions to reduce emissions through the theme of Zero Emissions Suburbs in urban estates, greenfield suburbs and demonstration projects.

In greenfield suburbs, actions have been taken to reduce emissions and environmental impacts from civil construction, and to incentivise residents to build all-electric, energy-efficient homes. In urban estates or where commercial sale of land occurs, contract clauses are included in the sales documents to require developers to ensure buildings have electric vehicle and bicycle charging infrastructure and to install solar PV and energy-efficient appliances where applicable.

2.7.1.3 Transport

2.7.1.3.1 Zero Emissions Vehicles Strategy 2022–30

The focus of the Zero Emissions Vehicles Strategy 2022–30 is on light vehicles, which make up 95% of the ACT fleet. The measures in this strategy include local actions to encourage uptake, greater industry support and development, and advocacy for national reforms to better enable this shift. It also sets an ambitious 2030 zero emissions vehicle sales target of 80–90%. This target is designed to provide clear guidance to industry and the community on the future of road travel in the ACT.

The strategy sets out policies that commit the ACT to phasing out new light internal combustion engine vehicles from 2035, expanding the public EV charging network to ensure that there are at least 180 publicly available charging stations in the ACT by 2025, and continuing advocacy for strong national policy.

2.7.1.3.2 Zero Emissions Transition Plan for Transport Canberra

The Zero-Emission Transition Plan for Transport Canberra outlines the key drivers, opportunities and constraints of the transition to a zero emissions public transport system by 2040 while optimising value for money. This will establish Transport Canberra – a division of the ACT Government's Transport Canberra & City Services directorate – as a leader in its field.

The plan responds to the emissions targets set out in the 2019–25 Climate Change Strategy to achieve zero government emissions by 2040 and an interim target of 33% reduction by 2025. With the achievement of 100% renewable sources for the ACT electricity supply, the transport sector is now the largest source of emissions in the ACT, comprising 62%.

2.7.1.3.3 Active Travel Plan 2024–30

The Active Travel Plan outlines the ACT Government's priorities for strengthening active travel and improving quality of life. That means making it safer, accessible, more convenient and more pleasant to choose walking, cycling and other types of active travel – whether for transport, recreation or social activities. Projects included demonstrate what these priorities mean in practice. New projects and initiatives will progressively be delivered in coming years.

2.7.1.4 Waste

2.7.1.4.1 ACT Circular Economy Strategy and Action Plan 2023–2030

The ACT Government's vision is for Canberra to become a circular city that supports sustainability and allows the community and environment to thrive. The plan drives the initial steps towards a more circular economy and highlights the important role for government, industry, business and the community to work collaboratively across the entire material lifecycle.

Actions within the plan align with the 9Rs framework: refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle and recover. Actions will be delivered by various areas of the ACT Government and are grouped into the following focus areas:

- procurement, skills, innovation and governance
- food and organics
- built environment
- consumer goods
- emerging and problematic waste streams
- creating space to showcase commitment to the circular economy.

2.7.1.4.2 Food and organic waste pilot

The ACT Government is strengthening Canberra's circular economy by investing in a large-scale Food Organics and Garden Organics (FOGO) facility to divert food and garden organics from landfill and reduce greenhouse gases by turning food scraps and garden waste into valuable compost. A FOGO processing facility in the ACT will allow the FOGO service to be rolled out to all ACT households. The facility will be capable of processing 50,000 tonnes of FOGO material per year and be able to expand to take up to 70,000 tonnes per year to meet future demand. The facility will help to achieve both resource recovery and emission reduction targets.

2.7.1.4.3 Landfill gas capture

Landfill gas capture and processing technology transforms waste into a valuable resource – energy. LGI Limited (LGI) is contracted to the ACT Government to undertake gas capture and power generation at the Mugga Lane landfill gas power station. The gas collected and processed by LGI at the Mugga Lane landfill gas-to-energy facility can power 5,700 homes. Four biogas-fuelled generators have been installed by LGI, which each generate 1.06 megawatts per hour, resulting in an estimated 37,000 megawatt hours of green electricity every year.

The ACT Government recently approved a project to expand the power station in partnership with LGI to establish 2 additional 1 megawatt gas-to-energy generators, an additional 12 megawatt of battery storage and a 20 megawatt grid connection. Once the project is completed, it is expected the power station will have capacity to generate 50,000 megawatt hours of dispatchable energy; enough energy to power up to 10,800 homes in the ACT each year.

2.7.1.4.4 Zero emission waste vehicles

The use of zero emissions vehicle technologies in the waste sector is emerging. The ACT Government has ambitious targets to reduce emissions and introduce zero emissions vehicles. Zero emission waste trucks are not only cleaner and quieter but will cut emissions as they run thousands of kilometres around the city each year.

A new consolidated household waste collection contract will improve resource recovery, reduce greenhouse gas emissions and provide better customer service, while protecting local jobs.

Following a competitive procurement process during 2023, the ACT Government has signed a new household waste collection contract which will see improvements in greenhouse gas emissions through increased operational efficiencies and flexibility, including the provision of a zero emissions vehicle.

2.7.2 New South Wales (NSW)

2.7.2.1 Cross-cutting

2.7.2.1.1 NSW Climate Change (Net Zero Future) Act 2023

In December 2023 the NSW Parliament passed the *Climate Change (Net Zero Future) Act* with cross-party support. The Act is a driver for whole-of-government action on climate change, legislating ambitious emissions reduction targets and setting up a strong, independent Net Zero Commission to keep current and future governments on track to net zero by 2050. The Act legislates:

- Guiding principles for action to address climate change that consider the impacts, opportunities and need for action in NSW.
- Emissions reduction targets for NSW:
  - 50% reduction on 2005 levels by 2030
  - 70% reduction on 2005 levels by 2035
  - net zero by 2050
  - interim targets for 2040 and 2045 to be set.
- An objective for NSW to be more resilient to a changing climate.
- Establishing an independent, expert Net Zero Commission.

The independent Net Zero Commission ensures accountability, playing a key role in tracking NSW's progress towards its emissions reduction targets and adaptation objective. The commission advises on NSW's approach to addressing climate change, including net zero and adaptation action plans, opportunities for jobs and investment in the clean economy, and monitoring the implementation of actions to meet the targets.

The Net Zero Plan Stage 1: 2020–2030 is the foundational policy for emissions reduction. It includes a range of initiatives targeting energy, electric vehicles, hydrogen, primary industries, technology, built environment, carbon financing and organic waste. It aims to reduce emissions across all sectors while growing the economy, creating new jobs and lowering the cost of living. It has 4 priorities:

1. Drive uptake of proven emissions reduction technologies.
2. Empower consumers and businesses to make sustainable choices.
3. Invest in the next wave of emissions reduction innovation.
4. Ensure the NSW Government leads by example.

Most NSW Government emissions-reduction programs are financed through the NSW Climate Change Fund, which is a levy on electricity and water providers.

2.7.2.1.2 NSW Climate Change Adaptation Strategy

The NSW Climate Change Adaptation Strategy seeks to make NSW more resilient and adapted to climate change. It sets 4 priority areas (with 16 actions):

1. Develop robust and trusted metrics and information on climate change risk.
2. Complete climate change risk and opportunity assessments.
3. Develop and deliver adaptation action plans.
4. Embed climate change adaptation in NSW Government decision making.

Under the strategy the NSW Government will complete climate change risk and opportunity assessments and adaptation action plans at least every 5 years.

The strategy also supports the continued development and improvement of the NSW Government's NSW and Australian Regional Climate Modelling (NARCliM) project. NARCliM2.0 was released in August 2024 and provides improved, continuous fine-scale climate projections for NSW to 2100 using updated greenhouse gas concentration scenarios.

2.7.2.1.3 NSW Environment Protection Authority Climate Change Policy & Climate Change Action Plan 2023–26

The NSW Environment Protection Authority (EPA) is the primary environmental regulator for NSW. The EPA Climate Change Policy and the steps in the Climate Change Action Plan 2023–26 outline the EPA's approach to protecting the environment from the threat of climate change.

The EPA's objectives are to help industry to decarbonise, and to support NSW's net zero emissions targets and enhance resilience to climate change for the regulated communities within the NSW EPA's remit.

The EPA has released the draft Climate Change Assessment Requirements and Guide that apply to planning proposals for large emitters. This requires proponents to comply with greenhouse gas assessment and reduction requirements. The EPA has also established industry-sector advisory groups to provide sector-specific support.

EPA will progressively implement mitigation actions, including to:

- introduce climate change licence requirements for key industry sectors
- require licensees to develop and implement Climate Change Mitigation and Adaptation Plans
- develop and implement programs to reach net zero emissions from organic waste in landfills by 2030.

2.7.2.2 Energy

2.7.2.2.1 Electricity Infrastructure Roadmap, Renewable Energy Zones and the Electricity Infrastructure Investment Safeguard

The Electricity Infrastructure Roadmap is the state's plan to unlock up to $32 billion in private investment in regional energy infrastructure to 2030, including in strategically planned and coordinated Renewable Energy Zones (REZs). The *Electricity Infrastructure Investment Act 2020* enables the roadmap. It aims to deliver at least 12 gigawatts of renewable energy generation and 2 gigawatts of long-duration storage by 2030, and even more over time.

The REZs are modern power stations that combine renewable energy generation such as wind and solar, storage such as batteries and network infrastructure such as high-voltage poles and wires, to deliver energy to homes, businesses and industries. The NSW Government has declared 5 REZs (Central-West Orana, New England, Hunter-Central Coast, South-West and Illawarra). The Energy Corporation of NSW (EnergyCo) is coordinating their delivery.

The Electricity Infrastructure Investment Safeguard provides a long-term signal for electricity infrastructure. It establishes a system of competitive tenders to offer Long-term Energy Service Agreements (LTESAs) for new electricity generation, long-duration storage and firming infrastructure projects.

2.7.2.3 Transport

2.7.2.3.1 Electric Vehicle Strategy

The NSW Electric Vehicle Strategy is the NSW Government's plan to accelerate uptake of elective vehicles in the state. It aims to increase EV sales to 52% of new car sales by 2030–31 and help NSW achieve net zero emissions by 2050. The NSW Government is currently developing an updated strategy, which will focus on delivering charging infrastructure and funding for fleet operators to transition their vehicles to EVs.

2.7.2.3.2 Transport for NSW (TfNSW) Net Zero and Climate Change Policy

The Transport for NSW Net Zero and Climate Change Policy sets out the principles and requirements to achieve its net zero emissions and climate change targets, support the transport sector's transition to net zero and continue creating a transport network that is resilient, responsive and optimally adapted to a changing climate. The policy includes commitments and targets for renewable energy, electrification and net zero operational, sector and embodied emissions.

2.7.2.4 Industrial processes and product use

2.7.2.4.1 Net Zero Industry and Innovation Program

The Net Zero Industry and Innovation Program is a commitment of over $1 billion to accelerate the development of clean technologies and industrial decarbonisation across NSW.

Under its investment plan, the program has 3 priorities:

1. Deploy opportunities to reduce industrial emissions.
2. Accelerate strategic abatement opportunities.
3. Develop low carbon infrastructure and industrial precincts.

It includes 3 streams focused on clean technology innovation, new low carbon industry foundations and high emitting industries.

The objectives of 2 streams – the High Emitting Industries stream and the New Low Carbon Industry Foundation stream – are to support hard-to-abate industries in NSW to accelerate their transition to net zero emissions, without compromising their contribution to the NSW economy and workforce, and to develop and grow low emissions industries in NSW.

The third stream – Clean Technology Innovation – aims to fast-track emerging clean technology solutions to reduce greenhouse gas emissions, offering grants for researchers, innovators and entrepreneurs to develop technologies and skills across regional and metro NSW.

2.7.2.4.2 Net Zero Manufacturing Initiative

The Net Zero Manufacturing Initiative aims to support NSW businesses and industries to remain leaders in the net zero transition. It is a $275 million commitment to invest in opportunity areas identified in the NSW Decarbonisation Innovation 2023 Study, offering grants for Renewable Manufacturing, Low Carbon Product Manufacturing and Clean Technology Innovation. It supports NSW's 5 Renewable Energy Zones and hydrogen hubs.

2.7.2.4.3 NSW Hydrogen Strategy

The Hydrogen Strategy is a nation-leading framework that provides $3 billion in incentives and sets out a clear and credible pathway to get green hydrogen production under $2.80 per kilogram in NSW by 2030. It aims to attract more than $80 billion of investment to 2050, drive deep decarbonisation and set NSW up as a clean energy and economic superpower.

2.7.2.5 Agriculture and land use, land use change and forestry

2.7.2.5.1 NSW Primary Industries Productivity and Abatement Program

The Primary Industries Productivity and Abatement Program aims to reduce agricultural emissions and increase carbon sequestration in vegetation and soils. It is scaling up high-quality abatement from the primary industries and land sector to contribute to NSW's 2030 emissions reduction target. The program addresses barriers to participation in environmental markets and provides income opportunities for farmed, public and First Nations-managed land.

2.7.2.6 Waste management

2.7.2.6.1 Waste and Sustainable Materials Strategy

The Waste and Sustainable Materials Strategy aims to halve food waste to landfill and achieve net zero emissions from organics to landfill by 2030.

The strategy includes mandates related to food and garden organics, and capture of landfill gas emissions, supported by:

- $65 million over 5 years, which will support the rollout of new organic waste collection services, the development of more processing capacity and a statewide education campaign
- $7.5 million over 5 years for installation of additional landfill gas infrastructure across NSW.

2.7.3 Northern Territory

2.7.3.1 Renewable Hydrogen Master Plan

The Renewable Hydrogen Master Plan provides a framework for the development of a renewable hydrogen industry in the Northern Territory with a focus on enabling activities required to secure private sector investment. The plan's intended outcomes include establishing advanced manufacturing, developing exports of renewable hydrogen, supporting green supply chains and growing a low-emissions economy.

2.7.3.2 Energy

2.7.3.2.1 Remote Power System Strategy

This strategy is under development. The objective of the strategy will be to deliver a greater amount of renewable energy to the 72 remote communities that are currently provided electricity through the Indigenous Essential Services program. The strategy aims to reduce energy-related diesel consumption in these communities while improving energy security and reducing emissions.

The strategy builds on the success of the completed Solar Energy Transformation Program, a $60 million program co-funded by the Northern Territory Government and ARENA which delivered 10 megawatts of solar generation to remote communities in the Northern Territory between 2017 and 2019. A further investment of $6.1 million has been made into a pilot project to install additional solar PV and energy storage at a remote Tiwi Islands community. It is expected to be operational in 2024, allowing the community to be powered by 50% renewable energy.

2.7.3.2.2 Home and Business Battery Scheme

The Home and Business Battery Scheme commenced implementation in 2020 to support homeowners and small businesses to connect batteries to existing rooftop solar systems or to install new integrated rooftop solar and battery systems. Since its inception, the scheme has provided over $14 million in grants to households and businesses and supported over $60 million in total project works across the Northern Territory. To date the scheme has supported the installation of over 2,500 battery systems with a combined total capacity of approximately 34 megawatt hours.

2.7.3.2.3 Solar for Multi Dwellings Grant Scheme

The Solar for Multi Dwellings Grant Scheme supports owners of units/apartments in multi-dwelling developments to install new shared rooftop solar PV systems for the benefit of residents, including tenants.

The scheme provides a grant to eligible unit management corporations in the Northern Territory of up to $7,500 per individual dwelling, to support up to 50% of the total installation costs of a shared solar PV system, required solar sharing technology, and, where relevant, smart meters and battery storage systems.

The scheme is funded by the Australian Government through its Community Solar Banks program and delivered by the Northern Territory Government's Department of Mining and Energy.

2.7.3.2.4 Greenhouse Gas Emissions Management for New and Expanding Large Emitters Policy

The Greenhouse Gas Emissions Management for New and Expanding Large Emitters Policy establishes the Northern Territory Government's minimum expectations on all new and expanding developments with the potential to emit large amounts of greenhouse gas emissions. The policy has informed the assessment and approval of development proposals, including the approval of onshore petroleum exploration activities.

Further expectations on the management of greenhouse gas emissions from onshore petroleum production in the NT are established in the Management of Greenhouse Gas Emissions from the Onshore Gas Industry Policy Statement. The policy requires all applications for onshore gas production to provide a Greenhouse Gas Abatement Plan demonstrating how the interest holder will contribute towards delivery of the NT's net zero emissions by 2050 target.

2.7.3.3 Transport

2.7.3.3.1 Northern Territory Electric Vehicle Strategy

The Northern Territory Electric Vehicle (EV) Strategy and Implementation Plan 2021–2026 was launched in July 2021 to support the increased uptake of EVs in the NT. The EV Strategy focusses on 4 priority areas including vehicle cost and availability; vehicle charging; knowledge, skills and innovation; and consumer information. As at 30 September 2024, there were 838 passenger EVs registered in the NT with EV uptake continuing to increase each quarter.

2.7.4 Queensland (policies as at September 2024)

2.7.4.1 Cross-cutting

2.7.4.1.1 Clean Economy Jobs Act 2024

The Queensland Government is committed to addressing climate change, reducing emissions and securing the state's economic future. To ensure this work is robust and creates confidence and trust the government passed the *Clean Economy Jobs Act 2024* in April 2024.

The Act legislates emissions reduction targets of:

- 30% below 2005 levels by 2030
- 75% below 2005 levels by 2035
- net zero by 2050.

The Act also requires the Responsible Minister to set 2040 and 2040 interim targets 10 years in advance, develop sectoral emissions reductions plans with periodic review, report annually to the Queensland Parliament on the government's progress towards its emissions targets and establish an expert panel to provide advice.

Initiatives set out in the legislation jointly create a robust pathway for decarbonising the economy that is built on ambition, expert advice, consultation and transparency.

2.7.4.1.2 Zero Net Emissions Infrastructure Plan

Queensland's whole-of-economy sectoral decarbonisation plans will be developed under the *Clean Economy Jobs Act 2024* and will seek to ensure all sectors are engaged in the pathway at each critical step towards net zero. A coordinated approach to develop and deliver sectoral decarbonisation plans will address and supersede previous commitments related to the development of a Zero Net Emissions Infrastructure Plan and a related 2022 State Infrastructure Strategy priority action to develop a roadmap exploring measures and actions to reduce emissions associated with the construction, operation and maintenance of Queensland Government infrastructure.

2.7.4.1.3 Queensland Renewable Energy and Hydrogen Jobs Fund

The Queensland Renewable Energy and Hydrogen Jobs Fund allows energy government owned corporations to increase ownership of commercial renewable energy and hydrogen projects, as well as supporting infrastructure, including in partnership with the private sector.

The existing skills and expertise from the energy government-owned corporations will be used to engage with market proponents and identify commercial investment proposals, with opportunities for appropriate returns for government.

The fund complements the commitment of $145 million to establish 3 Queensland Renewable Energy Zones (REZ) – the northern, central and southern REZ – to support significant renewables investment. In these areas, the Queensland Government will undertake strategic network investments, streamline the development of new renewable energy projects and work to match new and existing industrial energy demand with low-cost renewable energy.

As outlined in the Queensland Energy and Jobs Plan this funding will ensure publicly owned energy businesses can continue to invest in renewable energy, storage and hydrogen projects in the REZ regions. It will also help deliver on the long-term targets for these regions to reach at least 25 gigawatts of total renewable energy by 2035.

2.7.4.2 Energy

2.7.4.2.1 Queensland Energy and Jobs Plan

The Queensland Energy and Jobs Plan outlines how Queensland will transform its electricity system to deliver clean, reliable, affordable energy and provide power for generation. This will involve achieving renewable energy targets of 50% renewable energy by 2030, 70% by 2032 and 80% by 2035, and driving better outcomes for workers and communities.

The *Energy (Renewable Transformation and Jobs) Act 2024* supports delivery of the Queensland Energy and Jobs Plan to:

- set in law the 3 renewable energy targets, public ownership commitments and the Job Security Guarantee and Fund
- create the Renewable Energy Zone and Priority Transmission Investments frameworks to build the SuperGrid
- establish the Queensland Energy System Advisory Board, the Energy Industry Council and the Queensland Renewable Energy Jobs Advocate, which will enable a smooth and coordinated transformation.

As at 30 June 2024, 27.4% of electricity generated in Queensland is produced from renewable energy sources and the state is on track to achieve its 2030 target.

2.7.4.2.2 Renewable Energy Zones

Queensland's Renewable Energy Zones (REZs) are critical to the strategic development of renewable energy infrastructure in areas of Queensland with high-quality renewable energy resources like wind and solar, and with existing transmission infrastructure. The REZs focus on optimising renewable energy connections and reducing costs through economies of scale, thereby minimising environmental and social impacts.

Contributing to Queensland's clean energy economy, REZs also support the state's legislated target of 50% renewable energy by 2030. In advancing Queensland's energy sector, 12 potential REZs have been identified, with ongoing efforts to refine and develop these sites in partnership with local communities. The Department of Energy and Climate has also undertaken REZ Readiness Assessments in Central Queensland and the Callide area, assessing potential cumulative effects in areas poised to become REZs.

The REZ framework has been enshrined in the *Energy (Renewable Transformation and Jobs) Act 2024* and a comprehensive REZ Roadmap was published in early 2024. REZ readiness assessments have also been completed in Callide and Central Queensland.

Future plans including finalising underpinning regulations for the REZ framework, implementing readiness assessments for the North Queensland, Far North Queensland and Southern Queensland regions, and formally declaring REZs in line with unique development timeframes. All of these plans promise substantial renewable energy growth and socio-economic benefits for Queensland.

2.7.4.3 Transport

2.7.4.3.1 Queensland's Zero Emission Vehicle Strategy 2022–32

Queensland's Zero Emission Vehicle Strategy 2022–32 sets a vision for a cleaner, greener, integrated transport and energy network that encourages zero emission transport solutions. Increasing zero emission vehicle (ZEV) uptake continues to play an important role in contributing to the Queensland Government's target of net zero emissions by 2050.

The strategy sets clear targets to stimulate investment and provide consumer confidence to transition to ZEVs in Queensland:

- 50% of new passenger vehicle sales to be ZEVs by 2030 with 200,000 light ZEVs by 2027
- 100% of new passenger vehicle sales to be ZEVs by 2036
- 100% of eligible QFleet passenger vehicles to be ZEVs by 2026
- every new Translink-funded bus added to the fleet to be a zero-emission bus:
  - from 2025 in South East Queensland
  - from 2025–30 across regional Queensland.

A greater uptake of ZEVs delivers improved environmental outcomes and supports industries to create more sustainable jobs.

2.7.4.3.1.1 Queensland's Zero Emission Vehicle Strategy Action Plan 2022–24

The Queensland ZEV Action Plan 2022–24 outlines the ZEV Strategy's initial steps over 2 years to increase ZEV uptake.

Queensland Electric Super Highway (QESH) Phase 3:

- The Queensland Government is committed to providing efficient, reliable and affordable public EV charging to Queenslanders across a range of urban, regional, rural and remote routes.
- Completion of the QESH is anticipated by the end of 2024 and will boast an expansive network of 53 public EV fast-charging locations.

ZEV Rebate Scheme:

- The $45 million ZEV Rebate Scheme reduced upfront costs for Queenslanders purchasing a new ZEV. The scheme closed on Monday 2 September 2024.
- The scheme was successful in helping Queensland drivers transition to electric vehicles. Over 11,000 rebate applications were submitted over the life of the scheme.

Electric Vehicle Charging Infrastructure Co-Fund Scheme:

- The Queensland Government is encouraging private investment in charging infrastructure through the $10 million Co-Fund Scheme to ensure drivers have access to more fast-charging options across the state.
- The Co-Fund scheme will deliver fast charging options at 46 sites across more than 30 locations in Queensland.

2.7.4.3.2 Queensland Train Manufacturing Program

The Queensland Train Manufacturing Program (QTMP) will build 65 new 6-car passenger trains at a purpose-built manufacturing facility at Torbanlea in the Maryborough region. As part of the program a new rail facility will also be constructed at Ormeau in the Gold Coast region.

The QTMP will support South East Queensland's (SEQ) population and economic growth, as well as Cross River Rail and the Brisbane 2032 Olympic and Paralympic Games. The Queensland Government's Queensland Train Manufacturing Program was established to meet the increasing demand for rail transport in SEQ over the next 10 years.

The QTMP will support more than 1,300 jobs over the life of the program. Delivery of the QTMP remains on schedule with the first train on track to be manufactured and begin testing by late 2026.

2.7.4.3.3 Creating Better Connections for Queenslanders

Aligned to the Queensland Department of Transport and Main Roads' (TMRs) 30-year vision set by the Queensland Transport Strategy, Creating Better Connections for Queenslanders (released in August 2022) outlines initiatives to help shape Queensland's plans for the state's passenger transport system.

Creating Better Connections for Queenslanders details the department's vision for the future of passenger transport and its commitment to deliver a transport network that meets the needs of its customers. The department's plan for passenger transport revolves around 5 key priorities and 20 signature initiatives to be delivered over the next 10 years. The priorities are:

- Reliable and safe services.
- Responsive to changing community needs.
- Seamless end-to-end journeys.
- Easy and accessible.
- Environmentally sustainable.

The initiatives identified in the plan are deliverable over a 10-year period. All 20 signature initiatives are underway with many elements already complete.

2.7.4.3.4 Zero Emissions Bus Program

The Zero Emissions Bus Program aims to transition the government's bus fleet to zero-emission buses.

From 2025 all new buses in South East Queensland will be replaced with zero-emission buses, with regional implementation commencing 2025 to 2030. Stage 1 of the program will focus on transitioning existing diesel and compressed natural gas buses to battery electric buses on the South East Queensland urban network.

2.7.4.4 Industrial processes and product use

2.7.4.4.1 Queensland Resources Industry Development Plan

The Queensland Resources Industry Development Plan sets out a clear 30-year vision for Queensland's resources industry: to be a resilient, responsible and sustainable resources industry that grows as it transforms.

The plan contains 43 actions to deliver its outcomes, recognising that industry leadership in decarbonising operations and contributing to Queensland's emissions reductions targets is essential to securing long-term future export commodities in a global net zero economy.

Government and industry will need to work cooperatively so that, by 2050, Queensland's resources industry will be recognised globally as an ESG leader, a global supplier of critical minerals and a creator of high-quality, high-wage jobs and careers.

The plan outlines global challenges and changes facing the resources industry, opportunities for industry growth and diversification, and the collaboration and commitments required by government and industry to achieve this vision.

2.7.4.4.2 Queensland Critical Minerals Strategy

The Queensland Critical Minerals Strategy sets out an ambition to transform the state, national and global economy through the responsible use of critical minerals, creating sustainable economic prosperity for Queensland.

The strategy builds on the Queensland Resources Industry Development Plan to bring clear focus to the development of a critical minerals sector and to align the state's efforts to respond to climate change and decarbonising the economy.

2.7.4.4.3 Low Emissions Investment Partnership

The $520 million Low Emissions Investment Partnerships program is bringing forward investment in projects that will drive down emissions in Queensland's highest-emitting facilities. The program's initial focus is on reducing emissions from Safeguard Mechanism (see section 2.6.2.2) facilities in the metallurgical coal sector, which has a critical role in producing steel for the renewable technologies needed to decarbonise the global economy.

The program's key objectives are to:

- fast-track emissions reductions, with a preference for abatement that goes beyond Safeguard Mechanism requirements and is delivered before 2030
- increase resource optimisation and maximise the beneficial use of gas resources
- maximise economic opportunities and workforce development in regional Queensland
- develop low emissions knowledge within the sector and diffuse low emissions technology in Queensland.

The program takes a tailored approach to addressing the different abatement challenges and opportunities within the sector.

2.7.4.5 Agriculture and land use, land use change and forestry

2.7.4.5.1 Queensland Low Emissions Agriculture Roadmap 2022–32

The Queensland Low Emissions Agriculture Roadmap 2022–32 provides a framework to reduce agricultural emissions and increase carbon farming. It outlines technologies and policies needed to facilitate a measured and continued decline in production-based greenhouse gas emissions. It also outlines practices that producers can adopt now to better understand their greenhouse gas footprint and position their businesses to capitalise on low-emissions technologies as they become viable.

It will assist Queensland agribusinesses and the broader supply chain to lower their greenhouse gas emissions without impacting the supply of food and fibre. It seeks to support industries in the agriculture sector to set and deliver against their own industry targets and work towards the Queensland Government's commitment of a zero emissions economy by 2050.

The roadmap has been co-designed with key Queensland industry representatives to enable a coordinated sector-wide partnership approach to achieve carbon reductions in agriculture. It builds on and supports the current commitment by producers and industry, and connects to other government strategies.

An implementation plan has been developed to recognise the projects and programs already underway to deliver emissions reduction and identify future priority focus areas.

2.7.4.5.2 Land Restoration Fund

The Land Restoration Fund is expanding carbon farming in Queensland by supporting land sector carbon projects that deliver additional environmental, socio-economic and First Nations co-benefits. The fund supports landholders, farmers and First Nations people to generate new, regular income streams through carbon farming projects while providing valuable co-benefits such as healthier waterways, increased habitat for threatened species and more-resilient landscapes.

Since its establishment in 2019 the Land Restoration Fund has invested in carbon projects in 15 local government areas across Queensland. Across its first 2 investment rounds, as at 30 June 2024, the Land Restoration Fund has committed $81.2 million for 20 projects to deliver strong outcomes for the community and the environment. These projects are contracted to deliver over 1.15 million Australian Carbon Credit Units over the next 16 years, equivalent to more than one million tonnes of carbon dioxide sequestered or avoided.

2.7.4.6 Waste management

2.7.4.6.1 Waste to Resource Strategy

The Department of Transport and Main Roads published a Waste 2 Resource Strategy in 2022. The strategy sets out clear messages to industry of the importance in the use of recycled materials and sets direction that industry can use to guide innovative and improved practices. An objective of strategy is to support the circular economy which can be achieved by directing suitable wastes for reuse and recycling.

2.7.5 South Australia

2.7.5.1 Cross-cutting

2.7.5.1.1 South Australian Government Climate Change Actions

The South Australian Government is delivering a range of actions to further reduce greenhouse gas emissions and build a strong, climate-ready economy. Government actions address key emissions reduction objectives in focus areas including clean energy, the economy, agriculture, landscapes and habitats, transport, built and urban environments, communities and government leadership. The government is also leading by example by reducing emissions across government operations.

The South Australian Government is developing a state-wide emissions reduction strategy that builds on existing action to take the next steps to achieving 2030 and 2050 emissions reduction targets.

2.7.5.1.2 Amending the Climate Change and Greenhouse Emissions Reduction Act 2007

The South Australian Government is amending the *Climate Change and Greenhouse Emissions Reduction Act 2007* to update the state's greenhouse gas emission reduction and renewable electricity targets, as well as to strengthen requirements for government planning, risk assessment and climate action. The Climate Change and Greenhouse Emissions Reduction (Miscellaneous) Amendment Bill 2024 was introduced to the South Australian Parliament on 29 August 2024.

The updated targets are:

- Reduce the state's net greenhouse gas emissions by at least 60% by 31 December 2030 (from 2005 levels).
- Achieve net zero emissions by 2050.
- Achieve 100% net renewable electricity generation in the state by 31 December 2027.

In 2022 net emissions reduced by 57% from 2005 levels. South Australia has also transformed its electricity system from 1% to 74% renewable electricity generation in just over 16 years and is building on this transformation to support emissions reduction across other sectors.

2.7.5.1.3 Hydrogen and Renewable Energy Act 2023

The Hydrogen and Renewable Energy Act 2023 introduces a 'one window to government' licencing and regulatory system for large-scale hydrogen and renewable energy projects in South Australia. The Act, while facilitating secure land access and social and environmental benefits, will put First Nations people at the centre of the transformation. The Act and associated regulations commenced operation on 11 July 2024.

The Act provides an efficient, flexible, transparent and consultative regulatory framework that:

- licences and regulates the entire lifecycle of renewable energy and hydrogen projects
- expedites the development of the state's hydrogen sector and supports delivery of the Hydrogen Jobs Plan)
- maximises the benefits for all South Australians
- recognises that First Nations participation in decision making is central to South Australia's clean energy future
- maintains the government's commitment to multiple land use. It recognises all other overlapping legal rights over the same land such as pastoral leases, mining tenements and licences
- ensures proponents effectively address environmental, economic, public safety and social and cultural impacts in line with environment, social and governance requirements
- delivers investment certainty and security.

The South Australian Government commenced public consultation on the first 2 proposed release areas under the Act on 9 September 2024.

2.7.5.1.4 Hydrogen Jobs Plan

The South Australian Government has committed $593 million to the Hydrogen Jobs Plan, to build a world-leading hydrogen power plant, electrolyser and storage facility near Whyalla, in the state's Upper Spencer Gulf region, to be operational in 2026.

The Hydrogen Jobs Plan aims to:

- help unlock pipelines of renewable energy developments and business opportunities
- enhance South Australia's grid security through new dispatchable generation
- prove large-scale hydrogen production and generation technology
- activate other hydrogen projects in development, including export-focused projects
- provide jobs for South Australians
- support South Australia's continued clean energy transition and decarbonisation.

The facility will see the construction of a world-leading hydrogen power plant, electrolysers and storage facility, resulting in a new source of flexible power. This will provide firming services for industrial customers in South Australia, as well as grid stability for homes and businesses. The associated storage facility will store hydrogen for the operation of the power plant and potential use by local industry looking to decarbonise their operations.

The South Australian Government is delivering a Hydrogen Workforce Plan to help bridge the gap between current workforce capability and future demand.

2.7.5.1.5 Port Bonython Hydrogen Hub

The South Australian Government and the private sector are collaborating to deliver the Port Bonython Hydrogen Hub as a multi-user precinct leveraging the state's renewable energy opportunities and enabling export from a clean hydrogen industrial hub.

The Australian Government and South Australian Government signed a grant agreement in October 2023 to invest in developing common user infrastructure at the proposed Port Bonython Hydrogen Hub. The Australian Government has committed $70 million in matched funding, with $30 million from the South Australian Government and $40 million expected to be contributed by project partner developers. This will enable the export of hydrogen from the Port Bonython Jetty and early investigations into other potential common user infrastructure.

2.7.5.1.6 Business Sustainability Program

Green Industries SA's Business Sustainability Program is ongoing, supporting businesses of all sizes and from all industry sectors to go beyond compliance and work towards implementing sustainability, circularity and net zero initiatives.

The Business Sustainability Program fills an information gap, providing expertise as a basis for informed decision making and the implementation of sustainable change. It offers grants for projects that lead to improved materials and resource efficiency, better practice waste management, leaner and cleaner production, fewer carbon emissions and the implementation of circular economy principles.

2.7.5.1.7 South Australia's Small Business Strategy 2023–30

The South Australia's Small Business Strategy is designed to support small businesses to adapt, grow and succeed, now and in the future. This strategy aims to create jobs, build the South Australian economy and – most importantly – future-proof South Australia's 150,000 small businesses.

The strategy includes the delivery of the Small Business Sustainability Support Program to small businesses to increase their knowledge of environmental sustainability, understand its relationship to business and help build capability in adopting sustainable practices and reducing emissions.

2.7.5.1.8 Amending the Environment Protection Act 1993

In 2023 the *Environment Protection Act 1993* was amended to add climate change mitigation and adaptation terminology to the objects of the Act. In addition, climate change knowledge and experience were included as attributes that must be held by the Environment Protection Act Board. Key terms were also defined accordingly in the Interpretation section of the act. These amendments came into effect on 1 March 2024.

Further policy detail is now required to provide a clear, transparent and equitable approach for how the climate-related objects of the Act will be secured within the Act's regulatory framework. The most effective way to do this is through the development of a statutory climate change-specific Environment Protection Policy.

2.7.5.2 Energy

2.7.5.2.1 Energy Masters

The South Australian Government is a project partner to the $13.8 million Energy Masters project led by SA Power Networks. The project, supported by $6.2 million in funding from ARENA, aims to demonstrate the benefits of demand flexibility and smart energy management systems in homes in ways that could avoid or delay electricity network build costs, reduce the need for additional grid scale generation and storage, improve electricity market efficiency, improve the use of rooftop solar in the home and reduce energy bills and emissions.

The project trials these technologies in 500 South Australian households, allowing participants to optimise their energy use with home energy management systems, heat pump hot water systems, smart air-conditioning units and smart electric vehicle chargers. In return, households participate in a research program led by RACE for 2030, which will provide valuable insights into smart home energy management and inform the development of national standards.

2.7.5.2.2 emPowering SA program

The South Australian Government is delivering community batteries for South Australia through the emPowering SA program. The first community batteries already delivered under the program are emPowering Magill and emPowering Edwardstown, two 150 kilowatt/405 kilowatt-hour community batteries that will deliver renewable energy and lower residential electricity rates to at least 600 public housing tenants in Magill, Edwardstown and surrounds. Recent commitments by the Australian and South Australian Governments will now see a significant $28 million expansion of the project to deliver 16 more community batteries across the state with an aggregate capacity of 10,560 kilowatts and 21,600 kilowatt-hours. Over the 10-year operational life of the project this broader fleet will support reduced electricity bills for around 11,000 low-income households, delivering an expected $59 million of bill savings directly to those households. Based on initial modelling emPowering SA will also make a significant contribution to lower Scope 2 carbon emissions, reducing an average of 1,825 tonnes of CO_2-e from the grid per year to help South Australia reduce our emissions and meet our climate change targets.

2.7.5.2.3 Retailer Energy Productivity Scheme

The Retailer Energy Productivity Scheme is a South Australian Government energy productivity scheme that provides incentives for South Australian households and businesses to save energy, with a focus on low-income households. The scheme obliges retailers to deliver activities that support households and businesses in reducing their energy costs, while also maximising the benefits to South Australia's power system by delivering a smarter, more affordable, reliable and sustainable energy future.

2.7.5.2.4 Small Business Energy Grants program

The Small Business Energy Grants program (through round 2 of the Economic Recovery Fund) assists eligible small businesses and not-for-profit organisations to invest in energy-efficient equipment or improvements to reduce and manage their energy usage and costs. A total of $20 million is available in 2024–25 to support South Australian small businesses and not-for-profit organisations, with grants ranging from $2,500 to a maximum of $50,000 per eligible business. The government will provide up to 50% matched funding through reimbursement of eligible business expenditure from $5,000 up to $100,000 excluding GST and inclusive of the business's financial contribution. The Small Business Energy Grants program opened for applications in August 2024. Grants will be available until the grant funding has been fully allocated, or by 29 November 2024, whichever is sooner.

2.7.5.3 Transport

2.7.5.3.1 Expand EV Charging Infrastructure

The South Australian Government has invested $12.35 million in partnership with the Royal Automobile Association to deliver the state-wide electric vehicle charging network consisting of more than 530 charging points at over 140 sites in 52 locations throughout South Australia. The network extends to locations in rural, regional and metropolitan service locations, along highways and in tourism hotspots. At least 75% of the charging sites are located in regional areas of South Australia. By September 2024 the network was over 96% complete, with 53 DC and 87 AC charging sites in South Australia.

2.7.5.4 Industrial processes and product use

2.7.5.4.1 State Prosperity Project

The State Prosperity Project is a coordinated initiative by the government that focuses on leveraging South Australia's unique resources to drive economic growth, centred around renewable energy, critical minerals and green manufacturing in the Upper Spence Gulf region. Key elements include harnessing the region's abundance of solar, wind and mineral resources, particularly copper and magnetite iron ore, to establish South Australia as a global leader in hydrogen energy, green steel production and copper exports.

The main objectives are to create a sustainable, diversified economy through investments in renewable hydrogen (by the Hydrogen Jobs plan), large-scale desalination plants (such as the Northern Water project) and modern workforce training facilities, including technical colleges. The state also aims to streamline investment via the *Hydrogen and Renewable Energy Act 2023*, facilitating the development of green energy projects.

Forecasted outcomes include significant job creation, tripling copper production and the transformation of Whyalla Steelworks into a green steel producer. By 2050 the Northern Water project is expected to add $5.2 billion to the state's economy and support 4,200 full-time jobs. Overall, the initiative aims to position South Australia at the forefront of the global energy transition, securing long-term prosperity.

2.7.5.4.2 Green Iron and Steel Strategy

In June 2024 the South Australian Government released a Green Iron and Steel Strategy to position South Australia as a competitive producer of low carbon iron and steel. Significant growth of renewable energy and hydrogen production will be required to position South Australia as a leading global supplier of hydrogen embedded (near zero emissions) iron and steel products. These products will combine the benefits of both hydrogen and local iron processing, creating a sustainable and low-carbon solution for the steelmaking industry. Through the Green Iron and Steel Strategy, the South Australian Government released an Expression of Interest seeking involvement from businesses to jointly investigate and invest in building a green iron supply chain.

The strategy is a part of the South Australian Government's State Prosperity Project.

2.7.5.4.3 South Australia's Advanced Manufacturing Strategy

The Advanced Manufacturing Strategy identifies key areas of competitive advantage for South Australia and aligns them with strategic priorities that represent significant enablers of growth for the state. Manufacturing is a major enabler of South Australia's industrial transformation and will contribute to increasing South Australia's economic complexity, unlocking the full potential of opportunities in renewables, hydrogen, minerals, forestry, food, construction, health, defence and space. The strategy also supports connections to green global value chains and transition to net zero.

2.7.5.4.4 Learning Hub for Energy Efficient Construction

In 2023 South Australia launched an online Learning Hub for Energy Efficient Construction – 'Net Zero Energy Builder' – that links to free government and industry resources, case studies and nationally curated continuing professional development options for building, design, trade and regulator professionals. The site showcases South Australia's nationally respected Net Zero Homes – Skills Training course, which includes unique modules on design and construction of high-performing, efficient 7-star-plus homes, and integrating energy-efficient appliances, rooftop solar PV and storage to achieve true net zero outcomes.

2.7.5.4.5 APY Lands Retrofit Pilot Project

The South Australian Government is collaborating with the University of South Australia and industry, community and educational partners in supporting a pilot project to retrofit First Nations community housing in South Australia's remote Aṉangu Pitjantjatjara Yankunytjatjara (APY) Lands. The project partners will work with the APY community in Indulkana to modify a small group of houses, providing a framework for energy-efficient upgrades across the remainder of the APY Lands, as well as other remote areas across Australia.

Standard retrofit solutions are not suitable for the APY Lands due to environmental issues, and materials need to be sourced easily due to the distance from major cities. As labour costs in remote regions can be double that of metro areas, any repairs need to be carried out by local workers and affordable retrofit solutions are required. The innovative pilot project aims to improve energy efficiency, living conditions and health in the harsh and variable desert climate.

2.7.5.5 Agriculture and land use, land use change and forestry

2.7.5.5.1 Carbon Farming Roadmap for South Australia

The Carbon Farming Roadmap seeks to identify opportunities and remove barriers to the uptake of emissions reduction and carbon sequestration opportunities in soils, vegetation, forestry and livestock management. The roadmap includes initiatives to increase participation in carbon farming, improve productivity and generate income through carbon credits. The Department of Primary Industries and Regions, South Australia is implementing the roadmap through the inter-departmental Carbon Farming Roadmap Working Group to support the state's transition to net zero emissions by 2050.

The intended outcomes of the roadmap include increased industry knowledge and awareness of South Australia's carbon farming opportunities by demonstrating methods with the greatest applicability in the state and delivering extension activities including workshops and field days.

2.7.5.5.2 Blue Carbon Strategy for South Australia

The Blue Carbon Strategy 2020–25 for South Australia delivers practical actions and research to help coastal managers and investors to establish projects to store carbon and protect and restore marine and coastal environments to reduce greenhouse gas emissions.

A partnership between the Nature Conservancy and Department for Environment and Water has secured $2.9 million from the Australian Government under the Blue Carbon Ecosystem Restoration Grants to restore and enhance 12,400 hectares of mangroves and saltmarsh habitats located in the Adelaide International Bird Sanctuary.

The Blue Carbon Strategy has identified 4 key objectives and related key outcomes:

1. Connect blue carbon ecosystem restoration to carbon markets and other finance mechanisms to achieve blue carbon financing for blue carbon projects.
2. Deliver research to quantify blue carbon and co-benefits towards improved blue carbon and co-benefit valuation for project development.
3. Identify and implement blue carbon demonstration projects to demonstrate blue carbon project feasibility.
4. Integrate blue carbon into coastal policy, planning and management strategies for blue carbon to be a key factor in coastal decision making.

2.7.5.6 Waste management

2.7.5.6.1 South Australia's Waste Strategy 2020–2025

The Waste Strategy outlines actions that contribute to the development of a more circular economy. The strategy promotes innovation and business activity in the waste management, resource recovery and green industry sectors, and includes high-impact, specific actions including for food waste and single-use plastics, regulatory waste reforms, education and behaviour change, and supporting market development and remanufacturing.

The strategy, which is reviewed every 5 years, is designed to reduce greenhouse gas emissions by avoiding or diverting waste going to landfill and keeping material circulating within the economy at its highest beneficial use. The strategy has specific targets:

- Zero avoidable waste to landfill by 2030.
- Metropolitan Adelaide 2025 targets by waste sector:
  - Municipal solid waste diversion of 75%.
  - Commercial and industrial solid waste diversion of 90%.
  - Construction and demolition diversion of 95%.
- Per capita waste generation (5% reduction from a 2020 baseline).

In 2021–22 metropolitan Adelaide achieved waste diversion rates of 56% for municipal solid waste, 88% for commercial and industrial waste, and 87% for construction and demolition waste. Overall waste generation decreased to 4.88 million tonnes from 5.04 million tonnes the previous year, while the recovery rate fell from 83.3% to 81.9%.

Waste generation per capita decreased by 165 kilograms (5.8%) in 2021–22 compared to the previous year but decreased by 4.3% since 2019–20.

2.7.5.6.2 Valuing Our Food Waste – South Australia's strategy to reduce and divert household and business food waste 2020–25

The Valuing our Food Waste strategy aims to reduce and divert household and business food waste. It also aims to integrate policy measures, behavioural change actions and support for industry to address the estimated 200,000 tonnes of food waste sent to landfill each year in South Australia, and to contribute to national and global targets to reduce food waste.

Delivering on these actions will:

- support the National Food Waste Strategy 50% reduction target by 2030 by promoting food waste prevention measures
- provide metropolitan Adelaide households with access to an organics collection system to support state and national targets to halve the volume of food waste presented in household residual waste bins
- encourage the uptake of segregated organics recycling systems in businesses, including potential for legislative reform to increase the recovery of this material for processing into soil improvement products.

2.7.6 Tasmania

Tasmania first achieved net zero emissions in 2014 and has maintained this status ever since. The state's emissions profile is largely due to the carbon sink in its managed forest estate and its longstanding investment in renewable electricity generation. However, the net zero emissions profile is not guaranteed into the future due to a range of factors, including the increased risk of bushfire from a changing climate.

The Tasmanian Government has a range of policies and programs in place to reduce emissions across the economy and increase carbon sequestration.

2.7.6.1 Cross-cutting

2.7.6.1.1 Climate Change Action Plan

The Tasmanian Climate Change Action Plan aims to help Tasmania reach its target to maintain net zero greenhouse gas emissions, or lower, from 2030 and commits over $14 million in funding to deliver the plan over 2 years.

The action plan has 3 priority areas: information and knowledge, transition and innovation, and adaptation and resilience. Implementation of the plan is well underway and the government has formally reported on its progress in the first annual climate change activity statement. Key initiatives delivered in the 12 months since the release of the plan include:

- $1.2 million e-transport package to support the uptake of electric vehicles and e-mobility devices such as e-bikes.
- $4 million Low Emissions Livestock Grant program is supporting TasFarmers and partners to deliver a 3-year commercial-scale trial of *Asaparagopsis* feed supplements to reduce emissions from livestock.
- $500,000 program has commenced to increase climate change capacity and capability in local government, led by the Local Government Association of Tasmania.
- $600,000 Stems for CO2 program, through Private Forests Tasmania, to increase tree plantings on privately owned agricultural land.
- $350,000 Community Climate Change Action Grants program.

2.7.6.1.2 Sectoral Emissions Reduction and Resilience Plans

The *Climate Change (State Action) Act 2008* establishes a legislative framework for the Tasmanian Government to collaborate and consult with industry to develop sector-based emissions reduction and resilience plans. These plans aim to have a practical and balanced partnership approach between the Tasmanian Government and industry rather than regulated sectoral targets for emissions reduction.

The 6 sectoral plans include transport, waste, energy, industrial processes and product use, agriculture, and land use, land-use change and forestry (LULUCF). The Tasmanian Government is also preparing an emissions reduction and resilience plan for government operations. The development of all plans is underway, including extensive consultation with industry stakeholders, public consultation and consultation with government agencies.

The plans aim to identify priority actions to deliver emissions reduction and resilience in each sector, and future opportunities to inform budget and planning processes over the 5-year life of the plans. All sectoral plans are due to be completed by November 2024.

2.7.6.1.3 Renewable Hydrogen Action Plan

The Tasmanian Renewable Hydrogen Action Plan, released in March 2020, sets the vision for Tasmania to become a significant global supplier of renewable hydrogen for export and domestic use from 2030.

The plan has 4 objectives:

1. Explore the opportunities for using locally produced renewable hydrogen in Tasmania and for export.
2. Provide financial support for renewable hydrogen projects for export and domestic use and continue investment attraction activities, including with international trade partners.
3. Ensure a robust and supportive regulatory framework and assess supporting infrastructure.
4. Build community and industry awareness, develop skills and support research and education.

The Tasmanian Government has achieved the majority of the actions under the plan, including completing the Industry Activation Study in 2021 to identify near-term domestic projects, partnering with the Blue Economy Cooperative Research Centre, which plans to produce green hydrogen by 2024, and committing to conduct a green hydrogen bus demonstration project.

Other major achievements include entering a $70 million grant deed with the Australian Government to develop a green hydrogen hub at Bell Bay. The latest projections show that the Tasmanian Green Hydrogen Hub project will inject around $1.2 billion into the local economy over the duration of the project and support more than 700 local jobs. Countrywide Hydrogen has also been awarded up to $8 million to reduce the sale price of green hydrogen in Tasmania.

2.7.6.1.3.1 Renewable Hydrogen Industry Development Funding Program

The Tasmanian Renewable Hydrogen Action Plan includes a $50 million Tasmanian Renewable Hydrogen Industry Development Fund to kick start the industry.

$11.3 million was allocated from the fund to demonstrate 3 hydrogen buses as part of the Zero Emissions Bus Trial, as recommended by the Hydrogen Industry Activation Study. The hydrogen will be supplied by the Blue Economy CRC which is currently commissioning a 700 kilowatt electrolyser. The electrolyser is expected to produce green hydrogen for the buses by the end of the 2024.

The Green Hydrogen Price Reduction Scheme, announced on 25 October 2023, allocates a further $8 million from the fund to stimulate green hydrogen supply and demand.

Countrywide Hydrogen was announced as the successful scheme applicant on 13 May 2024. The first phase of the project is to construct a hydrogen production and refuelling facility in Brighton, which will produce up to 800 tonnes of green hydrogen per year. Countrywide anticipates making Financial Investment Decision by the end of 2024. The company is in advanced discussions with ARENA on capital funding.

The Zero Emissions Bus Trial and Green Hydrogen Price Reduction Scheme are complementary and support the activity under the Tasmanian Green Hydrogen Hub. For example, the Green Hydrogen Price Reduction Scheme has the potential to provide secure and affordable fuel to the bus projects.

2.7.6.2 Energy

2.7.6.2.1 Renewable Energy Action Plan

The Tasmanian Renewable Energy Action Plan was released by the Tasmanian Government in December 2020. The key objectives of the plan include transforming Tasmania into a Global Renewable Energy Powerhouse, making energy work for the Tasmanian community, growing the economy and providing jobs.

Key achievements under the plan include legislating the 200% Tasmanian Renewable Energy Target (TRET), releasing a Bioenergy Vision for Tasmania and releasing the Renewable Energy Coordination Framework to coordinate and support the renewable energy growth required to accomplish the TRET. The Tasmanian Government has also delivered targeted bill relief payments for residential customers, energy efficiency programs for business and households, and rebates for electric vehicles and e-mobility devices.

Ongoing actions under the plan include the $50 million renewable hydrogen development package, the Metro Hydrogen Electric Bus Trials and national-scale projects such as Marinus Link and Battery of the Nation.

2.7.6.2.2 Renewable Energy Coordination Framework

The development of a Renewable Energy Coordination Framework is an action of the Tasmanian Renewable Energy Action Plan. The framework sets out several critical actions which will be integral to the renewable energy expansion and load growth required to achieve the Tasmanian Renewable Energy Target of 200% of the 2020 baseline renewable energy generation per year by 2040.

The Tasmanian Government has made significant progress implementing actions under the framework. Recent highlights include consultation on establishing Tasmania's first Renewable Energy Zone and the release of the Renewable Energy Approval Pathway to support new projects.

2.7.6.2.3 Energy Saver Loan Scheme

The Energy Saver Loan Scheme offers Tasmanian households, residential landlords, community organisations and small businesses interest-free loans of up to $10,000 over terms of up to 3 years. The scheme offers up to $50 million in loan value and supports Tasmanians to invest in a range of energy efficiency products to sustainably reduce energy consumption and energy cost pressures. There have been over 4,000 applications for solar PV systems, with heating upgrades, double glazing, and hot water systems the next most popular upgrades. The range of eligible products has been extended to include retrofit insulation and electric vehicle chargers.

2.7.6.3 Transport

The Tasmanian Government has funded 2 rounds of the Electric Vehicle ChargeSmart Grant Program to support the installation of fast, destination and workplace charging infrastructure around the state. The most recent round was announced in 2021 and focused on regional areas and tourism hotspots, to support travel around the state.

A total of $4.55 million has been allocated to transition the government's vehicle fleet to 100% electric by 2030. Renewables, Climate and Future Industries Tasmania and the Department of Treasury and Finance are working together on a range of initiatives to support the government's fleet transition.

2.7.6.3.1 Transport Emissions Reduction and Resilience Plan

The *Transport Emissions Reduction and Resilience Plan 2024–29* was released in September 2024. Through the plan, the Tasmanian Government has committed $1.4 million to implement key new initiatives to reduce emissions and build resilience in the transport sector. The plan focuses on road emissions, which are Tasmania's main source of transport emissions.

The plan includes:

- Financial support for Tasmanians to purchase electric bikes through the Energy Saver Loan Scheme.
- Support for small businesses to purchase cargo e-bikes for last-mile deliveries and electric delivery vans.
- Working with partners on a Greater Hobart Bicycle Parking Master Plan and funding pilot sites for secure bike parking to support a sustainable and accessible transport network.
- A third round of the ChargeSmart Grants Program to install public fast electric vehicle charging in key locations.
- Supporting the Australian Electric Vehicle Association National Conference and the Energy, Efficiency, Electric Expo.
- Partnering with peak bodies and other industry organisations to develop public education resources about driving electric vehicles.
- Providing funding for industry to develop a skills transition plan to support the switch to electric vehicles.

These actions were informed through extensive consultation with businesses, industry, government and the community. The status of the actions will be outlined in an activity statement that is prepared and tabled in parliament each year.

2.7.6.3.2 e-Transport Support Package

In November 2023 the Tasmanian Government released its e-transport support package. Funding of $1.2 million supported 3 programs:

- $750,000 for rebates of $2,000 for the purchase of eligible battery electric vehicles by Tasmanians.
- $250,000 to support the inclusion of home electric vehicle charging infrastructure in the Energy Saver Loan Scheme.
- $200,000 for rebates for the purchase of e-mobility devices (up to $250), e-bikes (up to $500) and cargo e-bikes (up to $1,000).

This program resulted in 501 rebates for e-mobility devices, and 233 electric vehicle rebates have been approved and paid. There are 123 remaining rebates available for electric vehicles, which are either awaiting acquittal or being assessed.

2.7.6.4 Agriculture and land use, land use change and forestry

Information on 2 key initiatives being delivered through Tasmania's Climate Change Action Plan 2023–25 is below. The government is progressing a range of other programs, including the Carbon Farming Advice Rebate Pilot Program, expanding the Landcare Action Grants program to include carbon farming projects, and support for industry-led emissions reduction programs, for example the VinØ Program by Wine Tasmania.

Private Forests Tasmania has established the Tree Alliance Knowledge Hub to provide landowners and farmers with information about the benefits of integrating trees into their operations, and tools and resources to simplify the planning process.

Further initiatives are being considered as part of the Emissions Reduction and Resilience Plans for the agriculture and LULUCF sectors.

2.7.6.4.1 Low Emissions Livestock Grant Program

TasFarmers was awarded the $4 million Low Emissions Livestock Grant in mid–2024. The funding will support a commercial-scale trial of feed supplements to reduce emissions from livestock and demonstrate the feasibility and benefits of these technologies, to encourage broader uptake. TasFarmers will be working with the Tasmanian Institute of Agriculture, Fonterra, Annandale Dairy Farm, Sea Forest and Tasmanian feedlot AEON. The TasFarmers proposal will introduce Sea Forest's *Asparagopsis* seaweed feed supplements to approximately 24,000 head of livestock, across both dairy and beef, to reduce an estimated 16,350 tonnes of carbon dioxide equivalent over the next 3 years.

The project will also include education and awareness activities and the development of tools and resources for livestock producers to support them to adopt low emissions technologies on their farms. The data and learnings from the trial will be used to develop the resources.

2.7.6.4.2 Stems for CO2 program

Private Forests Tasmania is administering the $600,000 Stems for CO2 program that aims to reduce emissions by supporting Tasmanian farmers and landowners to plant and grow commercial trees on their properties. Stems for CO2 includes a $450,000 grant program for nearly 250 hectares of trees to be planted across 3 farming properties. The grants will directly support 3 Tasmanian farmers with the upfront establishment costs to successfully integrate commercial trees into their agricultural enterprises.

The Stems for CO2 program is complemented by $150,000 to undertake carbon modelling to determine the emissions reductions and develop case studies and educational resources to allow other farmers and landowners to understand the benefits of planting trees on their properties. Benefits include increased productivity and biodiversity, and reduced soil erosion.

2.7.6.5 Waste management

2.7.6.5.1 Waste and Resource Recovery Strategy

The *Waste and Resource Recovery Strategy 2023–26* aims to:

- support a strong circular economy to reduce waste and greenhouse gas emissions and improve the amenity, liveability and sustainability of Tasmania
- divert products and materials from landfill and recognise the inherent value of products and materials
- invest in circular economy programs to increase the recovery and reuse of products and materials, and respond to emerging issues.

Initiatives that are underway that may contribute to emissions reduction from the waste sector, particularly through the diversion of organic waste from landfill, include:

- supporting the optimisation of kerbside collection systems and upgrading of local government and private sector infrastructure to improve the collection and sorting of a range of materials (including organics)
- partnering with the Australian Government and industry to deliver 2 new organics processing facilities in the north and south of the state
- developing an organic waste action plan for government, business, industry and the community to reduce organic waste in line with Tasmania's organic waste targets.

The Tasmanian Government is also developing an Emissions Reduction and Resilience Plan for the waste sector, expected to be released in November 2024.

2.7.7 Victoria

2.7.7.1 Cross-cutting

2.7.7.1.1 Climate Change and Energy Legislation Amendment (Renewable Energy and Storage Targets) Act 2024

With the passage of the *Climate Change and Energy Legislation Amendment (Renewable Energy and Storage Targets) Act 2024* in March 2024 the Victorian Government set new targets to reduce the state's emissions on the way to net zero emissions by 2045. The targets are grounded in science while also considering the day-to-day needs of Victorian businesses and the community. They reflect what can be achieved through Victorian Government and community action and they will maintain Victoria's position as a climate leader nationally and internationally.

2.7.7.1.2 Whole of Victorian Government emissions reduction pledge

The whole-of-government emissions reduction pledge for 2021–25 describes the practical actions being taken to set the direction for Victoria's public sector and to show leadership in the transition to net zero emissions. Central to this pledge is the commitment for electricity used in government operations, including schools, hospitals, metropolitan trains and trams and other public services, to be 100% renewable by 2025.

The pledge includes a focus on the energy performance of government buildings by strengthening the environmentally sustainable design of new buildings and upgrading the energy efficiency of existing buildings including schools and hospitals.

The pledge underlines a commitment to reduce emissions and provide climate-friendly public services. Actions include:

- Supporting large-scale renewable energy projects to meet government electricity needs.
- The second Renewable Energy Target auction in 2022 that established 623 megawatts of new large-scale renewable energy generation projects.
- Commencing the transition of government fleet to zero emissions vehicles with more than 400 zero emissions vehicles introduced and 400 chargers installed at over 40 locations throughout the state.
- From 2025 all new bus purchases for public transport services to be zero emissions. A 3-year trial of zero emission technology leading up to 2025 involves 6 operators across Victoria introducing 52 zero emission buses into their fleets (50 electric and 2 hydrogen).
- New government office buildings and tenancy fit-outs requiring a minimum 6-star rating under the National Australian Built Environment Rating System from 2025.
- $40 million invested in public hospitals to install solar panels and upgrade to high-efficiency lighting.
- $60 million in the Greener Government Buildings program for energy performance upgrades and solar installations for government-owned sporting facilities, schools, hospitals, Technical and Further Education institutions and public transport facilities.
- All new government buildings and facilities that had not yet reached design stage to be built as all-electric from July 2023.
- $112 million for the Energy Efficiency in Social Housing program, aiming to reduce energy bills for social housing renters by supporting fuel shifting to electric appliances, improving thermal comfort of homes and improving household resilience to climate change.

2.7.7.2 Energy

Actions in the energy sector pledge are delivering significant progress towards the Victorian Government's goal of net zero emissions by 2045.

The energy sector is the largest single source of Victoria's greenhouse gas emissions, accounting for almost 70% of the state's total emissions in 2022, making it the most critical sector in which to drive ambitious emissions reduction action. The pledge has a dual focus on switching to clean energy sources and managing energy demand, and demonstrates that action to reduce emissions can yield multiple dividends.

Actions under the energy sector pledge flagged a reduction in emissions in Victoria by an estimated 2.2 Mt CO_2-e in 2025 and 3.7 Mt in 2030.

Two key market-based initiatives are the major drivers of emissions reductions:

- Victorian Renewable Energy Target.
- Victorian Energy Upgrades program (tradable white certificate scheme).

These well-established initiatives have been highly effective in driving change to date. Through regulated programs and legislated targets they provide investment certainty for transformational change and drive uptake at scale of low-emissions technologies.

Victoria achieved its renewable energy target for 2020 of 25% renewable energy generation and is now headed towards 40% renewable generation by 2025 and 65% by 2030. These targets are legislated, along with new targets added in March 2024, for 95% renewable energy by 2035, offshore wind (at least 2 gigawatts (GW) of offshore generation capacity by 2032, 4 GW by 2035, and 9 GW by 2040), and energy storage (at least 2.6 GW of energy storage capacity by 2030 and at least 6.3 GW by 2035).

The Victorian Energy Upgrades program is delivering on its emissions reduction and energy efficiency goals, including through new activities introduced to support the transition away from gas, towards electrification. Since the activities were introduced on 1 May 2023 over 13,000 households replaced inefficient gas heating and more than 24,000 households have replaced inefficient gas water heating, with this activity now generating the largest part of emission reduction under the scheme. It is complemented by the Solar Homes program, which has provided rebates and finance to support the installation of 285,291 small-scale solar PV systems and increasing numbers of heat pump hot water and battery storage systems.

Significant reductions in emissions are being delivered through improved energy efficiency, with minimum energy efficiency standards for rental homes taking effect in 2022, and 18,998 upgrades of social housing undertaken at the end of 2023–24.

Victoria is undertaking targeted interventions and working with market participants to change the energy system to better integrate renewables, with:

- electricity transmission upgrades and new interconnectors, guided by the Victorian Transmission Plan and Victorian Transmission Investment Framework
- distributed energy resources, such as rooftop solar and energy storage (e.g. Neighbourhood Batteries Initiative and the new 100 Neighbourhood Batteries program).

Victoria published its inaugural Gas Substitution Roadmap in 2022, and an update in December 2023, to help the gas sector transition to net zero emissions, including through energy efficiency, electrification, biomethane and renewable hydrogen.

2.7.7.3 Transport

The transport sector emissions reduction pledge contains initiatives that mark Victoria as a national leader in reducing transport emissions. Transport is the second-largest source of emissions in Victoria. In 2022 it accounted for 23.3% of the state's emissions.

Achieving substantial reductions in transport sector emissions will require a shift from petroleum-fuelled vehicles to zero emissions vehicles powered by clean energy as well as shifting trips to public and active transport.

Actions include:

- A $19 million investment under the energy sector pledge to establish a coordinated public fast-charging network at key tourist and community destinations and at high-use locations, and to support the rollout of charging infrastructure for commercial and government fleets.
- Investments in the public transport network, including the Metro Tunnel development, Regional Rail Revival Program and the Level Crossing Removal Project, to improve the efficiency and reliability of the network.
- Over 250 kilometres of new active transport links being delivered as part of a major transport infrastructure program and an additional 100 kilometres of new cycling routes being trialled.
- All new public transport bus purchases to be zero emissions buses from 2025.
- 400 zero emissions vehicles to be added to the Victorian Government fleet by 2023.
- Increasing active transport mode share to 25% by 2030.
- 50% target for all new light vehicle sales in Victoria by 2030 to be zero emissions vehicles. As of June 2023, 8.4% of all vehicles sold were zero emissions vehicles.
- A $46 million zero emissions vehicle subsidy program, the first of its type in Australia, providing grants to people and businesses wanting to buy zero emissions vehicles.
- $5 million to establish a commercial sector Zero Emissions Vehicle Innovation Fund to encourage the uptake of zero emission commercial vehicles.
- $20 million for a Zero Emission Bus Trial, with the results to inform the transition to 100% of bus purchases for use on the public transport network being zero emissions buses from 2025.
- Development of a new plan for Victoria, a strategy to guide Victoria's growth to 2050, focusing on initiatives that will enable a strong economy, more equitable access to services and jobs, and improved liveability and sustainability, and embed caring for Country and self-determination as a foundation for Victoria's future.

2.7.7.4 Industrial processes and product use

In 2021 the industrial processes and product use (IPPU) sector accounted for 4.9% of Victoria's greenhouse gas emissions. The majority of IPPU emissions come from gas leaks in refrigeration and air conditioning (RAC) equipment (73.6%) used in commercial, residential and transport applications. These emissions are expected to decline over the coming decades as alternatives begin to be used. Victoria is implementing a gradual phase down of Hydrofluorocarbons (HFC) as new, cost-competitive and lower emissions RAC equipment become more available.

A coordinated approach between state and national governments is the best way to reinforce action to reduce emissions in the sector. Victoria is improving the management of RAC equipment and refrigerant gases at a state level, while advocating for further national action. The industrial processes and product use sector emissions reduction pledge focuses on actions to enhance the management of large RAC systems and the handling and disposal of refrigerant gases in Victoria.

This initiative includes guidance on enhanced maintenance of large commercial RAC systems and safe management and disposal of refrigerant gases with high global warming potential in accordance with existing national legislation.

2.7.7.5 Agriculture

Through the Agriculture Sector Emissions Reduction Pledge the Victorian Government is investing almost $20 million over 4 years to ensure the sector is well positioned for a net zero emissions economy by 2045 while maintaining productivity and profitability.

Since the pledge was announced in May 2021, the government has:

- undertaken key trials for livestock methane abatement technologies, with promising early results
- launched the first Victorian agriculture and climate change statement, a collective vision co-developed with 16 organisations across the agriculture sector
- commenced a pilot to work with up to 250 farmers to develop and implement on-farm action plans to reduce emissions and build climate resilience.

The agriculture sector contributed 20% of Victoria's total greenhouse gas emissions in 2021, the third-largest share of total emissions in Victoria. This is informing the Victorian Government's focus on accelerating research in Victoria and strengthening the agriculture industry's capability to deploy low-emissions technologies.

Farmers can also consider the role of revegetation on-farm, with support available through the Victorian Carbon Farming Program and Victoria's participation in the Carbon Farming Outreach Program. The design and roll-out of the government's climate change initiatives continues to be shaped by industry leaders and internationally renowned climate experts who are members of the Victorian Agriculture and Climate Change Council.

2.7.7.6 Forestry and LULUCF

Preserving and enhancing the natural environment is an essential function of the Victorian Government. The land use, land use change and forestry (LULUCF) sector pledge has 2 primary elements:

- restoring degraded landscapes
- planting millions of new trees.

These initiatives remove emissions from the atmosphere and deliver a range of benefits. This pledge builds on the ambitious plan to improve biodiversity over the next 20 years by supporting the restoration of 100,000 hectares of habitat by 2030. It will also help secure a sustainable, long-term future for the Victorian plantation forestry industry.

In 2021 the sector contributed around 26% of Victoria's total emissions. Since 2012 LULUCF emissions have consistently declined and the sector has been a net sink, thus playing an important role in emissions reductions. The key actions in this pledge are:

- Investing in low-carbon landscapes through sustainable plantations and incentivising plantings of shelterbelt trees and agroforestry through the Victorian Carbon Farming Program.
- Restoring natural habitat on public and private land through the $77 million BushBank Program.
- The Victorian Forestry Plan assisting the forestry industry as it managed its gradual transition away from native forest harvesting. This has occurred with an end to native timber harvesting in Victoria on 1 January 2024.
- The $120 million Gippsland Plantations Investment Program provides incentives for plantation investors to undertake industrial-scale planting.

- The $10 million Gippsland Farm Forestry Program providing opportunities for landowners to diversify their income streams by establishing productive plantations in small woodlots or arrangements that are integrated into their land and farming enterprise.
- The Victorian Cultural Landscapes Strategy, written by Traditional Owners, that set out how they can lead planning and management of Country in line with cultural obligations to care for Country.
- The $15.3 million Victorian Carbon Farming Program provides an opportunity for private landholders to reduce emissions and build resilience to a changing climate with assistance to plant trees in line with their specific motivations and objectives for their farms.

2.7.7.7 Waste

Victoria's circular economy policy and action plan, Recycling Victoria – A New Economy, was launched in 2020. The emissions reduction opportunities in the plan are outlined in the Waste Sector Pledge released in 2021.

Mitigation measures in the plan and other programs include:

- Four-stream household waste system will make it simpler for households and the recycling industry to reduce contamination of recycling and increase the recovery of recyclable materials, particularly organics, which generate methane emissions when disposed of in landfill.
- Waste to energy scheme will enable certain amounts and types of waste to be diverted from landfill to thermal waste to energy facilities, reducing landfill emissions. Energy products from these facilities, such as gas, can substitute the use of fossil fuels.
- Waste levies will increase again by $40.52 per tonne to $169.79 per tonne from 1 July 2025 to ensure resource recovery is cost competitive compared to landfilling.
- The Recycled Markets Acceleration package has invested $30.5 million to drive demand for and increase the use of recycled materials across the Victorian economy.
- The Circular Economy Business Innovation Centre, a $17 million program that has supported bringing together governments, industry, research organisations and communities to collaborate across supply chains to reduce waste and increase reuse.
- Victoria's Container Deposit Scheme launched on 1 November 2023, which has seen over $74 million returned to Victorians returning eligible containers for a 10-cent refund.

2.7.8 Western Australia (WA)

2.7.8.1 Cross-cutting

2.7.8.1.1 Sectoral emissions reduction strategy

The Sectoral emissions reduction strategy (SERS) for Western Australia was released by the Western Australian Government on 13 December 2023. The strategy sets out priorities and tangible actions for reducing emissions to support the Western Australian Government's target of net zero emissions by 2050. The strategy addresses key sectors of the economy, covering all major sources of emissions including electricity, industry, transport, agriculture and land use, buildings and waste.

The strategy builds on significant decarbonisation work already underway, with $708 million being invested to transform the state's main electricity network to enable connection of large-scale renewable energy. An additional $74 million in funding was announced for 40 new actions. Some of the initiatives funded under the SERS include:

- expanding the Clean Energy Future Fund
- developing a Carbon Capture, Utilisation and Storage Action Plan
- streamlining assessment of priority electricity transmission infrastructure projects
- supporting decarbonisation planning and clean energy adoption in Horizon Power towns
- installing almost 70 additional electric vehicle chargers at new Metronet stations
- increasing the Western Australian Government's electric vehicle target to at least 50% of eligible new vehicles by 1 July 2025.

2.7.8.1.2 Government emissions interim target

In 2022 the Western Australian Government announced its commitment to a whole-of-government 2030 emissions reduction target of 80% below 2020 levels, from government agency operations and government trading enterprises. This interim target of 80% below 2020 levels applies to emissions from all government agencies, including transport, health and education and energy and water utilities.

This target includes a $3.8 billion investment in new green power infrastructure to enable Western Australia's state-owned coal power stations to be retired by 2030, also reducing emissions from the state-owned energy supplier, Synergy, by 80% by 2030.

To help achieve this target the government is developing further initiatives to reduce the net emissions of government, including energy efficiency measures, procurement of renewable energy, reduced emissions in the government's vehicle fleet and if required, the use of offsets. An emissions reporting system is also in development to enable all government agencies and trading enterprises to track and report emissions accurately, consistent with national standards.

2.7.8.1.3 Renewable Hydrogen Strategy

In 2019 the Western Australian Government announced its Renewable Hydrogen Strategy, setting out Western Australia's vision is to be a globally significant producer, user and exporter of renewable hydrogen. Since the release of the strategy, and through industry and government coordination, extensive work is now underway to develop hydrogen hubs in the Pilbara, Mid-West and Kwinana regions. The Australian and Western Australian Governments have a $140 million agreement to build the Pilbara Hydrogen Hub, intended to be a major centre for hydrogen production and export. The Western Australian Government has also committed $60 million to develop the Mid-West Hydrogen Hub and the Australian Government has announced $70 million for H2Kwinana. Western Australia has over 30 current and planned hydrogen projects, demonstrating Western Australia's potential as a large-scale producer of renewable hydrogen.

The Western Australian Government released the Renewable Hydrogen Strategy 2024–2030 in October 2024. It is a comprehensive update of the previous strategy. It outlines the establishment of renewable hydrogen hubs in Western Australia with investment in supporting infrastructure and the use of renewable hydrogen to decarbonise processes to produce green products (including ammonia and iron) and use in other Western Australian priority sectors. The refreshed strategy describes how Western Australia is well placed to export renewable hydrogen products and technologies globally.

2.7.8.2 Energy

2.7.8.2.1 Energy Transformation Strategy

The Western Australian Government has committed over $5.4 billion since 2017 to support the transition to renewable energy, including new generation, transmission and storage. The South West Interconnected System (SWIS) Demand Assessment and subsequent SWIS Transmission Planning Update has provided the basis for investment in transmission network upgrades and for further planning, design and procurement work required to underpin delivery of the projects.

Legislative reform is addressing limitations of existing governance arrangements to the flexibility of the power system in response to a changing energy system. From 2025, market reforms will support higher levels of renewable energy while maintaining reliability in the SWIS. Distributed energy resources (DER) capability will be advanced, current power system security concerns will be addressed and supporting DER regulation will be in development following Royal Assent of the *Electricity Industry Amendment (Distributed Energy Resources) Act 2024* in March 2024.

While the Energy Transformation Strategy is focused on the transition in the SWIS, there has been significant work undertaken to accelerate the decarbonisation of the North West Interconnected System and industry in the Pilbara. This work, which is outlined in the Pilbara Energy Transition Plan, focuses on encouraging common-use transmission infrastructure to minimise impact to land and unlock the region's best renewable energy resources. The plan was developed in consultation with Traditional Owners, government and industry, and seeks to future-proof the region's environment, cultural heritage and communities.

2.7.8.2.2 Synergy and the Water Corporation's Decarbonisation Plan

Synergy and the Water Corporation continue to progress the investment of $3.8 billion in new green power infrastructure on the SWIS via the development of 810 megawatt (MW) of new renewable generation capacity and 1,100MW/4,400 MWh of battery storage infrastructure. Kwinana Battery Energy Storage System 1 (100 MW/200MWh) was successfully commissioned by Synergy in 2023, with Kwinana Battery Energy Storage System 2 (200 MW/800MWh) under construction. Synergy's Collie Battery Energy Storage System (500MW/2000MWh) will be Synergy's third battery energy storage system and one of the largest in Australia. It is on track for

completion in 2025. Synergy continues to explore wind developments throughout the SWIS and is progressing the development of King Rocks Wind Farm (development approval up to 150 MW, with size subject to final investment decision), which is expected to be operational in 2026. In July 2024 the Water Corporation launched a request for information process to explore renewable wind energy options. The progression of these green infrastructure projects will support government's interim emissions reduction target of reducing carbon emissions by 80% by 2030, compared to 2020 levels.

2.7.8.2.3 The Clean Energy Future Fund

The Clean Energy Future Fund supports the implementation of innovative clean energy projects in WA with an emphasis on technologies with a strong potential for wider adoption.

The program has a budget of $37 million. In the first 2 rounds, 8 projects received a combined $12 million, saving 3.1 million tonnes of greenhouse gas emissions. If pilot projects proceed to commercial scale implementation, then lifetime emissions saving rises to 71 million tonnes.

Examples of funded projects include:

- replacing gas with electricity for calcination to decarbonise the alumina refining process
- designing and constructing a high-temperature biomass pyrolysis plant to produce 18 million litres of renewable diesel per year
- installing a 35 megawatt battery to replace gas-fired spinning reserve at Port Hedland Power Station.

2.7.8.2.4 Investment Attraction Fund – New Energies Industry

The Investment Attraction Fund New Energies Industries Funding Stream was launched in November 2023 to accelerate innovation, scale-up commercial potential and expand local manufacturing capacity in Western Australian based battery and critical minerals, renewable hydrogen, solar, wind and carbon capture and storage projects. The Funding Stream supports the state's economic development strategies, of which diversification and decarbonisation are key pillars.

2.7.8.3 Transport

2.7.8.3.1 Electric Vehicle Strategy & Electric Vehicle Action Plan

To meet Western Australia's 2050 net zero emissions target, vehicles will need to transition to electric and low emissions. The Electric Vehicle Strategy will support the transition with plans to invest over $200 million to decarbonise Western Australia's road transport sector, including $41 million to provide rebates on electric vehicle purchases, $23 million to install a statewide electric vehicle charging network, $15 million to provide grants to support not for profit businesses, charities and local government investment in charging infrastructure, $4 million to install charging infrastructure at train stations and $125 million to match the Australian Government's investment to deliver 130 electric buses and charging infrastructure.

The Western Australian Government's Sectoral Emissions Reduction Strategy includes commitments to develop passenger and road freight charging infrastructure strategies aligned with net zero pathways. It also commits to increase the Western Australian Government fleet electric vehicle target to at least 50% of all new purchases in eligible categories from 1 July 2025, supporting the supply of electric vehicles into the second-hand market.

The Western Australian Government's Electric Vehicle Action Plan provides priority actions to integrate electric vehicles within Western Australia's power systems. Central to this is network planning in support of electric vehicles uptake and initiatives to manage the impact on the grid.

2.7.8.4 Industrial processes and product use

2.7.8.4.1 Carbon Innovation Grant Program

The Carbon Innovation Grants Program supports feasibility studies, pilot projects and capital works to develop and implement innovative technologies that reduce, remove or offset hard-to-abate heavy industry greenhouse gas emissions.

The program has a budget of $15 million, with a total of $13 million grant funding available for distribution over 3 competitive grant rounds. The first round closed in December 2022, with 9 projects receiving a total of $4.24 million in funding. These projects span various sectors, including heavy rail transport, industrial manufacturing and mining.

Notable projects include piloting decarbonisation of heavy rail transport, feasibility studies on direct air carbon capture technology, offshore carbon sequestration and removal of coal from pigment manufacturing processes. The program aims to significantly reduce lifetime emissions from industrial processes, with the potential to abate over 74 million tonnes of carbon emissions if these projects are fully deployed at scale.

This initiative underscores WA's commitment to innovative solutions in tackling climate change and supporting sustainable industrial practices.

2.7.8.4.2 Lower Carbon Grants Program

The Lower Carbon Grants Program – Gorgon Fund was established in 2024 to support decarbonisation projects in Western Australia. The program is part of a $40 million funding agreement between the Western Australian Government and the Chevron Australia operated Gorgon Joint Venture. The program offers grants of between $5 million and $15 million, which will leverage co-contributions from project operators and their investors.

Projects supported through the fund will design, test, deploy or apply new technologies or other innovative applications to avoid or reduce greenhouse gas emissions, store carbon or remove emissions from the atmosphere. Funded projects will deliver benefits to the state through knowledge sharing, enhanced skills and capability, and economic diversification. It is also expected that the funding of novel decarbonisation projects will lead to similar projects being implemented elsewhere, multiplying the emissions reduction potential.

2.7.8.4.3 GreenTech Hub

The GreenTech Hub is also funded under the agreement between the Western Australian Government and the Chevron Australia-operated Gorgon Joint Venture. The innovation hub will support activities to accelerate research and development, commercialisation and deployment of technologies and services for achieving the Western Australian Government's commitment to reach net zero emissions by 2050.

The hub operator was announced as Curtin University in June 2024 and it is anticipated that the hub will be operational by late 2024. The hub will foster collaborative approaches to decarbonisation, working in good faith with researchers, industry and government. It aims to ultimately deliver initiatives that can demonstrate viable pathways to long-term and/or cost-effective green tech solutions.

2.7.8.5 Agriculture and land use, land use change and forestry

2.7.8.5.1 Carbon Farming and Land Restoration Program

The Carbon Farming and Land Restoration Program is a key initiative of the Western Australian Climate Policy. The program supports the growth of the state's carbon farming industry by providing financial assistance for new vegetation and soil projects in the South-West Land Division. These projects create jobs and regional economic stimulus, enhance and conserve biodiversity and agricultural productivity, create First Nations economic development and cultural opportunities, and encourage the supply of WA sourced carbon credits. The program also offers a voucher program to help landowners understand their carbon farming options, and research grants for trialling novel sequestration activities.

Since 2022 the program has invested $3.8 million into establishing 15 new carbon farming projects, leveraging a $3.7 million co-investment. Funding will be repaid with Australian Carbon Credit Units for state government obligations or to reinvest in new projects.

2.8 Assessment of economic and social impacts

Australia assesses the social and economic impacts of its policies and measures via a thorough impact analysis during the policy design phase. Under the Australian Government Impact Analysis framework, all policy decisions or action of the Australian Government that would result in more than a minor change in behaviour or impact for Australians must be accompanied by an appropriate level of analysis. As a first point of assessment, all new policy proposals are required to test impact analysis requirements with the Office of Impact Analysis (OIA) to ensure that analysis of the likely impact of major proposals is prepared to inform major policy decisions. Where required, this impact analysis (IA) includes an assessment of the potential economic, social and other impacts of new policies.

The IA largely focuses on the welfare of the Australian community but can include potential impacts on primary economic indicators, such as employment levels, wages, consumer sentiment, market competition, trade and economic growth. The IA can also include analysis of distributional effects to identify how certain cohorts, such as women, First Nations people or people in remote or regional areas, may be affected disproportionately by particular policies. In addition to the IA process, the Office for Women supports the analysis of gender impact assessments, the National Indigenous Australians Agency supports the analysis of First Nation impacts and the Department of Infrastructure, Transport, Regional Development, Communications and the Arts supports the analysis Regional Australia Impacts.

Impact analyses for decisions announced by the Australian Government are published online. The publication of IAs and information about OIA's assessment of their quality under the Australian Government Impact Analysis framework contributes to the transparency of the government's decision-making processes. Under the framework, one of the core elements of an IA and area of assessment by the OIA is the approach to consultation and how the consultation contributes to the development and analysis of the policy.

In addition to IA requirements, new policy proposals considered by the Cabinet must also include an assessment of potential impacts on:

- gender
- First Nations people
- regional Australia.

These processes ensure decision makers have confidence that the policy proposed is supported by the best analysis and evidence available, is well designed, well targeted and fit-for-purpose (OIA 2023).

Case Study: Support for Workers during the Net Zero Transition

The Net Zero Economy Agency completed an Impact Analysis (IA) in March 2024 on Support for Workers during the Net Zero Transition. The IA focussed on the employment, social and regional impact of the upcoming closure of coal-fired power stations with sizeable workforces and announced closure dates. The analysis considers the potential impact of 3 different policy options on employers, workers, governments and communities. The net benefits of 2 policy options through to 2035 have been estimated using an abridged cost benefit analysis framework and a combination of quantitative and qualitative analysis. The IA addresses the 7 IA questions and follows an appropriate policy development process commensurate with the significance of the problem and magnitude of the proposed intervention. The Office of Impact Analysis assessment is that the quality of the analysis in the IA is 'Good Practice'.

2.9 Mitigation co-benefits resulting from adaptation actions

Australia's NDC does not include mitigation co-benefits resulting from adaptation actions, so co-benefits are not specifically covered in this report. Instead, the focus is on Australia's emissions reduction policies, which are the primary avenue to achieve its NDC.

However, domestic and international adaptation actions are an important aspect of Australia's response to climate change. These actions are covered in Chapter 3 and Chapter 4.

2.10 Summary of greenhouse gas emissions and removals

On 13 April 2024 Australia submitted its National Inventory Report of anthropogenic emissions by sources and removals by sinks of greenhouse gases for the period 1990 to 2022 (NIR 2022) to the UNFCCC secretariat as a stand-alone document, consistent with Decision 18/CMA.1 (Annex I.E, paragraph 12). The NIR 2022 is available on the UNFCCC website: First Biennial Transparency Reports.

Additional information on Australia's greenhouse gas emissions and removals, as reported in the NIR 2022, is summarised below. Common Tabular Format 6 (Summary of greenhouse gas emissions and removals) is available for viewing and download on the UNFCCC website: First Biennial Transparency Reports https://unfccc.int/first-biennial-transparency-reports.

2.10.1 Overview: Australia's greenhouse gas emission and removals

The Australian greenhouse gas inventory is reported for Australian financial years as key data sources are published on this basis. The Australian financial year runs from 1 July of a given year to 30 June of the following year. The NIR 2022 covers the Australian financial years 1989–90 to 2021–22.

Australia's net greenhouse gas emissions from all sectors were 432.6 million tonnes (Mt) of carbon dioxide equivalent (CO_2-e) in 2021–22. Including the land use, land use change and forestry (LULUCF) sector, which is a net sink in 2021–22, this is a decrease of:

- 29.7% (182.8 Mt CO_2-e) from 615.4 Mt CO_2-e in 1989–90.
- 29.0% (176.8 Mt CO_2-e) from 609.4 Mt CO_2-e in 2004–05.
- 1.4% (6.1 Mt CO_2-e) from 438.7 Mt CO_2-e in 2020–21.

Table 2.11 presents emissions by sector for key years, including changes between 2021–22 and the years 1989–90, 2004–05, and the previous year (2020–21).

Table 2.11 Net greenhouse gas emissions by sector, Australia (Mt CO_2-e)

UNFCCC classification sector and subsector	Net emissions (Mt CO_2-e)							% change in emissions between 2021–22 and:		
	1989–90	2004–05	2009–10	2014–15	2019–20	2020–21	2021–22	1989–90	2004–05	2020–21
1 Energy (combustion + fugitive)	297.4	403.7	422.4	422.5	418.8	404.3	396.7	33.4	-1.7	-1.9
Stationary energy	195.7	278.9	288.2	278.7	271.7	265.6	258.9	32.3	-7.2	-2.5
Transport	61.4	82.0	88.6	95.2	93.2	90.1	89.8	46.3	9.4	-0.4
Fugitive emissions from fuel	40.3	42.8	45.5	48.6	53.9	48.6	48.1	19.3	12.3	-1.1
Carbon capture and storage	NO	NO	NO	NO	0.012	0.002	0.0003	NA	NA	-84.7
2 Industrial processes and product use	25.1	30.1	33.4	30.5	31.9	32.9	33.0	31.3	9.4	0.3
3 Agriculture	91.2	84.9	74.0	77.7	71.6	76.6	77.5	-15.0	-8.8	1.1
4 Land use, land use change and forestry	178.3	75.0	63.3	-9.7	-61.2	-88.5	-88.4	-149.6	-217.9	0.2
5 Waste	23.5	15.7	16.0	12.7	13.5	13.4	13.9	-40.9	-11.8	3.1
Total net emissions	615.4	609.4	609.2	533.7	474.5	438.7	432.6	-29.7	-29.0	-1.4
Memo: Total net emissions without application of the natural disturbance provision	615.4	577.9	584.9	516.9	1193.3	305.0	320.6	-47.9	-44.5	5.1

Note: This table is sourced from Australia's National Inventory Report 2022. NO stands for 'Not Occurring', NA stands for 'Not Applicable'.

2.10.2 Sectoral trends

As presented in Figure 2.10 the combined energy subsectors (including stationary energy, transport and fugitive emissions) were the largest source of greenhouse gas emissions in 2021–22, followed by the agriculture sector. Land use, land use change and forestry (LULUCF) was a net sink in that year.

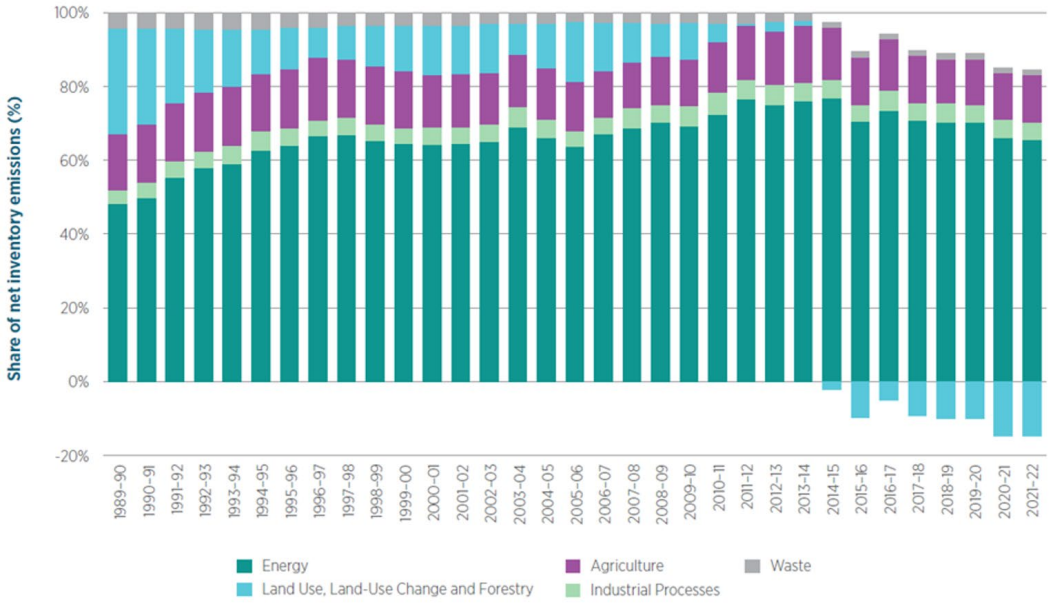

Figure 2.10 Contribution to total net emissions by sector, Australia, 1989–90 to 2021–22 (%)

Sectors with increasing emissions over the reporting period 1989–90 to 2021–22 included stationary energy, transport, fugitive emissions from fossil fuels and industrial processes and product use. Conversely, emissions decreased in the waste, agriculture and LULUCF sectors.

2.10.2.1 Energy

The largest sectoral increase in greenhouse gas emissions over the reporting period occurred in the stationary energy sector, driven in part by increasing population, household incomes and resources exports. Emissions from the public electricity and heat production sub-sector peaked in 2008–09 and have since declined by 26% despite continuing population and economic growth. This is primarily driven by changes in the generation mix, with a declining share from coal and increased share from renewables in the National Electricity Market, with the largest increases coming from wind and solar.[1]

The main drivers for the increase in transport emissions are continuing growth in the number of passenger vehicles, along with an increase in diesel consumption in heavy vehicles and an increase in air travel, other than where impacted by the COVID-19 pandemic. Fugitive emissions have increased over the period largely due to increased production from open-cut coal mines and increased gas production. The most recent increase, since 2014–15, is associated with an expansion of LNG exports.

2.10.2.2 Industrial processes and product use

The emissions in the industrial processes and product use sector have increased over time. The increase is primarily driven by the growth in the bank of hydrofluorocarbons (HFCs) used in refrigeration and air-conditioning equipment, which replaced ozone-depleting chemicals phased out by the Montreal Protocol. Increased HFC emissions over the period from refrigeration and air conditioning were partly offset by declining emissions in other activities, particularly in metals production. Declines in emissions from iron and steel production have been observed due to plant closures while declines in emissions from aluminium production are largely due to improvements in process control and plant upgrades and closures.

[1] Australia's National Electricity Market is one of the largest interconnected electricity systems in the world. It covers around 40,000km of transmission lines and cables, and interconnects the 6 eastern and southern states and territories. It delivers approximately 80% of all electricity consumption in Australia.

2.10.2.3 Agriculture

Agricultural emissions have decreased since 1989–90. Climate (droughts, recovery from droughts, large seasonal differences, rainfall and floods) as well as economic forces (national and international markets and produce demand) directly impact emissions from the agricultural sector. The decline is primarily associated with a decline in sheep numbers as a result of the wool crisis and the collapse of the wool reserve price scheme. From 1994–95 to 1999–2000 emissions increased due to increased beef cattle numbers and crop production, which resulted most markedly in increased enteric fermentation emissions and increased emissions from agricultural soils. From 1999–2000 until 2009–10 prolonged and widespread drought conditions over southern and eastern Australia contributed to reductions in livestock populations, crop production and fertiliser use. In turn, emissions declined over this period. As Australia saw relief from the Millennium Drought emissions rose between 2010–11 and 2016–17, as farmers were able to increase herds and flocks and crop production. Drought conditions in more recent years have resulted in a lack of feed and elevated levels of turn-off of cattle and sheep, and a contraction in the livestock population. In addition, crop production and fertiliser consumption has decreased. Decreases in emissions have followed. The higher rainfall from 2019–20 to 2021–22 was mostly reflected in improved growing conditions and water availability, although flooding did impact horticultural production regionally.

2.10.2.4 Waste

Emissions from the waste sector have decreased over time, as increases in waste generation associated with growing populations and industrial production have been offset by increased methane recovery. The majority of emissions were from solid waste disposal, which has experienced a substantial improvement in methane recovery rates since 1989–90. The increase in emissions in 2021–22 was primarily driven by declines in methane recovery over the year.

2.10.2.5 LULUCF

The decrease in emissions from LULUCF since 1989–90 has been mainly driven by the decline in emissions from land clearing (forest land converted to other land uses), forest cover expansion (including plantation establishment) and declines in the harvesting of native forests.

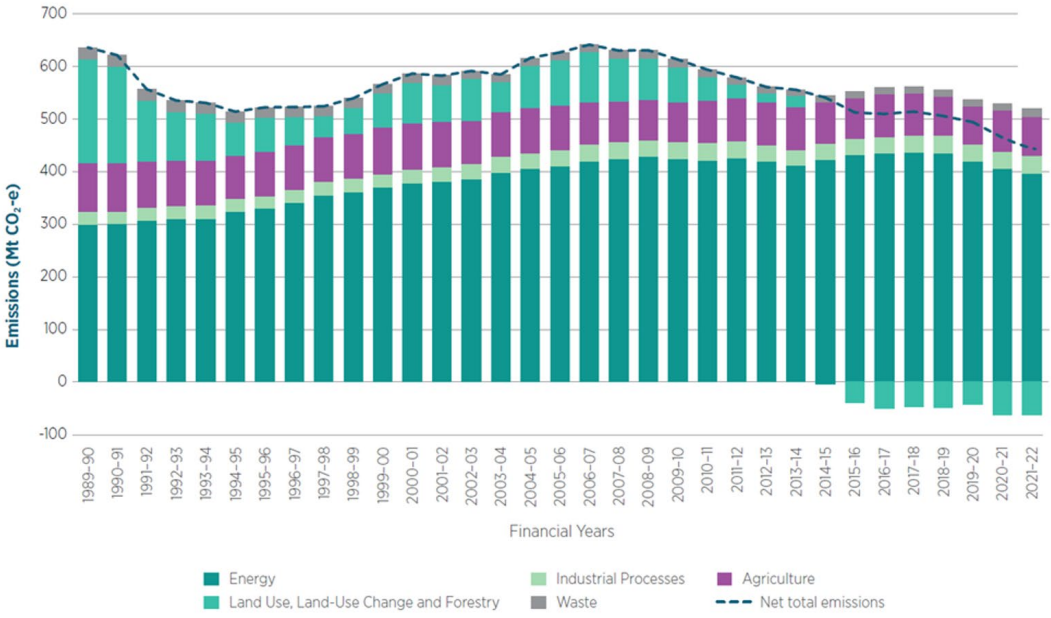

Figure 2.11 Greenhouse gas emissions by sector, Australia, 1989–90 to 2021–22 (Mt CO_2-e)

Trends in emissions from each sector are discussed further in Chapters 3–7 of the NIR 2022. Emissions in 2021–22 compared with 1989–90, 2004–05 and the previous year by sector are presented in the infographic (see Figure 2.12).

Emissions Sectors	2021-22 emissions	*Change in 2021-22 emissions since:* 1989-90	2004-05	2020-21
Total emissions	433 Mt CO_2-e	-183 Mt CO_2-e, -30%	-177 Mt CO_2-e, -29%	-6 Mt CO_2-e, -1%
1. Energy	397 Mt CO_2-e	+99 Mt CO_2-e, +33%	-7 Mt CO_2-e, -2%	-8 Mt CO_2-e, -2%
2. Industrial Processes and Product Use	33 Mt CO_2-e	+8 Mt CO_2-e, +31%	+3 Mt CO_2-e, +9%	+0.1 Mt CO_2-e, +0.3%
3. Agriculture	77 Mt CO_2-e	-14 Mt CO_2-e, -15%	-7 Mt CO_2-e, -9%	+1 Mt CO_2-e, +1%
4. Land use, land use change and forestry	-88 Mt CO_2-e	-267 Mt CO_2-e, -150%	-163 Mt CO_2-e, -218%	+0.2 Mt CO_2-e, +0.2%
5. Waste	14 Mt CO_2-e	-10 Mt CO_2-e, -41%	-2 Mt CO_2-e, -12%	+0.4 Mt CO_2-e, +3%

Figure 2.12 Comparison of 2021–22 emissions with past emissions levels by sector, million tonnes of carbon dioxide equivalent (Mt CO_2-e) and percentage change (%)

2.11 Projections of greenhouse gas emissions and removals

2.11.1 Australia's approach to emissions projections

Australia's emissions projections show how Australia is tracking against its 2030 emissions reduction commitments by examining the potential impact of policies and measures to reduce greenhouse gas emissions. Australia publishes projections of greenhouse gas emissions annually on the Department of Climate Change, Energy, the Environment and Water website, and tables them in the Australian Parliament.

The emissions projections include a baseline ('with measures')[2] and 'with additional measures' scenario. Projected emissions from international bunker fuels are also included. The 2024 emissions projections do not include a sensitivity analysis.

The emissions projections do not include a 'without measures' scenario. Australia notes that it is difficult to disentangle the impact of climate policies in place for over 25 years from other prevailing economic factors that drive emissions and that any 'without measures' projection is fraught with uncertainty. Australia prioritises its resources to prepare 'with measures' and 'with additional measures' scenarios to assess how Australia is progressing towards its emissions reduction targets.

The baseline ('with measures') emissions projections include policies finalised or legislated as of September 2024. Since Australia's fifth Biennial Report, these projections include the expanded Capacity Investment Scheme to help deliver on the government's 82% renewable electricity target, the Safeguard Mechanism reforms[3], and the New Vehicle Efficiency Standard (NVES).

Australia is continuing to develop policies and measures to reduce emissions. The 'with additional measures' scenario includes announced policies that are subject to detailed design or grant rounds yet to be announced. Some of these measures were announced as part of the Future Made in Australia plan to strengthen Australia's economic position as the world moves to a net zero economy.

The emissions projections do not include policies that are in earlier stages of design, consultation, or if their emissions reduction impact is dependent on investment decisions yet to be made. The Commonwealth is considering further policies and measures to reduce emissions and seize the opportunities of a global net zero economy, including in the context of developing the Net Zero Plan. Any new policies and measures announced through this process will be considered in future emissions projections.

In addition to preparing a National Inventory Report annually Australia also prepares Quarterly Updates of the National Greenhouse Gas Inventory for a domestic audience. These quarterly updates provide timely information for policymakers, markets and the public to understand how Australia is tracking against its targets. This process can include publishing recalculations to the historical time series where new data is available. The projections presented in this chapter were prepared based on the latest available quarterly data (National Greenhouse Gas Inventory Quarterly Update: June 2024) including recalculations that will be included in Australia's National Inventory Report 2023. Australia's base year (2005) emissions were 609 Mt CO_2-e in Australia's National Inventory Report 2022 (DCCEEW 2024g) and 613 Mt in the June 2024 Quarterly report (DCCEEW 2024k). All percentage changes from base year figures presented in this chapter are calculated relative to the revised figure. Because of these national circumstances, Australia's projections do not begin from Australia's National Inventory Report 2022, submitted in April 2024.

Projections of greenhouse gas emissions are consistent with *Australia's Emissions Projections 2024* (DCCEEW 2024i). The emissions projections outline national level and sectoral emissions trends through to 2040 to align with international reporting requirements.

The emissions projections are estimated on a UNFCCC accounting basis consistent with Australia's accounting for the 2030 target. Reporting years for all sectors are reported for Australian financial years as key data sources are published on this basis. For example, '2030' refers to financial year 2029–30 that covers the period 1 July 2029 to 30 June 2030.

[2] In this chapter, the terms 'with measures' scenario and baseline scenario are used interchangeably.
[3] The Safeguard Mechanism applies to facilities emitting more than 100,000 t CO_2-e of scope 1 emissions each year, including in mining, oil and gas production, manufacturing, transport and waste.

Sectors reported are consistent with reporting in Australia's national greenhouse gas inventory:

- Energy (subdivided into electricity, stationary energy, transport and fugitive)
- Industrial processes and product use (IPPU)
- Agriculture
- Waste
- Land use, land-use change and forestry (LULUCF).

2.11.2 Summary of Australia's emissions projections results

As reflected in Australia's Nationally Determined Contribution (NDC) under the Paris Agreement, Australia has committed to reduce emissions to 43% below 2005 levels by 2030 and to net zero by 2050. These targets are also legislated under the *Climate Change Act 2022*.

Australia's 2030 commitment is both a single-year target to reduce emissions to 43% below 2005 levels by 2030, and a multi-year emissions budget from 2021–30. The single-year point target is calculated as a 43% reduction in the year 2030 from 2005 levels. See sections 2.4 and 2.5 for further information on Australia's 2030 targets.

Australia's emissions projections 2024 (DCCEEW 2024i) reported that, under the baseline ('with measures') scenario, Australia's emissions are projected to be 352 Mt CO_2-e in 2030, just shy of the 2030 single-year point target. Over the period 2021 to 2030, baseline cumulative emissions are 4,225 Mt CO_2-e. As such, Australia's 2030 target is more than met when assessed on a multi-year emissions budget basis.

Under the 'with additional measures' scenario, Australia's emissions are projected to be 351 Mt CO_2-e in 2030. Over the period 2021 to 2030, Australia's cumulative emissions are projected to be 4,230 Mt CO_2-e (Table 2.12). Australia uses annual projected net greenhouse gas emissions and cumulative net emissions from 2021 to 2030 as key indicators.

Table 2.12 Tracking towards Australia's 2030 single-year point and multi-year emissions budget targets, Mt CO_2-e

	Emissions in 2030, Mt CO_2-e[4]	Cumulative emissions, 2021–2030 Mt CO_2-e
Baseline scenario	352	4,225
'With additional measures' scenario	351	4,230

Under the baseline and 'with additional measures' scenarios, Australia's emissions are projected to further decline to 301 Mt CO_2-e in 2035 and to 271 Mt CO_2-e in 2040.

2.11.3 Emissions trends in the baseline ('with measures') scenario

In this scenario emissions from almost all sectors are projected to decline, with the largest contributions coming from the energy (electricity, stationary energy, fugitives, transport) and IPPU sectors. The following section outlines emissions trends in the baseline ('with measures') by sector.

[4] Million tonnes of carbon dioxide equivalent

Table 2.13 Summary of emissions projections baseline ('with measures') by sector, Mt CO_2-e

Sector	1990	2005	2020	2022	2025	2030	2035	2040
Energy-electricity	130	197	172	157	144	59	37	29
Energy-stationary energy	66	82	100	102	96	93	80	68
Energy-fugitive	40	43	54	48	50	45	38	32
Energy-transport	61	82	93	90	100	95	87	80
Industrial processes and product use	25	30	32	33	32	27	24	20
Agriculture	95	89	77	83	82	83	84	84
Land use, land-use change and forestry	178	75	-61	-88	-77	-64	-61	-54
Waste	23	16	14	14	14	13	13	13
Total with LULUCF	**619**	**613**	**480**	**438**	**441**	**352**	**301**	**271**
Total without LULUCF	**441**	**538**	**542**	**527**	**518**	**416**	**362**	**325**

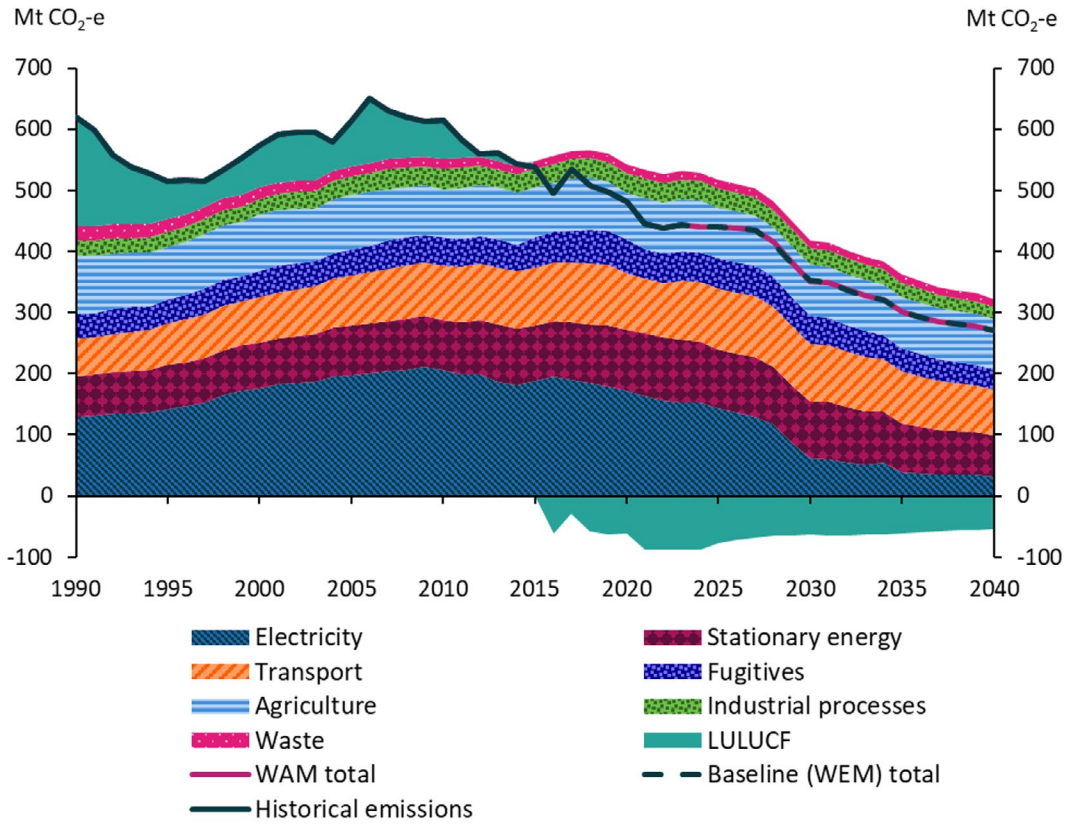

Figure 2.13 Australia's emissions projections baseline ('with measures') and 'with additional measures' scenario by sector, 1990 to 2040, Mt CO_2-e

Source: DCCEEW 2024i,k

2.11.4 Energy – electricity

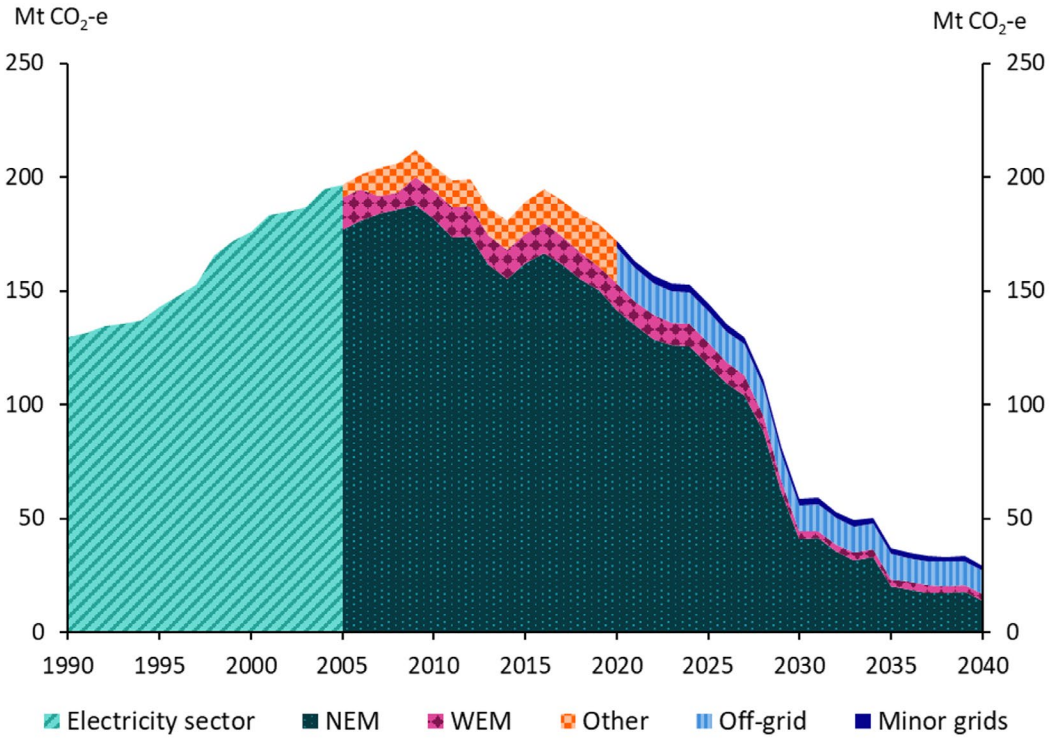

Figure 2.14 Electricity emissions in the baseline 'with measures' scenario, 1990 to 2040, Mt CO_2-e

Source: DCCEEW 2024i,k

Emissions from electricity generation are the result of fuel combusted for electricity production in the National Electricity Market (NEM), Western Australia's Wholesale Electricity Market (WEM), other small grids and off-grid. Electricity represents the largest share of emissions in the National Greenhouse Gas Inventory. Emissions are projected to be 59 Mt CO_2-e in 2030 before declining to 29 Mt CO_2-e in 2040.

The decline in electricity emissions is driven by the projected continued decarbonisation of electricity generation across the country, connected and enabled by the significant transmission expansion underway. The baseline emissions projections include the government's expanded Capacity Investment Scheme (CIS), along with state renewable targets and plans,[5] which will support delivering the Australian Government's 82% renewable electricity generation target for on-grid electricity by 2030.

2.11.4.1 National Electricity Market (NEM)

Emissions in the NEM are projected to decrease to 41 Mt CO_2-e in 2030 and 14 Mt CO_2-e in 2040 in the baseline scenario. The share of renewable generation in the baseline scenario is projected to continue to grow to 84% in 2030. In 2040, renewable generation in the NEM is projected to reach 94% of total generation. Both milestones assume the rollout of new large scale transmission projects will be delivered on time to enable connection of new generation into the grid.

2.11.4.2 Western Australia Wholesale Electricity Market (WEM)

Emissions in the WEM are projected to decline to 3 Mt CO_2-e in 2030 and 3 Mt CO_2-e in 2040 in the baseline scenario. The WEM is projected to increase renewable generation to meet demand as coal-fired power stations close over the projections period, in line with the Western Australian state government announcement. Despite increasing renewable build and generation, gas continues to be an important source of generation, as it supports the reliability of supply in the WEM as coal capacity exits and demand increases.

[5] The electricity emissions projections include the New South Wales Electricity Infrastructure Roadmap, the Queensland Energy and Jobs Plan and Queensland's state renewable energy target, Tasmania's renewable target, Victoria's renewable target, Victoria's Energy Storage Targets and Victoria's Offshore Wind Targets and the Western Australian Government's renewable announcement of 810MW of new wind capacity and 4,400 MWh of storage.

2.11.4.3 Off-grid electricity, and the North West Interconnected System (NWIS)

Emissions from off-grid electricity and the NWIS are projected to decline to 2030 in the baseline scenario. Off-grid electricity emissions are from 2 main users: industrial users for liquefied natural gas (LNG) production, and emissions from mining and remote communities. Emission from other grids, including off-grid are projected to decline to 14 Mt CO_2-e in 2030 and 12 Mt CO_2-e in 2040.

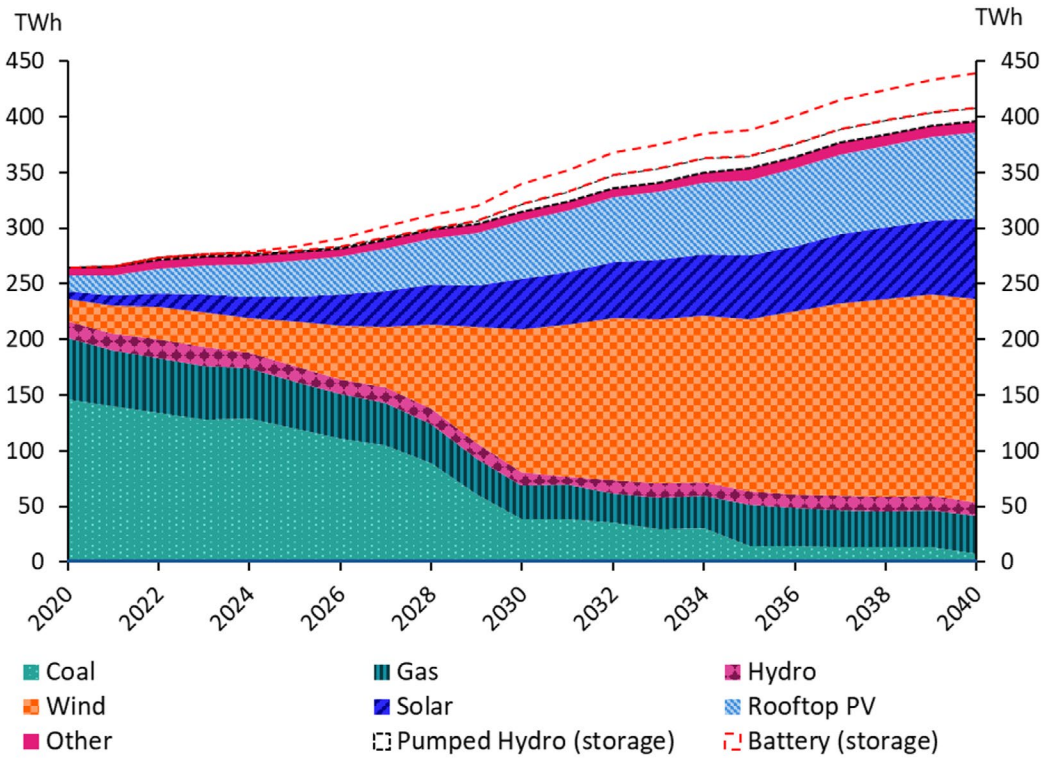

Figure 2.15 Electricity generation mix in Australia in the baseline 'with measures' scenario, by fuel, 2020 to 2040, TWh

Source: DCCEEW 2024f,i

Table 2.14 Electricity emissions in the baseline scenario, Mt CO_2-e

Grid, region	2005	2020	2025	2030	2035	2040
National Electricity Market	177	141	117	41	20	14
Western Australian Wholesale Electricity Market	14	12	10	3	3	3
Other grids, including off-grid	6	19	17	14	13	12
Total electricity sector	**197**	**172**	**144**	**59**	**37**	**29**

2.11.5 Energy – stationary energy, excluding electricity

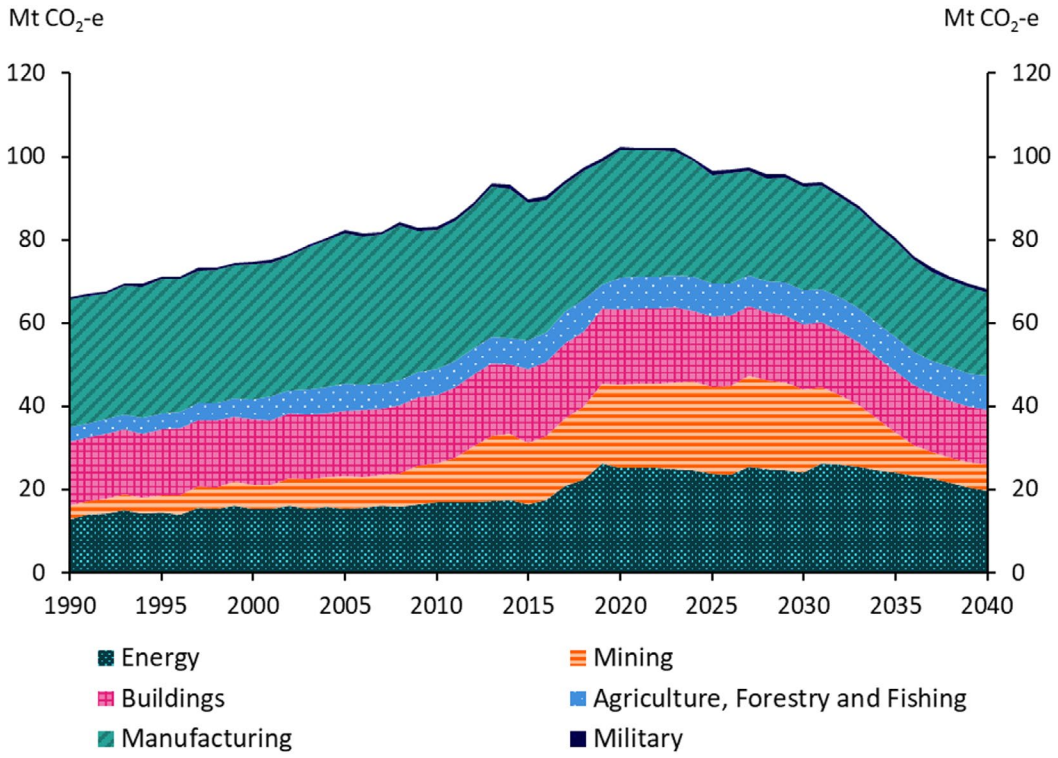

Figure 2.16 Stationary energy emissions in Australia in the baseline 'with measures' scenario, by sub-sector, 1990 to 2040, Mt CO_2-e

Source: DCCEEW 2024i,k

Stationary energy emissions are projected to be 93 Mt CO_2-e in 2030 before decreasing to 68 Mt CO_2-e in 2040.

2.11.5.1 Manufacturing

The manufacturing sub-sector is the largest source of emissions within the stationary energy sector with most manufacturing emissions generated from the manufacturing of basic non-ferrous metals such as alumina. Manufacturing emissions are projected to decline from 2024 due to the announced closure of the manufacturing facilities of Kwinana Alumina Refinery, Qenos Botany and Qenos Altona Plastic manufacturing, which results in a decline in emissions in the Non-ferrous metals and chemical manufacturing sub-sectors. Despite generally stable production forecasts, manufacturing emissions are expected to decline from 26 Mt CO_2-e in 2025 to 25 Mt CO_2-e in 2030 and 20 Mt CO_2-e in 2040. This is mainly driven by the Safeguard Mechanism, which is projected to encourage the uptake of cleaner fuels and technologies in the manufacturing sector, particularly after 2030.

2.11.5.2 Energy

The energy sub-sector includes fuel combustion emissions from oil and gas extraction, natural gas production and distribution, solid fuel manufacture and fuel refining. Emissions trends in the energy sub-sector are mainly driven by LNG production, which accounted for 71% of energy sub-sector emissions in 2022. Emissions from the energy sub-sector are projected to be 24 Mt CO_2-e and 20 Mt CO_2-e in 2030 and 2040, respectively. This is mainly due to the projected impacts of the Safeguard Mechanism reforms through fuel switching, improvements in energy and process efficiency, and the use of renewables in the oil and gas sector. The on-site emissions reduction in the energy sub-sector is projected to be 1 Mt CO_2-e in 2030, growing to 3 Mt CO_2-e in 2040. Projected declines in LNG and domestic gas production also contributes to lower emissions in 2040.

2.11.5.3 Buildings

The building sub-sector includes all the emissions from fuel combustion in residential and commercial buildings, as well as construction activities in infrastructure, commercial and residential buildings. Building sub-sector emissions are estimated to be 16 Mt CO_2-e and 13 Mt CO_2-e in 2030 and 2040, respectively. The declining trend is mainly driven by decreasing gas demand from increasing electrification in residential and commercial buildings.

2.11.5.4 Mining

Mining sub-sector emissions consists of coal mining and other mining. In 2022 other mining was primarily made up of emissions from iron ore (55%) and gold (19%) mining. Stationary energy emissions from coal mining are projected to remain relatively stable between 2022 and 2030 at 9 Mt CO_2-e before falling to 2 Mt CO_2-e in 2040. The reduction is driven by lower coal production due to lower international coal demand and abatement from the Safeguard Mechanism.

Emissions from other mining are projected to be 10 Mt CO_2-e in 2030 and 5 Mt CO_2-e in 2040. Decarbonisation activities across the other mining sub-sector is the major driver of a further 56% decline in emissions between 2030 and 2040.

The Safeguard Mechanism is projected to provide 2 Mt CO_2-e abatement in 2030 and is predicted to accelerate to 12 Mt CO_2-e in 2040. This is due to projected energy efficiency improvements, electrification and switching from diesel to low-carbon fuels across all mining equipment categories (e.g. haulage trucks, mining utes, excavators, loaders). The 2024 emissions projections also account for projected decarbonisation activities at non-Safeguard facilities across the mining sub-sector.

Table 2.15 Stationary energy emissions in the baseline scenario, Mt CO_2-e

Emissions by sub-sector	2005	2020	2025	2030	2035	2040
Manufacturing	36	31	26	25	23	20
Energy	15	25	24	24	24	20
Buildings	16	18	17	16	15	13
Mining	8	20	21	20	10	6
Agriculture, forestry and fishing	7	8	8	8	8	8
Military	1	1	1	1	1	1
Total	**82**	**102**	**96**	**93**	**80**	**68**

2.11.5.5 Agriculture, forestry and fishing and military

Emissions from energy use in agriculture, forestry and fishing activities, and military sub-sectors are projected to remain relatively stable to 2040.

2.11.6 Energy – transport

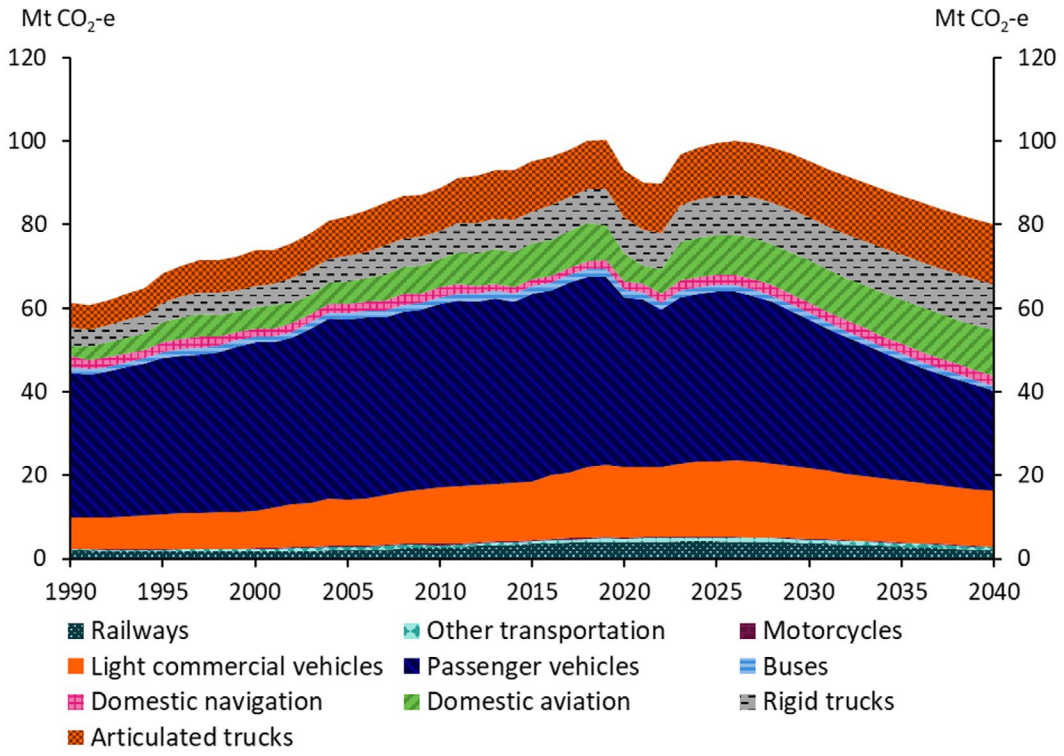

Figure 2.17 Transport emissions in Australia in the baseline 'with measures' scenario, by sub-sector, 1990 to 2040, Mt CO_2-e

Source: DCCEEW 2024i,k

Transport emissions are projected to decrease to 95 Mt CO_2-e in 2030 and 80 Mt CO_2-e in 2040. Transport emissions have not returned to pre-COVID-19 levels. Activity across all sectors has stabilised, and new post-COVID-19 habits appear to be firmly entrenched.

2.11.6.1 Road transport

Light vehicles make up the majority of Australia's transport emissions (61% in 2022) and includes cars and light commercial vehicles. Despite recent fluctuating EV sales growth, sales have remained at historically high levels on an annualised basis. Additionally, the New Vehicle Efficiency Standard (NVES) that was legislated in 2024 is projected to decrease transport emissions in the light vehicle fleet from 2025 onwards. Passenger vehicles are expected to contribute most of the projected decrease in transport emissions which are expected to be 36 Mt CO_2-e in 2030 and 24 Mt CO_2-e in 2040.

Emissions from all other road transport (predominantly trucks and buses) are projected to be 26 Mt CO_2-e in 2030 and 27 Mt CO_2-e in 2040, mainly due to increase in road freight activity which is partly offset by efficiency improvements and lower emissions from buses.

2.11.6.2 Non-road transport

Emissions from aviation are projected to be 10 Mt CO_2-e in 2030 and 11 Mt CO_2-e in 2040. Aviation activity is projected to increase however emissions increase at a slower rate due to abatement induced by the Safeguard Mechanism.

In the aviation sector on-site abatement is projected to come from ongoing operational and technological improvements, the progressive introduction of sustainable aviation fuel (SAF) from 2028 and the introduction of OneSKY air traffic management software.

Emissions in the rail sector are estimated to be 4 Mt CO_2-e and 2 Mt CO_2-e in 2030 and 2040. An improvement in the emissions intensity of rail is expected to arise from electrification, fuel switching to low carbon liquid fuels and efficiency improvements. This is projected to reduce emissions in the rail sector by 53% (2 Mt CO_2-e) in 2040.

Emissions from domestic navigation and other transport are projected remain flat over the projections period to 2040.

2.11.7 Energy – fugitive

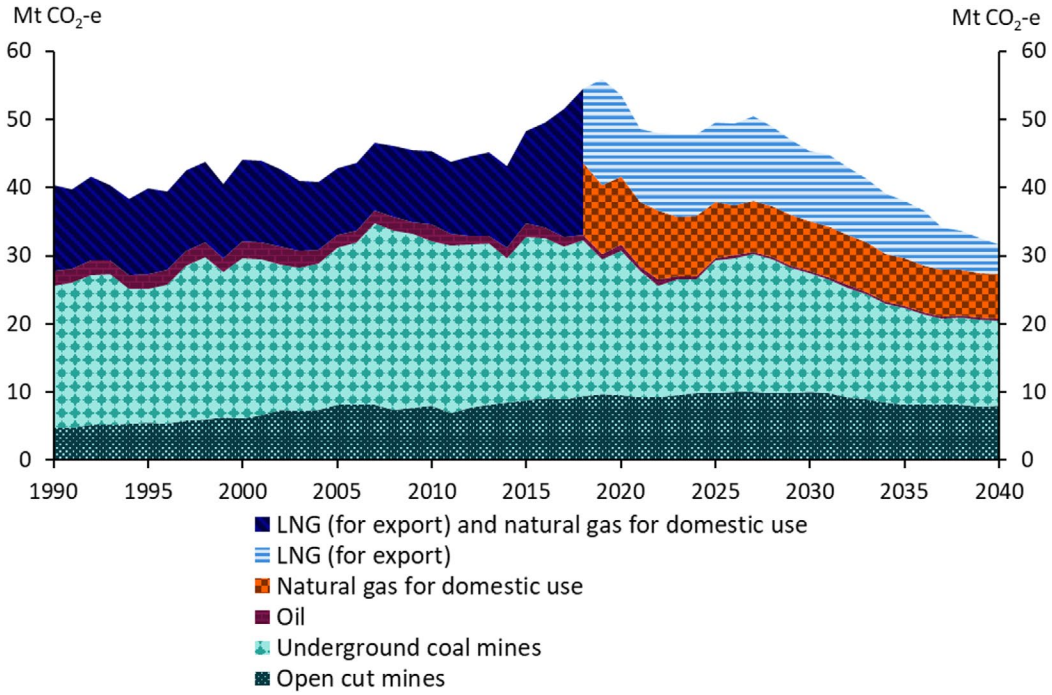

Figure 2.18 Fugitive emissions in Australia in the baseline 'with measures' scenario, by sub-sector, 1990 to 2040, Mt CO_2-e

Source: DCCEEW 2024i,k

Fugitive emissions are estimated to be 45 Mt CO_2-e in 2030 and to decline to 32 Mt CO_2-e in 2040.

2.11.7.1 Coal fugitive emissions

Coal fugitive emissions are projected to be 28 Mt CO_2-e in 2030 and are expected to decline to 20 Mt CO_2-e in 2040. From 2022 to 2024 coal production emissions were lower compared to the historical emission trend as several mines were impacted by operational outages. With these outages largely resolved, emissions are projected to increase from 2025 to 2027 as coal production increases.

From 2029 emissions are projected to decline due to reduced demand for Australian thermal coal, increased on-site abatement activities induced by the Safeguard Mechanism, and the closure of several large, gassy underground mines. On-site abatement from methane management at Safeguard facilities is projected to reduce coal fugitive emissions by 4 Mt CO_2-e in 2030 and 2035, and 6 Mt CO_2-e in 2040. Abatement is projected from ventilation pipework maintenance in underground mines, degasification for flaring and electricity generation and oxidation of ventilation air methane, including the Kestrel Mine Ventilation Air Methane Abatement Project that was awarded a grant in July 2024 under the Safeguard Transformation Stream of the Powering the Regions Fund.

2.11.7.2 Oil and gas fugitive emissions

Fugitive emissions from oil and gas are estimated to be 18 Mt CO_2-e in 2030 and decrease to 11 Mt CO_2-e in 2040. The main drivers of oil and gas fugitive emissions are levels of production, the geological characteristics of the basin and any capture of carbon dioxide. On-site emissions reduction at Safeguard facilities is projected to reduce oil and gas fugitive emissions by around 3 Mt CO_2-e in 2030, and by around 8 Mt CO_2-e in 2040.

Oil

Fugitive emissions from oil were estimated to be less than 1 Mt CO_2-e in 2024 and are projected to remain around that level through to 2040.

Domestic gas

Fugitive emissions from natural gas consumed in Australia (domestic gas) are projected to be 7 Mt CO_2-e in 2030 and are expected decrease to 6 Mt CO_2-e in 2040.

On-site emissions reductions at Safeguard facilities are projected to reduce domestic gas fugitive emissions. Much of the abatement is projected to come from Santos's CCS project at the Moomba plant. This project is Australia's largest onshore CCS project, with operations commencing this year and capturing up to 1.5 Mt CO_2 per year.

Liquefied natural gas (LNG)

Fugitive emissions at LNG facilities are projected to decrease to 10 Mt CO_2-e in 2030 and 4 Mt CO_2-e in 2040. On-site emissions reductions induced by the Safeguard Mechanism are projected to reduce LNG fugitive emissions by around 1 Mt CO_2-e in 2030, and by around 6 Mt CO_2-e in 2040. Of these emissions reductions, CCS is assumed to account for around 1 Mt CO_2-e in 2031 and 5 Mt CO_2-e in 2040. Safeguard facilities are also assumed to implement leak detection and repair, and reduced flaring to reduce on-site emissions.

Table 2.16 Fugitive emissions in the baseline scenario, Mt CO_2-e

Emissions by sub-sector	2005	2020	2025	2030	2035	2040
Open cut mines	8	9	10	10	8	8
Underground coal mines	23	21	19	18	14	12
Oil	2	1	<1	<1	<1	<1
Domestic natural gas	10[6]	10	8	7	7	6
Liquified natural gas		12	12	10	8	4
Total	**43**	**54**	**50**	**45**	**38**	**32**

2.11.8 Industrial processes and other product use

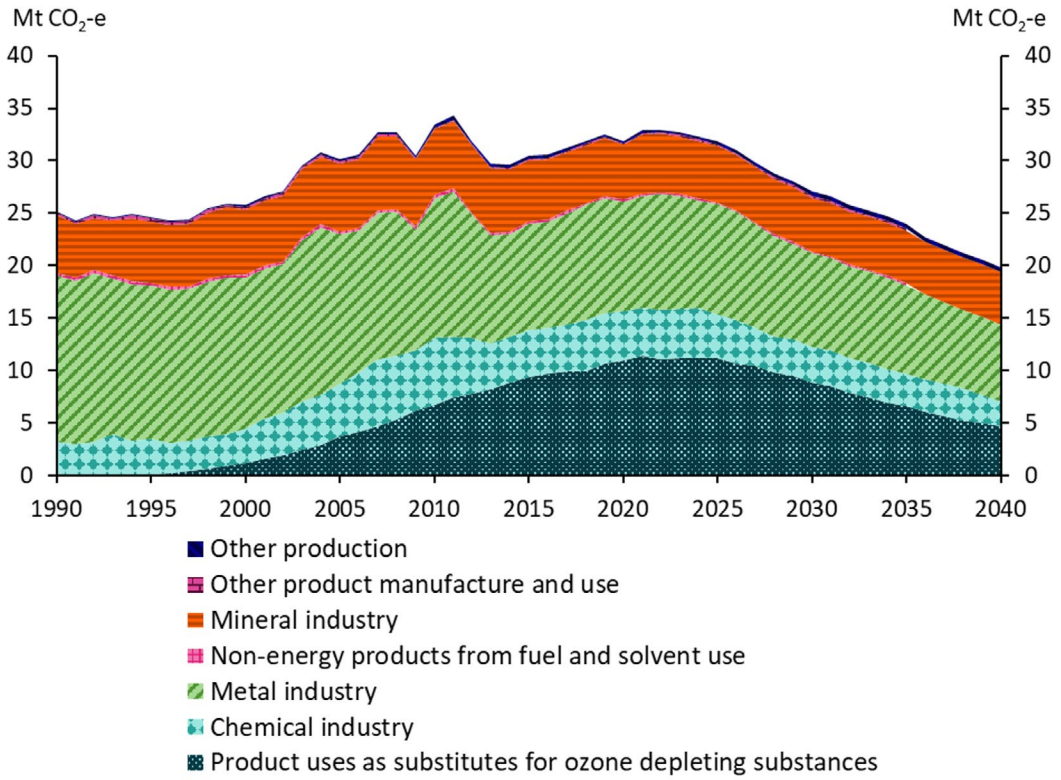

Figure 2.19 Industrial processes and other product use emissions in Australia in the baseline 'with measures' scenario, by sub-sector, 1990 to 2040, Mt CO_2-e

Source: DCCEEW 2024i,k

[6] Includes domestic natural gas and LNG.

IPPU emissions are estimated to be 27 Mt CO_2-e in 2030 and are expected to decrease to 20 Mt CO_2-e in 2040. This projected decrease in emissions is driven primarily by assumed on-site emissions reductions at Safeguard facilities and a projected decline in emissions from hydrofluorocarbons (HFCs). The projected on-site emissions reductions at Safeguard facilities are 3 Mt CO_2-e in 2030, increasing to 6 Mt CO_2-e in 2040.

2.11.8.1 Hydrofluorocarbon emissions

Currently, the largest source of emissions in the IPPU sector is the 'Product uses as substitutes for ozone-depleting substances' sub-sector (or HFCs). Emissions from HFCs are projected to decline to 9 Mt CO_2-e by 2030 and 5 Mt CO_2-e by 2040. The projected decrease is driven by the *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989* that legislates a decreasing annual import quota on bulk HFCs imports to 2036 and a ban on the import of small air conditioning equipment using refrigerants with a global warming potential (GWP) over 750 from 1 July 2024.

2.11.8.2 Metal industry emissions

The metal industry emissions are projected to be 9 Mt CO_2-e in 2030, and 7 Mt CO_2-e in 2040. This decrease in emissions is driven by the assumed on-site emissions reductions at Safeguard facilities. Emissions reductions are expected to occur mainly through technological improvements in steelworks facilities, such as the uptake of natural gas and hydrogen direct reduction of iron (DRI) and electric arc furnace (EAF) processes. Additional emissions reductions are assumed to be achieved through the use of biochar to replace coke, as well as the increased use of scrap content and efficiency improvements.

2.11.8.3 Other industry emissions

Emissions from the chemical industry sub-sector are projected to be 3 Mt CO_2-e in 2030 and 2 Mt CO_2-e in 2040. The Safeguard Mechanism is expected to incentivise decreases in chemical industry emissions through the catalytic reduction of nitrous oxide (N_2O) in the production of ammonium nitrate and the use of green hydrogen in other chemical processes and efficiency improvements.

Mineral industry emissions are projected to remain at around 5 Mt CO_2-e over the projections period to 2040. This reflects relatively low levels of on-site emission reductions at Safeguard facilities. There remains limited opportunities for emissions reductions in the cement industry (which accounted for 50% of emissions in the mineral industry in 2024) due to economic and technical challenges.

Emissions from all other IPPU sub-sectors are projected to be flat to 2030 and 2040.

Table 2.17 Industrial processes and product use emissions in the baseline scenario, Mt CO_2-e

Emissions by sub-sector	2005	2020	2025	2030	2035	2040
Product uses as substitutes for ozone depleting substances	4	11	11	9	7	5
Metal industry	14	10	11	9	8	7
Chemical industry	5	5	4	3	3	2
Mineral industry	6	5	5	5	5	5
Non-energy products from fuel and solvent use	<1	<1	<1	<1	<1	<1
Other production	<1	<1	<1	<1	<1	<1
Other product manufacture and use	<1	<1	<1	<1	<1	<1
Total	**30**	**32**	**32**	**27**	**24**	**20**

2.11.9 Agriculture

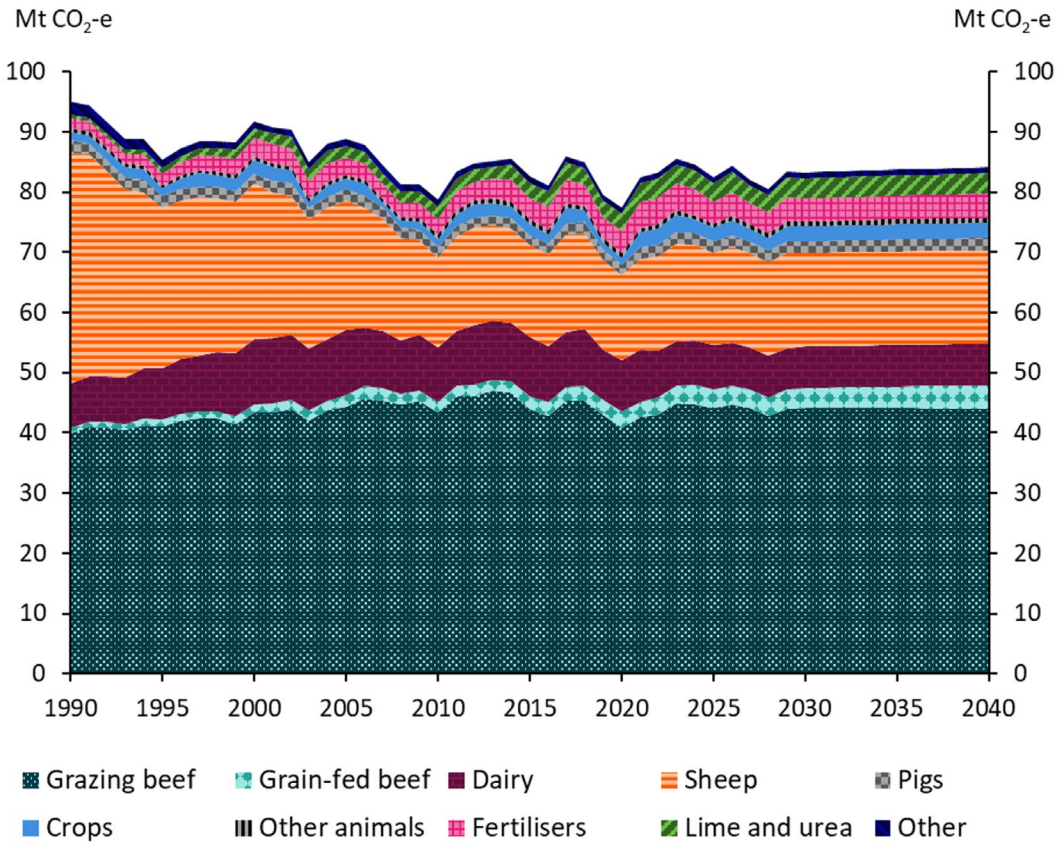

Figure 2.20 Agriculture emissions in the baseline 'with measures' scenario, 1990 to 2040, Mt CO_2-e

Source: DCCEEW 2024i,k

Agriculture emissions are estimated to be 83 Mt CO_2-e in 2030 and are expected to increase gradually to 84 Mt CO_2-e in 2040. This trend is projected to be primarily driven by changes to livestock numbers, particularly the increase in grain-fed cattle activity.

Short-term fluctuations in emissions are heavily influenced by climate variations. Emissions in later years are modelled to follow average seasonal conditions using a continuation of historical activity trends or recent averages.

2.11.9.1 Livestock trends

Emissions from livestock accounts for the majority of agriculture emissions (87% in 2030). Recent peaks in livestock emissions have followed above average rainfall driven by the 2020–2023 La Niña events. Grazing beef cattle consistently remain the largest contributor to livestock emissions and are projected to be 44 Mt CO_2-e in both 2030 and 2040 following a return to average seasonal conditions. Grain-fed beef cattle numbers continue to trend upwards accounting for a growing portion of the national beef herd, as the industry provides a more drought-resistant feeding system. Grain-fed cattle are projected to contribute 4 Mt CO_2-e in 2040.

2.11.9.2 Crop trends

Crop emissions are projected to be 2 Mt CO_2-e in 2030, with variations due to differing seasonal conditions forecast in each cropping zone. Long-term trends to 2040 project that emissions from crops will continue to increase, reaching 3 Mt CO_2-e in 2040.

Table 2.18 Agriculture emissions in the baseline scenario, Mt CO_2-e

Emissions by sub-sector	2005	2020	2025	2030	2035	2040
Grazing beef	44	41	44	44	44	44
Grain fed beef	2	3	3	3	4	4
Dairy	11	9	7	7	7	7
Sheep	22	14	15	16	16	16
Pigs	2	2	2	2	2	2
Other animals	1	1	1	1	1	1
Crops	2	1	2	2	2	3
Fertilisers	3	4	4	4	4	4
Lime and urea	2	3	3	3	3	3
Other	1	1	1	1	1	1
Total	**89**	**77**	**82**	**83**	**84**	**84**

2.11.10 Waste

Waste emissions are projected to be 13 Mt CO_2-e in 2030 and 13 Mt CO_2-e in 2040. This trend is primarily driven by declining emissions in the solid waste to landfill sector which is the largest contributor to waste emissions.

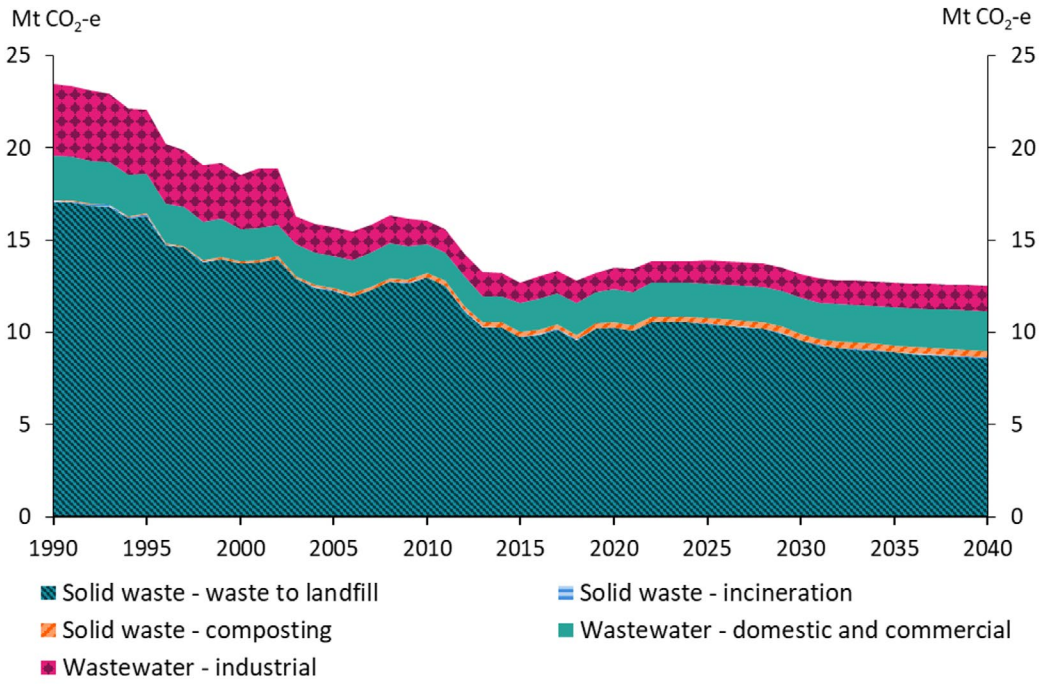

Figure 2.21 Waste emissions in the baseline 'with measures' scenario, 1990 to 2040, Mt CO_2-e

Source: DCCEEW 2024i,k

2.11.10.1 Solid waste trends

Emissions from solid waste disposal to landfill is estimated to be 10 Mt CO_2-e in 2030 and projected to decline to 9 Mt CO_2-e to 2040. The projected decline is similar to the historical emissions trend where increasing levels of recycling and resource recovery help offset the impacts of population growth on the volume of disposed waste.

Additionally, the increasing uptake of food organics and garden organics (FOGO) bins for households, and projects funded through the Recycling Modernisation Fund and approved Energy from Waste projects are predicted to partially offset landfill waste generated from population growth.

2.11.10.2 Wastewater trends

Emissions in the domestic and commercial wastewater sector are projected to increase marginally, in line with population. This increase is mitigated slightly by small projected increases in the proportion of the population connected to sewerage systems, as sewage emits less when processed in municipal wastewater facilities.

Emissions from industrial wastewater are projected to remain relatively unchanged between 2022 to 2040, with small increases in response to changes in commodity production levels.

Table 2.19 Waste emissions in the baseline scenario, Mt CO_2-e

Emissions by sub-sector	2005	2020	2025	2030	2035	2040
Solid waste to landfill	12	10	11	10	9	9
Solid waste – composting	<1	<1	<1	<1	<1	<1
Incineration	<1	<1	<1	<1	<1	<1
Domestic and commercial wastewater	2	2	2	2	2	2
Industrial wastewater	2	1	1	1	1	1
Total	**16**	**14**	**14**	**13**	**13**	**13**

2.11.11 LULUCF

Emissions from LULUCF have decreased since 1990 and are projected to reach -77 Mt CO_2-e in 2025. However, emissions are expected to increase to -64 Mt CO_2-e by 2030 and -54 Mt CO_2-e by 2040. Much of the emissions increases relate to a return to average climate conditions from an above average net sink in the three years to 2024. These trends have been partially offset by increasing abatement from Australian Carbon Credit Units (ACCU) Scheme.

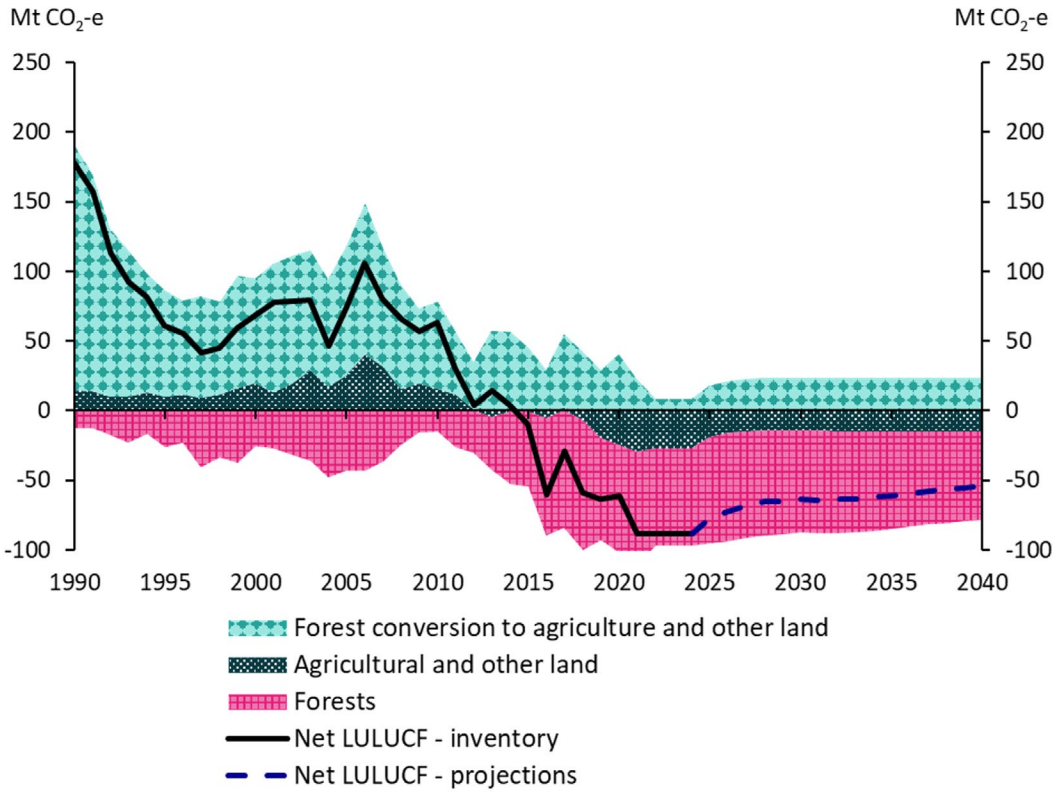

Figure 2.22 Emissions and removals from LULUCF in the baseline 'with measures' scenario, 1990 to 2040, Mt CO_2-e

Source: DCCEEW 2024i,k

2.11.11.1 Forests

The forest category includes forest land remaining forest land, land converted to forest and harvested wood products. The primary drivers of the forest lands emissions in the recent near-term are the return to average climate conditions after a period of La Niña which contributed to the significant sink in 2022. In the long term, the emissions from the declining sink in regeneration and ongoing harvesting of predominantly hardwood post 1990 plantations is projected to result in the slight decline of the sink. Those emissions will be partially offset by increasing sequestration under the ACCU scheme, and continuing sequestration in native forests, primarily driven by the cessation of harvesting in Victoria and Western Australia. Forest emissions are projected to be -73 Mt CO_2-e in 2030 and -63 Mt CO_2-e in 2040.

2.11.11.2 Agricultural and other lands

Agriculture and other lands is comprised of cropland remaining cropland, grassland remaining grassland, wetland remaining wetland, and settlements remaining settlements.

This category is sensitive to climatic variability and has been significantly affected by the greater than average soil carbon sequestration through the 2020, 2021 and 2022 La Niña events. This period of above-average rainfall and below-average temperatures and pan evaporation resulting in increased sequestration through crop and grass growth contributed to gains in soil carbon in the inventory. Following this, a return to average climatic conditions is projected to result in the sink from agricultural and other lands declining to -14 Mt CO_2-e in 2030 before stabilising to 2040. Emissions in agricultural and other lands are projected to be partially offset by abatement from agricultural carbon farming projects under the ACCU Scheme.

2.11.11.3 Forest conversions to agricultural and other lands

This category includes land converted to cropland, grassland, wetland and settlements. Historically this has been the largest source of emissions in the LULUCF sector through the loss of vegetation, burning of residues and decay of soil when land is cleared. Most forest conversion activity in Australia is to provide pastures for grazing activities, although some forest conversion occurs to support cropping, settlements, infrastructure and reservoirs.

Australia's remote sensing program published in the 2022 National Inventory Report found that land clearing activity, and resulting emissions, fell to record low levels in 2022 and strong post-drought recovery during La Niña, increased the size of the sink. The projections assumes no significant upward trend in clearing areas, especially primary clearing, which generates most emissions in this sector. Therefore, emissions are expected to remain fairly constant to 2040 at 24 Mt CO_2-e.

Table 2.20 LULUCF emissions in the baseline scenario, Mt CO_2-e

Emissions by sub-sector	2005	2020	2025	2030	2035	2040
Forests	-43	-78	-76	-73	-70	-63
Agricultural and other lands	25	-24	-19	-14	-15	-15
Forest conversion to agricultural and other lands	92	41	18	24	24	24
Total	**75**	**-61**	**-77**	**-64**	**-61**	**-54**

2.12 Emissions trends under the 'with additional measures' scenario

The 'with additional measures' scenario builds on the baseline ('with measures') scenario and provides insights into the emissions impacts of announced policies that are still subject to ongoing consultation and detailed design. The policies included in 'with additional measures' scenario are:

- The National Hydrogen Strategy, supported by the Hydrogen Headstart and Hydrogen Production Tax Incentive.
- The Critical Minerals Production Tax Incentive.
- The Industrial Transformation stream (round 1) of the Powering the Regions Fund.

The following stylised assumptions have been made about the policy settings to enable modelling for the purposes of the 'with additional measures' scenario. The measures are subject to ongoing consultation, and these assumptions should not be interpreted as final policy design decisions.

- Australia produces green hydrogen equivalent to the base targets set out in the National Hydrogen Strategy: 0.5 Mt in 2030, 3 Mt in 2035, 5 Mt in 2040.
- Some of the hydrogen is consumed in Australia including for alumina and ammonia as well as in the mining and transport sectors.
- After 2030 a growing proportion of hydrogen is exported, reaching around 65% of the hydrogen produced in Australia by 2040.
- Processing of critical minerals is increased as a result of the Critical Minerals Production Tax Incentive.

In this scenario significantly higher levels of hydrogen are produced compared to the baseline scenario. Hydrogen is produced using electrolysers connected, at first, to the electricity grid before moving largely to off-grid electrolysers powered by renewables by 2040. Hydrogen is used instead of fossil fuels mostly in sectors covered by the Safeguard Mechanism (e.g. ammonia, alumina, manufacturing), which increases the level of on-site abatement and reduces reliance on the Australian Carbon Credit Units (ACCU) Scheme to meet Safeguard Mechanism obligations. Substitution of fossil fuel with hydrogen is also projected to occur in passenger and road freight transport after 2030.

In the 'with additional measures' scenario, critical minerals production and processing is expected to more than double by 2040 compared to the baseline scenario, induced by the Critical Minerals Production Tax Incentive. The emissions associated with additional critical minerals production is relatively small due to facilities being subject the Safeguard Mechanism and powered by a largely decarbonised electricity grid.

The 'with additional measures' scenario shows that Australia is able to sustain strong emissions reductions as it positions its economy for a net zero world by pursuing economic diversification and prosperity through the Future Made in Australia plan. The following section outlines emissions trends by sector.

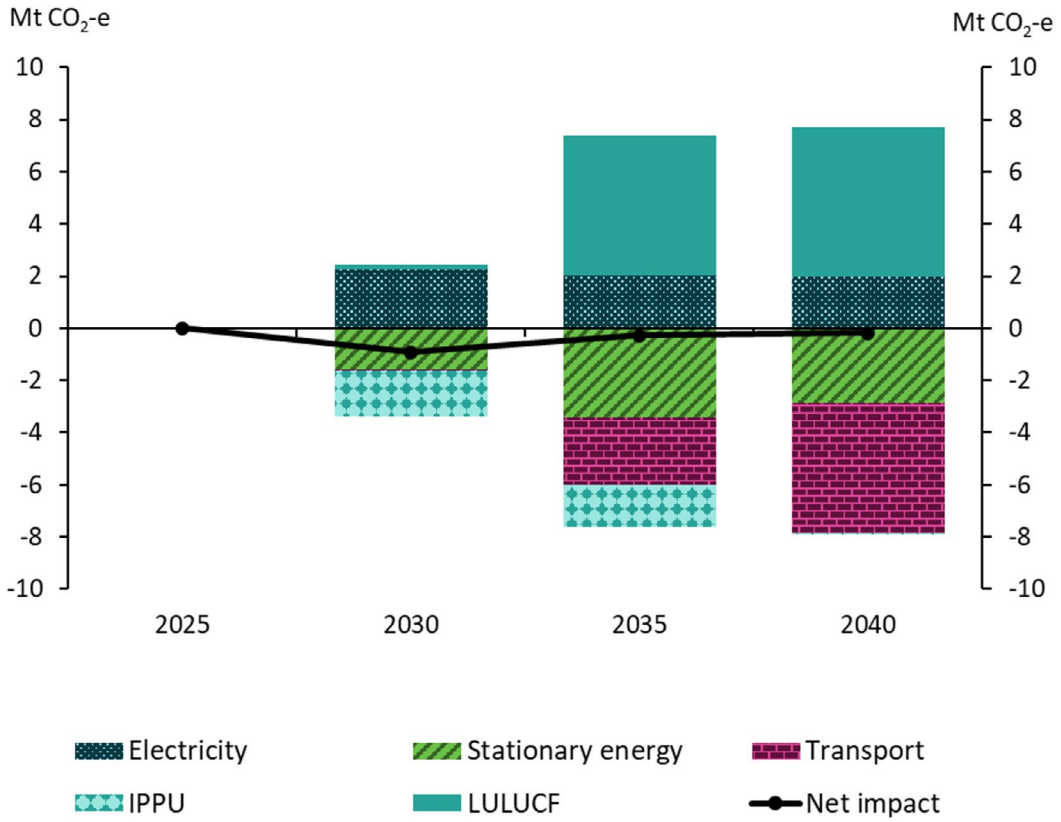

Figure 2.23 Change in emissions from baseline 'with measures' to 'with additional measures' scenario by sector, in key years, 2025 to 2040, Mt CO_2-e

Source: DCCEEW 202i.

Table 2.21 Summary of emissions projections 'with additional measures' scenario by sector and gas, Mt CO_2-e

Sector	1990	2005	2020	2022	2025	2030	2035	2040
Energy-electricity	130	197	172	157	144	61	39	31
Energy-stationary energy	66	82	100	102	96	92	77	65
Energy-fugitive	40	43	54	48	50	45	38	32
Energy-transport	61	82	93	90	100	95	84	75
Industrial processes and product use	25	30	32	33	32	25	22	20
Agriculture	95	89	77	83	82	83	84	84
Land use, land-use change and forestry	178	75	-61	-88	-77	-63	-56	-48
Waste	23	16	14	14	14	13	13	13
Total with LULUCF	**619**	**613**	**480**	**438**	**441**	**351**	**301**	**271**
Total without LULUCF	**441**	**538**	**542**	**527**	**518**	**415**	**357**	**319**

2.12.1 Energy – electricity

The 'with additional measures' scenario includes higher levels of electricity generation from higher hydrogen production and critical minerals processing when compared with the baseline scenario. New sources of electricity demand in the NEM in the form of electrolysers producing hydrogen in the 'with additional measures' scenario represents around 5% of total demand in 2030 and 9% of total demand in 2040 in the NEM. Despite this, electricity emissions are still projected to be 61 Mt CO_2-e in 2030 and to decrease to 31 Mt CO_2-e in 2040. This is because of increased uptake of renewables to power the grid and to produce hydrogen.

Australia's electricity emissions in the 'with additional measures' scenario are projected to be 4% higher (2 Mt CO_2-e) than the baseline electricity emissions projections in 2030 and 7% higher in 2040.

2.12.2 Energy – stationary energy, excluding electricity

All 3 elements of the 'with additional measures' scenario have impacts on projected stationary energy emissions. Under the 'with additional measures' scenario, stationary energy emissions are projected to be 92 Mt CO_2-e in 2030 and to decrease to 65 Mt CO_2-e in 2040. This represents a 2% decrease in 2030, and a 4% decrease in 2040, compared to the baseline scenario.

There is a slight increase in stationary energy emissions from the increased production of critical minerals under the Critical Minerals Production Tax Incentive. This is projected to be more-than-offset by the decrease in emissions due to higher hydrogen consumption predominantly at Safeguard facilities, and the impact of the Industrial Transformation Stream when compared to the baseline. Hydrogen consumption is expected to grow over time and is assumed to be mostly used within the alumina and ammonia manufacturing industries.

2.12.3 Energy – fugitive

Fugitive emissions in the 'with additional measures' scenario are unchanged compared to the baseline scenario.

2.12.4 Energy – transport

Only the hydrogen component of the 'with additional measures' scenario impacts the transport emissions projections. Use of hydrogen in the transport sector is estimated to lower emissions from 2030, with abatement growing to 5 Mt CO_2-e in 2040. The use of hydrogen will have the biggest impact on road freight (4 Mt CO_2-e in 2040), with smaller reductions (under 1 Mt CO_2-e in 2040) in domestic aviation, domestic navigation, rail transport and passenger road transport. Transport emissions are projected to be 95 Mt CO_2-e in 2030 and 75 Mt CO_2-e in 2040 and is 1% lower in 2030 and 6% lower in 2040 when compared to the baseline scenario.

2.12.5 Industrial processes and other product use

The hydrogen component of the 'with additional measures' scenario primarily affects emissions from ammonia production as hydrogen is assumed to replace natural gas as a feedstock. Use of hydrogen in ammonia production is estimated to lower emissions from 2028 when compared with the baseline scenario, with estimated abatement of just under 2 Mt CO_2-e in 2030, decreasing to just under 1 Mt CO_2-e in 2040.

The critical minerals component of the 'with additional measures' scenario impacts the metal and mineral sub-sectors, increasing emissions from 2032 by a small amount when compared with the baseline scenario. These emissions are estimated to increase by just under 1 Mt CO_2-e in 2040.

In aggregate, IPPU emissions are projected to be 25 Mt CO_2-e in 2030 and to decrease to 20 Mt CO_2-e in 2040. Australia's IPPU emissions are projected to be 6% lower (2 Mt CO_2-e) than the baseline IPPU emissions projections in 2030 but then converge toward the baseline scenario (less than 1% (less than 1 Mt CO_2-e) lower than the baseline in 2040.

2.12.6 Agriculture

Agriculture emissions in the 'with additional measures' scenario are unchanged compared to the baseline scenario.

2.12.7 Waste

Waste emissions in the 'with additional measures' scenario are unchanged compared to the baseline scenario.

2.12.8 LULUCF

In this scenario there is a net increase in LULUCF emissions as a result of reduced sequestration activities under the ACCU Scheme. This is because Safeguard facilities are projected to meet more of their Safeguard obligations through onsite abatement using hydrogen, compared to the baseline scenario.

Net LULUCF emissions are projected to be -63 Mt CO_2-e in 2030 and is expected to increase to -48 Mt CO_2-e in 2040. Net LULUCF emissions are projected to be 0.2 Mt CO_2-e higher in 2030 and 6 Mt CO_2-e higher in 2040 when compared to the baseline scenario.

2.13 Projections of international bunker fuels emissions

International bunker fuel emissions result from international aviation and international marine transport activities. These emissions are excluded from the national inventory total, by international agreement. Emissions from international bunker fuels supplied in Australia were 5 Mt CO_2-e in 2021 and 7 Mt CO_2-e in 2022 as transport activity was impacted by the COVID-19 pandemic restrictions on travel. Emissions are projected to be 19 Mt CO_2-e in 2030 and 22 Mt CO_2 -e in 2040, an increase of 198% above 2022 levels. When compared to the pre-COVID year of 2019, emissions increase by 9% in 2030 and by 22% in 2040.

The largest source of emissions is from the international aviation sector, accounting for 5 Mt CO_2-e in 2022 or 74% of international bunker fuels emissions. Activity in this sector is projected to increase with emissions projected to rise to 17 Mt CO_2-e in 2030 and 19 Mt CO_2 -e in 2040. International marine transport emissions were 1.9 Mt CO_2-e in 2022. Emissions from Australia's international marine transport sector is projected to increase slightly, with demand for Australia's resources and commodities likely to lead to increased export volumes. Emissions are projected to grow to 2.3 Mt CO_2-e in 2030 and 2.6 Mt CO_2-e in 2040.

International bunker fuel emissions are calculated from projections of activity and emission intensity. International aviation activity forecasts are obtained from the Bureau of Infrastructure and Transport Research Economics (BITRE). International marine activity projections are derived from historical growth rates and estimates from the Resource and Energy Quarterly (REQ). International aviation emission intensities are indexed to Australia's projection of domestic aviation emissions intensity. This includes efficiency improvements and some fuel switching to sustainable aviation fuel (SAF). International marine emission intensities are assumed to improve in line with historical trends.

This projection does not take account of targets and ambitions under the International Civil Aviation Organization (ICAO) and International Maritime Organization (IMO). Depending on actions taken under these targets and ambitions, emissions from both international aviation and marine could be lower than currently estimated but cannot be reliably quantified at this time. Australia is an active supporter of ICAO's efforts to reduce aviation emissions. At the ICAO 41st Assembly in October 2022 Australia fully supported the endorsement of a long-term aspirational goal (LTAG) for international aviation of net zero carbon emissions by 2050. Other measures that complement the goal include the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). CORSIA aims to cap international aviation emissions at a global baseline and encourage sustainable aviation fuel use to reduce emissions and offsetting where the baseline is exceeded. With the support of our international airlines Australia has participated in the voluntary phase of CORSIA since it commenced in 2019.

As a member state, Australia supports the IMO's efforts to reduce greenhouse gas emissions from international shipping. This includes the IMO's energy efficiency (carbon intensity) measures, commenced 1 January 2023, and the 2023 IMO Strategy for the Reduction of GHG Emissions from International Shipping, agreed in July 2023. The latter sets a global ambition to reduce shipping GHG emissions to net zero by, or around (i.e. close to) 2050, with interim check points of at least 20%, striving for 30% by 2030 and at least 70%, striving for 80% by 2040 compared to 2008. There is an additional ambition for the uptake of zero or near zero GHG emissions technologies, fuels and/or energy sources to represent at least 5% – striving for 10% – of the energy used by international shipping by 2030. The Australian Government is actively engaged in negotiating agreement by 2025 to the regulatory framework to reach these ambitions. Australia is also establishing Green Shipping Corridor Partnerships, with an MoU signed between Australia and Singapore in 2024.

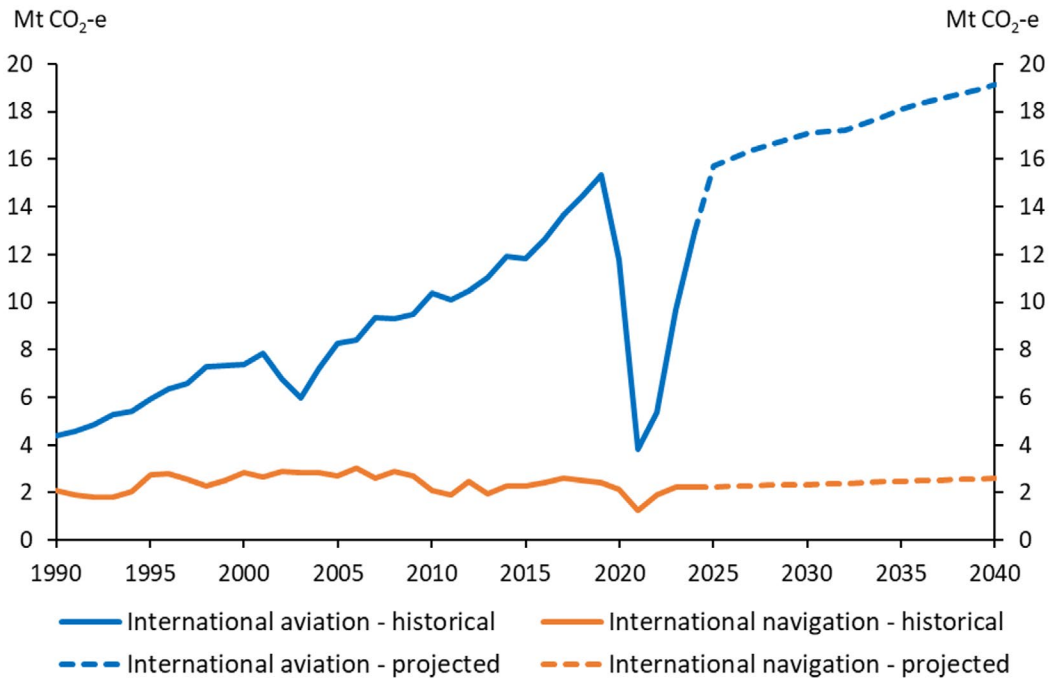

Figure 2.24 Emissions from international bunker fuels, 1990 to 2040, Mt CO_2-e

2.14 Australia's methodology

Australia's emissions projections are compiled using the United Nations Framework Convention on Climate Change (UNFCCC) accounting approach consistent with Australia's accounting against its 2030 targets. Reporting years for all sectors are reported for Australian financial years as key data sources and published on this basis. For example, '2030' refers to the financial year 1 July 2029 to 30 June 2030.

Australia's emissions projections comprise emissions of CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3 across the economy that are included in Australia's annual national greenhouse gas inventory. The emissions projections include all anthropogenic sources and sinks across Australia's economy, and ensures Australia's accounting is complete. Australia does not project indirect GHG emissions.

Emissions from the energy, Industrial processes and product use (IPPU), agriculture and waste sectors are included. The land use, land use change and forestry (LULUCF) sector has both emission sources and sinks that remove or sequester carbon dioxide from the atmosphere.

Australia applies the 100-year global warming potential values from the IPCC Fifth Assessment Report (AR5) to estimate emissions, consistent with rules adopted under the Paris Agreement (Decision 18/CMA.1 Annex 2.D Paragraph 37).

For details on assumption of policies and measures, see Appendix A.

2.14.1 Institutional arrangements, quality assurance

The projections are prepared using the best available data and expertise. DCCEEW engages with a technical working group comprising of representatives from Australian Government agencies to test the methodologies, assumptions, and projections results.

Australia values the engagement, review and feedback that comes from technical reviews by expert review teams coordinated by the UNFCCC secretariat. Australia 8th National Communication and 5th Biennial report was subject to an in-country review in 2024.

2.14.2 Key data sources

The key data sources used in the compilation of the emissions projections include:

- historical emissions data from the National Inventory Report 2022 (DCCEEW 2024g)
- the latest *Quarterly Update of Australia's National Greenhouse Gas Inventory: June 2024* (DCCEEW 2024k)
- commodity forecasts and activity levels informed by publications and data from government agencies and other bodies, including:
  - the Office of the Chief Economist within the Department of Industry, Science and Resources
  - the Australian Bureau of Agricultural and Resource Economics and Sciences
  - the Australian Energy Market Operator (AEMO)
  - the Clean Energy Regulator (CER).

Sector specific data sources, methodologies and models are described in Appendix B.

2.14.3 Changes in methodology since Australia's 5th Biennial Report

As this is Australia's first Biennial Transparency Report, changes in the methodology since Australia's 5th Biennial Report are outlined below. Since the 5th Biennial Report, there have been updates to inventory estimates, projections of sectoral activity data and the inclusion of new policies and measures. New policies that have been incorporated in the baseline ('with measures') since Australia's 5th Biennial Report include:

- the reforms to the Safeguard Mechanism
- the expanded Capacity Investment Scheme (CIS) which will deliver on the government's target to achieve 82% renewable on-grid generation, nationally, by 2030
- the National Electric Vehicle Strategy
- the New Vehicle Efficiency Standard
- announced projects under the Safeguard Transformation and Critical Inputs to Clean Energy Industries streams of the Powering the Regions Fund
- the Regulatory ban on the import and manufacture of small air conditioning equipment using refrigerants with a global warming potential (GWP) over 750.

In addition, the most important changes to the emissions projections methodology and models are:

- the development of a facility level model to estimate the impact of the Safeguard Mechanism (see Appendix A for further details)
- improvements to the ACCU Scheme model that projects increased ACCU demand from the reforms to the Safeguard Mechanism, balances supply and demand over the long-term and takes account of the current project pipeline and expectations of future supply for each project type.
- changes to the transport model to take a top-down approach to enable modelling of the NVES (see Appendix A and the Transport chapter in Appendix B for further details).

The impact of these updates are included in changes to projected emissions for 2030 (Table 2.22).

Table 2.22 Comparative sectoral breakdown of projections for 2030 under a 'with measures' scenario, UNFCCC accounting, Mt CO_2-e

Greenhouse gas emission projections (Mt CO_2-e)	Electricity	Stationary energy (excluding electricity)	Transport	Fugitives	IPPU	Agriculture	Waste	LULUCF	Total emissions
8th National Communication and 5th Biennial Report	79	101	103	55	28	79	11	-33	422
First Biennial Transparency Report	68	93	95	45	27	83	13	-64	361

2.15 Other information

2.15.1 Facilitating improved reporting and transparency over time

Australia is committed to continuous improvement and transparency of its reporting over time, and, to the extent possible, identifying and regularly updating and including information on areas of improvement.

To this end Australia's first Biennial Transparency Report has addressed some of the recommendations and encouragements from the technical expert review of Australia's 8th National Communication on Climate Change and the 5th Biennial Report. In response, section 2.8 outlines how impact analyses are conducted as part of the policymaking process and includes a case study to demonstrate it in practice (UNFCCC 2024).

Refer to Chapter 4, section 4.6 for further examples of Australia's improved reporting and transparency.

2.16 Chapter 2 – Appendix A: Assumptions on the policies and measures included in the projections

This section describes the assumptions for the policies and measures with the largest impact on the emissions projections. Additional information on other policies and measures and how these are incorporated in sectoral projections are described in Appendix B.

2.16.1 Baseline ('with measures') scenario

2.16.1.1 Electricity Sector Renewable Energy Targets and policies

The emissions projections include federal and state and territory policies that have an impact on electricity emissions. These include measures and targets to support increasing renewable generation and the orderly closure of coal power stations. See the Electricity chapter of Appendix B for further details of policy assumptions included in the emission projections.

2.16.1.2 New Vehicle Efficiency Standard (NVES)

The NVES imposes a regulatory obligation on car makers to supply vehicles that, on average, meet a certain CO_2-e grams/km emissions target. The target is reduced over time, which encourages suppliers to provide more efficient light vehicles. The NVES is technology neutral and encourages suppliers to sell more fuel-efficient vehicles, be they petrol, diesel, hybrid or EVs. To reflect the policy, the transport emissions model takes a top-down approach by considering activity levels and the emissions intensity of vehicles. The NVES currently specifies emission limits until 2029, after which these projections assume annual improvements will revert to the historical trend. A statutory review of the NVES is required to commence in 2026 to consider future NVES policy settings, including emissions limits after 2029. Figure 2.25 shows the average 'real world' emissions intensities of new vehicles used in the emissions projections. 'Real world' emissions are typically higher than the laboratory tests reported by manufacturers.

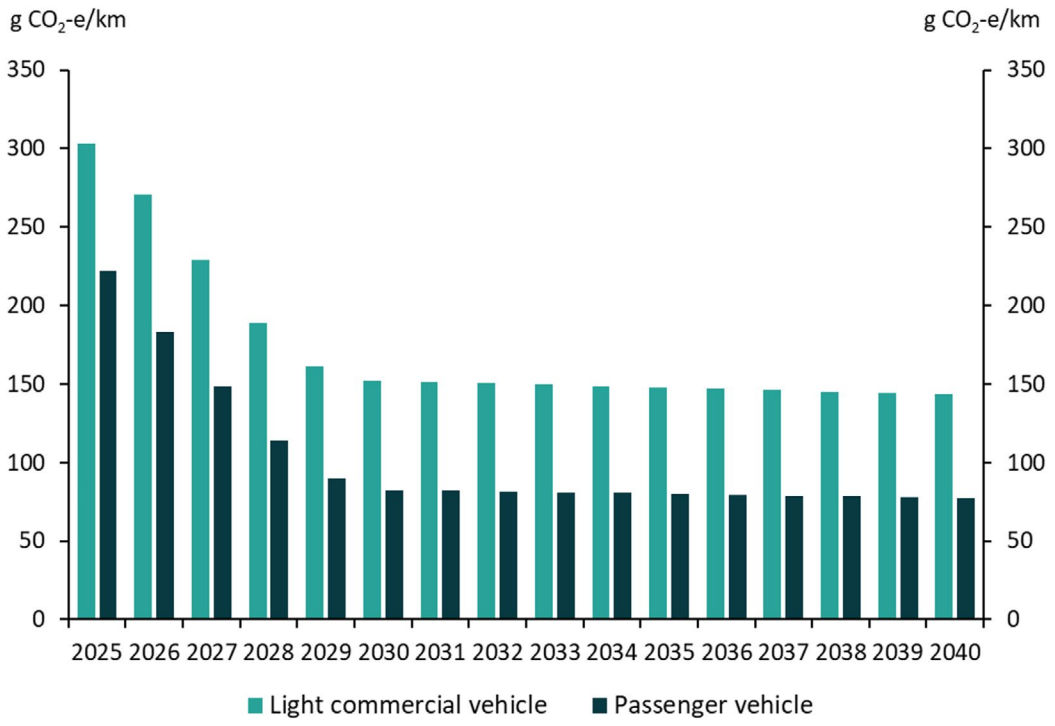

Figure 2.25 Projected real-world light vehicle emission intensities (average new vehicle), 2025 to 2040, grams CO_2-e per km

Source: DCCEEW 2024i

2.16.1.3 Safeguard Mechanism

The Safeguard Mechanism provides a legislated framework that sets limits, known as baselines, on the net emissions of large industrial facilities. The Safeguard Mechanism applies to facilities emitting more than 100,000 t CO_2-e of scope 1 emissions each year, including in mining, oil and gas production, manufacturing, transport and waste. Safeguard baselines are assumed to decline by the default rate of 4.9% each year to 2030, and the indicative rate of 3.285% each year beyond 2030. The actual decline rate beyond 2030 will be set in five-year blocks, consistent with updates to Australia's Nationally Determined Contribution (NDC) under the Paris Agreement. The Safeguard baseline projections also incorporate estimates of facilities expected to qualify for a lower baseline decline rate under trade-exposed baseline-adjusted (TEBA) arrangements. Facilities can meet their Safeguard obligations through a combination of on-site emission reductions at the facility; for example, through efficiency improvements or technology upgrades, and through the surrender of the Australian Carbon Credit Units (ACCU) Scheme or Safeguard Mechanism Credits (SMCs).

Baselines for existing facilities are set using a hybrid model initially weighted towards the use of site-specific emissions intensity values, transitioning to industry average emissions intensity values by 2030.

All new facilities will be given baselines set at international best practice levels, adapted for an Australian context. The baseline for reservoir carbon dioxide emissions of new gas fields supplying liquefied natural gas facilities is zero. Shale gas projects, including those in the Beetaloo Basin, must have net-zero scope 1 emissions from entry.

Australia uses a facility-specific model to estimate the impact of the Safeguard Mechanism reforms. The model estimates the:

- business-as-usual emissions assuming constant emissions intensities
- emissions reductions that occur on-site at facilities in response to the Safeguard Mechanism
- demand for ACCUs and SMCs to meet Safeguard compliance obligations.

To be able to project the impact of the Safeguard Mechanism, business-as-usual emissions are first projected, informed by production forecasts and emission intensities as outlined in the methodology section. These are called 'Safeguard facility business-as-usual emissions'. In the model, the difference between business-as-usual emissions and baselines can be met through on-site emissions reductions and/or through surrendering ACCUs or SMCs.

Australia commissioned energy consulting company RepuTex (in 2024) to provide on-site abatement estimates for Safeguard facilities, both at the individual facility level and by technology and IPCC sector.[7] In this analysis the uptake of abatement technology is informed by a Marginal Abatement Cost (MAC) model, covering over 100 decarbonisation activities for each year across projections outlook. Changes in MACs over time are informed by forecast changes in fuel and electricity prices as well as decreases in Capital Expenditure (CAPEX) for emerging technologies. The analysis also provided the estimated change in the type and/or quantity of fuel used in Safeguard facilities from abatement uptake. Based on this analysis, facilities prioritise low-cost process improvements first and then invest in large-scale projects including some assumed to be funded under the Safeguard Transformation stream of the Powering the Regions Fund, bringing forward activities that may not otherwise be cost-effective. The analysis also accounted for successful projects under the Powering the Regions Fund. These estimates were calibrated to DCCEEW's facility-by-facility projections of production. These estimates are also used to estimate the creation of SMCs.

The emissions reductions from on-site improvements and projects are incorporated into the emission projections for the electricity, stationary energy, fugitives, transport, IPPU and waste sectors. The emissions occurring at Safeguard facilities after taking account of these improvements and technology projects are called 'gross emissions'. In some cases, these improvements and technology projects reduce emissions at facilities such that a facility is no longer a covered Safeguard facility (i.e. its gross emissions fall below the 100,000 t CO_2-e threshold). Gross emissions 'all business-as-usual Safeguard facilities' refers to aggregate emissions from Safeguard facilities that would be covered under as 'business as usual' scenario, but whose emissions have fallen below 100,000 t CO_2-e after taking into account on-site abatement. 'Gross emissions Safeguard covered facilities' refer to aggregate emissions from covered Safeguard facilities only (i.e. above 100,000 t CO_2-e).

Once Safeguard gross emissions are estimated, the Safeguard model estimates the units (ACCUs and SMCs) needed to meet facility baselines. This is called 'net demand for units'. Facilities generate SMCs when their gross emissions are below their Safeguard baseline. These SMCs can be sold or banked to meet their own future Safeguard compliance obligations. Facilities may also need to purchase ACCUs. The net demand for ACCUs is an input to the ACCU model which projects supply and demand in the ACCU market.

The projections estimate of Safeguard baselines, on-site emission reductions and net demand for units in the baseline scenario are outlined in Table 2.23.

[7] RepuTex is an energy consulting company that provides price information, analysis and advisory services for the Australian carbon and electricity commodity markets.

Table 2.23 Safeguard emissions, on-site emission reductions and net demand for units in the baseline scenario, Mt CO_2-e

Emissions by sub-sector	2025	2030	2035	2040	2024–2030	2024–2040
Safeguard business-as-usual emissions[a]	**141**	**144**	**139**	**133**	**1,005**	**2,398**
On-site emission reductions[b]	-4	-22	-41	-55	-79	-498
Gross emissions all 'business-as-usual Safeguard facilities'[c]	**136**	**122**	**99**	**78**	**926**	**1,900**
Gross emissions Safeguard-covered facilities[d]	**136**	**121**	**96**	**75**	**924**	**1,871**
Net demand for units	-9	-25	-30	-32	-110	-409
Safeguard aggregate baselines[e]	**127**	**96**	**66**	**43**	**813**	**1,462**
Safeguard net emissions	**122**	**88**	**62**	**42**	**768**	**1,371**

Note: totals may not sum due to rounding

[a] Business as usual emissions in the absence of the Safeguard reforms are estimated by holding the emissions intensity of production fixed at current levels.

[b] 'On-site emission reductions' refer to aggregate on-site emission reductions from Safeguard facilities with BAU emissions above 100,000 tonnes CO_2-e in a given year.

[c] 'Gross emissions at all 'business-as-usual Safeguard facilities' are the aggregate on-site emissions of all facilities that were expected to be above the 100,000 tonnes CO_2-e threshold before the Safeguard reforms were implemented and on-site emissions reductions occurred. That is, it includes facilities whose emissions were above 100,000 t CO_2-e but then fall under 100,000 t CO_2-e after undertaking on-site emissions reductions.

[d] 'Gross emissions at Safeguard-covered facilities' are aggregate on-site emissions of Safeguard facilities that remain above the 100,000 tonnes CO_2-e threshold after on-site emissions reductions.

[e] Safeguard aggregate baselines are the sum of facility-level baselines.

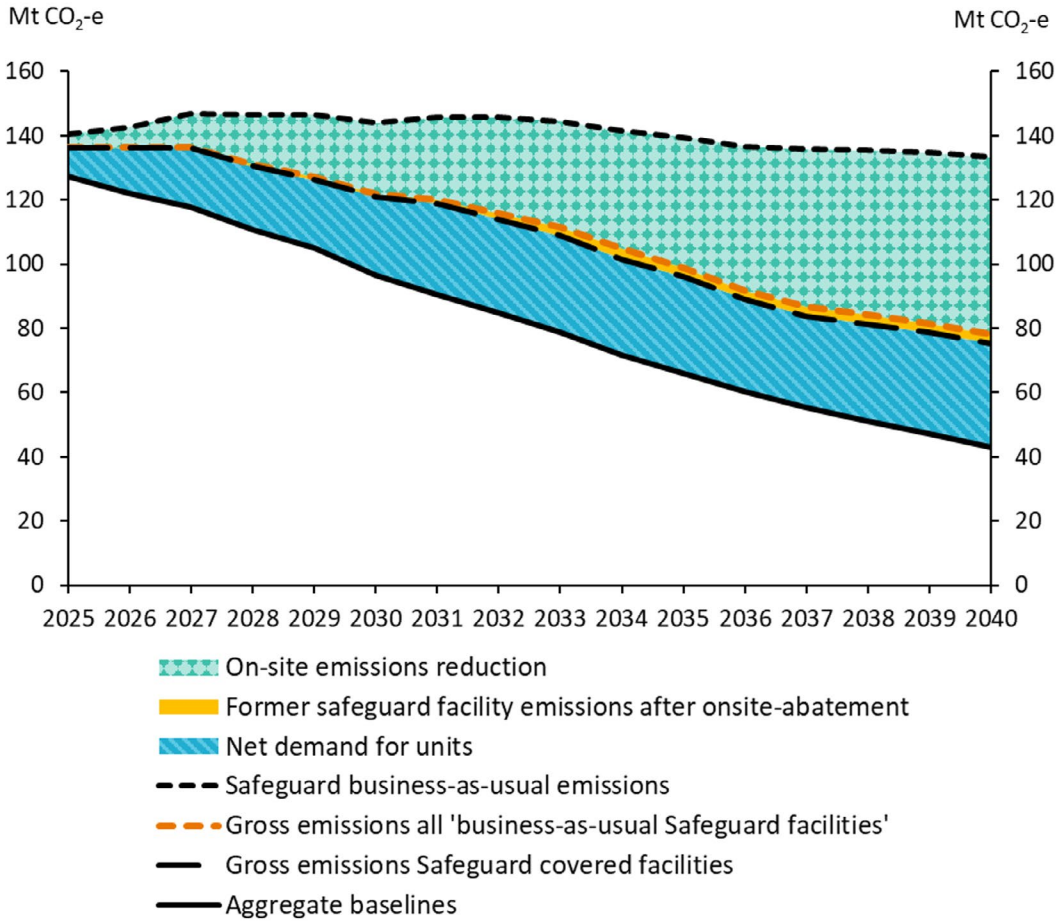

Figure 2.26 Safeguard business-as-usual, gross emissions, on-site emissions reductions and net demand for units in the baseline 'with measures' scenario, 2025–40, Mt CO_2-e

Source: DCCEEW 2024i

2.16.1.4 Australian Carbon Credit Units

An ACCU supply model is used to project ACCU supply by project type. These projections of ACCU supply flow through to the sectoral models as emissions reductions or removals. The majority of ACCU supply is expected to be generated from the LULUCF sector.

ACCU demand is projected from:

- Safeguard facilities, based on outputs from the Safeguard Mechanism model
- deliveries of ACCUs to Government, based on current fixed and optional carbon abatement contracts and estimated delivery rates
- Climate Active, based on internal estimates
- other sources of voluntary, state/territory and compliance demand, based on internal estimates.

Projections of ACCU supply are based on a range of inputs including forecasts of ACCU supply by project type, the latest data of known projects likely to generate ACCUs, the current project pipeline, expert advice on the expected outlook for certain project types and the expected time required to commence projects and ramp-up abatement. ACCUs do not need to be used in the year they are issued and can be held by market participants for future use or sale. ACCU supply, demand and unit holdings estimated in the baseline scenario of these projections are at Figure 2.27.

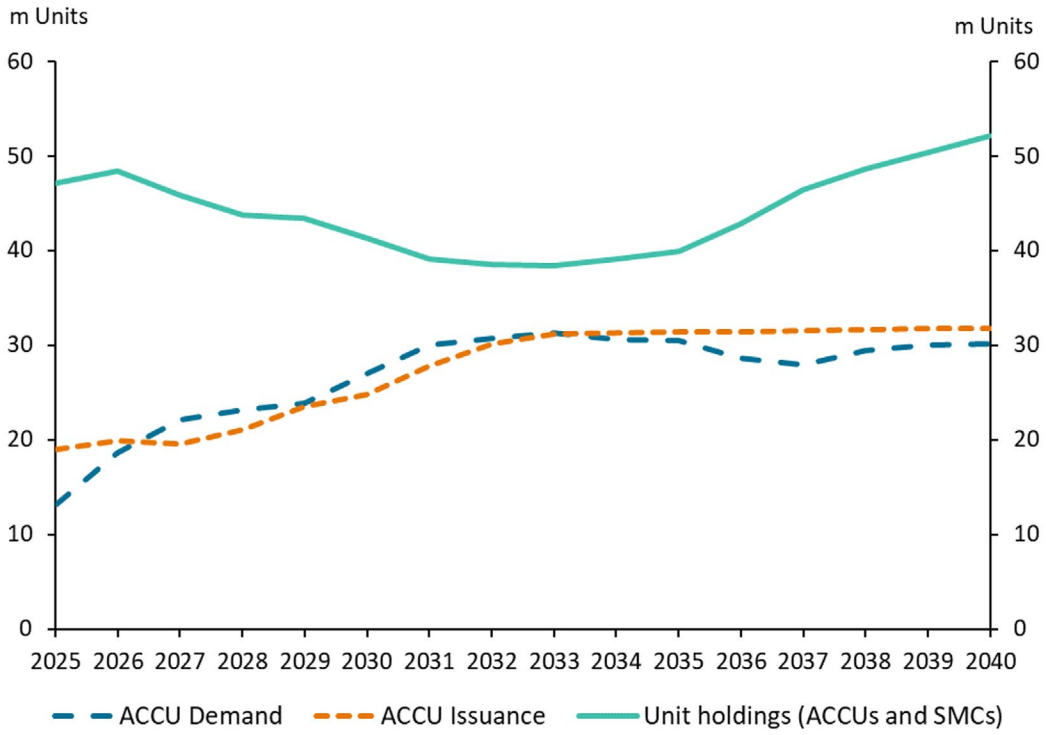

Figure 2.27 Projected ACCU issuance, demand and unit holdings in the baseline 'with measures' scenario, 2025 to 2040, million units

Source: DCCEEW 2024i

2.16.2 'With additional measures' scenario

The 'with additional measures' scenario provides insights into the emissions impacts of the following announced policies that are still subject to ongoing consultation and detailed design:

- the National Hydrogen Strategy, released in September 2024, supported by Hydrogen Headstart and the Hydrogen Production Tax Incentive
- the Critical Minerals Production Tax incentive
- the Industrial Transformation Stream (round 1) of the Powering the Regions Fund.

2.16.2.1 Hydrogen

The assumptions for modelling the impact of the National Hydrogen Strategy, supported by Hydrogen Headstart and the Hydrogen Production Tax incentive, are outlined below in Table 2.24. These assumptions are informed by Australia's National Hydrogen Strategy and National Hydrogen Infrastructure Assessment.

Table 2.24 Summary of hydrogen assumptions

Assumption	2030	2035	2040
Hydrogen production	0.5 Mt	3 Mt	5 Mt
Proportion of hydrogen exported	0%	60%	64%
Proportion of electrolysers located off-grid	31%	81%	88%

Note: 'Off-grid' refers to all locations where small electricity networks operate, and includes 'microgrids' not connected to the NEM, WEM, DKIS and NWIS.

The 'with additional measures' scenario assumes hydrogen production levels consistent with the National Hydrogen Strategy. To 2030 it is assumed that most hydrogen is produced using electrolysers that are connected to the NEM, the electricity grid covering the east coast of Australia. Electricity emissions associated with grid connected electrolysers are calculated using the emission intensities from the baseline electricity emissions projections. Although individual projects will likely contract with additional renewable generation, the 'with additional measures' scenario assumes that the renewable share and emissions intensity of the NEM is the same as the baseline for modelling purposes. As production of hydrogen increases, more electrolysers are assumed to be constructed off-grid which run entirely on renewable electricity generation. By 2040, 88% of hydrogen is produced using off-grid electrolysers.

Is it assumed that all hydrogen produced in Australia up until 2030 is consumed domestically. At first hydrogen is predominantly used for ammonia production and alumina refining before being deployed more widely in other manufacturing, mining and freight transport. With the exception of freight transport, these sectors are covered by the Safeguard Mechanism. It is assumed that the use of hydrogen in these sectors contributes to greater on-site abatement undertaken to meet Safeguard baselines, reducing the need to purchase ACCUs. The ACCU supply in the projections is adjusted to take account of this reduced demand. Abatement from hydrogen use is applied to the stationary energy, transport and industrial processes and product use sectors. After 2030 Australia begins to export hydrogen and ammonia as an energy carrier with exports growing 60% of production in 2035 and 64% in 2040.

2.16.2.2 Critical minerals

The critical minerals production tax incentive (CMPTI) is assumed to induce additional processing and refining of critical minerals than what is included in the baseline emission projections. The critical minerals included in the analysis are listed below:

- Nickel
- Lithium hydroxide
- Cobalt
- Graphite
- Vanadium
- High Purity Alumina
- Neodymium-Praseodymium oxide
- Dysprosium oxide
- Silica (silicon metal)
- Finished magnesium products.

Direct (Scope 1) emissions associated with this activity are calculated using international best practice emission intensities estimated under the Safeguard Mechanism (Australian Government 2015) where available or equal to existing or planned facilities of the same type when Safeguard International Best Practice Benchmarks are not available.[8]

As the critical minerals production is projected to generate emissions at some processing facilities of greater than 100,000 tonnes CO_2-e per year, it is subject to declining baselines under the Safeguard Mechanism that can be met through on-site abatement or the purchase of ACCUs. ACCU supply in the projections is adjusted to take account of this additional demand.

In addition to direct emissions, it is assumed that critical minerals production consumes electricity imported from the grid. Electricity emissions are calculated using estimated electricity consumption and the average emission intensities of the grid from the 2024 emissions projections.

[8] Best practice emissions intensity published in the National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015.

2.17 Chapter 2 – Appendix B: Emissions projections methodology summary

Australia's emissions projections incorporate a variety of data inputs, assumptions and methods. This appendix provides details on the modelling approach for sectors included in the emissions projections.

2.17.1 Electricity

2.17.1.1 Modelling approach

The electricity sector emissions projections have been prepared using PLEXOS energy modelling software for the National Electricity Market (NEM), Western Australia's Wholesale Electricity Market (WEM) and Darwin Katherine Interconnected System (DKIS), and Microsoft Excel modelling for off-grid electricity generation and the North West Interconnected System (NWIS).

The electricity sector is modelled in CO_2-e where the share of each greenhouse gas (GHG) is derived from inventory data at the most disaggregated level possible.

2.17.1.2 NEM, WEM and DKIS

PLEXOS is used to project emissions from Australia's NEM, WEM and DKIS electricity grids to 2040. PLEXOS is used for simulating energy market outcomes, including long-term investment planning and short-term half-hourly market dispatch behaviour. The PLEXOS modelling framework includes both an investment model and a dispatch model. For the NEM, this modelling framework has been adapted from the 2024 Integrated System Plan (ISP) model published by the Australian Energy Market Operator (AEMO). The investment model determines the required capacity mix to meet demand at the lowest system cost, subject to constraints. The dispatch model uses the capacity outputs from the investment model and performs a detailed short-term dispatch of both generation and storage assets to meet demand in each half-hourly interval. New large interconnector projects in the NEM are exogenous inputs into the model, in line with the progressive change pathway under AEMO's 2023 Inputs, Assumptions and Scenarios Report (IASR) (AEMO 2024a), and advice from DCCEEW.

The emissions projections are developed on the basis of adopted policies and measures as of September 2024. The baseline emissions projections, for the first time, include the government's expanded Capacity Investment Scheme (CIS). Through the CIS the government seeks competitive tender bids for variable renewable capacity and clean dispatchable capacity projects to deliver an additional 32 GW of capacity by 2030 and fill expected reliability gaps as ageing coal-fired power stations exit the market. A proportion of the total capacity under the expanded CIS will be allocated to specific jurisdictions through bilateral Renewable Energy Transformation Agreements, ensuring investment through the CIS complements investment under state systems. The CIS, along with state renewable targets and plans, will support delivering the government's 82% renewable electricity generation target for on-grid electricity (NEM (including Mt Isa), WEM, NWIS and DKIS) by 2030.

The projections assume that state renewable energy targets will be met in Queensland,[9] Victoria and Tasmania and include the New South Wales Electricity Infrastructure Road Map[10] (Table 2.24).

The Queensland Energy and Jobs Plan, Victoria's Energy Storage Targets[11] and Victoria's Offshore Wind Targets[12] also contribute to the projected decline in electricity emissions in the NEM. The WEM also sees large deployment of renewables and storage over the projections period due to the Western Australian Government's renewables announcement of 810 MW of new wind capacity and 4,400 MWh of storage.[13]

The projections include public closure announcements and state commitments including: Eraring power station closing in 2027; agreements between the Victorian Government and the owners of Yallourn and Loy Yang A Power station regarding their closures; Western Australia's commitment to close publicly owned power stations, Collie and Muja D, by 2030; and conversion of all publicly owned coal-fired power stations in Queensland to clean energy hubs by 2035[14] . The emissions projections include policies, transmission upgrades, and new or expanding projects as publicly announced. Rewiring the Nation is included in the projections to the extent that it supports delivery of national, state and territory renewable targets and plans, delivering new transmission and facilitating the connection of new renewable energy generation.

[9] The electricity emissions projections modelling was finalised prior to the Queensland 2024 State General Election and reflects the policies and targets of the government at that time.
[10] Targets: 12 GW of new renewable capacity and 2 GW of long-duration storage (e.g., pumped hydro storage) additional to Snowy 2.0 by 2030.
[11] Target of 2.6 GW of renewable energy storage capacity by 2030 and 6.3 GW by 2035.
[12] Offshore wind targets of 2 GW by 2032, 4 GW by 2035 and 9 GW by 2040.
[13] A megawatt (MW) is a unit of measurement for power or how much energy can be delivered per unit of time; and a megawatt hour (MWh) is a unit of measurement of energy, equivalent to 1 MW of power supplied/consumed for 1 hour.
[14] As of September 2024, noting a state election has since occurred.

Assumptions regarding build costs are informed by the 2024 GenCost current policies scenario (Commonwealth Scientific and Industrial Research Organisation (CSIRO) 2024).

2.17.1.3 Off-grid

Off-grid refers to all locations where small electricity networks operate, and includes 'microgrids' not connected to the NEM, WEM, DKIS and NWIS. Off-grid electricity demand is predominantly from industrial users for mining and liquefied natural gas (LNG) production.

Off-grid electricity emissions are calculated using 2 models. The first is a bottom-up model that is driven by the production of LNG at individual facilities, with production assumptions in line with estimates under the fugitive emissions sector modelling and electricity use assumptions based on information reported by facilities under the National Greenhouse and Energy Reporting (NGER) Scheme. The second is a top-down model that is driven by demand for off-grid electricity excluding LNG and assumptions of changes in the fuel mix, in particular the uptake of solar and wind technology.

It is assumed that some non-electricity facilities covered by the Safeguard Mechanism will choose to reduce emissions through fuel switching and electrification, and this contributes to additional electricity demand. In the off-grid modelling, additional demand from Safeguard facilities is assumed to be met by renewable generation.

For off-grid generation, emissions are calculated by the following equations for LNG and non-LNG off-grid electricity, respectively:

$$E_t = \sum_i (EF_{it} \cdot EC_{it} \cdot P_{it})$$

Where:

E_t = LNG off-grid electricity emissions in year t (Mt CO_2-e)

EF_{it} = facility-specific electricity emissions intensity factor in year t (Mt/MWh)

EC_{it} = facility-specific electricity consumption factor for unit of production in year t (MWh/Mt)

P_{it} = production at facility i in year t (Mt).

$$E_t = \sum_i (Ef_i \cdot Fc_i \cdot G_{it})$$

Where:

E_t = annual non-LNG off-grid electricity emissions in year t (Mt CO_2-e)

Ef_i = emissions factor for consumption by fuel i (Mt CO_2-e /PJ)

Fc_i = fuel consumption factor per unit of electricity generation (PJ/GWh)

G_{it} = electricity generation by fuel i in year t (GWh).

2.17.1.4 Activity data

2.17.1.4.1 NEM, WEM and DKIS

Forecasts of electricity demand are a key input into the electricity sector emissions projections. AEMO's 2024 ISP (AEMO 2024b) is used to inform electricity demand projections for the NEM and the 2024 WEM Electricity Statement of Opportunities (ESOO) is used for the WEM (AEMO 2024c).

The ISP 2024 step change scenario for the NEM and the expected growth scenario for the WEM were used as the basis for the projections demand series. However, some adjustments were made as outlined below.

AEMO's electricity demand series is adjusted to account for differences in the consumption of electricity from electric vehicles (EVs), grid connected electrolyser demand, energy efficiency measures and electrification that are reflected in other sectors in the projections. The electricity emissions projections include consumption of electricity from electric vehicles consistent with estimates provided by the transport sectoral expert and electrification assumptions consistent with estimated in the stationary energy sector.

Data and information from the Utilities Commission of the Northern Territory (Utilities Commission of the Northern Territory 2024), which include demand forecasts by AEMO for the Commission, and trends from PLEXOS analysis are used in modelling the DKIS.

2.17.1.4.2 Small grids and off-grids

In the NWIS, demand has been calculated using a regression analysis between electricity generation and iron ore output.

Off-grid demand is derived using production estimates of LNG in line with assumptions in the fugitive emissions sector, and estimates under the report commissioned by DCCEEW from Advisian on electrification opportunities in Australian mining (Advisian 2022). Electrification and fuel switching expected from some facilities covered by the Safeguard Mechanism also influence off-grid demand.

2.17.1.4.3 Renewable capacity

The Clean Energy Regulator's (CER) pipeline of large-scale renewable projects as of July 2024 was used in the 2024 projections (CER 2024). The pipeline provides renewable uptake to the mid-2020s, after which new renewable capacity reflects outcomes of the PLEXOS modelling. The CER's modelling of rooftop solar was used in the projections to 2030. After 2030, the projections adopt growth rates from AEMO's 2023 IASR workbook (step-change) (AEMO 2024a).[15]

Future large battery projects reflect public announcements and AEMO's existing, committed and anticipated new developments in the 2024 Generation Information list (AEMO 2024d). For small scale battery storage, installation is assumed to grow in line with the installation of rooftop solar systems. Specifically, the small-scale battery deployment ratios from AEMO (AEMO 2024a) are used in proportion with the installation of rooftop systems under the CER projections.

Table 2.25 Renewable energy targets included and assumed to be met in the projections[a]

	2030	2032	2035	2040
Queensland (QRET)[b]	50%	70%	80%	
Victoria (VRET)	65%		95%	
Tasmania (TRET)[c]	150%			200%
Australia, on-grid	82%			

Note

[a] State and territory renewable energy targets are not included where the underpinning policy to reach the target is undergoing detailed design.

[b] The electricity emissions projections modelling was finalised prior to the Queensland 2024 State General Election and reflects the policies and targets of the government at that time.

[c] Tasmania's interim renewable energy target accounts for exports. The TRET is based on Tasmania's 2020 demand i.e. 15,750 GWh for the interim target of 150% by 2030, and 21,000 GWh for the 200% target by 2040.

Wind and utility solar are projected to meet a growing share of the underlying demand. A level of curtailment was assumed to apply to some renewable generation during periods of low minimum demand to ensure an operable and secure system. In 2030 this curtailment was assumed to be equivalent to 7% of renewable generation in the NEM in the baseline scenario.

Several state renewable energy targets are included in the 2024 emissions projections electricity modelling. These are outlined in Table 2.25.

[15] The step-change scenario aligns best with the CER rooftop solar trends to 2030.

2.17.1.5 Data sources

Table 2.26 Data sources for electricity demand projections

Grid	Data source for electricity demand
National Electricity Market	AEMO 2024 Integrated System Plan
Wholesale Electricity Market	AEMO 2024 Electricity Statement of Opportunities for the WEM
Darwin Katherine Interconnected System	Northern Territory Electricity Outlook Report (Utilities Commission of the Northern Territory 2024)
North West Interconnected System	Regression analysis between electricity generation and iron ore output
Off-grid	LNG production consistent with production assumptions in the fugitive emissions sector

2.17.1.5.1 Transmission

Transmission networks transport electricity from generators to distribution networks and then to customers. In Australia there are transmission networks in each state, and both territories are serviced by a distribution network. The NEM is an interconnected transmission network on the east coast of Australia connecting Queensland, New South Wales, the Australian Capital Territory, Victoria and Tasmania.

When a data model is constrained with certain parameters, it can lead to the model making supplementary assumptions to meet a set requirement. In constraining the electricity model to meet state targets, the electricity emissions projections modelling assumes that the necessary transmission will be available to achieve the renewable targets, supported by Rewiring the Nation.

Interconnector capability and transmission projects are informed by AEMO's 2023 Inputs, Assumptions and Scenarios workbook (AEMO 2024a), the New South Wales Network Infrastructure Strategy (Government of New South Wales 2023) and DCCEEW advice. The timing and assumptions for major projects are outlined in Table 2.27.

Table 2.27 Major project assumptions

Project	Assumption and timing
Marinus Link	Completion of cable 1 by December 2030 (750 MW) Completion of cable 2 by December 2032 (750 MW)
Copperstring 2032	Completion by 2029 (500 kV transmission line)
Waratah Super Battery	Completion by 2025 (910 MW)
Snowy 2.0	Commercial operation by December 2028 (2,200 MW)

2.17.2 Stationary Energy

Projection models are grouped into 6 sub-sectors: energy; mining; manufacturing; buildings; agriculture, forestry and fishing; and other, which is solely emissions from fuel used by military vehicles within Australia.

2.17.2.1 Modelling approach

The stationary energy models are a combination of facility-specific and top-down models depending on the emission source and the availability of data. The structure of these models is provided in Table 2.28.

The production data for LNG are estimated at the facility level, because each facility has a different emissions intensity. Emissions intensities are calculated based on emissions reported through the NGER Scheme. The emissions intensity is updated yearly for each facility.

2.17.2.2 Activity data

Activity data used in the stationary energy sub-sectors are presented in Table 2.28.

Emissions projections in the stationary energy sector are estimated using activity data from various sources including Office of the Chief Economist (OCE) commodity forecasts (OCE 2024a, OCE 2024b), Australian Energy Update (DCCEEW 2024e), Wood Mackenzie long-term outlook reports (2024b), IBISWorld industry reports (IBISWorld 2024a, 2024b, 2024c, 2024d), AEMO's Gas Statement of Opportunities (GSOO) (AEMO 2023, AEMO 2024e), Australian Construction and Industry forum reports, and Company Reports. Where forecast activity data is unavailable, activity is kept constant at the base year level. The emissions from these sub-sectors are relatively small.

The projections also consider any company announcements regarding the closure or change in production capacity and potential new facilities. The emissions reductions from the Safeguard Mechanism reforms and other policies and measures are also included.

All stationary energy sub-sectors, except in the energy sub-sector, are modelled in CO_2-e where the share of each GHG is derived from inventory data at the most disaggregated level possible. The gases modelled in the Energy sub-sector are CO_2, CH_4, and N_2O.

Table 2.28 Summary of activity data and calculation methods for each stationary energy sub-sector

Emissions sub-sector	Activity data	Calculation method
Energy		
LNG (facility-level model)	Production data from the gas fugitives sector and emissions intensity from the NGER and various environmental impact studies; on-site abatement estimates from the Safeguard Mechanism model	$E_t = \sum_i (EF_{it} \cdot P_{it}) - SG_t$ Where: E_t = emissions in year t (Mt CO_2-e) EF_{it} = facility-specific emissions factor in year t P_{it} = production at facility i in year t SG_t = emissions reduction from Safeguard Mechanism reforms in year t
Oil and other gas extraction (top-down model)	Western Australia gas demand from AEMO (AEMO 2023); East Coast gas demand from AEMO (2024e); crude and condensate oil demand from OCE (2024a, 2024b); on-site abatement estimates from the Safeguard Mechanism model	$E_t = (E_{t-1} \cdot \Delta Production) - SGt$ Where: E_t = emissions in year t (Mt CO_2-e) E_{t-1} = emissions in the previous year $\Delta Production$ = change in production between year t and year t – 1 SG_t = emissions reduction from Safeguard Mechanism reforms in year t
Manufacture of solid fuels (top-down model)	Iron and steel growth rates from OCE[a] (2024a, 2024b) and Wood Mackenzie long-term outlook report (2024b)	
Gas production and distribution (top-down model)	Western Australia gas demand from AEMO (2023); east coast gas demand from AEMO (2024e), on-site abatement estimates from the Safeguard Mechanism model	
Fuel refining (top-down model)	Total petroleum refinery output from OCE (2024a, 2024b), For renewable fuels, emissions are sourced from environmental impact statement, on-site abatement estimates from the Safeguard Mechanism model	

Emissions sub-sector	Activity data	Calculation method
Mining		
Coal mining (top-down model)	Production data from the coal fugitives sector; on-site abatement estimates from the Safeguard Mechanism model	$E_t = (Fc_{t-1} \cdot Ec \cdot Ef \cdot \Delta P) - SGt$ Where: E_t = emissions in year *t* (Mt CO_2-e) Fc_{t-1} = fuel consumption in the previous year *Ec* = energy contents of the fuel *Ef* = emissions factors of the fuel *ΔP* = percentage change in production between year *t* and year *t* - 1 SG_t = emissions reduction from Safeguard Mechanism reforms in year *t*
Other mining (iron ore, gold, copper, nickel, zinc, bauxite, lithium, mineral sand, and manganese) (top-down model)	Production data from OCE (2024a, 2024b), Wood Mackenzie long-term outlook report (2024b), and IBISWorld (2024c, 2024d); base year proportion of the type and amount of fuel used in each commodity derived from NGER energy data, on-site abatement estimates from the Safeguard Mechanism model as well as the emissions reduction from technological improvement in non-safeguard mines (Advisian 2022)	
Manufacturing (top down model)		
Non-ferrous metals (alumina; aluminium; refined nickel, copper, zinc, lithium, lead/ acid battery, battery recycling, recycled metal, and e-waste)	Production data from OCE (2024a, 2024b) and Wood Mackenzie longterm outlook report (2024b); base year proportion of the type and amount of fuel used in each commodity derived from NGER energy data; on-site abatement estimates from the Safeguard Mechanism model	$E_t = (Fc_{t-1} \cdot Ec \cdot Ef \cdot \Delta P) - SGt$ Where: E_t = emissions in year *t* (Mt CO_2-e) Fc_{t-1} = fuel consumption in the previous year *Ec* = energy content of the fuel *Ef* = emissions factor of the fuel Δ*P* = change in production between year *t* and year *t* - 1 SG_t = emissions reduction from Safeguard Mechanism reforms in year *t*
Non-metallic minerals (cement, lime, plaster and concrete; ceramics; glass and glass products and other)	IBISWorld industry reports analysis (IBISWorld 2024a, 2024b) and Cement Industry Federation (CIF 2023); Decarbonisation Pathways for the Australian Cement and Concrete Sector (VDZ 2021); base year proportion of the type and amount of fuel used in the process derived from NGER energy data; on-site abatement estimates from the Safeguard Mechanism model	
Iron and steel	Production data from OCE (2024a, 2024b) and Wood Mackenzie long-term outlook report (2024b); on-site abatement estimates from the Safeguard Mechanism model	
Pulp, paper and print	Data from DCCEEW (2024g, 2024k); final data point (2024) held constant, on-site abatement estimates from the Safeguard Mechanism model	
Chemicals (other petroleum and coal product and basic chemical, chemical and plastic)	Ammonia: Wood Mackenzie long-term outlook report (2024b) and company reports, derived proportion of the base year from NGER data; on-site abatement estimates from the Safeguard Mechanism model; other petroleum and coal product and plastic held constant at 2024 level, on-site abatement estimates from the Safeguard Mechanism model	

Emissions sub-sector	Activity data	Calculation method
Food processing, beverages and tobacco	n/a	10-year historical average emissions growth, on-site abatement estimates from the Safeguard Mechanism model
Other manufacturing	n/a	
Buildings (top down model)		
Residential and commercial	Annual gas consumption data from AEMO (2023, 2024e), Step Change demand series adjusted with electrification values from the progressive change scenario, and energy efficiency from orchestrated step change – low energy efficiency scenario to reflect current policy settings; wood and wood waste fuel use from Energy Consult (2022); derived proportion of emissions from wood biomass and others from DCCEEW (2024e)	$E_t = E_{wt} + E_{gt}$ $E_{wt} = E_{wt-1} \cdot \Delta Consumption$ $E_{gt} = E_{gt-1} \cdot \Delta Demand$ Where: E_t = emissions in year *t* (Mt CO_2-e) E_{wt} = emissions in year *t* (Mt CO_2-e) from burning wood biomass at residential buildings E_{gt} = emissions in year *t* (Mt CO_2-e) from natural gas consumption at residential and commercial buildings E_{wt-1} = emissions in the previous year from consumption of wood or other fuels E_{gt-1} = emissions in the previous year from natural gas consumption Δ*Demand* = change in gas consumption in commercial/residential buildings between year *t* and year *t* - 1 Δ*Consumption* = change in wood consumption between year *t* and year *t* - 1
Construction	Activity data from Australian Construction Industry Forum (ACIF 2024)	$E_t = E_{t-1} \cdot \Delta Activity$ Where: E_t = emissions in year *t* (Mt CO_2-e) E_{t-1} = emissions in the previous year ΔActivity = change in activity between year *t* and year *t* - 1
Agriculture, forestry and fishing (top down model)		
	Farm production data from the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES 2024d, ABARES 2024e); average rate of change in diesel consumption derived from NGER data	$E_t = (E_{t-1} \cdot \Delta Production) \times (1 - Dcr)$ Where: E_t = emissions in year *t* (Mt CO_2-e) E_{t-1} = emissions in the previous year ΔProduction = change in production between year *t* and year *t* - 1 *Dcr* = average rate of change in diesel consumption per unit of production Emissions held constant at 2028 level.
Other (military) (top-down model)		
	Data from DCCEEW (2024g, 2024k)	10-year average of historical emissions

[a] Production data for most commodities are sourced from the OCE, which is provided to 2029. Growth rates from Wood Mackenzie long-term outlook reports have been used for 2030 and beyond

2.17.3 Transport

Transport sub-sectors are modelled based on projected activity and changes in emissions intensity. In addition, retirement rates and activity by vintage are also considered for the light duty vehicle sub-sector. The exception to this modelling approach is for pipeline transport. Projected pipeline emissions are based on projections of state-level natural gas consumption and production.

2.17.3.1 Modelling approach in the baseline scenario

The transport sector emissions projections are modelled using several sub-models outlined in Figure 2.28. Results from sectoral models are rescaled to the latest National Greenhouse Gas Inventory quarterly update (DCCEEW 2024k) and used as input to the Combined Totals model. Projected on-site abatement from the Safeguard Mechanism are added, before being entered into the Emissions Projections by State and Territory and by gas.

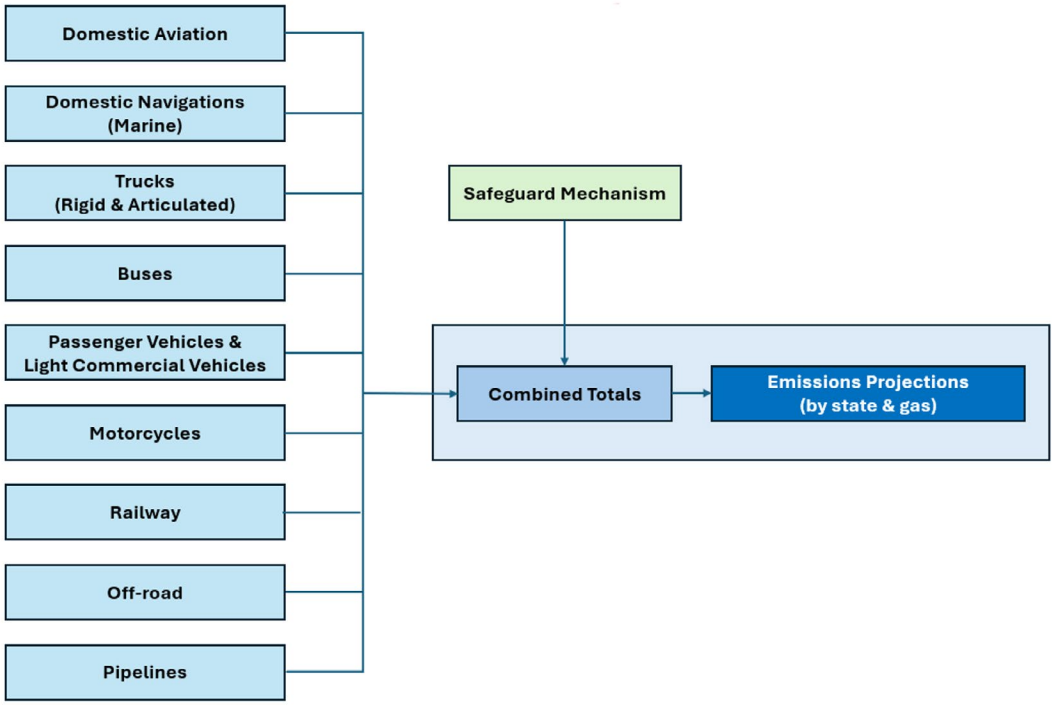

Figure 2.28 Simplified flowsheet of the transport sector emissions model

The model underpinning the 2023 emissions projections had a bottom-up approach, distinguishing between emissions from various technologies. However, the policies having the biggest impact on transport emissions – the New Vehicle Efficiency Standards and the Safeguard Mechanism – are by design technology agnostic and the 2024 transport emissions projections model was redesigned to reflect these policies. The 2024 transport model takes a top-down approach where only average emission intensity is considered, regardless of the underlying technology.

Projected emissions for transport models are the product of projected activity and average emissions intensity of each transport sector segment. Emissions are projected as CO_2-e and then the share of each greenhouse gas is estimated by using the shares published in the latest inventory data at the most disaggregated level possible.

2.17.3.2 Activity projections

Freight projections are derived from the Bureau of Infrastructure and Transport Research Economics' freight forecasts (BITRE 2022b). Updates of projected commodity movements derived from the Resources and Energy Quarterly (OCE 2024b), Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES 2024e), GDP updates (Department of the Treasury 2023) and population updates (ABS 2024l) are incorporated where there have been significant changes since the last BITRE forecast.

Aviation, motorcycle and bus passenger activity are measured in passenger kilometres travelled (PKT). Aviation passenger activity is derived from aviation forecasts (BITRE 2024a). Passenger vehicle, motorcycle and bus passenger activity is assumed to be a function of population change (ABS 2024l). PKT estimates (BITRE 2023c)

for buses, or vehicle kilometres travelled (VKT) estimates for passenger vehicles and motorcycles, are scaled to population forecasts. Light commercial vehicles have a hybrid freight and passenger function, but projected activity is calculated in VKTs and is assumed to be driven only by population change.

Almost all passenger railways have been electrified. Emissions from the remaining passenger rail activity is small and is grouped with freight activity. For marine passenger activity, including recreational craft, and off-road transport, activity is assumed to be a function of population and is scaled to population forecasts. Pipeline activity is scaled to department projections of natural consumption or production excluding LNG, by state.

2.17.3.3 Emission intensity projections

Under the NVES each vehicle manufacturer has a national average CO_2 target for the passenger and light commercial vehicles they produce, expressed in grams of CO_2/km, which they must meet or beat. Over time the CO_2 target is lowered and in order to continue to meet or beat the target, companies must provide more choices of fuel-efficient, low or zero emissions vehicles. The NVES is technology neutral and encourages suppliers to sell more fuel-efficient vehicles, be they petrol, diesel, hybrid or EVs. To reflect the policy the transport emissions model takes a top-down approach by considering only activity levels and the emissions intensity of vehicles. No assumptions are made about individual technologies such as electric or hybrid vehicle adoption or efficiency improvements in internal combustion vehicles.

The headline limits for new vehicles under the NVES are stated in the New Vehicle Efficiency Standard Bill 2024 and are measured based on the New European Driving Cycle (NEDC) test procedure. Real world emission intensities are typically higher than the NEDC laboratory tests reported by manufacturers. An NEDC-to-real world conversion rate of 1.39 is used in the emissions projections (DITRDCA 2024).

The NVES currently specifies emission limits until 2029, after which these projections assume annual improvements will revert to the historical trend, from a 2029 base. A statutory review of the NVES is required to commence in 2026 to consider future NVES policy settings, including emissions limits after 2029.

The light vehicle model projects vehicle stock and average emissions by vintage. Average fleet emissions are updated as more efficient vehicles enter the fleet and older vehicles are retired. Late model vehicles are on average driven more kilometres per year than older models. The proportion of total annual kilometres driven by new vehicles is adjusted upwards, while the proportion of total kilometres driven by older models is reduced. Retirement rates are calculated from BITRE's annual Road Vehicle survey (BITRE 2024b).

The emission intensity of pipeline transport efficiency is assumed to remain flat over the projections period.

Emission intensity calculations for other sectors are based on the analysis of multiple data sources including BloombergNEF (2024), consultancy reports (TER 2022) and historical trends.

2.17.3.4 Safeguard Mechanism in the transport sector

It is assumed that some transport emissions covered by the Safeguard Mechanism will reduce emissions through fuel switching, efficiency gains and electrification. To prevent double counting, modelled on-site abatement from Safeguard facilities is updated to exclude emissions intensity improvements already included in the projections. Safeguard Mechanism abatement is then deducted from the projections to estimate the final model results.

2.17.4 Fugitive emissions from fuels

Emissions from the fugitive emissions sector are projected using emission estimation models maintained and updated by DCCEEW using external inputs. The models are a combination of facility-specific and top-down models, depending on the nature of the emission source and the availability of data.

2.17.4.1 Coal fugitives

2.17.4.1.1 Operating coal mines

2.17.4.1.1.1 Modelling approach

A mine-by-mine model of fugitive emissions from operating coal mines is used to projects emissions by greenhouse gas. A mine-by-mine model takes account of the emissions intensity of each mine. These depend on the operational and geological characteristics of the mine.

$$E_{gt} = \sum_{gi}(P_{it} \cdot El_{gi}) - \mathrm{SG}_{gt}$$

Where:

E_{gt} = annual emissions from operating coal mines of greenhouse gas *g* in year *t* (Mt CO_2-e)

P_{it} = coal production at mine *i* in year *t* (kt)

EI_{gi} = the emissions intensity of greenhouse gas *g* of production at mine *i*, (Mt CO_2-e/kt coal)

SG_{gt} = abatement incentivised by the Safeguard Mechanism of greenhouse gas *g* in year *t* (Mt CO_2-e).

2.17.4.1.1.2 Activity data

The emissions intensity of coal mines includes all sources of fugitive emissions from vented CH_4 and CO_2, flaring and post mining. For operating mines, the emissions intensity is sourced from the most recent 7 years of National Greenhouse Gas Inventory data, which are based on company data reported under the NGER Scheme. For some mines expert judgment is applied to exclude years impacted by operational problems and to take into account trends in the emissions intensity of the mine that could be due to mining different parts of the coal resource or updated gas management practices. For prospective coal mines the emissions intensity is sourced from environmental impact statements or is the average for currently operating mines in the same coal basin.

Mine-by-mine production estimates for existing and new mines are informed by OCE (2024a, 2024b) for 2024–29 and Wood Mackenzie (2024b) for 2030 to 2040. Coal production is separately estimated for thermal and metallurgical coal production at each mine.

An estimate of total demand for Australian coal is made for thermal coal and metallurgical coal based on OCE for 2024–29 and growth rates from the Wood Mackenzie Energy Transition Scenario from 2030, with adjustments to domestic demand to account for the emissions projections modelling of the electricity sector.

For each year, the sum of production from coal mines is calibrated to total demand for Australian thermal and metallurgical coal. If forecast production from existing mines is greater than estimated demand for Australian coal then all thermal or metallurgical coal mines' production is scaled down at an equal rate to balance demand and production. If there is a shortfall, production from prospective new unspecified mines are added to meet this demand. Production from prospective new unspecified mines are not estimated on a mine-by-mine basis but are estimated in total for metallurgical and thermal coal and are allocated to New South Wales and Queensland underground and open cut coal mines based on the production profiles of potential new thermal and metallurgical mines. The emission factors applied are equal to the current average for each mine type in each state.

Production from brown coal mines is sourced from the electricity sector modelling.

2.17.4.1.2 Abandoned coal mines

2.17.4.1.2.1 Modelling approach

CH_4 emissions occur under certain conditions following the closure of underground coal mines. Emissions are estimated using a mine-by-mine model developed for the National Greenhouse Gas Inventory. The model is extended to include projected closures of underground coal mines to 2040.

$$E_t = \sum_i \left(ED_i \cdot EF_i \cdot (1 - F_{it})\right) - ER_{it}$$

Where:

E_t = emissions from abandoned coal mines in year *t* (Mt CO_2-e)

ED_i = annual emissions of mine *i* in the year before decommissioning (Mt CO_2-e)

EF_i = emission factor for mine *i* at a point in time since decommissioning. It is derived from the Emissions Decay Curves (DCCEEW 2024g)

F_{it} = fraction of mine *i* flooded at a point in time since decommissioning

ER_{it} = quantity of CH_4 emissions avoided by recovery at mine *i* in year *t* (Mt CO_2-e).

The model requires the CH_4 emissions at the time of closure, the mine type, mine void size and mine water inflow rates. Emissions at the time of closure and mine void volume are sourced from the operating coal mines

model. Emission decay curves are calculated from the formulas published in the National Inventory Report (DCCEEW 2024g). Mine flooding rates are estimated based on the mine's water production region consistent with the National Greenhouse Gas Inventory.

2.17.4.1.2.2 Activity data

Closure dates are sourced from mine-by-mine forecasts provided by the OCE (2024a, 2024b) and Wood Mackenzie (2024b) and are consistent with the operating coal mines model.

2.17.4.2 Oil and gas fugitives

2.17.4.2.1 Oil

Oil fugitive emissions are separated into 6 sub-sectors:

1. crude oil production
2. crude oil transport
3. exploration
4. other – abandoned wells
5. refining/storage
6. flaring.

2.17.4.2.1.1 Modelling approach

The gases modelled in the oil fugitives sub-sector are CO_2, CH_4, and N_2O.

Oil fugitive emissions projections for crude oil production, crude oil transport, refining/storage and flaring are calculated using the following equation:

$$E_t = \sum_i (Pr_t \cdot (El_{cp} + El_{ct} + El_{rs} + El_f)) - SG_t$$

Where:

E_t = oil fugitive emissions in the year t (Mt CO_2-e)

Pr_t = proxy indicator in year t

EI_{cp} = average emissions intensity for crude oil production (Mt CO_2-e / ML of crude oil and condensate production)

EI_{ct} = average emissions intensity for crude oil transport (Mt CO_2-e / ML of crude oil and condensate production)

EI_{rs} = average emissions intensity for refining/storage (Mt CO_2-e/ ML of refinery output)

EI_f = average emissions intensity for oil flaring (Mt CO_2-e / ML of crude oil and condensate production).

SG_t = emissions reductions from Safeguard Mechanism reforms in year t (Mt CO_2-e).

Projected emissions for oil exploration are calculated as a 10-year average of historical fugitive emissions from oil exploration.

Projected emissions from abandoned wells are calculated based on historical rates of fugitive emissions growth from abandoned wells. For the 2024 projections, the assumed annual growth rate is 3%.

$$E_t = 1.03E_{t-1}$$

Where:

E_t = emissions in year t

E_{t-1}= emissions in the year t – 1.

2.17.4.2.1.2 Activity data

Activity data used to estimate emissions from oil and gas fugitives is provided in Table 2.29.

Table 2.29 Summary of data sources for preparing oil fugitive emissions

Fugitive emissions source	Proxy indicator	Source
Oil – production	Crude oil and condensate production	OCE (2024a, 2024b)
Oil – transport	Crude oil and condensate production	OCE (2024a, 2024b)
Oil – exploration	Historical 10-year average of emissions from oil exploration	DCCEEW (2024g, 2024k)
Oil – abandoned wells	3% growth in emissions derived from historical growth in emissions	DCCEEW (2024g, 2024k)
Oil refinery	Refinery output	OCE (2024a, 2024b)
Oil – flaring	Crude oil and condensate production	OCE (2024a, 2024b)

Fugitive emissions from oil exploration and abandoned wells is small (0.003 Mt CO_2-e in 2024) but volatile from year to year. Average historical emissions levels have been used to project future emissions from this source, in lieu of a more appropriate proxy indicator.

2.17.4.2.2 LNG facilities

2.17.4.2.2.1 Modelling approach

A facility-by-facility model is used to project fugitive emissions from LNG. The gases modelled in the LNG fugitives sub-sector are CO_2, CH_4, and N_2O. Factors influencing the emissions from an LNG facility are the operation of the plant, the reservoir CO_2 concentration and source of the feed gas, abatement actions and annual production.

$$E_t = \sum_i (P_{ti} \cdot (El_{vi} + El_{fi} + El_{oi}) - CCS_{ti} - SG_{it})$$

Where:

E_t = LNG fugitive emissions in year *t* (Mt CO_2-e)

P_{ti} = production at facility *i* in year *t* (Mt LNG)

EI_{vi} = venting emissions intensity at facility *i* (Mt CO_2-e/Mt LNG)

EI_{fi} = flaring emissions intensity at facility *i* (Mt CO_2-e/Mt LNG)

EI_{oi} = other leaks emissions intensity at facility *i* (Mt CO_2-e/Mt LNG)

CCS_{it} = CO_2 captured and stored at facility *i* in year *t* (Mt CO_2).

SG_{it} = emissions reductions at facility *i* in year *t* from the Safeguard Mechanism reforms (Mt CO_2-e) (excluding CCS).

Emissions intensities for venting, flaring and other fugitive leaks at operating facilities are based on NGER data. For newer facilities or new feed gas sources, emissions intensities are sourced from environmental impact statements or other sources if available.

2.17.4.2.2.2 Activity data

LNG production projections for each facility are informed by estimates from the OCE (2024a, 2024b) and Wood Mackenzie (2024a). The projections consider committed and prospective additions and removals in capacity, given the global outlook for LNG.

2.17.4.2.3 Domestic natural gas

2.17.4.2.3.1 Modelling approach

Domestic natural gas is natural gas consumed in Australia. It is distinguished from LNG, which is predominantly produced for export. The small amount of LNG produced for domestic consumption is treated as domestic gas in the projections. The gases modelled in the domestic gas fugitives sub-sector are CO_2, CH_4, and N_2O.

The sources of fugitive emissions from domestic natural gas in the projections are gas exploration, other post-meter emissions, other abandoned wells, production, processing, transmission, distribution, venting and flaring. Proxy indicators are used to project the growth in emissions at the state level from the sub-sectors as listed below.

$$E_t = \sum_i (P_{it} \cdot El_i) - CCS_{it} - SG_{it}$$

Where:

E_t = annual emissions in year t (Mt CO_2-e)

P_{it} = gas production at basin i in year t (PJ)

EI_i = the emissions intensity of processing/processing/flaring/venting at basin i (Mt CO_2-e/PJ gas produced)

CCS_{it} = CO_2 captured and stored at facility i in year t (Mt CO_2-e)

SG_{it} = emissions reductions at basin i in year t from the Safeguard Mechanism reforms (Mt CO_2-e) (excluding CCS).

The emissions intensities of processing, production, flaring and venting at basins across Australia were calculated from emissions estimates in the National Greenhouse Gas Inventory and historical gas production.

2.17.4.2.3.2 Activity data

Estimates of gas production for domestic consumption (including new gas developments) are informed by estimates from the OCE (2024a, 2024b), AEMO (2023, 2024e) and Rystad Energy (2024). Domestic gas demand over the projections period is first estimated using AEMO demand forecasts for the step change scenario in the eastern market and the expected scenario in the western market (AEMO (2023, 2024e)). Secondly, adjustments are made to the AEMO forecasts to account for gas power generation demand from the electricity emissions projections modelling and energy efficiency improvements (as outlined in the stationary energy sector).

For each year, the sum of gas production estimates for domestic consumption is calibrated to total domestic demand in the eastern and western domestic gas markets. If forecast production is greater or less than estimated domestic demand, production is decreased or increased as required to balance demand and production in each market. Where additional production is brought on to meet demand, that production is assumed to have emissions intensities equal to the Perth basin in the western gas market and the average of emissions intensities from the Bowen-Surat and Cooper-Eromanga basins in the eastern gas market.

Emissions intensities for new gas developments are derived from environmental impact statements if available, and state average emission intensities from the National Greenhouse Gas Inventory (DCCEEW 2024g).

Fugitive emissions associated with gas extracted from the Beetaloo sub-basin are calculated from emissions intensities from Surat Bowen coal seam gas (CSG) for production sub-sectors. For processing, flaring and venting emissions, Beetaloo emissions intensities are derived using the CSIRO study of whole-of-life GHG emissions from the Surat Basin for the GISERA project (Schandl et al. 2019).

Table 2.30 Summary of data sources for gas fugitive emissions

Fugitive emissions source	Proxy indicator	Source
Distribution	Unaccounted for gas losses	AEMO (2024e)
Exploration – flared	Total gas production	OCE (2024a, 2024b); AEMO (2023, 2024e)
Exploration – leakage – conventional	Conventional gas production	OCE (2024a, 2024b); AEMO (2023, 2024e)
Exploration – leakage – unconventional	Unconventional gas production	OCE (2024a, 2024b); AEMO (2023, 2024e)
Exploration – venting – completions – conventional	Conventional gas production	OCE (2024a, 2024b); AEMO (2023, 2024e)
Exploration – venting – completions – unconventional	Unconventional gas production	OCE (2024a, 2024b); AEMO (2023, 2024e)
Exploration – venting – workovers	Unconventional gas production	OCE (2024a, 2024b); AEMO (2023, 2024e)
Other – abandoned wells	Historical growth rate of emissions abandoned gas wells	DCCEEW (2024g)

Fugitive emissions source	Proxy indicator	Source
Other – post meter emissions	Derived total appliance in the commercial and residential sector, vehicle stock projections, industrial natural gas consumption	AEMO (2023, 2024e); ABS (2021); Energy Consult (2015, 2022)
Processing	Domestic gas production (conventional and unconventional)	OCE (2024a, 2024b); AEMO (2023, 2024e); emission projections models for LNG
Production – offshore platforms	Number of shallow and deep offshore platforms	AME Group; Company Reports
Production – onshore gathering and boosting – conventional gas	Conventional gas production	OCE (2024a, 2024b); AEMO (2023, 2024e); emission projections models for LNG
Production – onshore gathering and boosting – unconventional gas	Unconventional gas production	OCE (2024a, 2024b); AEMO (2023, 2024e); emission projections models for LNG
Production – onshore wells – conventional gas	Conventional gas production	OCE (2024a, 2024b); AEMO (2023, 2024e); emission projections models for LNG
Production – onshore wells – unconventional gas	Unconventional gas production	OCE (2024a, 2024b); AEMO (2023, 2024e); emission projections models for LNG
Production – onshore wells – water production	Unconventional gas production	OCE (2024a, 2024b); AEMO (2023, 2024e); emission projections models for LNG
Transmission and storage – LNG terminals	Number of LNG terminals operating	AEMO (2024e); AME Group; company reports
Transmission and storage – storage – LNG	Number of LNG storage stations operating	AME Group; company reports
Transmission and storage – storage – natural gas	Number of gas storage stations operating	AEMO (2024e); AME Group; company reports
Transmission and storage – transmission	Total pipeline length	APGA (2023); company reports
Venting and flaring – flaring – gas	Domestic gas production (conventional and unconventional)	OCE (2024a, 2024b); AEMO (2023, 2024e)
Venting and flaring – venting – gas	Domestic gas production (conventional and unconventional)	OCE (2024a, 2024b); AEMO (2023, 2024e)

2.17.4.2.4 Major new oil and gas projects included in the projections

Major new oil and gas developments are generally assessed on a project-by-project basis. The new gas fields supplying existing LNG facilities included in the 2024 emissions projections have a zero baseline allocation for their reservoir CO_2 emissions under the Safeguard Mechanism reforms. New shale gas projects, including those in the Beetaloo sub-basin, must have net-zero scope 1 emissions from entry.

Table 2.31 Major new oil and gas projects

Project	Project type	Timing (financial year)	Assumed supply type
Barossa (NT)	Offshore gas	Production to start in 2025	Export
Waitsia stage 2 (WA)	Onshore gas	Production to start in 2025	Domestic and Export
Beetaloo (NT)	Onshore gas	Production to start in 2026	Domestic
Crux (WA)	Offshore gas	Production to start in 2027	Export
Dorado (WA)	Offshore oil	Production to start in 2027	Domestic
Pluto expansion (WA)	LNG train	Operational from 2027	Export
Scarborough (NT)	Offshore gas	Production to start in 2027	Export
Narrabri (NSW)	Onshore gas	Production to start in 2029	Domestic
Browse (WA)	Offshore gas	Production to start in 2031	Export

2.17.4.3 Industrial Processes and Product Use

Emissions from the IPPU sector are projected using bottom-up models developed within DCCEEW. Where possible, emissions are projected by estimating fuel use at the facility level, to account for different fuel types, and the emissions intensity of production across facilities.

2.17.4.3.1 Modelling approach

A summary of data sources and model frameworks applied is provided in Table 2.32.

Unless otherwise specified, the emissions intensity of production is assumed to be constant across the entire projections period and is based on the emissions reported in Australia's National Inventory Report 2022 (DCCEEW 2024g).

The gases modelled in the IPPU sector are CO_2, CH_4, N_2O, CF_4, C_2F_6, SF_6 and 12 species of HFCs. The chemical industry sub-sector is modelled in CO_2 and N_2O. The gases modelled in the metal industry are CO_2, CH_4, N_2O, CF_4, and C_2F_6. Other product manufacturing and use are modelled in SF_6 and HFCs. All other remaining sub-sectors are modelled in CO_2.

2.17.4.3.2 Activity data

Emissions projections in the IPPU sector are estimated using activity data from various sources including OCE commodity forecasts (OCE 2024a, OCE 2024b), Wood Mackenzie long-term outlook reports (2024b), company reports, IBISWorld industry reports (2024a, 2024b, 2024c, 2024d), and the Organisation for Economic Co-operation and Development (OECD 2023).

Emissions from the 'product uses as substitutes for ozone depleting substances' and 'other product manufacture and use' sub-sectors are estimated by extrapolating models used in the preparation of the National Inventory Report. A detailed methodology for these sub-sectors is available in the National Inventory Report 2022 (DCCEEW 2024g).

Table 2.32 Summary of sources and formulae used for each IPPU sub-sector

Emissions sub-sector	Data source	Formula
Chemical industry		
Ammonia	*Wood Mackenzie long-term outlook report* (2024b) *and company reports*	$E_t = \sum_i (U_{it} \cdot EC_j \cdot EF_j) - SG_{it}$ Where: E_t = emissions in year *t* (Mt CO_2-e) U_{it} = natural gas consumption at facility *i* in year *t* EC_j = the energy content of natural gas EF_j = the emissions factor of natural gas SG_{it} = emissions reductions at facility *i* in year *t* from the Safeguard Mechanism reforms (Mt CO_2-e)
Nitric acid	DCCEEW estimates based on projected iron ore and coal production	$E_t = \sum_i (EF_{it} \cdot P_{it}) - SG_{it}$ Where: E_t = emissions in year *t* (Mt CO_2-e) EF_{it} = facility-specific emissions factor in year *t* P_{it} = nitric acid production at facility *i* in year *t* SG_{it} = emissions reductions at facility *i* in year *t* from the Safeguard Mechanism reforms (Mt CO_2-e)
Titanium dioxide Synthetic rutile	World GDP growth from the Organisation for Economic Co-operation and Development (OECD 2023)	$E_t = \sum_{i,j} (U_{jit} \cdot EC_j \cdot EF_j) - SG_{it}$ Where: E_t = emissions in year *t* (Mt CO_2-e) U_{jit} = the use of fuel *j* at facility *i* in year *t* EC_j = the energy content of fuel *j* EF_j = the emissions factor of fuel *j* SG_{it} = emissions reductions at facility *i* in year *t* from the Safeguard Mechanism reforms (Mt CO_2-e)
Acetylene	Population forecasts from ABS (2024l) and Department of the Treasury (2023)	$E_t = E_{t-1} \cdot \Delta Population$ Where: E_t = emissions in year *t* (Mt CO_2-e) E_{t-1} = emissions in the previous year $\Delta Population$ = change in population between year *t* and year *t* - 1
Petrochemical and carbon black	n/a	$E_t = E_{t-1}$ Where: E_t = emissions in year *t* (Mt CO_2-e) E_{t-1} = emissions in the previous year
Metal industry		
Aluminium production	Production data from OCE (2024a, 2024b) and Wood Mackenzie long term outlook reports (2024b).	$E_t = \sum_{i,j} (U_{jit} \cdot EC_j \cdot EF_j) + (PFC_{t-1} \cdot \Delta Production) - SG_{it}$ Where: E_t = emissions in year *t* (Mt CO_2-e) U_{jit} = the use of fuel *j* as a reductant at facility *i* in year *t* EC_j = the energy content of fuel *j* EF_j = the emissions factor of fuel *j* PFC_{t-1} = perfluorocarbon emissions in the previous year $\Delta Production$ = change in production between year *t* and year *t* – 1 SG_{it} = emissions reductions at facility *i* in year *t* from the Safeguard Mechanism reforms (Mt CO_2-e)

Emissions sub-sector	Data source	Formula
Iron and steel production	Production data from OCE (2024a, 2024b) and Wood Mackenzie long-term outlook report (2024b)	$E_t = \sum_i (EF_i \cdot P_{it} - cs_{it}) - SG_{it}$ Where: E_t = emissions in year *t* (Mt CO_2-e) EF_i = facility-specific emissions factor P_{it} = production at facility *i* in year *t* cs_{it} = carbon content in steel at facility *i* in year *t* SG_{it} = emissions reductions at facility *i* in year *t* from the Safeguard Mechanism reforms (Mt CO_2-e)
Ferroalloys production	Company statements	$E_t = \sum_{i,j} (U_{jit} \cdot EC_j \cdot EF_j) - SG_{it}$ Where: E_t = emissions in year *t* (Mt CO_2-e) U_{jit} = the use of fuel *j* as a reductant at facility *i* in year *t* EC_j = the energy content of fuel *j* EF_j = the emissions factor of fuel *j* SG_{it} = emissions reductions at facility *i* in year *t* from the Safeguard Mechanism reforms (Mt CO_2-e)
Other metal production (copper, nickel, silicon and lead)	Production data from OCE (2024a, 2024b) and Wood Mackenzie long-term outlook report (2024b)	$E_t = \sum_{i,j} (U_{jit} \cdot EC_j \cdot EF_j) - SG_{it}$ Where: E_t = emissions in year *t* (Mt CO_2-e) U_{jit} = the use of fuel *j* as a reductant at facility *i* in year *t* EC_j = the energy content of fuel *j* EF_j = the emissions factor of fuel *j* SG_{it} = emissions reductions at facility *i* in year *t* from the Safeguard Mechanism reforms (Mt CO_2-e)
Mineral industry		
Cement Lime	Production forecast from Cement Industry Federation and IBISWorld industry report (2024a).	$E_t = \sum_i (EF_i \cdot P_{it}) - SG_{it}$ Where: E_t = emissions in year *t* (Mt CO_2-e) EF_i = facility-specific emissions factor P_{it} = production at facility *i* in year *t* SG_{it} = emissions reductions at facility *i* in year *t* from the Safeguard Mechanism reforms (Mt CO_2-e)
Limestone and dolomite and other carbonates	DCCEEW estimates based on projected ceramics, ferroalloy production, glass production, and iron and steel production. Zinc production data from OCE (2024a, 2024b) and Wood Mackenzie long-term outlook report (2024b).	$E_t = E_{t-1} \cdot \Delta Production$ Where: E_t = emissions in year *t* (Mt CO_2-e) E_{t-1} = emissions in the previous year $\Delta Production$ = change in production between year *t* and year *t* - 1
Non-energy products from fuel and solvent use		
Lubricant use	n/a	$E_t = E_{t-1}$ Where: E_t = annual emissions in year *t* E_{t-1} = emissions in the previous year

Emissions sub-sector	Data source	Formula
Product uses as a substitute for ozone depleting substances		
	DCCEEW (2024g)	Based on National Inventory Report methodology
Other product manufacture and use		
Electrical equipment	DCCEEW (2024g)	Based on National Inventory Report methodology
SF_6 and PFCs from other product uses	Population forecasts from ABS (2024l) and Department of the Treasury (2023)	$E_t = E_{t-1} \cdot \Delta Population$ Where: E_t = emissions in year *t* (Mt CO_2-e) E_{t-1} = emissions in the previous year Δ*Population* = change in population between year *t* and year *t* - 1
N_2O from product uses		
Other production		
	DCCEEW estimates based on projected ammonia production and food, beverages and tobacco production	$E_t = E_{t-1} \cdot \Delta Production - SGt$ Where: E_t = emissions in year *t* (Mt CO_2-e) E_{t-1} = emissions in the previous year Δ*Production* = change in production between year *t* and year *t* – 1 SG_t = emissions reductions in year *t* from the Safeguard Mechanism reforms (Mt CO_2-e)

2.17.4.4 Agriculture

Emissions from the agriculture sector are projected using bottom-up modelling. The model is maintained and updated within DCCEEW using external inputs.

2.17.4.4.1 Modelling approach

Emissions from agricultural activity are calculated as

$$E(t) = \sum_i \sum_j \sum_k N_{jk}(t) \cdot \frac{E_{ijk}(0)}{N_{jk}(0)}$$

Where:

E(t)= Emissions in year *t* (Mt CO_2-e), with E(0) denoting emissions in the latest inventory year

i = IPCC sub-sector, such as enteric fermentation, manure management, etc

j = commodity, in the relevant units (head, kt, etc), such as grazing beef cattle, grain-fed beef cattle, sheep, wheat, rice, etc

k = state or territory

N_{jk} = Quantity of activity type by commodity, by state or territory, in relevant unit quantity (number of head, kilotonnes, hectares, etc)

The gases modelled in the agriculture sector are modelled in CO_2-e, where the share of each GHG is derived from inventory data at the most disaggregated level possible.

The projections include abatement from Australian Carbon Credit Units (ACCU) Scheme projects such as beef cattle herd management, the destruction of methane generated from manure in piggeries and animal effluent management.

2.17.4.4.2 Activity data

Emissions are projected by calculating the amount of agricultural activity in Australia each year. This is done by drawing on external data sources that contain activity numbers and activity growth rates (Table 2.33).

The ABARES is a key data source informing the agricultural emissions projections. These projections are informed by ABARES' short- and medium-term commodity forecasts, which incorporate climate impacts. Where activity data are not available for particular commodities, an appropriate proxy such as production (quantity of end product), or a relevant driver, such as growth in another connected commodity (as informed by historical comparisons), is used. For example, nitrogen fertiliser, lime and urea use increase in line with crop production. Historical trends are also used to inform growth if projected activity data are unavailable.

The projections also include a trend towards grain-fed beef cattle, following the historical trend towards a greater proportion of beef cattle spending longer in feedlots. This trend has an impact on the overall emissions intensity of beef cattle production. The diets of grain-fed beef cattle are more energy intensive than those of grass-fed cattle, and animals convert a portion of this additional energy to emissions in the gut.

As emissions within agriculture relate to biological processes, as well as manure and residue management, individual commodities can contribute several types of gases to multiple IPCC sub-sectors.

Table 2.33 Summary of principle data sources for agriculture

Commodity	Emissions sub-sectors	Data sources	Unit of activity
Grazing (grass-fed) beef	Enteric fermentation Manure management Agricultural soils	ABARES (2024d, 2024e) DCCEEW estimate based on historical trends	Head of animal
Grain-fed beef	Enteric fermentation Manure management Agricultural soils	ABARES (2024d, 2024e) DCCEEW estimate based on historical trends	Head of animal
Dairy	Enteric fermentation Manure management Agricultural soils	ABARES (2024d, 2024e) DCCEEW estimate based on historical trends	Head of animal
Sheep	Enteric fermentation Manure management Agricultural soils	ABARES (2024a, 2024e) DCCEEW estimate based on historical trends	Head of animal
Crops	Agricultural soils Field burning of agricultural residues Rice cultivation	ABARES (2024d, 2024e) DCCEEW estimate based on historical trends OECD-FAO (2024)	Non-rice crops: kilotonnes of crop Rice: kilotonnes of rice Hectares of area under cultivation
Pigs	Enteric fermentation Manure management Agricultural soils	ABARES (2024d, 2024e) DCCEEW estimate based on historical trends	Head of animal
Poultry	Manure management Agricultural soils	ABARES (2024d, 2024e) OECD-FAO (2024) DCCEEW estimate based on historical trends	Head of animal
Other animals	Enteric fermentation Manure management Agricultural soils	Activity held constant at final year of inventory	Head of animal
Fertilisers	Agricultural soils	DCCEEW estimate based on historical trends	Kilotonnes
Lime and urea	Liming and urea application	DCCEEW estimate based on historical trends	Kilotonnes

2.17.4.5 Waste

The waste sector emissions projections are prepared by DCCEEW, and include 5 waste sub-sectors:

- solid waste to landfill
- biological treatment of solid waste (composting)
- incineration
- domestic and commercial wastewater
- industrial wastewater.

2.17.4.5.1 Modelling approach

The waste sector models largely replicate the methods used to calculate historical waste emissions, described in the *National Inventory Report 2022* (DCCEEW 2024g). The solid waste sector modelling is completed on a site-specific basis to take account of the emission characteristics of individual landfills. The gases modelled in the waste sector are CO_2, CH_4, and N_2O.

2.17.4.5.1.1 Solid waste deposited at landfills

Waste deposited in landfills is classified according to three waste streams: municipal solid waste (MSW), commercial and industrial waste (C&I) and construction and demolition waste (C&D). Each of these streams is further disaggregated into a mix of individual waste categories: food, paper and cardboard, garden and park, wood, textiles, sludge (including biosolids), nappies, rubber and leather, and inert (concrete, metal, plastics, glass, soil etc.). With the exception of inert waste, all of these waste categories produce emissions when in landfill and are modelled in the projections.

The projections model the amount of each category of non-inert waste deposited in landfills. The amount of waste generated is projected to grow with population, with the exception of nappies. The quantity of nappy waste is projected to grow proportional to projected changes in the population under 2 years old and over 85 years old.

The proportion of each waste category sent to landfill is adjusted to account for policies and trends within the sector. Modelled policies and measures include the planned rollout of Food Organics and Garden Organics (FOGO) bins to households (Table 2.34), projects funded through the Recycling Modernisation Fund (RMF), approved Energy from Waste (EfW) projects, reforms to the Safeguard Mechanism, and ACCU projects.

Progress towards the following targets is incorporated in the model through an assumed gradual reduction per capita based on separate annual deposition estimates for relevant materials (e.g., textiles, rubber and leather, wood, etc) and based on advice from Blue Environment (Blue Environment 2023a):

- National Food Waste Strategy: halve food waste generation by 2030.
- National Waste Policy Action Plan: 80% average resource recovery rate by 2030, reduce total waste generated by 10% per capita by 2030, halve the amount of organic waste sent to landfill for disposal by 2030.
- State and territory resource recovery targets.
- State and territory waste generation reduction targets.

Projects funded through the RMF are included where they are considered to contribute additional capacity; meaning that the project is expected to primarily receive material streams that previously went to landfill. For non-inert waste, this includes some projects targeted at paper and cardboard waste, and tyres.

EfW facilities will divert some combustible waste from landfill and convert it to energy. The combustion emissions from these facilities are counted in the electricity sector, and do not contribute to the incineration sub-sector of the waste sector. The EfW facilities included in the model are:

- Kwinana facility in Western Australia, which is expected to incinerate approximately 400 kt of MSW and C&I waste annually from 2025.
- East Rockingham facility in Western Australia, which is expected to process 300 kt of MSW and 30 kt of C&I waste annually from the end of 2024.
- Laverton North waste gasification project in Victoria, which is expected to process 200 kt of MSW annually from the end of 2024.
- Maryvale facility in Victoria, which is expected to process 325 kt of MSW and C&I waste annually from 2026.

On-site abatement incentivised by the Safeguard Mechanism, as well as abatement from ACCU projects, is modelled separately and subtracted at the end of the modelling process. The waste projections apply a continual methane capture rate derived from the latest inventory data and applied based on each state and territory capture rate. This is based on the assumption that the amount of methane capture will not decline throughout the projection period.

Historical waste is modelled on a facility-by-facility basis to reflect the characteristics of each landfill, including weather conditions. Future waste deposited is estimated on separate state and territory bases, reflecting the average conditions of landfills in each jurisdiction.

Table 2.34 FOGO commitments included in the solid waste to landfill emissions projections

Jurisdiction	Commitment	Modelled rollout	Source
ACT	All households to have access to FOGO by 2025	100% by 2025	ACT Government (2011) ACT Government (2022)
NSW	FOGO collection for all households by 2030	100% by 2030	NSW Government (2021)
QLD[a]	Councils to identify best fit-for-purpose option for household organic waste and begin rollout	75% by 2030 90% by 2035	Queensland Government (2022)
SA[b]	FOGO for all households in Adelaide metro area	84% by 2030	GISA (2020)
TAS	Introduce weekly FOGO collections	100% by 2030	DNRET (2022)
VIC	Every Victorian household to have access to a FOGO bin or local composting by 2030	100% by 2030	RV (2020)
WA	FOGO for all households in Perth and Peel regions by 2025	80% by 2025	Waste Authority (2019)

[a] Assumptions of the percentage availability of FOGO bins in Queensland are based on advice from Blue Environment (Blue Environment 2023a).

[b] The roll-out of FOGO bins in South Australia currently exceeds the target set in *Supporting the Circular* Economy (GISA 2020; Blue Environment 2023b). The proportion of households projected to have FOGO bins is therefore held constant over the projections period.

2.17.4.5.1.2 Biological treatment of solid waste

The biological treatment of solid waste sub-sector includes emissions from the composting and anaerobic digestion of organic waste. The quantity of waste processed in this way is projected to grow as policies and programs are implemented to divert organic waste from landfills. In particular, the rollout of FOGO bins to households is projected to contribute significantly to this diversion. The commitments from state and territory governments included in these projections are outlined in Table 2.34.

2.17.4.5.1.3 Incineration

In Australia, incineration emissions are generated from thermal oxidation of clinical waste and solvents. The model assumes that clinical waste increases proportionately to population and the volume of solvents incinerated remains constant over the projections period.

At the time of publishing, several EfW projects had been approved. Specific EfW facilities included in the model are outlined above in the modelling approach for solid waste deposited at landfills. They will generate energy from the incineration of combustible waste. Under IPCC guidelines, emissions generated through the combustion of waste for energy are accounted for within the electricity sector.

2.17.4.5.1.4 Domestic and commercial wastewater

Emissions are estimated separately for unsewered and sewered populations, which have different assumed chemical oxygen demands (CODs).

The unsewered COD per capita ratio is applied to a projection of the unsewered population in each state and territory. Emissions are calculated based on the inventory CH_4 emissions factor and the percentage of wastewater anaerobically treated (50%).

The sewered COD per capita is applied to a projection of the sewered population in each state and territory. COD flows are used to estimate emissions from domestic and commercial wastewater facilities. COD influent refers to COD entering the wastewater facility in wastewater. COD outflow refers to:

- COD removed as sludge within the facility
- COD discharged from a facility as effluent, such as into rivers or the ocean
- COD in sludge removed to landfill or other land-based sites.

COD outflows are projected using ratios to COD influent. The ratios are a national average based on the latest inventory data. COD outflows are projected for each state and territory using the calculated ratio and the COD influent for the relevant year. This approach assumes that the proportion of COD outflow to COD influent remains constant over the projection timeframe. The proportion of CH_4 recovered is held fixed from the latest inventory year.

N_2O emissions are calculated by replicating the same assumptions and calculations used to project CH_4 from the sewered population. However, N_2O emissions do not include any GHG recovery and are applied to the entire Australian population rather than only the sewered population.

Table 2.35 Summary of calculation methods for each domestic and commercial wastewater sub-sector

Emissions sub-sector	Calculation method
Sewered population, methane	
Total	$\mathrm{CH}_{4(t)} = \mathrm{CH}_{4(ww)} + \mathrm{CH}_{4(sl)} - CH_{4(cap)}$ Where $CH_{4(t)}$ is the total estimated CH_4 emissions from the treatment of wastewater at municipal wastewater treatment plants $CH_{4(ww)}$ is the estimated CH_4 emissions from the treatment of sewage at wastewater plants $CH_{4(st)}$ is the estimated CH_4 emissions from treatment of sludge at wastewater plants $CH_{4(cap)}$ is the estimated captured CH_4 emissions
Wastewater	$\mathrm{CH}_{4(ww)} = (\mathrm{COD}_{in} - \mathrm{COD}_{sl} - \mathrm{COD}_{out}) \times \mathrm{EF}_{ww}$ Where $CH_{4(ww)}$ is the estimated CH_4 emissions from the treatment of wastewater $CH_{4_{in}}$ is the amount of COD input entering into wastewater treatment plants $CH_{4_{sl}}$ is the amount of COD treated separately as sludge $CH_{4_{out}}$ is the amount of COD effluent discharged from wastewater treatment plants into aquatic environments EF_{ww} is the emission factor for wastewater treated at wastewater treatment plants
Sludge	$\mathrm{CH}_{4(sl)} = (\mathrm{COD}_{sl} - \mathrm{COD}_{trl} - \mathrm{COD}_{tro}) \times \mathrm{EF}_{sl}$ Where $CH_{4(sl)}$ is the estimated CH_4 emissions from the treatment of sludge $CH_{4_{st}}$ is the amount of COD treated separately as sludge COD_{trl} is the amount of COD as sludge removed and sent to landfill COD_{tro} is the amount of COD as sludge removed and sent to a site other than landfill EF_{sl} is the emission factor for sludge treated at wastewater treatment plants
Sewered population, nitrous oxide	
Total	$N_2O_{(t)} = N_2O_{on} + N_2O_{eff} + N_2O_{sl}$ Where $N_2O_{(t)}$ is the total estimated N_2O emissions from domestic and commercial wastewater treatment N_2O_{on} is the estimated N_2O emissions from sewage treatment at a wastewater plant N_2O_{eff} is the estimated N_2O emissions from the discharge of effluent N_2O_{sl} is the estimated N_2O emissions from the application of treated sludge to land

Emissions sub-sector	Calculation method
Unsewered population	
Total	$CH_{4(t)} = \mathrm{COD}_t \times EF_t$ Where $CH_{4(t)}$ is the estimated CH_4 emissions from the unsewered wastewater COD_t is the amount of COD produced by the unsewered population EF_t is the emission factor for unsewered wastewater

2.17.4.5.1.5 Industrial wastewater

Industrial wastewater emissions are projected for the following sub-sectors: dairy production, pulp and paper production, meat and poultry processing, organic chemicals production, sugar production, beer production, wine production, fruit processing and vegetable processing.

The emissions projections are based on changes to commodity production levels. Growth rates are based on long-term forecasts using sector-specific metrics (Table 2.36).

Table 2.36 Data sources for industrial wastewater commodity trends

Commodity	Activity data source
Dairy production	Agriculture activity projection
Pulp and paper production	Historical trends (ABS 2024j)
Meat and poultry processing	Agriculture activity projection
Organic chemical production	Historical trends (ABS 2024j)
Sugar production	Agriculture activity projection
Beer production	Historical trends (ABS 2024k)
Wine production	Historical trends (ABARES 2024e)
Fruit processing	Historical trend (ABARES 2024e)
Vegetable processing	Historical trend (ABARES 2024e)

Table 2.37 Summary of calculation method for the industrial wastewater sub-sector

Emissions sub-sector	Calculation method
Total	$\mathrm{CH}_{4(t)} = \mathrm{CH}_{4(ww)} + \mathrm{CH}_{4(sl)}$ Where $CH_{4(t)}$ is the total estimated CH_4 emissions from the treatment of wastewater at municipal wastewater treatment plants $CH_{4(ww)}$ is the estimated CH_4 emissions from the treatment of sewage at wastewater plants $CH_{4(sl)}$ is the estimated CH_4 emissions from treatment of sludge at wastewater plants
Wastewater	$\mathrm{CH}_{4(ww)} = (\mathrm{COD}_{in} - \mathrm{COD}_{sl} - \mathrm{COD}_{eff}) \times \mathrm{EF}_{ww} - CH_{4(ww,cap)}$ Where $CH_{4(ww)}$ is the estimated CH_4 emissions from the treatment of wastewater COD_{in} is the amount of COD input entering into wastewater treatment plants COD_{sl} is the amount of COD treated separately as sludge COD_{eff} is the amount of COD effluent discharged from wastewater treatment plants into aquatic environments EF_{ww} is the emission factor for wastewater treated by wastewater treatment plants $CH_{4(ww,cap)}$ is the estimated captured CH_4 emissions from wastewater treatment
Sludge	$\mathrm{CH}_{4(sl)} = (\mathrm{COD}_{sl} - \mathrm{COD}_{trl} - \mathrm{COD}_{tro}) \times \mathrm{EF}_{sl} - CH_{4(sl,cap)}$ Where $CH_{4(sl)}$ is the estimated CH_4 emissions from the treatment of sludge COD_{sl} is the amount of COD treated separately as sludge COD_{trl} is the amount of COD as sludge removed and sent to landfill COD_{tro} is the amount of COD as sludge removed and sent to a site other than landfill EF_{sl} is the emission factor for sludge treated by wastewater treatment plants $CH_{4(sl,cap)}$ is the estimated captured CH_4 emissions

2.17.4.6 Land use, land use change and forestry

The LULUCF sector includes emissions and removals from forests, agricultural lands, and changes in land use that arise from management practices (e.g. clearing) and impact the carbon stored in vegetation and soils.

2.17.4.6.1 Modelling approach

The Full Carbon Accounting Model (FullCAM) is used to project emissions where sufficient input data exists. FullCAM is an empirically constrained, mass balance, carbon cycling ecosystem model used to estimate carbon stock changes across the Australian landscape, including for Australia's National Greenhouse Accounts. FullCAM integrates data on climate, soil, management and land use change observed from satellites. A detailed description of the model is outlined in the National Inventory Report (DCCEEW 2024g). The LULUCF sector emissions projections build on this approach using the UNFCCC sub-sectors grouped into the categories outlined in Table 2.38.

For categories where a clear trend is established in the historical data or is a likely function of ongoing management cycles (e.g. plantations) a continuation of the trend has been projected. For categories that have more variable emissions that oscillate around an average, for example carbon pools that are particularly sensitive to climate, a return to the average has been projected. For some other less material categories with no clear trend, the current short term net emission level using the 2020–22 mean has been held constant. More detail is provided in Table 2.38.

Table 2.38 Summary of emissions categories, modelling approaches and data sources for the LULUCF sector

Emissions category	Approach/assumptions	Data sources
Forests		
Forest land remaining forest land	Modelled at sub-sector level as below.	
Harvested native forests	FullCAM estate model with future harvesting areas assumed to remain constant based on current log volumes in all states except for Victoria and Western Australia which have announced cessation of native forest harvesting from 1 January 2024.	Australian Forestry and Wood products statistics (ABARES 2024f)
Pre-1990 plantations	Net emissions and removals return to long-term mean by 2040 as replanting occurs following harvesting of the majority of the softwood estate (with a 35 year harvest cycle) in the short-term.	Historical trends (DCCEEW 2024g)
Biomass burning	Includes prescribed burns and wildfire. Losses and subsequent recovery from non-anthropogenic fires assumed to average out over time. Net emissions and subsequent removals are assumed to return to long-term average by 2040.	Historical trends (DCCEEW 2024g)
Fuelwood	Net emissions to continue at 2020, 2021, and 2022 historical average.	Historical trends (DCCEEW 2024g)
Land converted to forest land	Modelled at sub-sector level as below. This incorporates the impacts of ACCU Scheme projects over the projection period.	ACCU projection
Plantations (Hardwood, Softwood, Environmental)	Net emissions and removals reflect cyclic growth/ harvest pattern.	Historical trends (DCCEEW 2024g)
Regeneration	The net sink is assumed to return to the long-term average by 2040, from current levels which reflect strong post-drought growth.	Historical trends (DCCEEW 2024g)
Regrowth following observed land clearing	Often subject to re-clearing, the net sink from these areas are assumed to return to the long-term average by 2040.	Historical land clearing activity (DCCEEW 2024g)
Biomass burning and mangroves	Net emissions to continue at current level.	Historical trends (DCCEEW 2024g)
Harvested wood products	Wood product use is assumed to continue at current level and the net sink is modelled as described in the National Inventory Report 2022.	Historical trends (DCCEEW 2024g)
Forests converted to Agricultural and other lands		
Land converted to grassland, converted to cropland, land converted to settlements, and land converted to wetlands	Primary land clearing is the key driver of emissions in these sectors. Primary clearing has been in decline since 1990, and the current average (2020, 2021, and 2022) lower levels of primary clearing are assumed to be sustained over the projection period leading to stabilisation of net emissions.	Historical land clearing activity (DCCEEW 2024g)

Emissions category	Approach/assumptions	Data sources
Agricultural and other lands		
Cropland remaining cropland and grassland remaining grassland	Emissions in these sub-sectors reflect both climate and management influences and are currently at an all-time low following several years of above average rainfall in much of Australia; the net sink is assumed to stabilise at historical average emissions covering a range of historically wetter and drier climate conditions. Emissions from soil carbon ACCU projects are also included in this category.	Historical trends (DCCEEW 2024g) ACCU projection
Wetland remaining wetland and settlements remaining settlements	Current management practices are assumed to remain unchanged to 2040. Emissions to continue at current levels.	Historical trends (DCCEEW 2024g)

2.18 Chapter 2 – Appendix C: Tracking to Australia's 2030 target in the emissions projections

Australia has committed to reduce emissions to 43% below 2005 levels by 2030 and to net zero by 2050. These targets are stated in Australia's Nationally Determined Contribution (NDC) under the Paris Agreement and legislated under the *Climate Change Act 2022*.

Australia's 2030 commitment is both a single-year target to reduce emissions to 43% below 2005 levels by 2030 and a multi-year emissions budget from 2021–30.

When tracking against Australia's 2030 target the emissions projections uses the latest emissions inventory data. Australia's national greenhouse gas inventory is updated and published on a quarterly basis. From time to time these quarterly updates include updates to historical emission estimates.

Tracking against Australia's target in the emissions projections takes account of the latest inventory estimates published in the June 2024 Quarterly Update of the National Greenhouse Gas Inventory. Therefore the 2030 target estimates below are different to the estimates in section 2.5, which is based on the latest National Inventory Report.

This June 2024 Quarterly Update of the National Greenhouse Gas Inventory included an upward recalculation in the time series of agriculture emissions due to revised beef herd numbers published in June 2024 by the Australian Bureau of Statistics (ABS). A new method incorporating several data sources has replaced the previous data based on annual surveys, resulting in higher herd numbers. The updated emission estimates will be included in Australia's 2023 National Inventory Report.

Under the baseline ('with measures') scenario Australia's emissions are projected to be 352 Mt CO_2-e in 2030, 42.6% below 2005 levels, just shy of the 2030 target. Over the period 2021 to 2030, baseline cumulative emissions are 4,225 Mt CO_2-e. That is, Australia's 2030 target is more than met when assessed on a budget basis.

Under the 'with additional measures' scenario Australia's emissions are projected to be 351 Mt CO_2-e in 2030, 42.7% below 2005 levels. Over the period 2021 to 2030 Australia's cumulative emissions are projected to be 4,230 Mt CO_2-e.

Table 2.39 Tracking towards Australia's 2030 single-year point target

	Emissions in 2030, Mt CO_2-e	% below 2005
Emissions projections 2030 single-year point target	350	43%
Baseline scenario	352	42.6%
'With additional measures' scenario	351	42.7%

Table 2.40 Tracking towards Australia's 2030 emissions budget target

	Cumulative emissions, 2021–30 Mt CO_2-e	% above/below emissions budget
Emissions projections 2021–30 emissions budget	4,377	
Baseline scenario	4,225	-3%
'With additional measures' scenario	4,230	-3%

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3 Information related to climate change impacts and adaptation under Article 7 of the Paris Agreement

Key Points

- Australia's changing climate affects health, the environment, infrastructure, the economy and social stability.
- The Australian, state and territory and local governments have different but complementary responsibilities for climate adaptation, and there is significant work happening across all levels of government to improve the resilience and adaptative capacity of businesses, communities and the environment.
- The government is developing the National Climate Risk Assessment to identify and prioritise the things that Australians value the most that are at risk from climate change. The government is also developing a National Adaptation Plan, which will establish a framework for addressing the priority climate risks identified in the Risk Assessment. The Risk Assessment will provide vital input into the development of the Adaptation Plan and support adaptation by other levels of government, business and the community.
- Recent initiatives progressed by the Australian Government, including the Commonwealth Climate Disclosure, are driving climate risk management and disclosure in the private and public sectors.
- Disaster risk management and resilience has also been a key focus across federal, state and territory governments, particularly given recent flooding events.
- Action is occurring across many sectors given the diversity of climate change impacts. For example, the National Health and Climate Strategy was launched in December 2023 to drive national action for mitigation and adaptation in the health sector.
- Australian state, and territory governments are implementing evidence-based climate adaptation measures that are tailored to their jurisdictions' specific needs and conditions, and half of Australian states and territories have legislated requirements for climate adaptation policies.
- Local governments across Australia are working to integrate climate adaptation into their decision making to protect communities' health and wellbeing, property, infrastructure and livelihoods.
- Chapter 3 fulfils paragraphs 104–117 of the modalities, procedures and guidelines.

Structure

Chapter 3 commences by setting out Australia's national circumstances and institutional arrangements with specific relation to climate adaptation policy. The chapter then notes national and state and territory priorities and barriers for climate adaptation work. This is followed by information on cross-cutting national adaptation strategies, as well as information on national-level sectoral policies and plans being implemented by the Australian Government. A comprehensive summary of each state and territory's adaptation measures is provided, followed by a report on the progress of adaptation work across jurisdictions to date. The chapter outlines monitoring and evaluation of climate adaptation policies, and finishes with examples of best practice collaboration to meet Australia's adaptation goals.

3.1 National circumstances, institutional arrangements and legal frameworks

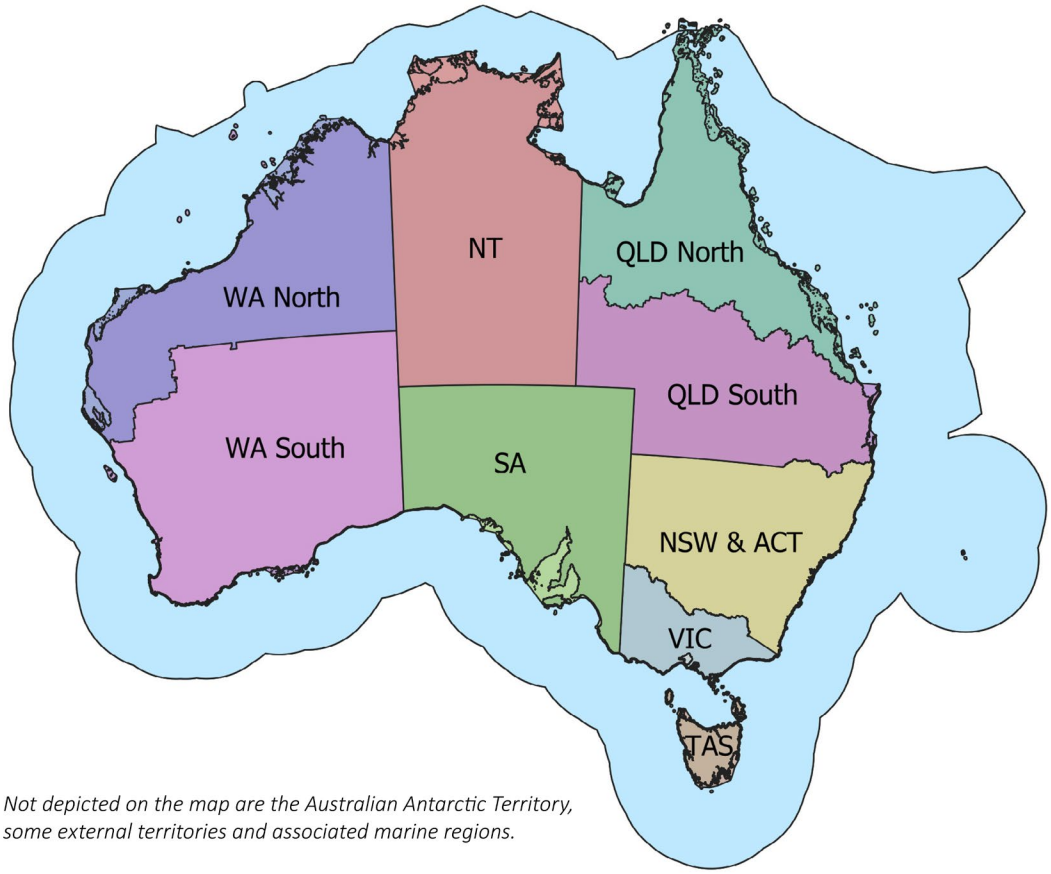
3.1.1 National circumstances

Like the rest of the world, Australia's climate is changing. Despite increasing global action, the cascading impacts of climate change will continue to increase, exacerbating existing and creating new climate risks. Of particular concern is the increase Australia expects to see in the frequency and intensity of extreme events. Climate change and its impacts are already affecting human health and wellbeing, the environment, infrastructure and the economy, and adaptive actions are needed now to avert further damage, build resilience and reduce risk.

3.1.2 Biogeophysical characteristics

Australia's many and varied ecosystems are experiencing climate change in equally varied ways. As outlined in the 2021 State of the Environment report Australia's bioregional framework includes 89 different regions and 419 sub-regions based on common climate, geology, landforms, native vegetation and species information. These range from deserts to tropical rainforests, freshwater wetlands, woodlands, savannahs, shrublands, grasslands and tundra. Each of these has been significantly impacted by land-use change, and climate change is further exacerbating these impacts.

The National Climate Risk Assessment (see sections 3.4.1 and 3.8.1) has identified 11 distinct regions for assessment across Australia, including its oceanic Exclusive Economic Zone and external territories. These are presented in Figure 3.1. Queensland and Western Australia have been divided into north and south as they both encompass tropical and sub-tropical regions.



Not depicted on the map are the Australian Antarctic Territory, some external territories and associated marine regions.

Figure 3.1 State- and territory-based regions identified by the National Climate Risk Assessment, including coastal zones and Australia's exclusive economic zone

3.1.3 Australia's economy, demographics and adaptive capacity

As noted in Chapter 2, section 2.1.3 Australia has a developed, open and highly integrated international economy, with a skilled workforce. Australia has the economic conditions, physical and technological infrastructure, and governance structures in place to support significant adaptative capacity for climate change – efforts are already well underway, as will be detailed later in this chapter. Maturity in the development and implementation of adaptation measures varies across jurisdictions but efforts are ongoing and often supported by legislation and mandated reporting and evaluation.

Australian demographics are diverse and include a wide range of cultures, ethnicities, professions and living and financial situations. The population of approximately 27 million is concentrated in major cities, with one in 4 people living in inner regional and outer regional Australia. The remaining 2% live in remote and very remote areas. Each of these regions experiences climate change differently; for example, remote areas may suffer more from challenges of water security while urban areas can be more vulnerable to flash floods.

A 2019 audit of Australia's infrastructure by the independent statutory agency Infrastructure Australia found that most Australians have good access to high-quality infrastructure including social and health services, roads and public transport, reliable water and connection to electricity that meets demand. However, infrastructure delivery is challenging in regional and remote places where extreme climates can particularly limit services and impact building costs.

There are a number of communities in more vulnerable situations regarding climate impacts, such as the elderly, First Nations people and the socioeconomically disadvantaged. This vulnerability often overlaps with a reduced capacity for adaptation, such as an inability to diversify income streams or access services in rural communities, or important First Nations cultural links to traditional lands and ecosystems being altered by climate change.

The Intergovernmental Panel on Climate Change (IPCC) – Sixth Assessment Working Group II report, Climate change 2022: impacts, adaptation and vulnerability concluded that adaptation progress in Australia is 'uneven' and current adaptation is largely incremental and reactive. However, the report also noted that the ambition, scope and progress on adaptation by Australian governments is rising as adaptation is occurring and becoming mainstreamed in jurisdictional planning processes, and adaptive capacity is considered generally high in Australia's human systems. The report noted there is growing awareness of the need for more proactive adaptation planning at multiple scales and across sectors, and a better understanding of future risks and limits to adaptation is emerging. Disaster risk reduction and climate adaptation are increasingly being considered together, and public and private climate adaptation services are informing climate risk assessments, though they face challenges of fragmentation, duplication and inconsistency. The report also noted local governments in Australia are increasingly implementing adaptation plans but often lack the resources to monitor, evaluate and update plans as necessary.

The Australian Government is working to improve key enablers to transformational adaptation, including shifting from reactive to anticipatory planning, integration and coordination of efforts across levels of government and sectors, inclusive and collaborative institutional arrangements, and providing national policy leadership and consistent and accessible information, along with adaptation funding and finance. These measures are explored further throughout this chapter.

3.2 National institutional arrangements and legal frameworks

The *Climate Change Act 2022*, which legislates Australia's current greenhouse gas emissions reduction targets (see Chapter 2), also requires reporting on impacts. This includes a requirement for the Minister for Climate Change and Energy to prepare and table an Annual Climate Change Statement and for the independent Climate Change Authority to give the Minister advice in relation to preparation of the annual statement.

Legal requirements for the disclosure of climate risks and solutions being implemented to address them have also been recently introduced for both the private and public sectors. The Commonwealth Climate Disclosure, introduced in 2024, will work alongside the Australian Public Service Net Zero by 2030 target and the government's Approach to Climate Risk and Opportunity Management in the Public Sector 2024–26 (see section 2.6.3.4).

To adapt to the impacts of climate change Australia has a collaborative institutional mosaic of governance frameworks. All levels of government, businesses, communities and individuals have important, complementary and differentiated roles in adapting to the impacts of climate change.

Roles and responsibilities for climate change adaptation in Australia were agreed to by the Council of Australian Governments' (COAG) Select Council on Climate Change in 2012. This framework guides federal, state and territory

government cooperation and highlights the specific roles and responsibilities for each level of government and non-government sectors. The COAG principles place local initiative and private responsibility at the forefront of climate change adaptation, noting adaptation works best if the solutions are designed and implemented as close as possible to where the impacts are being felt. Within these roles, there is both scope and need for new models of governance and partnerships to address shared challenges, and the Australian Government has indicated its intent to strengthen adaptation action within its existing roles, with the range of increased action already underway outlined in this chapter.

Under the 2012 COAG Agreement the Australian Government roles and responsibilities include:

- providing national leadership on adaptation reform
- providing nationally authoritative climate science and information, including updated climate projections and scenarios of future climate, to inform decision making across the economy
- managing climate risks to Australian Government assets and services, including investments in public infrastructure – for example through improved resilience in critical infrastructure such as telecommunications and energy networks
- maintaining a strong, flexible economy and a well-targeted social safety net to ensure resources are available so at-risk groups are not disproportionately affected.

The Australian Government collaborates on adaptation with state and territory governments and the Australian Local Government Association through the Energy and Climate Change Ministerial Council. This is supported by the Adaptation Working Group (AWG), chaired by the Australian Government and with members representing all Australian jurisdictions. The AWG is a national network between jurisdictions to foster best practice approaches to adaptation and enable jurisdictions to collaborate and consult on priority matters of common interest. There are 2 formal sub-groups under the AWG:

- The National Partnership for Climate Projections (NPCP) – a collaboration of Australian, state and territory governments, science institutions and universities that is aiming to develop a consistent approach to deliver comparable, robust, fit-for-purpose future climate projections information to assess climate risks and inform adaptation planning. The NPCP Steering Committee meets twice a year in May and September, to progress activities and assess progress toward the agreed partnership goals outlined in the NPCP Roadmap.
- The Coastal Hazards Working Group – a cross-jurisdictional sub-group that collates existing information on coastal hazard risk management and explores and recommends options for collaborative approaches to coastal erosion management that will build resilience to coastal hazards.

3.3 State, territory and local government institutional arrangements and legal frameworks

State and territory governments are undertaking a substantial amount of adaptation action. Their roles and responsibilities under the COAG 2012 arrangements include:

- providing local and regional science and information to assist both government and private parties in assessing climate risks and adapting to climate change
- determining and administering land-use planning systems for strategic and master planning and development control
- managing risks to a broad range of services to citizens, including in areas such as emergency management, transport, environment, health services and public housing
- administering a significant body of legislation, including ensuring their regulatory and market frameworks promote effective adaptation by private parties
- managing a substantial amount of assets and infrastructure
- planning and managing use of Crown lands.

A number of states have legislation relating to climate science, climate risk assessment and/or adaptation.

The Australian Capital Territory's (ACT) *Climate Change and Greenhouse Gas Reduction Act 2010* (CCGHGR Act) sets the ACT's emission reduction targets and the functions of the relevant portfolio Minister. It also establishes the ACT Climate Change Council, which advises the Minister on matters relating to greenhouse gas emissions and building resilience and adapting to climate change. A 2022 amendment of the CCGHGR Act requires an independent entity to assess, and report to the Minister once every 5 years about government policies, programs and practices to address climate change in the ACT, including actions taken to mitigate and adapt to climate change.

In November 2023 the New South Wales (NSW) Government introduced the *Climate Change (Net Zero Future) Act 2023*. This Act legislates emission reduction targets and a net zero commitment for the state by 2050 for the first time. It also includes an objective for NSW to be more resilient to a changing climate. The Act also establishes guiding principles for action to address climate change and an independent Net Zero Commission. This commission will monitor, review and report on progress in NSW towards the Act's emission reduction targets and adaptation objective. Regulations can be made under the Act which may make provision about the implementation of the adaptation objective. The NSW Climate Change Policy Framework 2016 helps guide NSW Government policy and programs to achieve the Act's objectives. In 2023 the NSW Government also introduced requirements for certain government agencies to make climate-related disclosures in annual reports through regulations under the NSW *Government Sector Finance Act 2018*.

On 29 August 2024 South Australia introduced the Climate Change and Greenhouse Emissions Reduction (Miscellaneous) Amendment Bill 2024 to amend the *Climate Change and Greenhouse Emissions Reduction Act 2007*. The amendment strengthens requirements around government planning, risk assessment and action on climate change. It includes a requirement for preparation of a state-wide climate risk assessment to identify climate-related risks and opportunities and inform adaptation planning. It also includes the ability for the Premier to nominate a public sector entity to prepare a plan for an entity or sector relating to climate change mitigation or adaptation or both. It also requires public sector action and reporting on managing climate risk in government operations and activities.

Tasmania's *Climate Change (State Action) Act 2008* was amended in November 2022. It includes a range of measures that will improve the resilience of Tasmania's economy, community and environment to the impacts of a changing climate. Under the Act, Tasmanian Government is required to:

- prepare a statewide climate change risk assessment within 2 years and an update at least every 5 years
- partner with industry and business to develop sector-based emissions reduction and resilience plans within 2 years and update the plans at least every 5 years; the first transport plan was released in September 2024
- prepare a climate change action plan within 2 years, and at least every 5 years thereafter; the Act requires the action plan to include measures that build resilience to the impacts of climate change through adaptation measures
- produce an annual climate change activity statement to report on progress.

Victoria's approach to climate change is set out in the *Climate Change Act 2017*, which establishes a 5-yearly framework comprising a Climate Change Strategy, Climate Science Report, and adaptation action plans. The Act requires consideration of climate change in broader Government decisions and policies where relevant, and sets policy objectives and guiding principles to inform those decisions.

Western Australia introduced the Climate Change Bill 2023 on 30 November 2023 to legislate its contribution to national and global goals for decarbonisation, provide certainty for businesses and attract investment for the transition to net zero emissions. The Bill includes provisions to develop climate adaptation strategies and sector adaptation plans to enhance climate resilience, enabling the state government and community to work together to build a shared understanding of climate impacts and prioritise adaptation responses. The legislation would require sector adaptation plans to be prepared for health and human services, emergency management, primary production, infrastructure and built environment, small and medium enterprises, natural environment and water security and any prescribed sector. Sector adaptation plans may also be developed for other sectors prescribed in regulations.

Local governments are similarly instrumental in adaptation and their responsibilities under the COAG 2012 arrangements include:

- developing local adaptation plans and managing local level assets
- managing risks and impacts to local government service delivery
- ensuring policies and regulations under their jurisdiction – including local planning and development regulations – incorporate climate change considerations and are consistent with state and national adaptation approaches
- coordinating with state governments and the Australian Government about on-the-ground needs of local and regional communities
- communicating directly with local communities, ensuring they are directly involved in adaptation efforts.

Reporting on activities to meet these responsibilities varies across jurisdictions.

3.4 Impacts, risks and vulnerabilities

3.4.1 National impacts, risks and vulnerabilities

Australia's climate is changing and this change is expected to accelerate, further affecting Australians and the things they value.

A comprehensive analysis of national climate risks is underway through the National Climate Risk Assessment (Risk Assessment). The Risk Assessment is a key example of the Australian Government meeting its COAG responsibility of providing nationally authoritative climate science and information to inform decision making.

The Risk Assessment has identified 56 nationally significant risks facing Australia from climate change. Of these, 11 priority risks are undergoing detailed analysis as part of the Risk Assessment's release; these are outlined in Figure 3.2. Release of this first national Risk Assessment will mark a significant step in Australia's efforts to understand climate risks and will benefit Australia for years to come – helping us prepare for and adapt to a more challenging climate. It will form the basis of a comprehensive and ongoing resource on Australia's climate risks for all levels of government, business and the community, enabling climate action to be scaled up over time.

The methodology for the Risk Assessment has been published by the Department of Climate Change, Energy, the Environment and Water. Following its delivery, Australia will be able to provide additional reporting on associated uncertainties and challenges, for identifying current and projected climate trends and hazards, and observed and potential impacts of climate change. The case study below provides further detail on the methodology for the Risk Assessment.

Case Study – Example of a methodology for determining current and potential impacts of climate change, including sectoral, economic, social and/or environmental vulnerabilities

Development of the National Climate Risk Assessment methodology

The Risk Assessment methodology was developed through a partnership between the Australian Climate Service (ACS) and the Australian Government Department of Climate Change, Energy the Environment and Water, with support from consultancy Deloitte and a First Nations-led consultancy Murawin. This partnership established a series of Working Groups which comprised representatives from each organisation, including the Australia Bureau of Statistics, the Bureau of Meteorology, Geoscience Australia and Commonwealth Scientific and Industrial Research Organisation (CSIRO). The Working Groups drew on a range of inputs to develop the Risk Assessment methodology. This included:

- A review of domestic and international (for example the United Kingdom, United States, New Zealand and Germany) approaches to conducting multi-sector risk assessments.
- A significant stakeholder engagement process that engaged future end users of the Risk Assessment's outputs. This included stakeholders from all levels of government, private sector, academia, non-government sector and First Nations people.
- Two sectoral risk assessments piloted, which are reported on separately, along with select stress tests conducted on particular components of the Risk Assessment methodology.

The scoping and development of the methodology and overall program design was underpinned by its own set of principles:

- **User-focused:** Scoping of the Risk Assessment started with asking what users needed to inform their climate change preparedness and adaptation planning, decision making and investment.
- **Collaborative design:** The methodology to be developed with input from key stakeholders including government departments, First Nations people, industry, scientific experts and other identified stakeholders.
- **Evidence-based and drawing on best practice:** The methodology to draw on best available science, data and knowledge, and learn from international leading practices as exemplified in the New Zealand National Climate Risk Assessment (2020), the German Climate Impact and Risk Assessment (2021), the United Kingdom Climate Change Risk Assessment (2022), the US National Risk Index (2021) and the US National Climate Assessment (2018).
- **First Nations lens:** Procurement of an Indigenous-led First Nations Advisory Service Provider to actively engage with First Nations people to ensure that the methodology draws on the wisdom of Traditional Owners who have cared for country and adapted to a changing climate for millennia.

- **Coordinating and building on existing effort:** Collaborating with other government agencies at all levels and other key stakeholders, the Risk Assessment will draw on available knowledge and experience, build confidence and maximise the complementarity of other related assessment outputs, particularly sub-regional assessments.
- **Using and building Australian Government capability:** The Risk Assessment to draw on ACS expertise and create an enduring capacity to monitor and track climate change impacts and risks, making this knowledge accessible for decision making.
- **Modular and iterative approach to the first Risk Assessment:** The Risk Assessment is piloting the proposed methodology to learn and will adjust the methodology if required.
- **Adaptive:** Identifying data gaps and planning for a more comprehensive second national climate risk assessment.
- **Transparency:** New knowledge, methods and data to be publicly shared for others to draw on, learn from and use.

During scoping of the Risk Assessment, stakeholders from all levels of government, private sector, academics, non-governmental organisations and First Nations communities were consulted to understand:

- their perspective on elements at risk – things of value to Australians that could be impacted, negatively or positively, by climate change
- current uses of climate risk information
- what they would like to see included in the Risk Assessment, as well as desired outputs and products.

The Risk Assessment has engaged closely with national agencies leading relevant projects and programs such as the National Partnership for Climate Projections, the National Health and Climate Strategy, and the Treasury's modelling of climate risks and opportunity including through the Measuring What Matters and Intergenerational Report. Key feedback received from stakeholders in the scoping stage included:

- Address complex risk, seeking alignment with leading practice where practicable.
- Where possible, align with recognisable domain policy frameworks from outside the field of climate change.
- Engage stakeholders and users on an ongoing basis and employ collaborative design principles to ensure buy-in to end products.
- Ensure outputs support improved climate risk decision making for user groups.
- Consider connection and integration with other programs of work across government, where relevant.

The methodology was also reviewed by a range of stakeholders from each stakeholder category listed above and has informed this document.

The Risk Assessment is engaging a range of appropriate experts and practitioners to ensure it is informed by the most current knowledge. This will ensure that end users who will draw on the Risk Assessment's findings are involved in the process, supporting the Risk Assessment's uptake. Care is being taken to ensure that the stakeholders engaged will also be able to advise the Risk Assessment on the justice and equity considerations relevant to risks and opportunities.

The Risk Assessment draws on and extends the substantial amount of research produced on national impacts, risks and vulnerabilities. For example, climate change is expected to affect human life and health through a variety of channels, from acute impacts associated with natural disasters to the slow-onset changes such as increases in average temperature, extreme heat and some vector-borne diseases. The 2023 National Statement on Climate Change and Agriculture is another example of existing research on climate impacts on specific industry sectors.

Section 2.1.5 of Chapter 2, provides a detailed outline of the impacts of climate change on Australia's ecosystems, including warming air and sea temperatures leading to an increased frequency of extreme heat events over land and sea. There has been an increase in extreme fire weather, and in the length of the fire season, across large parts of the country since the 1950s, especially in southern Australia. In recent years pressures on ecosystems showing signs of collapse have become more severe, widespread and frequent. Climate change has shown to be a key pressure for 18 out of 19 Australian ecosystems assessed, primarily through changes in temperature (DCEEW 2021).

Australia's 2023 Intergenerational Report highlights that sustained action across adaptation and emissions reduction will be required to maintain productivity and fiscal sustainability as well as achieve better social and environmental outcomes, with effective investments in resilience reducing costs to the economy in the long run.

Climate change also presents unprecedented challenges to Australia's national security. These challenges stem from the economic, strategic, political and social challenges of dealing with climate impacts both domestically

and internationally. The independent findings of the 2023 Defence Strategic Review recognised climate change as a national security issue with significant implications for Australia and the IndoPacific region. Notwithstanding heightened geopolitical challenges, Australia is building national resilience while working with partners and neighbours to support a stable and prosperous region that can resist the worst impacts of climate change.

Along with action to reduce emissions, Australia is taking practical actions now to adapt to climate change to protect individuals, communities and the environment (see section 3.8.1)

Figure 3.2 National Climate Risk Assessment priority risks

3.5 State- and territory-level impacts, risks and vulnerabilities

Australian states and territories are already experiencing a diversity of climate impacts, risks and vulnerabilities. As outlined in section 3.3 half of Australian states and territories have legislative obligations around adaptation. Many states and territories publish regular reports on observed and projected impacts of climate change. This evidence base supports governments to plan and implement effective adaptation at the local and national scale, and to support business and community to adapt.

Each state and territory government has undertaken various levels of climate risk assessment and adaptation planning for their jurisdictions. All state and territory governments have produced publicly accessible material describing the observed and potential impacts of climate change specific to their jurisdiction, including:

- Climate Change Snapshot – Australian Capital Territory
- Regional Climate Change Snapshots – New South Wales
- State of the Science and Climate Change Impacts report – Northern Territory
- Pathways to a climate resilient Queensland – Queensland Climate Adaptation Strategy 2017–30
- Climate Science and Knowledge Resources – South Australia
- Climate Futures for Tasmania 2010
- Victoria's Changing Climate
- Climate Science Initiative – Western Australia

Some state and territory governments are in the process of developing further risk assessments and other materials on the observed and potential impacts of climate change on their jurisdictions. For example, the Tasmanian Government released its first statewide risk assessment for climate change on 29 November 2024, and is developing new fine-scale climate projections.

3.5.1 Australia Capital Territory

The Australian Capital Territory (ACT) has partnered with the New South Wales (NSW) Government in the NSW and Australian Regional Climate Modelling (NARCliM) project. NARCliM creates climate change projections by using regional climate models to downscale the IPCC global climate models. For the ACT, NARCliM projects a future climate that has increasing temperatures, more hot days, fewer cold nights, changing rainfall patterns and an increasing number of high Forest Fire Danger Index days (see section 2.1.5.1).

The ACT has already experienced severe weather events because of this warming trend. The Black Summer bushfires in 2019 and 2020, followed by substantial hail and flooding events in Canberra in 2020, significantly impacted natural ecosystems, community wellbeing and the ACT economy.

In 2022 the ACT Government commissioned a Climate Change Risk Assessment to identify and assess physical climate-related risks for ACT Government services, operations and assets, and identify opportunities to improve resilience across the risks identified. The Risk Assessment identified key risks across 5 value domains: social, economy, natural environment, built environment and governance. In total, 26 priority risks from a total of 59 total identified risks were assessed by the project; 6 of these 26 have been given an extreme risk rating due to their potential severe consequence:

- Extreme weather events leading to economic damage, loss of productive, increased business costs and reduced viability of businesses, resulting in compromised economic prosperity of the ACT.
- Extreme weather events and longer-term changes in climate leading to adverse impacts upon vulnerable community members resulting in poor health outcomes and increased demand on health services.
- Poor air quality (e.g. bushfire smoke, dust storms, thunderstorm asthma) leading to an increase in hospital admissions resulting in increased acute strain on the ACT health services.
- Increasing temperatures and changing frequency and intensity of bushfires leading to longer, more intense fire seasons resulting in elevated environmental losses and ecosystem disruption.
- Changes in climate (temperature, rainfall, drought and snow cover) leading to negative changes in the composition and stability of alpine and sub-alpine environments resulting in a loss of these ecosystems.
- Extreme weather events and poor air quality leading to increased human safety concerns resulting in high and consistent demand for response and recovery services across directorates.

3.5.2 New South Wales

Significant impacts from climate change are already occurring in NSW and are expected to be felt more widely in the future. NSW has already warmed by 1.4°C since national records began in 1910 and 6 of the 10 warmest years on record since 1910 have occurred since 2013. The warmest year on record for both average temperature and maximum temperature was 2019, when average temperature was 1.2°C above the 1990–2009 average. Temperature has been increasing in recent decades. Between 1910 when national records began and the 1990–2009 baseline, temperature has risen by 0.84°C. Further temperature increases are expected in all parts of the state, with the greatest increases inland, including the Far West, New England and North West, and Central West and Orana Regions. The number of hot days experienced by NSW is projected to increase across spring, summer and autumn, with the largest increase expected during summer.

Cold nights, where the minimum temperature drops below 2°C, are expected to decrease. These are important for the survival of some important plant species. Increased minimum temperatures and a reduction in the number of cold nights will also have significant impacts on snow cover and snow depth. Natural snow depth in alpine areas has declined by over a third since the 1950s and years with persistent heavy snow cover have become rare. Further reductions in natural snow depth, particularly under a high-emissions scenario, are likely to impact alpine biodiversity that depends on long-lasting snow cover and restrict recreational opportunities, affecting local economies dependent on snow-based tourism.

Climate change will influence rainfall patterns and the total amount of rainfall that NSW receives. These changes may have widespread impacts on water security, native species' reproductive cycles and agricultural productivity. For example, the ecological character of the NSW Central Murray Forests in the Murray Murrumbidgee region has already been impacted by the reduced frequency, extent and duration of spring floods from water extraction and climate change, which has caused a significant decrease in waterbird breeding. Climate change could further exacerbate these impacts, particularly under a high-emissions scenario.

The 2022 flood events in NSW and Queensland are expected to be some of the most significant disasters economically in the recorded history of Australia (Climate Council 2022). The Insurance Council of Australia has recorded more than $6.3 billion worth of claims to date (Insurance Council of Australia 2024). The first 2022 flood in Lismore was the largest flood event in that city since records began in 1887. Four people lost their lives and more than 2,000 premises became uninhabitable.

The number of severe fire weather days will continue to increase for most of NSW during spring and summer, with many regions projected to experience a doubling or even tripling of severe fire weather days by 2090 under a high-emissions scenario.

Sea levels are rising and projected to have a major impact on coastal communities in NSW over coming decades. At the NSW baseline sea-level monitoring gauge at Port Kembla, average sea level has been rising at a rate of approximately 3.7 mm/year since 1991. Sea level along the NSW coast is projected to continue rising under all emissions scenarios. Later in the century, sea-level rise is projected to accelerate under both emissions scenarios, with significantly faster acceleration under a high-emissions scenario. Communities, infrastructure and natural ecosystems are also expected to be increasingly vulnerable to the impacts of sea-level rise in the future. By 2061 an estimated 39,000–46,000 NSW properties could be exposed to coastal erosion or inundation, with annual costs from property damage and loss of land totalling approximately $1–1.5 billion.

At the beginning of 2020, 100% of NSW was in drought. Between 2017 and 2020 many regions in NSW have faced the lowest rainfall and driest conditions in 120 years of records. In fact 2019 was the driest and warmest year on record for NSW with rainfall 55% below average. The drought's economic, social and environmental impacts spread well beyond the farm gate, with communities experiencing significant financial and mental health hardships. The drought is estimated to have cost the NSW economy $5.7 billion of gross state product in 2018–19, with further estimated losses of $6.3 billion in 2019–20.

3.5.3 Northern Territory

Like other states and territories the Northern Territory (NT) is already experiencing the impacts of climate change:

- All of the NT has warmed since 1910, with the average annual temperature increasing by 1.5°C.
- December–February rainfall has increased over almost all of the NT, while June–August rainfall declined over most of the region.
- The number of days with dangerous weather conditions for bushfires has increased in nearly all locations.

The 2020 report Climate Change in the Northern Territory: State of the science and climate change impacts was prepared for the NT Government by the National Environment Science Program Earth Systems and Climate Change Hub. It notes key impacts for the NT across systems including human health, coasts and marine resources, the water supply and security, biodiversity and ecosystems, economic sectors and assets, infrastructure

and construction, energy and minerals, defence and tourism. How these impacts play out across the Territory will be region and ecosystem specific and cannot be generalised for the whole of the NT.

Regarding health impacts, these are similar to other states and territories as increased temperatures and extreme heat days will result in heat stress and dehydration. Increased floods (and humidity) could amplify vector-borne diseases such as malaria, dengue and other fevers.

The NT's coastal areas are vulnerable to sea level rise, which will be felt most acutely from the combination of extreme events such as high tides, surface waves, storm surge and flooding rivers, which are becoming more intense and frequent. Rising sea levels and storm surges will impact coastal communities and infrastructure, cultural artefacts and sacred sites, ecosystems like estuarine foreshores, and have the potential to contaminate groundwater sources and cause soil erosion. Extreme weather and flooding can disrupt transport networks, impacting on food availability and security, as well as provision of health and support services.

The identity and lifestyle of most Territorians are integrated with the NT's biodiversity and ecosystems through both employment and leisure. For First Nations people, who managed and originally shaped the NT landscape, connections with the natural world are deeply spiritual and reflected in an intricate belief system with resounding expression in ancient art forms. The way that climate change impacts the natural environment of the NT will vary between regions, ecosystems and species. Rising temperatures and sea levels, as well as climate-induced changes in fire regimes and extreme weather events, will intensify existing threats such as habitat loss, invasive species and drought. Marine heatwaves can cause coral bleaching, which can damage the integrity of reefs and reef ecosystems. Increasing sea and air temperatures could change species' ranges and the timing of life cycle stages.

Agribusiness, construction, tourism and energy and minerals are key pillars of the NT's economy. Each industry sector is likely to face challenges and impacts from climate change. These risks include loss of productivity from heat stress to livestock and crops, loss of pasture from floods and bushfires, disruption to transport networks and logistics, damage to mine sites and production disruptions from flooding and heavy rainfall, and losses in tourism revenue and jobs due to damage of attractions and ecosystems by climate-related events.

3.5.4 Queensland

Queensland often experiences climate extremes such as floods, droughts, heatwaves and bushfires. Climate change is exacerbating the frequency and severity of these events. Queensland will increasingly be affected by changes in temperature, rainfall, sea level and extreme weather conditions.

Average temperatures across the state are currently 1°C higher than they were 100 years ago. Recent decades have shown a clear warming trend. Since 1900 summer/wet season rainfall has increased over most of Queensland while winter/dry season rainfall has declined. The number of days with dangerous weather conditions for bushfires has increased in nearly all locations across the state. The number of severe land-falling tropical cyclones near and south of Cairns has declined since the late 19th Century.

Queensland's climate is already highly variable but climate change is leading to shifts beyond this natural variability. The most recent projections for Queensland are based on the modelling completed by the Coupled Model Intercomparison Project Phase 6 (CMIP6) that supported the development of the Sixth Assessment Report (AR6) from the IPCC. However, projections for Queensland based on the previous 5th phase (CMIP5) models are also available.

Queensland can expect higher temperatures, hotter and more frequent hot days, harsher fire weather, fewer frosts and reduced rainfall in the south-east. Queensland will also experience more intense downpours, less frequent but more intense tropical cyclones in the north, rising sea levels, more frequent sea-level extremes and warmer and more acidic seas.

The Queensland Future Climate Science Program is delivered through a partnership between the Queensland Government and the University of Queensland. The program involves downscaling global climate models to provide high-resolution climate projections for Queensland, analysis of climate extremes and the translation into knowledge and climate services.

The Queensland Future Climate Dashboard (the dashboard) and Regional Explorer provide easy-to-use interfaces to Queensland's high resolution climate data and summary information. These online tools allow users to explore climate projection data for over 200 different regions, 3 emissions scenarios (SSP1-2.6, SSP2-4.5 and SSP3-7.0), calendar seasons and time-steps (for 2030, 2050, 2070 and 2090).

In addition to high spatial resolution (10 km grid) the dashboard provides access to a wide range of climate variables, including extreme events, in a variety of output formats including maps, charts, tables and shapefiles to support further analysis and to inform risk assessments.

The Queensland Government has developed a range of state-wide risk assessments that can support future decisions including the Queensland State Heatwave Risk Assessment 2019 and the Severe Wind Hazard Assessment for Queensland.

3.5.5 South Australia

South Australia is facing a number of impacts from climate change including sea-level rise, reduced average rainfall, intensification of storm events and more frequent and severe heatwaves, bushfires and droughts. These changes are likely to impact on agricultural production, public health, community wellbeing, natural landscapes and wildlife habitats, and public and private infrastructure, particularly in coastal areas. In 2023 the Department for Environment and Water (DEW) prepared trend and condition report cards that include information on the condition of rainfall, temperatures and sea levels and projected trends under a changing climate.

The DEW Guide to Climate Projections for Risk Assessment and Planning in South Australia 2022 provides a summary of the changes in climate that are projected to occur in South Australia over the coming 80 years. The projections use NARCliM1.5 data at grid resolutions of 10 km and 50 km. Based on this guide, projections for South Australia indicate that:

- maximum, minimum and average temperatures will increase
- the frequency of very hot days will continue to increase and heatwaves will get longer and hotter
- warming conditions will reduce the frequency of frost events
- average annual rainfall will decline
- the amount of rain falling and the frequency of extreme rainfall events will increase
- the time spent in drought will increase
- sea level will continue to rise
- sea surface temperatures will continue to rise and acidity will continue to increase
- harsher fire weather will be experienced and fuels will be drier and more ready to burn.

In late 2023 DEW commenced work on a South Australian Climate Change Risk Assessment. This project is due to be completed in 2025. It will support decision makers to better understand the wide range of risks and opportunities that South Australia may face due to climate change and which risks need to be addressed most urgently.

In 2023 DEW launched a new online mapping tool that provides information on the likely future changes in South Australia's climate to help councils, regions, industry and climate adaptation leaders to plan for the future.

The DEW Climate Change Science and Knowledge Plan for South Australia 2022 identifies critical science and information that is needed to inform climate change risk assessment, mitigation, planning and adaptation responses in South Australia. It provides a comprehensive plan to prioritise, coordinate, translate and deliver this climate science and information.

3.5.6 Tasmania

Under a changing climate Tasmania's terrestrial environments are projected to experience a rise in annual average temperatures of approximately 2.9°C under a high-emissions scenario and 1.6°C under a low-emissions scenario. Temperature increases in Tasmania are less than the projected global average temperature rise due to the moderating influence of the Southern Ocean. Significant changes in seasonal and regional rainfall patterns are projected, including an increase in rainfall intensity and associated flooding. More hot summer days and heatwaves are projected and fire seasons will become longer, with more days at the highest range of fire danger. Coastal and marine environments will also experience significant impacts. Sea levels are projected to rise 0.17–0.22 m relative to 2010 values by 2050, and 0.22–0.70 m relative to 2010 values by 2100. Mean statewide sea surface temperature will increase in all seasons by the end of the century and there will be a significant increase in pan evaporation of up to 19% by 2100. Increased frequency and intensity of storm events, and associated coastal erosion and inundation are also projected. Ocean acidification will increase and there will be changes in nutrient levels and species distribution.

Climate Futures for Tasmania (CFT) is Tasmania's most up-to-date and accessible source of downscaled climate change projections. CFT was developed in 2010 and provided the first fine-scale climate information for Tasmania. The Tasmanian Government is currently developing new downscaled climate projections for Tasmania, an initiative funded through Tasmania's Climate Change Action Plan 2023–25.

3.5.7 Victoria

Victoria's Climate Science Report 2024 describes how the state's climate is changing, and includes climate projections based on the latest generation of global climate models. These models are from the sixth phase of the World Climate Research Programme's Coupled Model Intercomparison Project (CMIP6).

Long-term observed records show that Victoria's climate is changing under the influence of both natural variability and global warming. The average temperature across the state has warmed by just over 1.2°C since official Bureau of Meteorology records began in 1910, and by around 1.4°C since the pre-industrial era. Cool season rainfall has decreased by more than 10% compared to 1961–90. Mean sea level for Melbourne (recorded at Williamstown) has risen by approximately 2 mm per year between 1966 and 2019. There has been an increase in dangerous fire weather and in the length of the fire season across southern Australia since the 1950s.

Climate projections suggest that Victoria will continue to become warmer and drier in the future. However, natural year-to-year and decade-to-decade variability mean that relatively cooler periods and very wet years will still occur.

By the 2050s, under a high emissions (SSP3-7.0) scenario, very hot days (99.9th percentile from the historical baseline) could occur on average 3–70 times per decade, compared to the 3-4 per decade experienced historically. By the 2090s Victoria is projected to have warmed on average by 3.1°C (2.2 to 3.6°C) under a high emissions scenario compared with 1986–2005. This would see Victoria frequently experiencing currently unprecedented high temperatures.

Heatwave events cost 0.025% or $87 million of Gross State Product (GSP) in Victoria each year, according to a 2018 heatwave vulnerability assessment by Natural Capital Economics. Melbourne faces the highest value economic impact from these events ($52.9 million) but regional economies with a high dependency on the agriculture sector are most vulnerable to heatwaves. For severe level heatwave events almost half of the total economic impacts are incurred by the agriculture sector. Outdoor workers in the construction sector are also highly vulnerable to heatwaves. Loss to the Victorian construction sector from an extreme heatwave event is estimated as $103 million.

Victoria is also likely to have a significantly lengthened fire season with the number of very high fire danger days likely to continue to increase. Victoria's Bushfire Management Strategy acknowledges that climate change is increasing the frequency, severity and duration of dangerous bushfire weather conditions in Victoria. The fire season starts earlier in spring, is more intense and destructive, and continues longer into autumn. Larger areas may be burnt in a single fire season and fires will occur in places that have not burnt historically. This could negatively impact the natural environment and result in damaging consequences for Victorian communities.

Sea levels are projected to rise regardless of the emissions scenario. This will lead to a heightened risk of inundation, erosion and algal blooms, and changes to flood regimes and wave dynamics. Many existing developments were not designed with natural processes in mind, resulting in infrastructure and coastal uses that conflict with natural coastal processes. The impact of climate change is also threatening natural and cultural values by altering ecosystems and damaging sites of cultural significance. Annual rainfall is projected to decrease across the state on average, especially with declines across winter and the cool season (April to October). When extreme rainfall events do occur, they are likely to be more intense. Areas of the Victorian Alps are projected to see a greater reduction in rainfall than the surrounding areas. Victorian alpine areas are also projected to continue to experience declining snowfall of 35–75% by the 2050s under a very high emissions scenario (equivalent to 'high' in CMIP5). Comparison of observations and projections in Victoria suggest that temperature has been tracking towards the upper limit of projections while winter rainfall has been tracking towards the drier end of projections. An increasingly hotter and drier climate is projected to significantly reduce inflows. This could have serious future consequences for water availability across Victoria's catchments.

3.5.8 Western Australia

Western Australia's (WA) 2023–24 summer was the hottest on record, 1.9 °C above the 1961–90 average. Many sites experienced their highest summer temperature on record, including Marble Bar which recorded a daily maximum temperature of 49.3°C, according to the Bureau of Meteorology (BOM). In 2023 annual rainfall was below to very much below average in western and far southern WA and the Gascoyne and Central West experienced their driest year on record. Record rainfall was received in the south and west Kimberley in December–January 2023–24 due to the slow-moving ex-tropical cyclone Ellie. This caused extensive flooding of the Fitzroy River resulting in community evacuation and significant infrastructure damage (according to BOM).

The Western Australian climate projections: summary document provides a summary of the changes in climate and sea levels likely to occur over the coming decades in WA. It is designed to support high-level climate risk assessments and adaptation planning. The information is based on the Climate Change in Australia projections produced by the CSIRO and BOM in 2015.

The Climate Science Initiative (CSI) Program is producing WA's most comprehensive climate science projections to provide a strong foundation for climate risk modelling. Projections using data from the Coupled Model Intercomparison Project Phase 6 (CMIP6) are being produced for 3 scenarios that represent the most likely range of future emissions – SSP1-2.6 as a low-end scenario, SSP2-4.5 as a moderate scenario and SSP3-7.0 as a high-end emissions scenario. The CSI will deliver high resolution climate projections for WA representing the best understanding of how the climate will change to year 2100 through a range of climate variables, such as rainfall, temperature, humidity and wind speed.

3.6 Adaptation priorities and barriers

3.6.1 National adaptation priorities and barriers

Consistent with the UNFCCC Adaptation Policy Cycle Australia's current adaptation priorities are being informed by national and sub-national risk assessments. The Australian Government is now developing Australia's National Adaptation Plan and the National Climate Risk Assessment, meaning adaptation priorities will be informed by Australia's first in-depth, national-level assessment of how climate change puts what Australians value at risk now and in the future. More information on the Adaptation Plan and Risk Assessment is at section 3.8. Australia's 6 sectoral net zero plans integrate resilience into mitigation strategies, complementing adaptation priorities (see Chapter 2). Considering mitigation and adaptation together helps de-risk Australia's pathway to net zero and means the co-benefits of actions which have both mitigation and adaptation benefits can be realised. The Future Drought Fund provides an example of a significant national policy that prioritises adaptation to climate change impacts, namely increasing periods of prolonged drought.

The Australian Government faces a number of barriers to enabling and supporting effective adaptation efforts. Governments at all levels face difficult choices in allocating resources across climate, disaster risk reduction and a host of other priorities in a manner consistent with medium-term fiscal strategies and other macroeconomic policy priorities. Mainstreaming adaptation action will require more workers to consider and manage climate impacts as part of their core roles. The National Adaptation Plan Issues Paper sought feedback on barriers to and enablers of effective adaptation policies, and received feedback covering areas such as:

- clarification of roles and responsibilities for adaptation
- governance and legislative arrangements for adaptation planning and risk assessment
- equipping the workforce with the skills to manage climate risks
- the provision of easily accessible, reliable and useable climate data and information.

The Australian Government is considering these as part of developing the National Adaptation Plan.

3.7 Adaptation priorities for states and territories

Due to Australia's size, varied geography and differing local contexts, states and territories face a wide range of climate impacts and risks. Therefore, while adaptation policies often have common themes, they vary according to the priority risks in individual states and territories. The following section provides some examples from across Australia that highlight the context-specific nature of adaptation and the need for locally led adaptation that works in concert with national frameworks and guidance.

3.7.1 Australian Capital Territory's adaptation priorities

The ACT Climate Change Strategy 2019–25 prioritises an integrated approach to climate change, which means considering both mitigation and adaptation outcomes of decisions and policy measures. In taking this approach the ACT Government will thoroughly consider synergies and trade-offs in responding to climate change, helping to avoid unintended negative outcomes. The strategy notes priority areas of:

- community leadership
- a just transition
- transport
- energy, buildings and urban development
- ACT government leadership
- waste avoidance and management
- land use and biodiversity.

3.7.2 New South Wales's adaptation priorities

In June 2022 the NSW Government released the NSW Climate Change Adaptation Strategy, which sets out the NSW Government's approach to climate change adaptation, supported by funding of $93.7 million over 8 years. The NSW Strategy sets 4 priority areas for NSW Government action:

- Develop robust and trusted metrics and information on climate change risk.
- Complete climate change risk and opportunity assessments.
- Develop and deliver adaptation action plans.
- Embed climate change adaptation in NSW Government decision making.

These priority areas are intended to achieve the strategy's objectives of a well-adapted:

- built environment and infrastructure
- natural environment, biodiversity, ecosystems and natural resources
- economy, businesses, industries and livelihoods
- society, government, communities, families and individuals.

Under the 4 priority areas, there are a number of actions, which set out a detailed program of work, including metrics development, research, development of climate change projections, adaptation communication, regular climate change risk and opportunity assessments and adaptation action plans, and actions to make climate change adaptation part of NSW Government decision making. NSW has committed to publish an Adaptation Action Plan which will include actions across the 4 key domains outlined in the objectives of the NSW Climate Change Adaptation Strategy. The NSW Reconstruction Authority has developed Australia's first State Disaster Mitigation Plan. This supports the NSW Government's commitment to making communities safer, more resilient and better prepared to face the challenges of disasters caused by natural hazards such as floods, bushfires, storms and cyclones and coastal erosion and inundation under a changing climate.

3.7.3 Northern Territory's adaptation priorities

The NT released the Climate Change Response: Towards 2050 in 2020, communicating the Territory's key strategic objectives for acting on climate change. The Climate Change Response provided high-level direction for climate change adaptation:

- Build a resilient Territory.
- Unlock opportunities from a low carbon future.
- Inform and involve all Territorians.

3.7.4 Queensland's adaptation priorities

The Queensland Climate Adaptation Strategy 2017–30 (Q-CAS) was released in 2017 to address the risks and harness the opportunities of a changing climate. Q-CAS is centred around a partnership approach that recognises that a collaborative approach is needed to ensure resilience is embedded in Queensland's diverse economies, landscapes and communities. Q-CAS outlines 18 actions across 4 distinct but complementary pathways to address the multiple climate adaptation needs of the community, governments and businesses:

- People and knowledge: empower best practice climate science, education and engagement to support climate risk management within Queensland's communities.
- State government: embed the consideration of climate adaptation into policies, regulations and procedures, and address risks to assets and services.
- Local governments and regions: partner with local governments and other regional organisations to develop regional adaptation solutions, including embedding climate risk in planning and development decisions.
- Sectors and systems: assist sector leaders to collaborate with government agencies, local governments and other stakeholders to identify adaptation needs and prioritise adaptation activities.

3.7.5 South Australia's adaptation priorities

In May 2022 the South Australian Parliament declared a climate emergency, committing to restoring a safe climate by transforming the economy to net zero emissions. The South Australian Government is working with business, industry and community to build a strong, net zero emissions future and adapt to climate change. A range of priority actions will be delivered in the near term to tackle climate change. These actions build on a foundation of existing government climate change actions and strong leadership in renewable energy and emissions reduction. South Australia – Responding to Climate Change outlines the priority actions that the South Australian Government will be focusing on in the near term to build a strong, net zero emissions future and adapt to climate change. These priority actions build on a strong foundation of existing government action to address climate change mitigation and adaptation. The 4 climate resilience priority actions are:

- Greening South Australian communities: An Urban Greening Strategy for metropolitan Adelaide is being developed to increase tree canopy and green spaces and cool the city.
- Dedicated biodiversity legislation: A new act will be developed to protect biodiversity and support climate adaptation approaches to conservation.
- Independent Planning Review: An independent review of planning legislation and the Planning and Design Code to ensure planning decisions encourage more liveable, competitive and sustainable long-term growth.
- Urban Water Strategy: A strategy will be developed to integrate management of recycled water (including stormwater) and mains water to support liveability and climate resilience.

3.7.6 Tasmania's adaptation priorities

Tasmania's *Climate Change (State Action) Act 2008* outlines the Tasmanian Government's climate change priorities, including:

- A greenhouse gas emissions reduction target for Tasmania of net zero emissions, or lower, from 2030.
- The development of sector-based emissions reduction and resilience plans, to be updated every 5 years.
- The preparation of a climate change risk assessment every 5 years.
- The preparation of a climate change action plan every 5 years.
- The preparation of an annual greenhouse gas emissions report and annual climate change activity statement.

Tasmania's Climate Change Action Plan 2023–25 outlines the government's plans for action on climate change until 2025. Under the plan, 3 key priority areas are identified: information and knowledge; transition and innovation; and adaptation and resilience. The action plan includes actions to build Tasmania's resilience to the impacts of climate change such as:

- Producing up to date fine-scale climate projections for Tasmania (in progress).
- Delivering Tasmania's first statewide climate change risk assessment (released 29 November 2024).
- Developing a whole-of-government policy framework to embed climate change consideration into government decision making (in progress).
- Working with local government to co-design and implement a program to build climate change capability in Tasmania's councils (in progress).
- Working with coastal managers across state and local government to develop a consistent statewide approach to managing the impacts of coastal hazards under a changing climate (in progress).
- Updating the Enterprise Suitability Mapping to incorporate the latest climate projections and extend the maps out to 2100 to support decision making in the agriculture sector (in progress).
- Exploring development of a risk information portal that spatially enables municipal emergency risk assessments (in progress).

3.7.7 Victoria's adaptation priorities

The 5-yearly planning framework set out in *Victoria's Climate Change Act 2017* comprises a Climate Change Strategy, Climate Science Report and adaptation action plans. Victoria's Climate Change Strategy (released in 2021) outlines the Victorian Government's plan to achieve a net zero emissions, climate-resilient, prosperous and liveable state. The strategy is a 5-year plan that outlines emission reduction targets and identifies Victoria's adaptation priorities.

These priorities consist of addressing the current climate change impacts, reducing barriers to adaptation and laying the foundations for transformational adaptation. They are supported by key enablers to build capacity and partnerships, embed consideration of climate change in governance and strategic planning, develop sustainable adaptation finance and foster leadership and innovation.

3.7.8 Western Australia's adaptation priorities

WA's Climate Adaptation Strategy (released in July 2023) aims to ensure WA's communities, environment and economy are resilient to future climate change. It sets out 4 directions (priorities) to support and accelerate climate adaptation across the state:

- Produce and communicate credible climate information and resources.
- Build public sector climate capability and strengthen accountability.
- Enhance sector-wide and community partnerships to unite and coordinate action.
- Empower and support the climate resilience of Aboriginal people.

3.7.9 Barriers to adaptation for states and territories

While priorities for adaptation actions may differ across jurisdictions the barriers and challenges to implementation are similar. With climate events projected to increase, the likelihood of 'compound extremes' increases, where multiple extreme events occur together or in sequence. This causes compounding impacts and places significant demand on state and territory response capabilities.

State and territory governments are seeking to further build internal capacity to respond to climate change. This includes technical and policy skills to embed the consideration of climate impacts in governance, risk management and policy development and evaluation.

Another adaptation barrier is lack of access to useable climate information at the scale required to support robust, informed decision making. State and territory governments already produce substantial information on climate projections and risks for their jurisdictions. Given its role in providing national climate science and information the Australian Government is working to complement this information through the National Climate Risk Assessment.

3.8 Adaptation strategies, policies, plans, goals and actions to integrate adaptation into national policymaking

3.8.1 Cross-cutting national adaptation strategies, policies, plans, goals and actions

Australia is developing and implementing adaptation actions in accordance with the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change. Australia's efforts are contributing to sustainable development while ensuring an adequate adaptation response.

Adaptation planning needs to be properly informed to be effective and avoid maladaptation, or actions that inadvertently increase vulnerability to the impacts of climate change. A foundational requirement for adaptation planning is the preparation of integrated vulnerability and risk assessments. When based on reliable information these assessments will inform the development of robust and effective adaptation plans. Recognising the importance of a national framework underpinned by the best information, the Australian Government is developing Australia's first National Climate Risk Assessment and National Adaptation Plan. These policies are central to the government's work to strengthen adaptation, reduce climate risk and ensure Australia can continue to prosper in an increasingly climate-disrupted future.

The analysis from the risk assessment will inform national priorities for climate adaptation and resilience actions through the National Adaptation Plan. The plan will establish a framework for adapting to the nationally significant climate risks identified in the risk assessment. The plan will be the foundation for the Australian Government's adaptation efforts, showcasing national adaptation priorities and guiding the government's adaptation leadership.

The National Adaptation Plan will complement other adaptation and resilience frameworks and efforts, including Australia's disaster risk reduction work lead by the National Emergency Management Authority and the forthcoming National Resilience Framework. The framework will enhance Australia's capacity to anticipate, prevent, prepare, absorb, adapt and evolve from all-hazard crises. The framework will outline the Australian Government's role, priorities, approach and architecture for resilience, and will guide resilience policy, regulation and investment across the Australian Government.

As previously noted the Risk Assessment has been developed in recognition of the Australian Government's role and responsibilities in providing leadership on national adaptation reform and providing climate information that is meaningful for decision makers responding to climate change. The risk assessment is an intentionally participatory process. The Australian Government has worked on the risk assessment with world-leading scientists and across all levels of government, industry and community, and with First Nations peoples, to ensure consideration of the different roles that each play in responding to climate change risks.

The first pass assessment identified 11 priority risks and provided an opportunity to further progress engagement with experts and stakeholders. The second pass assessment consists of an in-depth analysis of those priority risks (see Figure 3.2) using both qualitative and quantitative methods.

The risk assessment follows an evidence-based process and will be delivered in-line with the following principles:

- **Robust:** Align with international leading practices, be repeatable, use multi-disciplinary approaches, incorporate traditional knowledge and ongoing learning.
- **Holistic:** Take a holistic approach by considering both current and future risks, assessing interdependencies and accounting for complex, cascading and compounding risks. Acknowledge gaps and limitations in the assessment and proposed actions.
- **Actionable:** Communicate findings effectively, support improved climate risk decision making, inform the National Adaptation Plan and integrate with existing programs.
- **Precautionary approach:** When evidence or confidence is limited employ a precautionary approach instead of inaction, identifying potential risks and taking necessary actions to mitigate them. Recognise that societal values shift over time.
- **Inclusivity and empowerment:** Ensure that the risk assessment process is relevant, participatory and enabling, involving all relevant stakeholders and recognising their knowledge and experience.
- **Equity and justice:** Address differential impacts of climate risks, avoid exacerbating inequalities and address inter-generational equity.
- **First Nations knowledges and traditional owners:** Recognise and respect First Nations as traditional owners and custodians, valuing their unique and important traditional knowledge and ways of knowing and seeing to care for Country. Support the self-determination of First Nations communities and enable First Nations-led responses to address climate change.
- **Collaborative and values based:** Emphasise collaborative decision making, involve those affected by the risks and consider societal values in determining the importance of a risk.
- **Sustainable development and caring for Country:** Consider the needs and stability of governance structures, market systems and institutions while assessing risks. Prioritise prosperity for people and the planet in assessing risks. Recognise that all things hold some intrinsic value and add to the unique identity of Australia.
- **Market activation:** Support adaptation through market forces and early leadership while avoiding maladaptation and perverse incentives.

The technical input for the risk assessment has been developed by the Australian Climate Service (ACS). As outlined in the case study in section 3.4, the risk assessment methodology was developed through a partnership between the ACS and the Australian Government Department of Climate Change, Energy the Environment and Water, with support from specialised consultants and a series of Working Groups. Table 3.1 below provides a summary of the approach to the design of elements of the first pass of the Risk Assessment.

Table 3.1 Approaches to element design of the National Climate Risk Assessment

Design construct	Approach
Risk framework	IPCC AR6 and ISO
Type of risk assessment	Physical only 2 pass process
Type of analysis	Qualitative high-level first pass (2023) Quantitative and semi-qualitative second pass of national priority risks (2024)
Climate futures	Global Warming Levels 2050: GWL1.5°C, GWL2°C 2090: GWL2°C, GWL3°C

Design construct	Approach
Climate hazards	A set of 10 priority hazard categories
Time horizons	Pre-industrial: 1850–1900 Baseline: 2010–2030 Medium term: 2040–2060 Long-term: 2080–2100
Geographic scope	11 Geographic zones covering Australia, its surrounding oceans, external territories and the Antarctic
Elements and systems at risk	From across natural, built, economic and social domains: Natural environment Primary industries and food Defence and national security Economy, trade and finance Health and social support Infrastructure and the built environment Regional and remote communities First Nations values and knowledge systems
Complex risks	Identify complex risks across the methodology

The ACS was established in response to the Royal Commission into National Natural Disaster Arrangements. It brings together the information and expertise of Australia's foremost climate science and data experts in the Bureau of Meteorology, the Commonwealth Scientific and Industrial Research Organisation, the Australian Bureau of Statistics and Geoscience Australia. The ACS leads the technical risk analysis for the National Climate Risk Assessment by delivering a baseline of current climate risks, including new and emerging risks at a national scale.

The ACS is a key vehicle through which the Australian Government is meeting its COAG responsibility of providing nationally authoritative climate science and information to inform decision making across the economy. The Australian Government recognises the importance of accessible, useable climate information and acknowledges the rapidly growing demand for climate and disaster risk information. Following an independent review that concluded in April 2024 the Australian Government has been considering the suitability of the ACS's structure and functions to deliver on this demand, with a response forthcoming.

These national policies and programs will provide foundational support and national coordination for the substantial existing state and territory work on adaptation, detailed further below. The Australian Government has also increased requirements across sectors for government and non-government entities to undertake risk assessments, disclose climate risks and develop plans to manage these risks. For example, the Australian Government is working to mandate, integrate and mainstream adaptation planning and policy into all government decision-making processes. The Commonwealth Climate Disclosure (introduced in 2024) requires Commonwealth entities and Commonwealth companies to publicly report on their exposure to climate risks and opportunities, as well as actions to manage them in their annual reports. The Climate Disclosure builds on the government's Approach to Climate Risk and Opportunity Management in the Public Sector 2024–26 (released in February 2024). Under the Climate Risk and Opportunity Management Program (CROMP) climate risk and opportunity will be included in Australian public sector decision-making processes, enterprise risk management, and key corporate documentation. Australia's next Biennial Transparency Report will be able to report on the implementation of these initiatives.

For the private sector, recent and new climate risk disclosure and management requirements for large listed and unlisted businesses, financial institutions and critical infrastructure will together provide the basis for management and monitoring of climate risks for a substantial part of Australia's assets. Mandatory disclosures for large businesses and financial institutions will commence on 1 January 2025.

3.9 National adaptation strategies, policies, plans, goals and actions to integrate adaptation into priority policy sectors and strategies

The cross-cutting measures outlined above will help to provide a national framework for adaptation action. This section outlines a number of climate adaptation policy initiatives across the following priority sectors for the Australian Government:

- health and social support
- infrastructure and the built environment
- the economy and financial systems
- regional and remote communities
- the natural environment
- primary industries
- defence and national security
- First Nations communities.

3.9.1 Health and social support

The health and social support system refers to population health and wellbeing, as well as provision and availability of, and access to, health, wellbeing and social services. This system includes services that encompass:

- healthcare
- public and preventative health
- aged care
- disability services
- housing support
- employment and financial wellbeing
- supporting infrastructure.

Examples of national-level priority actions in this system include those outlined in the National Health and Climate Strategy, such as:

- Completing the health component of Australia's National Climate Risk Assessment.
- Developing a standalone Health National Adaptation Plan, expected to be published in 2025.
- Developing guidance and an accompanying toolkit on climate risk assessment and adaptation planning for health and aged care services, expected to be released in 2025.
- Developing a National Heat-Health Action Plan to minimise the health impacts of heat.

The Australian Government is also specifically working in partnership with First Nations communities, Aboriginal Community-Controlled Health Services and First Nations health workforce to address the impacts of climate change on First Nations health. This includes supporting the implementation of Objective 7 of the National Aboriginal and Torres Strait Islander Health Plan 2021–31, which aims to grow the First Nations environmental health workforce, implement housing and infrastructure solutions, strengthen food security and improve disaster planning, preparedness and recovery.

3.9.2 Infrastructure and the built environment

The infrastructure and built environment system refers to the intricate networks of human-made structures across Australia. This system includes:

- physical buildings and amenities
- green and blue spaces
- supporting infrastructure such as transport, water and energy systems.

Australia has a range of programs, strategies, reviews and frameworks that are related to capability building and adaptation for the built environment.

- The Critical Infrastructure Risk Management Program (CIRMP) is intended to uplift core security practices that relate to the management of certain critical infrastructure assets. The CIRMP framework requires responsible entities to identify hazards that could impact assets and take a holistic and proactive approach to minimise or eliminate material risks of such hazards occurring. One of the hazards identified in the CIRMP is natural hazards such as fires, floods, cyclones, storms, heatwaves, tsunamis and pandemics.
- The Critical Infrastructure Resilience Strategy will uplift the security and resilience of Australia's critical infrastructure in the face of all hazards and advance national security, the economy and social prosperity. Disruptions to critical infrastructure systems can result from all types of natural and human-made hazards and threats, such as major weather events or human error. Such disruptions can create a cascade of consequences with profound effects on societies, communities and interconnected infrastructure systems.
- The Critical Infrastructure Annual Risk Review communicates on the key risk-driven issues affecting the security of Australia's critical infrastructure. This is part of wider efforts to ensure the security, continuity and resilience of critical infrastructure in the face of severe weather events, which put pressure on the delivery and resilience of critical infrastructure systems. The review explores risk considerations for 10 sectors within the economy that will be impacted by natural hazards including communications, healthcare, data storage, energy, water, food, transport, financial services, space technology and education.
- The National Construction Code sets out the minimum requirements for the design and construction of buildings in Australia. This includes for the safety, health, amenity, accessibility and sustainability of certain buildings. The most recent update to the code includes stronger requirements for dwellings to be energy efficient so they reduce energy consumption, reduce greenhouse gas emissions and improve occupant health and amenity.
- The Trajectory for Low Energy Buildings was agreed by all Commonwealth, state and territory energy ministers in 2019. It is a national plan that aims to achieve zero-energy and carbon-ready commercial and residential buildings in Australia. It is being updated in 2024 to support all Australian governments' Net Zero by 2050 targets.
- The Nationwide House Energy Rating Scheme (NatHERS) provides ratings of the energy performance of free-standing homes, townhouses and apartments and supports homeowners to design, build and renovate more sustainable, climate-resilient homes. From mid-2025 NatHERS will expand to offer ratings for existing homes and advise on how to improve energy performance.

Improvements in energy performance reduce emissions and enhance resilience by reducing the energy required to achieve a given level of comfort or performance. Further detail on other measures to improve energy performance in the built environment is included in Chapter 2 of this report, including the National Energy Performance Strategy.

3.9.3 The economy, trade and finance

The economy, trade and finance systems encompass Australia's:

- interconnected insurance and investment markets
- import and export markets
- the distribution of goods and services
- institutional arrangements that govern them.

This system includes the institutional arrangements governing economic activities and trade networks across all scales. Understanding the importance of making finance flows consistent with a pathway towards low greenhouse gas emissions and climate resilience, the government has published the Sustainable Finance Roadmap (the roadmap), which builds on the Australian Sustainable Finance Strategy, to help mobilise private sector investment needed for a sustainable economy. Through this roadmap, the government has laid the foundations for its sustainable finance agenda. Key elements for adaptation investment include:

- Implementing mandatory disclosure of climate-related risks for large businesses and financial institutions, commencing 1 January 2025.
- Completing the development of the initial phase of Australia's Sustainable Finance Taxonomy (the taxonomy) against the climate mitigation objective by the end of 2024. Developed in partnership between the government and the Australian Sustainable Finance Institute (ASFI), it will cover activities that contribute to climate change mitigation in 6 priority sectors. The taxonomy also includes a 'Do No Significant Harm' framework to ensure than an activity that makes a substantial contribution to climate change mitigation does not cause significant harm to the taxonomy's other environmental objectives, such as climate adaptation and resilience. The Government will make the taxonomy available for voluntary use by mid-2025. The government

will also consider permanent governance arrangements and explore initial use cases for the taxonomy in the context of Budget 2025–26.

- Undertaking research into key sustainability-related data challenges faced by financial system participants, to be led by the Council of Financial Regulators.
- Developing best practice guidance for corporate transition plan disclosures by the end of 2025. Credible and robust transition plans can support an entity's approach to managing physical and transition risks, and provide signals to markets to support effective capital allocation.
- Issuing Australian sovereign green bonds to help mobilise additional climate-aligned capital. Australia's first green bond was issued in June 2024 and climate adaptation activities are eligible to be financed through Green Treasury Bonds. Further government funding for adaptation will be considered for Green Bond financing using the approach outlined in the government's Green Bond Framework.

As well as the Strategy and Roadmap, the Australian Government is considering ways to address the price and availability of insurance for natural hazards which are increasing in severity and/or frequency due to climate change. The government has established the Hazards Insurance Partnership and the Insurance Affordability and Natural Hazards Risk Reduction Taskforce to develop an integrated, cross-government approach to minimising the impacts of disaster on the community and help address insurance costs driven by more frequent and intense weather events.

The Australian Prudential Regulation Authority (APRA) is leading efforts to better understand how climate-related financial risks affect banks, insurers and superannuation funds. Building on the Banking Climate Vulnerability Assessment, the Insurance Climate Vulnerability Assessment (CVA) will assess the impact of climate risk on affordability of general insurance over the medium term (to 2050). APRA aims to publish insights from the Insurance CVA in the first half of 2025.

3.9.4 Regional and remote communities

The regional and remote communities system refers to all (natural, social, economic and built) aspects of communities in Australia that are beyond major urban centres. This system includes regional centres, towns, remote communities, mining settlements, small islands and external territories.

The Australian Government works in partnership with all levels of government to address the challenges and opportunities of regional and remote areas and support the equitable delivery of critical services in a changing climate. The government's Regional Investment Framework guides investment across government to support delivery of smart and responsible investment in the regions and help regions undergoing significant economic change to transition or adapt to specific structural challenges. There is a range of current Australian Government initiatives with a focus on improving economic and community resilience in regional and remote Australia, which presents an opportunity to strengthen adaptation action. These initiatives include the:

- Net Zero Economy Agency, which aims to promote a positive economic transition by helping workers and communities in Australia's regions and remote areas transition to a green economy through the Net Zero Jobs Plan, the Energy Industry Jobs Plan, the Regional Workforce Transition Plans, Regional Workforce Transition Officers and the Transitioning Workforce Fund.
- Jobs and Skills Councils, which have been established as part of reforms to the Vocational Education and Training sector to develop skills and workforce solutions for their industries, bringing together employers and unions to work in partnership with governments and training providers.
- Transition Support Network, which works with employment facilitators across Australia including the Australian Government Employment Facilitators; employment facilitators focus on reskilling, upskilling and employment pathways for people in their region.
- Water Infrastructure for Sustainable and Efficient Regions Initiative, part of the National Water Grid Fund, which supports construction of small-scale water infrastructure projects to deliver water security benefits to regional and remote communities, with a focus on maximising positive environmental outcomes.

3.9.5 The natural environment

The natural environment refers to Australia's ecosystems, biodiversity and natural processes. This includes:

- ocean around Australia (covering the Exclusive Economic Zone and sub-Antarctic islands)
- coastal areas and shorelines
- natural environment that is not part of urban or agricultural zones (with some overlap), such as national parks, rangelands, grasslands, forests and bushland, and other natural landscapes.

The Australian Government is developing and implementing policies and programs to contribute to building the resilience of Australia's environment and heritage. Some key policies and programs include:

- Australia's Strategy for Nature 2024–2030, which includes national targets to guide biodiversity action until 2030 and will:
  - support Australia's carbon abatement and adaptation efforts
  - minimise the impact of climate change on biodiversity
  - place priority degraded areas under effective restoration by 2030
  - protect and conserve 30% of Australia's land and 30% of Australia's oceans by 2030.
- A commitment to increase funding to expand the Indigenous Protected Areas Program.
- The Natural Heritage Trust, which is the Australian Government's primary investment platform for environmental protection, sustainable agriculture, and natural resource management including the management of World Heritage sites that have natural heritage values.
- The Climate Change Toolkit for Australia's World Heritage properties, developed by CSIRO, which provides a framework for property and environmental managers to undertake climate risk and vulnerability assessments and adaptation planning.
- The *Nature Repair Act 2023*, which establishes a framework for a world-first national, voluntary, legislated biodiversity market. The Nature Repair Market Scheme will enable and incentivise private finance to help to repair and protect Australia's unique natural environment and will reward landholders for protecting biodiversity.
- The Nature Positive Plan, which sets out the government's commitment to reform Australia's environmental laws to better protect, restore and manage Australia's unique environment and heritage. The plan includes a commitment to integrate climate considerations into new laws without duplicating existing mechanisms to reduce emissions.

3.9.6 Primary industries and food

The Australian Government is working with the primary industries and food sectors to build climate resilience and increase uptake of climate-smart, sustainable practices through a range of national programs and initiatives, including:

- The National Statement on Climate Change and Agriculture, which presents a unified vision and shared commitment by the country's agriculture ministers to work in partnership with the sector on climate change and agriculture.
- The Agriculture and Land Sectoral Plan, one of 6 sectoral decarbonisation plans being developed to support Australia's 2035 national emissions reduction target and a 2050 Net Zero Plan.
- The National Drought Agreement with states and territories, and an Australian Government Drought Plan improve drought preparedness and resilience, both of which are expected to be finalised in 2024.
- The Climate-Smart Agriculture Program, funded under the Natural Heritage Trust, which is providing $302.1 million over 5 years from 2023–24 to 2027–28 under multiple investment streams for climate-smart, sustainable agriculture investments. The program will support Australia's agriculture sector to be positioned for sustainable growth in a changing climate and to contribute to environmental and public good outcomes.
- The Australian Agricultural Sustainability Framework, led by the National Farmers' Federation in partnership with government. The framework is progressing a science and data-led approach to develop internationally recognised best practice for making, verifying and tracing sustainability claims. This will help consumers, policy makers and the wider public have reliable information on the sustainability impacts of agricultural products, operations and supply chains.
- The $5 billion Future Drought Fund.

Work is also underway to support the fisheries sector adapt to a changing climate. In particular, the Australian Fisheries Management Authority (AFMA) Climate Adaptation Program aims to ensure information on climate impacts is being incorporated into fisheries management across all AFMA fisheries, and that operational and management adaptation options are being developed and implemented. AFMA and CSIRO teamed up to develop the Adaptation of fisheries management to climate change handbook designed to help fisheries managers and operators identify effective responses to climate change by working through an evidence-based process.

Investing in programs that drive research and adoption of climate-smart practices will be essential to Australia's farming future in a changing climate. The nation's 15 Rural Research and Development Corporations manage approximately $800 million per year and support innovation on priority issues. The RDCs support the agriculture, fisheries and forestry sectors to protect and enhance environmental resilience, and have prioritised significant investments to support industry to prepare, mitigate and adapt to the impacts of climate change.

At COP28, Australia endorsed the Emirates Declaration on Sustainable Agriculture, Resilient Food Systems and Climate Action, along with 159 other countries. Australia also endorsed the Glasgow Breakthrough Agenda on

Agriculture, co-founded the Forests and Climate Leaders' Partnership and joined the International Drought Resilience Alliance. Australia also continues to support the Agriculture Innovation Mission (AIM) for Climate and the Sustainable Productivity Growth (SPG) Coalition.

3.9.7 Defence and national security

The defence and national security system refers to the structures and functions dedicated to safeguarding Australia's domestic stability and international interests, including disaster readiness and risk reduction. This system includes:

- all emergency management services and their workforce and volunteers
- defence operations and workforce
- the role of the military in disaster response
- geopolitical tensions arising from extreme events.

Australia is working to address national security threats through a whole-of-nation effort. While defence and national security are Australian Government responsibilities, adapting to climate change is a responsibility shared with others, particularly owners and operators of critical infrastructure assets. As noted in section 3.4, the findings of the independent Defence Strategic Review recognised climate change as a national security issue with significant implications for Australia and the Indo-Pacific region. The Australian Government has agreed in principle to 2 climate change adaptation recommendations from the review:

- The Australian Government should work with the states and territories to develop national resilience and response measures for adverse climate change at the local level without the need for Australian Defence Force support, except in the most extreme emergencies.
- Defence should be the force of last resort for domestic aid to the civil community, except in extreme circumstances.

In support of these recommendations the Australian Government is exploring options to support state- and territory-led domestic crisis response efforts. These options will be informed by a comprehensive public consultation process, including sectoral and industry roundtables, state and territory engagement, and submissions to a public discussion paper.

The Australian Government is providing national leadership in ensuring Australia has the necessary policy, legislation and capability to manage increasingly complex cascading and concurrent national crises, including those arising from climate change. The *Climate Change Act 2022* requires the government to report on the risks to Australia from climate change impacts in the annual statement on climate change, and includes a list of important impacts such as national security. The annual statement includes an update on progress to address these risks, with a focus on the following initiatives.

The Second National Action Plan to implement the National Disaster Risk Reduction Framework implements the Sendai Framework for Disaster Risk Reduction in Australia. The Action Plan was endorsed by the National Emergency Management Minister in August 2023 and implementation is led by the National Emergency Management Agency (NEMA). It aims to mature Australia's disaster risk reduction system and empower all Australians to take locally-led, targeted and coordinated action. The forthcoming National Resilience Framework (the Framework) is being designed to support cross-portfolio consideration of a range of nationally significant risks, including those driven by rapidly evolving climate and geopolitical dynamics. The Framework is complemented by a range of other actions the Australian Government is taking to reduce national risk and improve resilience, including through the Disaster Recovery Funding Arrangements and the Disaster Ready Fund (DRF).

The Disaster Recovery Funding Arrangements are the primary mechanism through which the Australian Government provides financial assistance directly to the states and territories by sharing the cost of disaster relief and recovery assistance. These arrangements have also been used to fund large-scale post-disaster resilience and risk reduction initiatives, such as infrastructure betterment and resilient homes programs.

The DRF is the Australian Government's flagship initiative for disaster resilience and risk reduction. The government is providing up to one billion dollars through the DRF with funding running over 5 years from July 2023. The funding supports projects that address the physical and social impacts of disasters caused by climate change and other natural hazards on communities.

NEMA administers the DRF in partnership with states and territory government agencies responsible for emergency management. Round 1 provided $200 million of Australian Government investment for 185 projects in 2023–24. Round 2 of the DRF will provide up to $200 million of Australian Government investment for 164 projects in 2024–25. Successful projects under Round 2 of the DRF were announced in August 2024. Additional detail on the refinement and improvement of the DRF over time is included in a case study in section 3.13.1.

A range of recent independent reviews and Parliamentary Inquiries will help the Australian Government further improve these arrangements and initiatives, including the Independent Review of National Natural Disaster Governance Arrangements (Glasser Review), the Independent Review of Commonwealth Disaster Funding Arrangements (Colvin Review), and the Senate Select Committee on Australia's Disaster Resilience.

3.9.8 First Nations communities

First Nations peoples are intimately connected to Country and their knowledges, sciences and practices can contribute significantly to solving the challenges of climate change. Recognition of First Nations values and knowledges, and empowering and partnering with First Nations peoples, can support place-based climate adaptation. These activities can also bring new jobs and investment to communities, while reinforcing connections to Country. Examples of national action underway include:

- The inaugural Pacific Regional Gathering, hosted by Australia in October 2023, which saw Indigenous peoples and governments from across Australia, New Zealand and the Pacific come together to discuss the impacts of climate change and how to achieve holistic solutions.
- The 2018 National Indigenous Dialogue on Climate Change, the 2021 National First Peoples Gathering on Climate Change, the subsequent 2022 formation of the National First Peoples Platform on Climate Change and the most recent National First Peoples Gathering on Climate Change in November 2024. This First People-led event enables climate scientists and First Nations people to exchange ideas on how to respond to the threat of climate change.
- The Indigenous Rangers Program, which supports First Nations rangers across Australia to work with governments on their own traditional lands and in jointly-managed parks and Indigenous Protected Areas, using First Nations knowledges, sciences and practices combined with western science, to prepare for, and respond and adapt to, the impacts of climate change. The number of Indigenous Rangers will double to 3,800 by 2030 through the expansion of the Rangers Program, with a total investment of over $1.3 billion from 1 July 2021 to 30 June 2028.
- First Nations peoples' and communities' contributions to government reports and analysis, including the 2021 State of the Environment report, which included an Indigenous-led theme and Indigenous co-authorship.
- The Australian Government's commitment of $15.9 million to establish a climate centre focussed on the Torres Strait and Northern Peninsula Area. The purpose of the centre is to create a First Nations led, co-ordinated, regional response to climate change impacts. The design and implementation of the centre will be led by First Nations leaders and Traditional Owners of the Torres Strait and Northern Peninsula Area region, in partnership with government and non-government agencies.
- Stage 2 of the Seawalls Program, which is delivering coastal protection works across 5 islands in the Torres Strait to protect vulnerable communities and infrastructure against climate-related inundation and erosion ($20 million matched by Queensland Government, total $40 million from 2019–26). This program is delivered through the Torres Strait Regional Authority (TSRA).
- The Indigenous Protected Areas Program, which has been supporting First Nations communities to voluntarily dedicate and manage their land as protected areas since 1997. In addition to environmental resilience and cultural heritage protection, IPA program participants report benefits of empowerment, cultural connection and wellbeing, as well as broader socio-economic benefits for local communities. Funding for IPAs will increase by $10 million annually, with a total investment of $231.5 million over the next 5 years to 30 June 2028.

The National Strategy for Food Security in Remote First Nations Communities, under development in partnership with state and territory governments and First Nations health organisations. The strategy aims to coordinate action across Australia to address the unique and specific food security needs of First Nations people living in remote communities, including to improve the preparedness and resilience of First Nations communities to the impact of climate change.

3.10 State- and territory-level adaptation strategies, policies, plans, goals and actions to integrate adaptation into priority policy sectors

The diversity of adaptation priorities and barriers, see section 3.7, and climate impacts, risks and vulnerabilities, see section 3.5, underscore the importance of state and territory governments having jurisdiction-specific adaptation strategies, policies, plans and other relevant documents. Examples from states and territories are discussed below.

3.10.1 Australia Capital Territory

The ACT Government is delivering critical policy work to support community adaptation and resilience, and to support the priorities of the ACT Parliament and Government, ACT Climate Change Strategy 2019–25, Canberra's Living Infrastructure Plan: Cooling the City and CBR Switched On: ACT's Economic Development Priorities 2022–25.

The ACT's adaptation efforts are guided by several policies, plans and strategies, including:

- The ACT Climate Change Strategy 2019–25, which takes an integrated approach to climate change policy by bringing together adaptation, resilience and emissions reduction.
- The Nature Conservation Strategy, which focuses on protecting and restoring natural ecosystems to be more resilient to a changing climate.
- The Living Infrastructure Plan which provides a strategic framework for improving the ACT's climate resilience and reducing urban heat through planting trees and other living infrastructure. This includes a plan to have 30% of the ACT's urban environment covered by tree canopy by 2045.
- The NARCliM climate modelling project, which provides detailed climate projections for the ACT, including expected rainfall, bushfire risk and frequency of extremely hot days (see section 3.16.2).
- The ACT's Urban Forest Strategy 2021–45, which sets out the ACT Government's vision for a resilient and sustainable urban forest that supports a liveable city and the natural environment.

3.10.2 New South Wales

The NSW *Climate Change (Net Zero Future) Act 2023* legislates emission reduction targets and a net zero commitment for the state by 2050. It also includes an objective for the state to be more resilient to a changing climate. The Act establishes guiding principles for action to address climate change and an independent Net Zero Commission. This commission will monitor, review and report on progress in NSW towards the Act's emission reduction targets and adaptation objective. Regulations can be made under the Act which may make provision about the implementation of the adaptation objective.

In June 2022 the NSW Government released the NSW Climate Change Adaptation Strategy, which sets out the NSW Government's approach to climate change adaptation, supported by funding of $93.7 million over 8 years. Under the strategy the NSW Government has committed to release adaptation action plans and climate change risk and opportunity assessments. These will be completed at least every 5 years. The strategy sets out criteria for the development of risk and opportunity assessments which include:

- user focus
- use the best available evidence
- cover the whole of NSW
- leading approach
- align with leading best practice and standards
- 2 or more scenarios
- analyse risk distribution
- First Nations priorities
- cover both acute events and chronic hazards
- cover compounding, cascading and cumulative risks
- identify key risks and opportunities
- prioritise risks and opportunities, and complement other assessments.

The strategy also set out the criteria for the development of adaptation action plans which include:

- cover the whole of NSW
- set priority actions
- enable First Nations adaptation
- support climate change risk management
- have clear roles and responsibilities
- address priority risks and opportunities
- enable systems adaptation
- engage with national and international action
- contribute to sustainable development
- set short-, medium- and long-term goals, objectives and targets and align with the metrics, developed under Priority 1 of this strategy.

NSW has also been rapidly progressing in its management of climate change impacts on statewide disaster risk management. The NSW Reconstruction Authority was established in 2022 following extensive flooding throughout NSW in 2022 and a subsequent flood inquiry. The Authority was established through the *NSW Reconstruction Authority Act 2022*, which states the Act's primary objective is to promote community resilience to the impact of disasters in NSW through disaster prevention, preparedness and adaptation, and recovery and reconstruction following disasters.

The NSW Reconstruction Authority is required to assess and consider the impacts of climate change on disasters in the development of the State Disaster Mitigation Plan. The NSW Reconstruction Authority Regulation 2023 was released to support the Act.

The Climate Risk Ready NSW program builds the capability of state and local governments to assess and manage climate change risks to protect government assets, infrastructure and services. The program delivers the Climate Risk Ready NSW Guide and nationally accredited training.

3.10.3 Northern Territory

The Northern Territory Climate Change Response: Towards 2050 has informed climate change adaption and focus in the NT, with specific reference to the objective of A Resilient Territory.

To support the objective of a Resilient Territory, a first pass climate change risk assessment process for the NT was undertaken, focusing on how the risks of a changing climate will impact the future liveability of the NT. The outcomes of the climate risk assessment will now inform the government's priorities in delivering climate change adaptation action.

The NT is focused on protecting its significant biodiversity and natural systems from the impacts of climate change. A project has commenced to identify the actions that can be taken to reduce potential impacting pressures on the NT's natural systems.

A heat mitigation and adaptation strategy for Darwin, the NT's capital city, was developed through a partnership between the NT Government, the Australian Government, the City of Darwin Council and CSIRO, Australia's national science agency. It has provided strategic direction for the delivery of key initiatives including:

- A Heatwave Management Plan to help NT residents to adapt to and reduce the health impacts of extreme heat.
- Improvements to the NT Planning Scheme 2020 provisions for apartment, mixed use and commercial developments across the Territory to enhance landscaping outcomes, facilitate greater breeze penetration and improve shade provision to reduce heat capture of paved surfaces.

3.10.4 Queensland

The Queensland Government is helping Queenslanders understand and adapt to climate change. This includes providing regionally specific information and tools such as the Queensland Future Climate website, the Climate Change in Queensland map application, Regional Climate Change Impact Summaries and climate risk toolkits. Policies and programs include:

- The Queensland Strategy for Disaster Resilience, which promotes a systems approach to disaster resilience that connects with a range of agencies and sectors to deliver improved outcomes.
- The Drought and Climate Adaptation Program, which aims to help producers better manage drought and climate impacts.
- The State Planning Policy 2017 including guidelines to address the impacts of climate change.

- The Queensland Water Act 2000 including guidelines to incorporate climate change in water security risk planning.
- The Queensland Flood Risk Management Framework, which sets the direction for flood risk management statewide, outlines roles and responsibilities, and guides and supports decision making by councils.
- The Reef 2050 Long-term Sustainability Plan (with the Australian Government), including strategies and actions to support the adaptation of Great Barrier Reef ecosystems to climate change.
- Conserving Nature: a biodiversity conservation strategy for Queensland, which includes a goal that Queensland's biodiversity is supported to adapt to changing environments aiming to maximise climate resilience of Queensland's biodiversity, by working with the community to implement Queensland's Biodiversity and Ecosystems Climate Adaptation Plan.
- The Regional Drought Resilience Planning Scheme, which supports entities in developing draft regional drought resilience plans and implementing activities to increase preparedness for future drought disruptions.
- The Queensland Reef Water Quality Program, which funds a range of projects working with industry, agricultural producers, communities and Traditional Owners to improve reef water quality.

3.10.5 South Australia

The South Australian Climate Change Actions sets out the foundational actions the South Australian Government is delivering to tackle climate change. These government actions are helping to build a strong, climate-ready economy, further reduce greenhouse gas emissions and support adaptation to a changing climate.

The South Australian Government supports Regional Climate Partnerships, which are regional, cross-sectoral groups delivering practical action to strengthen the climate resilience of their communities, economies and natural and built environments across the state. Partners include councils, regional organisations of councils, Regional Development Australia organisations, Landscape Boards and the South Australian Government.

Some of the Regional Climate Partnerships are underpinned by sector agreements established under the state's climate change legislation. Sector agreements support collaboration and align regional and on-ground climate actions with broader statewide climate change policy directions. Agreements typically encourage actions to reduce greenhouse emissions and adapt to climate change.

Regional Climate Change Adaptation Plans were completed for all 11 state government regions by 2016. The regions developed their adaptation action plans in 2 stages. The first stage was to develop integrated vulnerability assessments (IVAs), which identified the key risks to industry, community and the natural environment. The second stage saw the regions building on the IVAs by identifying and prioritising adaptation options with the community, including their regional values, and identifying appropriate timescales for implementing adaptation actions.

3.10.6 Tasmania

Tasmania's *Climate Change Action Plan 2023–25* outlines a range of actions to manage risks and take advantage of potential opportunities from climate change to build the resilience of our communities, environments, industries and infrastructure.

Under the action plan the Tasmanian Government has committed to developing a whole-of-government policy framework to embed climate change considerations in Tasmanian Government decision making. The framework will consider ministerial guidelines, guidance material and decision support tools, information on scientific, legal and market developments, and training opportunities.

In addition to the legislative requirement for Emissions Reduction and Resilience Plans to be developed for the six key sectors of the state's economy, the Tasmanian Government is also developing and Emissions Reduction and Resilience Plan for government operations.

Following a 2018 analysis of Tasmanian local government's climate change governance, 17 of Tasmania's 29 councils participated in the Climate Resilient Councils program. Each council received a detailed project report that assessed how climate change is considered by the council and suggested opportunities for further integration of climate-related risk management into council decision making.

Building on the previous Climate Resilient Councils program and existing local government-led programs, the Tasmanian Government is now supporting a $500,000 statewide climate change action program for local government, in partnership with Tasmania's local government sector. The Local Government Climate Capability Program will build the sector's capacity to respond to the impacts of the changing climate and will enable councils to further understand and manage climate-related risks that are likely to affect their operations and service delivery.

Tasmania's Disaster Resilience Strategy 2020–25 recognises that climate change is increasing the risk of disasters. A new Disaster Resilience Strategy for Tasmania is currently being developed, and will also consider the impacts of climate change on disaster prevention, preparedness, response and recovery.

The Tasmanian Government remains committed to the effective management and protection of the Tasmanian Wilderness World Heritage Area (TWWHA), which is recognised under the World Heritage Convention as having both cultural and natural heritage of Outstanding Universal Value. In September 2021 the Tasmanian Government released the Tasmanian Wilderness World Heritage Areas Natural Values Climate Change Adaptation Strategy 2021–31, which aims to manage climate risk by planning for the potential impact of heatwaves, seasonality of weather variables, coastal erosion and extreme weather events.

In June 2022 the Tasmanian Parks and Wildlife Service also released a fire management plan for the TWWHA. The ecosystems of the TWWHA are a product of millennia of fire management, with records of people using fire as a management tool in the region at least 40,000 years ago. Active fire management is still required to preserve the World Heritage values of the TWWHA and achieve the objectives of the TWWHA Management Plan, which was released in 2016.

The fire plan provides a strategic and comprehensive management framework for guiding fire management and mitigating bushfire risk into the future. It was developed through extensive consultation with stakeholders and the public. Key strategies in the plan include the development and implementation of a planned burning program and improving rapid attack capability, including winch-capable crew.

3.10.7 Victoria

Building Victoria's Climate Resilience outlines the Victorian Government's current adaptation action and next steps in the form of adaptation action plans. The first set of adaptation action plans have been prepared for essential systems that are vulnerable to climate impacts or critical to climate resilience. The 7 plans – built environment, education and training, health and human services, natural environment, primary production, transport and water cycle systems – were published in 2022 and are currently being implemented. They will be updated every 5 years to 2050. Each plan was informed by system experts as well as public consultation. The plans aim to build asset resilience and help governments, industries and communities make climate-ready decisions.

The Victorian Public Health and Wellbeing Plan 2023–27 sets the direction for improving public health and wellbeing in Victoria. It brings government departments and partners together in a coordinated systems approach to improve health and wellbeing for Victorians and includes 'tackling climate change and its impacts on health' as a key priority area. This priority aims in part to accelerate action to support communities to adapt to climate change and its impacts on health. The *Public Health and Wellbeing Act 2008* requires Victorian local councils to prepare municipal public health and wellbeing plans every 4 years and to have regard to the Victorian plan when preparing their plans. Victoria's *Climate Change Act 2017* also requires Victorian councils to have regard to climate change when preparing their plans.

The Victorian Government recognises that action on climate change is a significant priority for First Nations groups across Victoria. This is reflected in the priorities and objectives throughout many groups' whole-of-Country plans, which outline a community's vision, aspirations, strategies and actions for their Country. The Victorian Government is supporting First Nations people to take action on climate change through a range of programs and initiatives:

- The Cultural Landscapes Strategy provides direction to the Victorian Government about how to enable and empower Traditional Owner self-determination in land management. The Cultural Landscapes Strategy sets out a framework and pathways to lead the planning and management of Country in line with cultural obligations to care for Country.
- BushBank allocates $14.5 million to provide opportunities for Traditional Owners to lead and participate in habitat restoration and carbon markets. These projects are designed to address biodiversity loss and climate change, and enable Traditional Owners to heal Country and practice self-determination.
- The Traditional Owners Renewable Energy Program provides grant funding to support Victorian Traditional Owner Corporations (TOCs) to design and implement their plans and aspirations in renewable energy.
- The First Peoples' Adoption of Renewable Energy Program enables First Nations communities to build renewable energy capacity and capability in an empowered and self-determining way. These projects, resources, planning and processes for local renewable energy development contribute to jobs, knowledge and skills development.
- The Traditional Owner Climate Action Grant program is enabling self-determination and transferring power and resources to First Nations people, giving traditional owners the resources and scope to determine what climate action means to their community.

Treaty and the Yoo-rrook Justice Commission are also key steps towards advancing self-determination, healing and supporting Traditional Owners' rights on Country.

In 2021, 5-year community-led Regional Adaptation Strategies were released. These plans outline how Victorians want to adapt to climate change in their own communities and were informed by regional climate projections and targeted guidance. They complement the systembased adaptation action plans by ensuring that adaptation is integrated locally and caters to diverse community needs, values and priorities across the state's different regions.

Additional strategies in place to address climate change impacts include Water for Victoria, Victoria's strategic water plan for management of Victoria's water resources now and into the future, and the updated Central and Gippsland Region Sustainable Water Strategy. This was delivered in 2022 to meet the current and emerging water challenges over the next 50 years.

The Victorian Waterway Management Strategy provides the framework for government, in partnership with the community, to maintain or improve the condition of rivers, estuaries and wetlands so that they can continue to provide environmental, social, cultural and economic values for all Victorians. In 2022 the Victorian Government committed to an action that a new, updated strategy would consider a climate change adaptation lens and associated principles to incorporate climate change adaptation thinking into the way waterways are managed.

The Marine and Coastal Policy 2020 guides decision makers in the planning, management and sustainable use of the coastal and marine environment. It provides direction to decision makers, including local councils and land managers, on a range of issues including dealing with the impacts of climate change. The Marine and Coastal Strategy 2022 is a 5-year action plan to implement the Marine and Coastal Policy. The strategy was developed with input from Traditional Owners, the Victorian Marine and Coastal Council, marine and coastal managers, communities and interest groups.

3.10.8 Western Australia

WA has established a number of state-level strategies, policies and actions to integrate climate adaptation into priority policy sectors. The foundational Climate Adaptation Strategy was released in July 2023 aiming to ensure WA communities and the economy are resilient to the risks posed by climate change. Actions within the Climate Adaptation Strategy are supported by a range of programs and initiatives including the Climate Risk Capability Initiative, which aims to strengthen the capability of the public sector to assess and manage climate risk through training programs and tools. The Climate Risk Framework (CRF) Program is being developed to support the WA Government to monitor, assess and report on the implications of climate change on the state's finances, infrastructure, physical assets and service delivery. The WA Department of Water and Environmental Regulation (DWER) is coordinating the delivery of a Sector Adaptation Plan Program for WA to identify sector specific climate impacts and priority adaptation actions as required by the Climate Change Bill 2023.

The Unified Natural Hazard Risk Mitigation Exploratory Decision-Making Tool (UNHARMED) – WA is a spatial modelling multi-agency project that has potential to contribute to government knowledge and responsiveness to climate risks. It aims to embed climate resilience and natural hazard risk considerations (bushfire, coastal inundation, earthquake and flooding) into WA land use planning policies and decisions. The Social Housing Energy Performance Initiative is a $63.2 million partnership to deliver energy upgrades to remote and regional social housing properties across the state, pending signing of a Federation Funding Agreement with the Australian Government. The Waterwise social housing program under Waterwise 2 Kep KatitjinGabi Kaadadjan aims to reduce water wastage through replacing inefficient fixtures and fittings.

A range of measures to support coastal adaptation is being implemented across WA. The Western Australian Planning Commission's State Planning Policy No. 2.6 – State Coastal Planning Policy, and associated documents, guide decision making in coastal areas and ensure planning proposals provide an adequate public coastal foreshore reserve, avoid, where possible, development on land at risk of coastal hazards, or include a plan for adaptation and/or retreat when necessary. Coastal Hazard Risk Management and Adaptation Plans help land managers identify, plan for and adapt to the impacts of coastal hazards such as erosion and inundation. CoastWA is a state coastal planning and management program designed to manage the impacts of coastal erosion with a funding commitment for 2021–22 to 2025–26 of $33.5 million.

The Climate Change Adaptation Modelling (CCAM) Project aims to deliver rigorous adaptation modelling for significant state-owned cultural assets, encompassing technical, financial, economic and non-monetary analysis to provide a comprehensive understanding of climate change hazards, risks, impacts, vulnerabilities and adaptive measures. The CCAM project commenced in March 2024 with an estimated completion date of early 2025.

In the health and emergency response sectors, the WA Department of Health has piloted the development of the Health and Human Services Sector Adaptation Plan, while WorkSafe provides guidance to persons conducting a business or undertaking on planning for emergencies or climate-related events.

WA is supporting small and medium enterprises (SMEs) to better anticipate, manage and adapt to the impacts of climate change through the delivery of a Climate Adaptation Program. The program comprises a toolkit, a training program and science and innovation funding for SMEs. WA will also deliver a SME Sector Adaptation Plan to identify and prioritise climate impacts and adaptation actions to enhance the climate resilience of the SME sector.

WA has a number of policies in place to protect and enhance the climate resilience of its natural environment, including the Forest Management Plan 2024–33 (FMP) to protect and manage over 2.5 million hectares of south-west WA native forests against the impacts of a drying climate, and the Climate Adaptation Initiative to support research into the climate adaptation of WA's biodiversity. The marine and terrestrial conservation reserve system of WA is managed through a series of management plans to increase resilience of habitats and species to climate change by monitoring marine and terrestrial ecosystem values, and adapting management responses to reduce pressures. The WA Marine Science Institution is also investigating the impacts of marine heatwaves on fisheries and the marine environment. The Enhanced Prescribed Burning Program is a 4-year, $22 million program to mitigate against the frequency and size of bushfires in forests in southwest WA, to meet prescribed burning objectives and to protect both the community and the environment from the impacts of bushfire.

The Aboriginal Ranger Program (ARP) is delivering jobs, training and community development opportunities for First Nations people across a range of tenures in regional and remote communities across WA. Projects can be focussed either wholly or partially on focussed on climate action deliverables. Examples of climate action specific projects include a Carbon Economy Preparation Project that will enable First Nations people to participate in the renewable energy and carbon capture sector, a project aimed at extending First Nations ranger enterprises of seed collecting, propagation and planting for carbon offsets and land regeneration, and enhancing cultural burn planning and implementation capacity.

3.11 Progress on the implementation of adaptation

3.11.1 National progress on implementation of adaptation measures

The Australian Government has strengthened its efforts to increase Australia's capacity to manage the risks of climate change and adapt to its impacts (see sections 3.8.1 and 3.9). The following summarises progress on some of the key national measures outlined in those sections:

- The government is developing the National Climate Risk Assessment and National Adaptation Plan.
- The Sustainable Finance Roadmap was delivered in June 2024 and mandatory disclosures for of climate-related risks for large businesses and financial institutions will start on 1 January 2025.
- Australia's first National Health and Climate Strategy was delivered in December 2023 (see section 3.9.1).
- In 2024, 164 successful projects worth up to $200 million were announced under Round 2 of the DRF. Examples of funded projects include flood levee design and upgrades, community awareness campaigns and education programs, and improved data, analysis and monitoring systems for natural hazards. Planning for Round 3 is now underway.

3.12 State and territory progress on implementation of adaptation measures

States and territories have formulated and implemented adaptation plans, policies and other relevant strategies at different times. The specific progress for states and territories on key adaptation initiatives is discussed below.

3.12.1 Australian Capital Territory

The Australian Capital Territory (ACT) has made progress on a number of key initiatives that support climate adaptation. For example, under the Urban Forest Strategy (2023) new laws are in place to protect existing urban trees on both public and private land in the ACT through the *Urban Forest Act 2023*.

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Under the Living Infrastructure Plan the ACT Government is evolving its urban planning practices to ensure we remain resilient to climate change with a particular focus on the role of living infrastructure (such as trees, shrub beds and wetlands) to reduce urban heat and make the city climate ready. The plan sets targets of 30% tree canopy cover and 30% surface permeability across Canberra's (Australia's capital city) urban footprint by 2045. The ACT Government introduced climate-ready planning reforms through the 2023 Territory Plan and Planning Act to strengthen tree canopy cover and urban heat provisions for all different residential and commercial zones. This will help to mitigate urban heat and ensure communities have natural surrounds to enjoy.

The ACT Community Zero Emissions Grants program supports activities that take action on climate change and help reduce greenhouse gas emissions in the ACT. The ACT Government has supported 35 different projects since the program began in 2017. Projects funded in 2023 included a climate resilience and adaptation education program, a campaign to help improve health outcomes for people impacted by poor air quality, a college-based, paddock-to-plate food production program, an onsite mulcher to increase composting production at a local community farm garden and establishing a worm farm alongside educational workshops on the benefits of vermicomposting. Other key adaptation achievements in 2023–24 include:

- Green roofs and walls investigation: examined barriers that prevent the development and implementation of green roofs and green walls in Canberra's built environment and provided recommendations.
- Measuring the cooling benefits of living infrastructure in urban Canberra: analysed temperature differences between different forms of living infrastructure to identify, compare and differentiate their respective cooling benefits. This report will help the ACT Government improve heat resilience in areas where it may be harder to increase tree canopy cover by using other forms of living infrastructure, such as shrub beds, green walls and roofs, or wetlands.
- Microclimate Assessment guide: the use of microclimate assessments is being piloted in an ACT Government-led land release planning project. This work aims to reduce the urban heat impact of development.
- ACT Government Research Project with Australian National University's National Centre for Epidemiology and Population Health: to develop a methodology to quantify and monetise the co-benefits of energy efficiency (including health, wellbeing, productivity and whole-of-society economic benefits) and spatial mapping to identify geographical variation in risk factors and priority populations.
- Development and piloting of a climate change risk management and adaption planning toolkit: given the critical role of Community Sector Organisations (CSOs) in supporting community resilience, the ACT Government, in collaboration with the ACT Council of Social Services and CSOs, co-designed a climate change risk management and adaptation planning toolkit. The toolkit will enable CSOs to better understand their climate risks and associated impacts to their operations, clients, staff, volunteers and assets, and to develop climate change adaptation action plans to mitigate those impacts. The toolkit is being piloted with a CSO to ensure its effectiveness and support evaluation. The results of this pilot will inform phase 2 piloting with a larger cohort of CSOs in 2025.
- The ACT Government continues to deliver a range of innovative rebates, loans, incentives, grants and other programs to support ACT households, businesses, schools and community to make sustainable choices, enhance resilience and be energy efficient.
- Independent legislated review: the ACT Government is conducting an independent review to assess and report on government policies, programs and practices to address climate change in the ACT, including actions taken to mitigate and adapt to climate change. This is a legislated requirement under the Climate Change and Greenhouse Gas Reduction Act 2010. The review aims to evaluate the appropriateness and effectiveness of ACT Government action to mitigate and adapt to climate change as well as identifying gaps and opportunities in government action to address climate change in the ACT.
- Climate Adaptation for Nature (CAfN) initiative: the ACT Government began the CAfN initiative in early 2022 to respond to identified and emerging risks of climate change to nature and instituted 2 case studies. In recognising the importance of Country to the Ngunnawal community, a yarning circle was held with the Ngunnawal community on climate change adaptation as an initial engagement in August 2023; participants highlighted their long history of adaptation to change spanning tens of thousands of years and identified a set of priority actions for government.
- The Territory Plan 2023: new planning rules to improve electrification, climate adaptation and resilience outcomes were implemented as part of the 2023 Territory Plan. These include new requirements for electric vehicle charging and urban tree canopy, clearer planning pathways for batteries and hydrogen, and the introduction of urban heat provisions.

3.12.2 New South Wales

Under the NSW Climate Change Adaptation Strategy 2022 the NSW Government has committed to release adaptation action plans and a climate change risk and opportunity assessment. These will be completed at least every 5 years. The NSW Government continues to deliver on the actions in the strategy.

In 2024 the NSW Reconstruction Authority released the first State Disaster Mitigation Plan (SDMP), which sets out 37 short- to medium-term actions for delivery across government to address existing policy and program gaps, and supported the development of local disaster adaptation planning. After the release of the SDMP, the authority released draft guidelines for the development of Disaster Adaptation Plans (DAPs) for consultation. DAPs are plans for defined geographic areas with different adaptation pathways identified depending on several factors including trigger points or disaster magnitude.

3.12.3 Northern Territory

The Northern Territory Climate Change Response: Towards 2050 has informed climate change adaption and focus in the NT, with specific reference to the objective of A Resilient Territory. Progress on implementing key adaptation measures include:

- commencing and completing a first pass NT climate risk assessment process
- key NT Government agencies developing and implementing processes to identify and address climate risks that have the potential to impact future service delivery, staff and assets
- commencing a project to identify measures and actions that can be taken to enhance the resilience of significant NT biodiversity and natural ecosystems
- establishing a Climate Change Health Advisory Committee within the Health Department to provide oversight of human health impacts and appropriate responses
- developing and implementing a Heatwave Management Plan to help Territorians adapt to and reduce the health impacts of extreme heat
- making improvements to the NT Planning Scheme 2020 to support urban heat mitigation measures.

3.12.4 Queensland

Queensland is progressing implementation of the adaptation measures detailed in previous sections. For example, the Queensland Government has partnered with the Local Government Association of Queensland (LGAQ) to support Queensland local councils manage their climate risk through the Queensland Climate Resilient Councils (Q CRC) and QCoast2100 programs.

The Q CRC program provides key services and products to help local governments better plan and respond to climate change. On joining, Council staff and members receive a face-to-face briefing on climate change risks and a governance assessment. There are 54 Queensland local governments in the Q CRC program. In May 2024 the program was extended to June 2026 providing an additional $2 million funding over 2 years to deliver further support and advice for councils. This includes a First Nations Climate Risk and Resilience Strategy, establishing a Climate Resilience Advisory Panel to give councils direct access to expert advice, and funding to help councils to identify, understand and respond to climate risks.

The Queensland Government is investing $20.2 million to help coastal councils and their communities plan and prepare for coastal hazards (storm tide, coastal erosion and rising sea levels from climate change) through the QCoast2100 program. Coastal communities in Queensland have significant housing, infrastructure and commercial assets, as well as areas of cultural significance and high ecological values, at risk of inundation or sea erosion, so it is important to understand the threats to these assets and how the risk can be best managed in consultation with the local community.

The aim of the QCoast2100 program, delivered in partnership with the Local Government Association of Queensland, is to enable councils to identify areas vulnerable to coastal hazards and assets at risk, and to develop Coastal Hazard Adaptation Strategies (CHAS), which will identify adaptation measures for existing assets, now and in the future, and also inform planning for future development. As of June 2024, 37 of the 41 coastal councils in Queensland have engaged in QCoast2100 and have completed, or nearly completed, a CHAS or hazard risk assessment. The QCoast2100 program has received a total of $7 million since 2021 to implement works and actions recommended in a CHAS.

The Queensland Government recognises the impacts of climate change on Queensland workers and will be among the first jurisdictions in Australia to develop a specific Heat Stress Code of Practice in 2024. This industry code will be enforceable in Queensland workplaces through the work health and safety legislation. The code will provide ways for workplaces to identify and manage the risks of heat-related injuries.

Queensland uses climate modelling to identify water impacts across regions or in specific water plan areas. Queensland scales down global climate projections to help predict how global temperature increases will affect regional climates. This is then combined with existing models and test predictions. This enables planning to allocate and manage water supplies for a range of climate futures. In 2023 the Queensland Government published Queensland's Water Plans in a Variable and Changing Climate, which helps describe how climate and water modelling science come together to underpin statutory water planning in the state. It is a legislative requirement for water plan reviews to consider climate change impacts on water availability.

Climate risks to transport infrastructure are being managed through the Climate Change Risk Assessments for Infrastructure Projects. This includes the Engineering Policy 170 Climate Change and Natural Hazards Risk Assessment and the Climate Change and Natural Hazards Risk Assessment Guideline. This suite of materials is structured to provide policy context at the international, national, state and departmental levels; and in the sustainability assessment context, climate change exposure, natural hazards and projections specific to projects

and programs. This policy has been developed to guide projects and provide a consistent approach to climate change and natural hazards risk assessment and treatment options across the Queensland Transport and Roads Investment Program (QTRIP).

Released in November 2022 the Towards Tourism 2032: Transforming Queensland's Visitor Economy Future tourism industry strategy includes priorities to deliver 'a clear industry pathway towards net zero emissions' and support 'sustainable and regenerative tourism practices'.

3.12.5 South Australia

As outlined in section 3.10.5 regional climate change adaptation plans were completed for all 11 state government regions by 2016. The 11 regional partnerships are now working collaboratively to manage climate risks in their regions by implementing the practical and evidence-based actions outlined in the plans.

Some of the Regional Climate Partnerships are underpinned by sector agreements established under the state's climate change legislation. Sector agreements support collaboration and align regional and on-ground climate actions with broader statewide climate change policy directions. Agreements typically encourage actions to reduce greenhouse emissions and adapt to climate change. Some examples of Regional Climate Partnership initiatives are provided below.

Where We Build, What We Build: This project mapped hazards, identified and rated the resilience of existing homes and designed an ideal climate-ready home. The project will provide information to help developers and the community to build more climate-ready homes. The project was a partnership between the Australian and South Australian governments, Insurance Council of Australia and Resilient Hills & Coasts.

Urban Heat and Tree Canopy Mapping: These 2 projects mapped temperature hotspots and tree canopy cover across metropolitan Adelaide, which are captured in an interactive online map. The information is being used to inform tree planting, water management, urban planning and health and wellbeing initiatives. The projects were a partnership involving the South Australian government, Resilient South, Adapt West, Resilient East and Adapting Northern Adelaide.

Smart Irrigation and Live Air Temperature Monitoring: This project combines remote sensing technology and weather predictions to irrigate public spaces efficiently so they stay cooler and greener at a lower cost. It includes an interactive map to help residents find the coolest parks to spend time on a hot day. This project is a partnership between SA Water and the Regional Climate Partnerships.

Climate Ready Schools and Communities: Climate Ready Schools supports students to use local government climate data to inform practical action within their schools. The program was developed by Green Adelaide Education and Resilient South. Climate Ready Communities is creating a network of people to lead conversations and take climate action in their communities. The program was developed by Red Cross and Resilient South. Climate-ready schools and climate-ready communities are now being delivered across several other regions.

Climate Governance Assessments: The Climate Governance Assessments have adopted an award-winning methodology to assess performance in addressing climate change to help improve climate risk management by councils. Resilient South and Resilient Hills & Coasts partnered in piloting this approach, which is now being adopted in councils across several other regions.

Feeling Hot! Hot! Hot! Heatwave Hypothetical: These guides community members through a heatwave scenario to improve preparedness and response to heatwaves. To demonstrate this community and service providers were engaged in a lively, interactive event that built knowledge and capacity and showcased best practice responses. The event resources are publicly available so that other organisations can replicate the event in their region. The concept for this event was developed by Resilient South and adapted by Resilient East in partnership with government and community organisations.

Adapt Now – Changing for Climate Change: Building on the Hot! Hot! Hot! hypothetical event previously undertaken by Resilient South and Resilient East, the AdaptNow event focused on the cascading impacts of heatwave, bushfire smoke, heatwave and flood risk. A recording of the event is publicly available.

Coastal Climate Hazard Mapping and Strategies: This project mapped coastal climate hazards including sea-level-rise, erosion and storm surge, and actively engaged communities to understand the risks and plan responses. Wattle Range Council pioneered this award-winning approach (Limestone Coast), which has since been taken up by Kangaroo Island Council (Resilient Hills & Coasts) and others. An online map of coastal climate hazards has been developed by the Eyre Peninsula and Limestone Coast regional climate partnerships, with assistance from the South Australian Government. The Regional Climate Partnerships work closely with the Coast Protection Board, Metropolitan Seaside Councils Committee and South Australian Coastal Councils Alliance on coastal climate risk and mitigation strategies.

Supporting Resilient and Regenerative Agriculture: Regional Climate Partnerships have delivered a number of initiatives to support farmers to manage climate risks. This includes resilient and regenerative agriculture projects to improve soil health and water retention, smart farming techniques using soil moisture probes to inform targeted interventions for climate variability, and carbon farming projects to diversify farm income and sequester carbon. These initiatives are being undertaken in the Barossa, Northern and Yorke, Far North, Murraylands and Riverland, Limestone Coast and Resilient Hills and Coasts regions.

Clean and Community Energy: Many councils involved in Regional Climate Partnerships are leading the transition to a low carbon future through solar generation, LED streetlights and electric vehicle fleet transitions, as well as by supporting businesses and households to transition to energy that is clean, secure and affordable. A group of councils involved in Regional Climate Partnerships have jointly procured community emissions profiles for all South Australian municipalities. The profiles measure community greenhouse gas emissions across an entire local government area and can help target efforts to cut emissions.

Adaptation Practitioners Network: The Adaptation Practitioners Network facilitates regular peer-to-peer learning and collaboration between climate practitioners from the public, private, research and community sectors across the state.

3.12.6 Tasmania

Tasmania's Climate Change Action Plan 2023–25 details the government's plans for action on climate change until 2025 and supports Tasmania's transition to a low emissions economy. Funding of $10 million has been allocated to implement the Action Plan, in addition to significant investment already underway in climate change activities. As detailed in the 2024 Climate Change Activity Statement, of the 98 actions in the action plan:

- 11 have been completed
- 8 are nearing completion
- 49 are in progress
- 29 are ongoing
- 1 has been discontinued.

These actions will contribute to the achievement of the vision and objectives of the Action Plan, supported by total funding of over $250 million.

The action plan includes a priority area called Climate Adaptation and Resilience, which includes a range of adaptation measures. Achievements in the 12 months since the release of the action plan include:

- A $500,000 program has commenced to build climate change capacity and capability in local government, led by the Local Government Association of Tasmania.
- The government launched the $350,000 Community Climate Change Action Grants program (in August 2024), an open grants program to support a wide range of community-level actions to improve information and knowledge about climate change, reduce emissions and build resilience to the changing climate.
- Legislated commitments, including the development of sectoral emissions reduction and resilience plans and a statewide climate change risk assessment (both released on 29 November 2024).

3.12.7 Victoria

Natural domain

Victoria's current Adaptation Action Plans for the natural environment and primary production systems include examples of some of the statewide adaptation actions already underway.

The *Natural Environment Climate Change Adaptation Action Plan 2022–26* builds on adaptation progress and outcomes to date, including:

- responding to the 2019–20 bushfires by coordinating recovery and protecting biodiversity
- supporting Traditional Owners to apply their ecological knowledge and lead cultural heritage and related activities in areas affected by the 2019–20 bushfires
- looking beyond single fire events to consider long-term strategies for maximising ecosystem resilience
- implementing Victoria's biodiversity plan, Protecting Victoria's Environment – Biodiversity 2037 – which ensures that the impacts of climate change are considered in all conservation decisions.

The *Primary Production Climate Change Adaptation Action Plan 2022–26* also builds on adaptation progress and outcomes to date including:

- implementing policies and strategies (such as Victoria's Agriculture Strategy) that support thriving primary industries to better manage climate risks and opportunities
- collaborating with and supporting primary producers to adapt to climate change
- investing in, testing and demonstrating new technology and programs
- developing and delivering information and tools with farmers.

Built domain

All sectors have an interest in effectively adapting the built domain, especially assets and infrastructure. Victoria's current Adaptation Action Plans for the built environment, transport and water cycle systems include examples of some of the statewide adaptation actions undertaken in the built domain.

The *Built Environment Climate Change Adaptation Action Plan 2022–2026* builds on adaptation progress and outcomes including:

- strengthening minimum energy efficiency standards for rented homes
- mapping coastal inundation hazards and requiring planning schemes to respond to potential coastal impacts
- providing guidance for development in flood-affected areas
- mapping heat vulnerability and preparing advice
- improving planning and building system responses to bushfire risk
- building energy infrastructure resilience.

The *Transport Climate Change Adaptation Action Plan 2022–2026* builds on adaptation progress and outcomes including:

- considering long-term climate change in the planning, design, construction and operation of transport infrastructure
- reviewing emergency management plans and supporting passenger safety and wellbeing during heatwaves
- building climate scenarios into transport project flood and drainage models, standards and design outputs.

The *Water Cycle Climate Change Adaptation Action Plan 2022–2026* builds on adaptation progress and outcomes including:

- providing leadership on water and adaptation through Water for Victoria and the Pilot Water Sector Climate Change Adaptation Action Plan 2018–2020
- improving water efficiency and reliability in regional communities
- providing hydrology and climate science for Victoria's water sector and supporting citizen science
- delivering regional catchment strategies through local and regional partnerships between catchment management authorities, Traditional Owners and the broader community
- implementing urban water strategies and drought preparedness plans
- supporting vulnerable customers, schools and communities
- coordinating state-level responses to manage harmful algal blooms
- improving the resilience of water and flood monitoring stations as part of Victoria's Bushfire Recovery Plan.

Social domain

Victoria's current Adaptation Action Plans for the education and training, and health and human services systems include examples of some of the key statewide adaptation actions undertaken to date in the social domain.

The *Education and Training Climate Change Adaptation Action Plan 2022–2026* builds on adaptation progress and outcomes including:

- partnering to comprehensively manage risks, prepare and plan, respond to and recover from extreme events
- requiring all schools to comply with Victoria's bushfire preparedness guidelines
- supporting education and training providers to incorporate climate change into teaching and learning and integrating environmental sustainability as a priority outcome.

The *Health and Human Services Climate Change Adaptation Action Plan 2022–2026* includes 14 strategic actions to:

- engage with the public and stakeholders on climate resilience and health to encourage action to protect the health and wellbeing of the Victorian community
- build the resilience of health and social housing infrastructure to improve the health and safety of residents, patients, visitors and staff
- improve sector capability to respond to climate change and integrate climate adaptation within organisational governance to actively respond to and reduce climate risks across the health and human services system.

3.12.8 Western Australia

WA is progressing implementation of the adaptation measures detailed earlier in this chapter. Progress updates in key areas is summarised below.

Under the Waterwise Perth Action Plan 2 Kep Katitjin – Gabi Kaadadjan key adaptation successes include 12GL of water saved between 2019–23 and 185,000 plants and trees planted to reduce urban heat and improve biodiversity values. The Waterwise social housing program under Waterwise 2 Kep Katitjin-Gabi Kaadadjan aims to reduce water wastage through replacing inefficient fixtures and fittings. Currently over 1,300 properties have been retrofitted.

Significant work has already been undertaken to develop an Emergency Management Sector Adaptation Plan (SAP) to accelerate climate change adaptation through the emergency management sector. Public consultation in early 2024 sought feedback on sector adaptation objectives and actions, reporting processes and governance structure, and current and planned adaptation activities undertaken by relevant organisations. The SAP for Health and Human Services has commenced. The SAP for the Small and Medium Enterprise (SME) sector is in the planning phase. The climate adaptation toolkit, a key component of the SME Climate Adaptation Program, is being finalised and is intended to be released in the coming months.

An Urban Greening Strategy for the Perth and Peel Regions is being developed to realise multiple objectives including enhancing urban greening to support adaptation to extreme heat and reduce the urban heat island effect. The strategy will support, align with and complement existing state and local government policies, projects and programs relating to urban forests and green spaces. Detailed scoping of the strategy began in January 2024, consultation ran from February 2024 to June 2024, with the final strategy being developed.

The review of State Planning Framework to incorporate climate adaptation is an ongoing strategic piece of work under Action 16 in the WA Climate Adaptation Strategy. Recent work includes:

- R-Codes Vol. 1 (previously the Medium Density Housing Code) is complete and incorporate orientation requirements to support passive solar design outcomes and tree planting/landscape requirements.
- State Planning Policy (SPP) 2.9 – Water has been updated to consolidate water-related planning policies to ensure future development considers the water-related impact of climate change. SPP2.9 has been approved by the WAPC and is awaiting government approval to gazette.
- The preparation of the 8 new Regional Planning Strategies to provide an updated strategy for each region which will consider economic, social and environmental factors including the impact of climate change and the net zero transition.
- Neighbourhood Design project (Liveable Neighbourhoods policy review) is underway and is due to be drafted for WAPC approval. The policy and guidelines will consider an embedded site and context analysis process to support more site responsive and climate adaptive structure planning.
- DPLH has also begun several background studies and is undertaking monitoring and evaluation to refine the policy processes. This will further facilitate the incorporation of enhanced climate adaptation considerations into the State Planning Frameworks.

DPLH has also begun several background studies and is undertaking monitoring and evaluation to refine the policy processes. This will further facilitate the incorporation of enhanced climate adaptation considerations into the State Planning Frameworks. Coastal hazard mapping and data acquisition is being advanced through significant expansion of existing high-resolution land and seabed elevation data. Since July 2022 LiDAR survey of erosion hotspots along the Southern and Gascoyne coasts has been captured. Coastal Hazard Risk Management and Adaptation Plans have either been completed (or are currently being completed) by 40 of 53 coastal and estuarine local governments.

Since 2021 more than $17.3 million in CoastWA grants has funded 146 projects that plan for, manage and protect coastlines against coastal hazards. CoastWA program achievements are closely monitored and publicly reported annually.

3.13 Monitoring and evaluation of adaptation actions and processes

3.13.1 National monitoring and evaluation of adaptation actions and processes

In Australia's 8th National Communication the Australian Government reported on the National Climate Resilience and Adaptation Strategy 2021–25. Many of the actions in the strategy are now being progressed, including the National Climate Risk Assessment. Once finalised, the National Adaptation Plan will supersede the National Climate Resilience and Adaptation Strategy 2021–25.

The government is incorporating an adaptation monitoring and evaluation framework in the development of the National Adaptation Plan, and as a first step sought feedback through a public consultation on ways to measure progress in adaptation.

In addition to monitoring and evaluation of the forthcoming National Adaptation Plan, Australia undertakes monitoring and evaluation of specific policies and programs as part of standard practice. For example, many of the policies and programs listed in previous sections, such as the new mandatory climate-related financial disclosures for financial institutions and large business, have regular reviews built into their governance arrangements. An update on progress in developing and delivering action in support of the National Health and Climate Strategy's vision statement will be published by 2026.

As noted in section 3.1, the *Climate Change Act 2022* includes a requirement for the Minister for Climate Change to prepare and table an annual climate change statement. The statement represents a transformational change in Australia's climate change governance. The statement provides greater accountability and transparency on emissions reductions targets, as discussed in Chapter 2. The statement must also report on risks to Australia from climate change impacts, such as those relating to Australia's environment, biodiversity, health, infrastructure, agriculture, investment, economy or national security. The 2024 Annual Climate Change Statement provides an update on the implementation of adaptation measures, highlighting the National Adaptation Plan and National Climate Risk Assessment as the main national policies for understanding and responding to climate impacts.

The *Climate Change Act 2022* also requires that the Climate Change Authority provide independent advice to the Minister for Climate Change and Energy relating to the Annual Statement. Annual Statements must be prepared having regard to the Climate Change Authority's advice.

An example of improvement to a national program based on outcomes of monitoring and evaluation is provided in the case study below on the DRF.

Case Study – Improving funding arrangements to support community resilience against climate and other disasters

Disaster Ready Fund

In 2015 the Australian Productivity Commission conducted an inquiry into national disaster funding. It found the Australian Government was over-investing in post-disaster reconstruction and under-investing in mitigation to reduce the risk of disaster impacts.

Recognising that investment in mitigation and resilience initiatives reduces disaster loss and damage and ensures communities are better placed for recovery, the Australian Government established the DRF in 2022. The DRF is providing up to $1 billion over 5 years from 1 July 2023 for projects that build resilience to the physical and social impacts of disasters caused by climate change and natural hazards. The DRF contributes to Australia fulfilling its obligations under the UN Sendai Framework for Disaster Risk Reduction and Australia's National Disaster Risk Reduction Framework.

The National Emergency Management Agency (NEMA) administers the DRF in partnership with state and territory government agencies responsible for emergency management.

Round 1 provided $200 million of Australian Government investment for 185 projects in 2023–24. Round 2 will deliver up to $200 million in 2024–25 for 164 projects across Australia.

Following the implementation of Round 1 NEMA sought feedback from a wide range of stakeholders including states and territories, Australian Government agencies, the Australian Local Government Association and Local Government Associations, First Nations representatives, not for profits and charities, the academia and research sector and members of the public through a survey published to the NEMA website.

Based on the key themes identified in the feedback received, changes introduced for Round 2 included:

- extending the application timeframes and ensuring application dates were consistent across Australia
- expanding delivery locations to include the Indian Ocean Territories of Christmas and Cocos Keeling Islands
- providing more guidance on how to apply for a waiver of the co-contribution requirement and how to submit multi-jurisdictional and national projects.

Round 2 also introduced 4 new Investment Principles to ensure the projects recommended for funding supported outcomes across a broad range of natural hazards, project types and geographic areas and had tangible links to state and territory disaster risk and resilience plans.

NEMA is currently working on the design of Round 3 of the DRF. Round 3 will provide up to $200 million in 2025–26 and will build on the experiences and outcomes of Round 1 and 2.

3.13.1.1 Facilitating improved reporting and transparency over time

Australia is committed to continuous improvement of its reporting and, to the extent possible, identifying and regularly updating and including information on areas of improvement.

To this end, Australia's first BTR has addressed some of the encouragements from the United Nations Framework Convention on Climate Change Report on the technical review of the 8th National Communication and the technical review of the 5th Biennial Report of Australia, Table I.4, No.1, United Nations, 4 June 2024. In response, Australia has reported on 'specific results of scientific research in the field of vulnerability assessment and adaptation' in this chapter. Specific examples include:

- results of the first pass of the National Climate Risk Assessment in section 3.4
- results of state and territory risk assessments included in section 3.5
- case studies on the update of the Australian Rainfall and Runoff Guidelines in 2024 and the CSIRO's collaborative adaptation research programs in section 3.16.1.
- case studies on the NARCliM modelling project and the collaboration to develop an adaptation plan by the National Environmental Science Program Climate Systems Hub and the Butchulla people on K'gari in section 3.16.2.

Refer to Chapter 2, section 2.12 and Chapter 4, section 4.6 for further examples of Australia's improved reporting and transparency.

3.14 State and territory monitoring and evaluation of adaptation actions and processes

In addition to developing strategies and progressing adaptation actions, states and territories are well progressed in monitoring and evaluating their progress. Some examples of state and territory progress to monitor, evaluate and learn from adaptation action and processes are highlighted below.

3.14.1 Australian Capital Territory

The ACT conducts the 'Living well with a changing climate' longitudinal survey every 5 years to monitor, evaluate and assess community climate change resilience in the region. LIDAR (light detection and ranging) data capture and analysis of Canberra is also conducted every 5 years to assess progress towards the 30% tree canopy cover and 30% permeable surfaces targets.

In 2023 the ACT Government introduced a requirement for all government departments to report on actions undertaken to address the priority risks relevant to their work area.

3.14.2 New South Wales

The NSW Climate Change Adaptation Strategy includes actions to develop monitoring and evaluation for strategy actions and for the strategy itself. At least every 5 years, a panel of suitable experts will publish an evaluation report on the effectiveness of the strategy in building resilience and driving adaptation. The first evaluation report will be published in 2028, with future reports published at least every 5 years after that.

The NSW Government will also publish data and projections on climate change risks, including the financial impacts of those risks, in the NSW Treasury Intergenerational Report, which is released every 5 years. In late 2022 all NSW Government entities were surveyed to understand their climate change risk management, planning and implementation of adaptation actions. The survey has been run every 3 years since 2015 and includes an assessment of adaptive capacity within each entity. The information is used to inform reviews and improvements to program design, including knowledge and capacity-building activities. Outcomes of the survey are reported to each responding entity so that they can baseline their own performance and make plans to improve.

The Net Zero Commission has been established under the *Climate Change (Net Zero Future) Act 2023* and has a role in assessing NSW's progress towards the adaptation objective for NSW to be more resilient to a changing climate through its annual report. The NSW Government will also publish whole-of-government climate change disclosures consistent with the Taskforce on Climate-related Financial Disclosures recommendations and other leading international and national standards and guidance as they evolve.

3.14.3 Northern Territory

The Northern Territory released a progress report to provide updates on the policy objectives set out in the Northern Territory Climate Change Response: Towards 2050.

3.14.4 South Australia

As noted above, the South Australian Climate Change Actions sets out the foundational actions the South Australian Government is delivering to tackle climate change and build a strong, climate ready economy, further reduce greenhouse gas emissions and support adaptation to a changing climate. Reporting on these actions is undertaken annually.

3.14.5 Tasmania

Under the *Climate Change (State Action) Act 2008* the Climate Change Office must produce an annual climate change activity statement which records progress on the action plan. The 2024 Climate Change Activity Statement was released in September 2024.

The *Climate Change (State Action) Act 2008* is also independently reviewed every 4 years. The 2024–25 independent review of the Act is commencing and will be combined with a review of climate change governance arrangements in Tasmania (as outlined in the action plan).

3.14.6 Victoria

Victoria's Climate Change Strategy includes an adaptation priority to 2025 to monitor, evaluate, report on and improve climate change adaptation by developing and implementing a new long-term framework based on statewide risk assessments.

A Climate Change Adaptation Action Plan Monitoring, Evaluation, Reporting and Improvement (MERI) Framework and implementation guidance was developed by the Department of Energy, Environment and Climate Action (DEECA) in 2023. It involved comprehensive and collaborative consultation with a broad range of government agencies, including representatives from the 7 Adaptation Action Plan (AAP) systems, and various cross-cutting policy areas. The framework seeks to deliver a climate change adaptation MERI foundation for Victoria. It recognises the unique monitoring and evaluation needs of each AAP system, while facilitating consistency in reporting across the AAPs.

3.14.7 Western Australia

Western Australia's Climate Adaptation Strategy includes actions to:

- Establish robust metrics to measure progress towards building climate resilience and adaptation across WA's communities and sectors (Action 23).
- Develop a framework for monitoring, evaluation and reporting to track implementation progress (of the Climate Adaptation Strategy) (Action 37).

Monitoring and evaluation of adaptation initiatives will be underpinned by Climate Change Bill 2023, which contains provisions to iteratively assess Climate Adaptation Strategies and Sector Adaptation Plans (SAP) on a 5-year cycle.

Individual adaptation programs and projects have monitoring and evaluation processes in place where relevant. For example, the Waterwise Perth Action Plan 2, Kep Katitjin – Gabi Kaadadjan, and CoastWA have well-established monitoring, evaluation and reporting processes.

3.15 Averting, minimising and addressing loss and damage associated with climate change impacts

Australia looks forward to reviewing the voluntary guidelines for enhancing the collection and management of data and information on loss and damage to inform the preparation of future biennial transparency reports, to be prepared by the Executive Committee of the Warsaw International Mechanism for loss and damage as mandated by Decision 1/CMA.5 on outcomes of the first Global Stocktake.

3.16 Cooperation, good practices, experience and lessons learned

3.16.1 National examples of cooperation, good practices, experience and lessons learned

Mainstreaming and strengthening adaptation is central to Australia's collective adaptation action. As national adaptation policies are developed and implemented, the Australian Government has learned a number of lessons on best practices in adaptation which are now being put into practice.

Information and data

Effective adaptation requires robust, useable and accessible climate science, information and data. Up-to-date, reliable, useable and accessible data on climate impacts is fundamental to improving resilience. Investing in long-term data collection and analysis and committing resources will ensure science can better understand climate risk, including tipping points and systems thresholds and provide greater confidence for long-term investment.

The Australian Government established the Australian Climate Service (ACS) in 2019 in response to the Royal Commission into National Natural Disaster Arrangements. As noted in section 3.8.1 of this chapter the ACS brings together the information and expertise of Australia's foremost climate science and data experts in the Bureau of Meteorology, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Australian Bureau of Statistics and Geoscience Australia. The ACS is delivering critical climate information such as the National Climate Risk Assessment which will deliver a baseline of current climate risks, including new and emerging risks at a national scale.

The Australian Government is committed to providing the national climate information and science Australians need to make informed adaptation decisions. The government is currently considering the suitability of the ACS's structure and functions to deliver on this demand.

Supporting private sector investment in adaptation

While there are clear private benefits from adaptation action, there is also a need for government initiatives that incentivise private sector investment in adaptation. Catalysing private sector investment in adaptation and resilience at scale will require supporting data and understanding and addressing existing barriers.

Aligning mitigation, disaster risk reduction and adaptation strategies

There are significant benefits from aligning mitigation, adaptation and disaster risk reduction, and risks from not doing so. Developing net zero pathways which consider the impacts of climate change means more robust pathways capitalising on areas of significant co-benefit such as improved energy performance. Disaster risk reduction and adaptation draw on closely related data and information, with opportunities to develop a shared evidence base to support resilience in both current and expected future climates.

The value of First Nations knowledge and experience

Government jurisdictions across Australia acknowledge that the knowledge, values, practices and perspectives of First Nations people is invaluable to Australia's successful adaptation to climate change. Working in partnership with First Nations people to understand lessons for adaptation policy in general, and support the development of First Nations-led policies, requires adaptation policymakers to collaborate in culturally appropriate ways to find new solutions together to combat climate change.

National and cross-jurisdictional collaboration

Understanding that cooperation is central to best practice adaptation outcomes. Australia is working on a range of programs to support and implement cooperation across and between all levels of government and the private sector. States and territories are active participants in initiatives convened by the Australia Government that support collaboration and engagement across the jurisdictions and with stakeholders. These include:

- Adaptation Working Group of the Energy and Climate Ministerial Council, which shares lessons on best practice adaptation including through workshops on topics of interest to member jurisdictions. Recent topics have included adaptation indicators, reflections on Monitoring, Evaluation, Reporting and Improvement (MERI) frameworks and key performance indicators.
- The National Partnership for Climate Projections (see Figure 3.3 for current priority areas), a collaboration of Australian, state and territory governments, science institutions and universities aiming to develop a consistent approach to deliver comparable, robust, fit-for-purpose future climate projections information to assess climate risks and inform adaptation planning.
- The cross-jurisdictional Community of Practice for Climate Science, established by state and territory governments and the Australian Government in 2019 to enable all jurisdictions to collaborate and participate in better meeting the needs of climate science users.
- The National Environmental Science Program Climate Systems Hub, which includes a network of knowledge brokers supported by and based across state and territory governments.
- Facilitating contributions to the 'Enabling Best Practice Adaptation' research program, part of the National Environmental Science Program's Climate Systems Hub research. Hub researchers cooperate with the Adaptation Working Group of officials from across Australia as sources of inputs on adaptation case studies and key users of the research on best practice.
- Climate Adaptation 2023, a substantial national conference led by the National Environmental Science Program's Climate Systems Hub to bring together researchers, policymakers and practitioners from across Australia to share and learn about best practice adaptation.

The two case studies below are examples of national collaborations using science to support adaptation. The case study on CSIRO adaptation programs also highlights Australia's regional approach in responding to climate change, and to achieve better outcomes for adaptation through collaboration across Pacific cultures.

Case study – National scientific collaboration on climate projections to support adaptation

Australian Rainfall and Runoff Guidelines – 2024 update

The Australian Government has worked with the professional body Engineers Australia to lead the update of Australia's flood guidance to incorporate climate science in a collaboration between government, industry and scientists.

Australian Rainfall and Runoff: A Guide to Flood Estimation, published by Engineers Australia, is one of the most widely used references to help practitioners, designers and decision makers assess flood risk for the built environment. In August 2024 the Australian Government provided an update to the Climate Change Considerations chapter, to replace the 2019 edition in Book 1, Chapter 6 of Australian Rainfall and Runoff: A guide to Flood Estimation (Ball et al. 2019). The Climate Change Considerations chapter update incorporates the latest peer-reviewed climate change science to enable practitioners and decision makers to appropriately consider and account for climate change in flood estimation and management. Key updates to the chapter include:

- A move from uniform to variable rainfall adjustments to reflect evidence that the duration of a storm matters for estimating how temperature affects rainfall.
- Adjustments to historical rainfall data to reflect climate change to date.
- Provision of 'climate change adjustment factors' for different storm durations across a range of future climate scenarios. These take into account that warmer air holds more moisture but also that the relationship between temperature and additional moisture varies with the duration of the storm.
- Provision of guidance for other factors that influence design flood estimates (e.g. changes in rainfall losses, temporal patterns and sea-level rise).
- Inclusion of worked examples for real life applications to demonstrate application of the guidance to possible future climate scenarios.

The Department of Climate Change, Energy, the Environment and Water, in partnership with Engineers Australia led the update of the chapter drawing on scientific and professional expertise.

A Technical Working Group of engineers, hydrologists and climate scientists from a diverse range of institutions including the Australian Climate Service, the Bureau of Meteorology, state government agencies, industry, universities and the National Environmental Science Program Climate Systems Hub, reviewed the latest science relevant to the guidance and drafted the update.

- A Project Control Group provided advice on translation of the science into useable guidance. It included members from Insurance Council of Australia, Infrastructure Australia, Natural Hazards Research Australia, Geoscience Australia, Engineers Australia, Australian Climate Service and the University of Melbourne.

The update was further informed by stakeholder input via 2 rounds of public consultation in June 2023 and early 2024 to ensure that the guidance met user needs. Over 90 submissions from engineering practitioners, designers and government decision makers across Australia were received across the 2 consultations. This online consultation was complemented by discussions and presentations at relevant workshops and conferences. The update was published in draft form and may be updated in 2025 following user feedback.

Case study – National scientific collaboration on climate adaptation

CSIRO adaptation programs

Recognising the importance of cooperation, Australia's national science agency, CSIRO, has a range of collaborative programs that span governments, communities and jurisdictions.

- The Climate Science Centre (CSC) is actively involved in the development and delivery of Intergovernmental Panel on Climate Change (IPCC)-aligned science and science-based services in the Pacific. CSIRO's engagement in the Pacific is coordinated in partnership with the Secretariat for Pacific Regional Environment Programme (SPREP), in particular the SPREP Climate Resilience Program (CRP) and the Pacific Climate Change Centre (PCCC). Recent collaborations include the Green Climate Fund Vanuatu Climate Information Services for Resilient Development and Pacific National Adaptation Plans: Climate Impact, Vulnerability and Risk Assessments.
- The CSIRO Pacific AgriFood Futures initiative is a 3-year investment (2023–25) to build collaborations and networks between Australian and Pacific knowledge systems to respond to the 2 biggest food system challenges in the Pacific region: climate and health. A number of departments are key partners including the Department of Foreign Affairs and Trade (DFAT), the Department of Climate Change, Energy, the Environment and Water, and the Department of Agriculture, Forestry and Fisheries (DAFF), as well as the Australian National University (ANU).
- The CSIRO Partnership with Google boosts the impact of the DFAT-CSIRO-ANU Indo-Pacific SciTech4Climate partnership. The partnership brings Google technologies and investment together with learnings from Australian Traditional Owner ranger groups and CSIRO science to support Fiji and Indonesia with blue carbon and seagrass mapping.
- Through the Pacific Blue Carbon Initiative, a co-investment with the Department of Industry, Science and Resources (DISR) and DAFF, CSIRO has supported Fiji and Papua New Guinea to help establish policy and technical expertise for the sustainable management of coastal blue carbon resources, achieving benefits for climate action, sustainable livelihoods and maritime security.

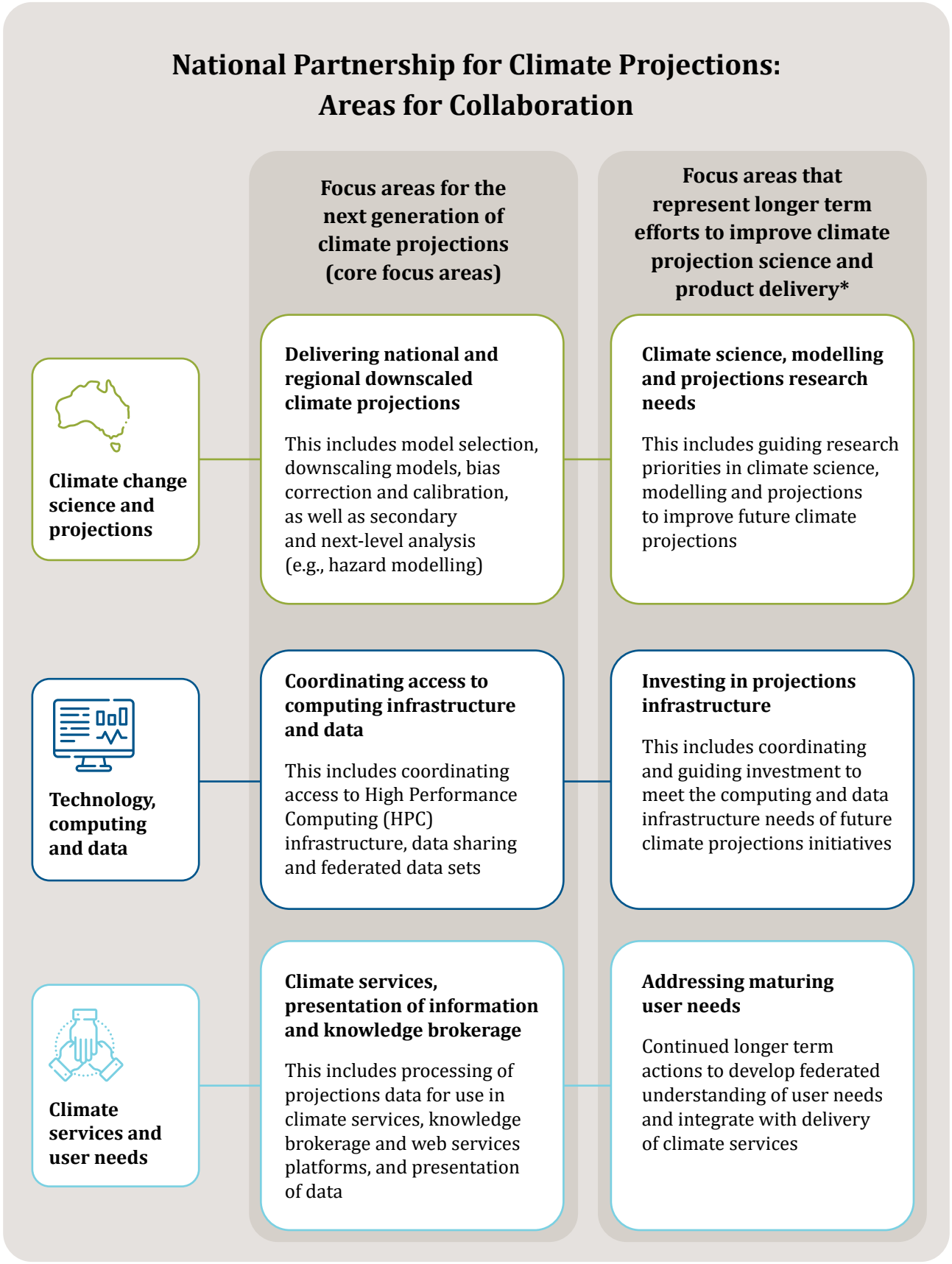

Figure 3.3 Current priority areas for collaboration for the National Partnership for Climate Projections

3.16.2 State and territory examples of cooperation, good practices, experience and lessons learned

As Australian states and territories undertake adaptation action, there are increasing examples of effective cooperation and best practice to learn from. The examples below highlight the benefit of sharing and learning from other jurisdictions' experiences and understanding of the enabling conditions for effective adaptation outcomes.

3.16.2.1 New South Wales, South Australia and Victoria

NSW, South Australia and Victoria joined the Mediterranean Climate Action Partnership in 2023–24. The partnership aims for regions around the world facing similar challenges in adapting to climate change to work together to create innovative solutions and increase resilience.

To deliver on these ambitious outcomes MCAP members commit to advancing 5 core goals:

1. **Expand public awareness** of climate impacts and solutions in the region and around the world, with innovative communications amplified through a common voice.
2. **Learn from each other** and build capacity around what does and does not work to confront shared climate threats through member convenings, study tours and expert exchanges.
3. **Exchange approaches** on policies, programs and governance, investment and economic development strategies, and foster research collaboration that advances shared knowledge on trends and impacts.
4. **Accelerate concrete actions** in Mediterranean regions to protect communities from climate change impacts, while reducing greenhouse gas pollution, conserving ecosystems, halting biodiversity loss, implementing nature-based climate solutions, increasing nature restoration and accelerating the clean energy transition.
5. **Track and report progress** to the global community in appropriate settings.

NSW attended the first convening of MCAP in Barcelona in June 2024 and led the technical working group on wildfire. This partnership is ongoing and will now turn to focus on projects for collaboration to increase regions adaptive capacity.

The case study below presents an example of best practice for inter-state cooperation on climate adaptation science.

Case study: Inter-state cooperation for robust climate modelling

NSW and Australian Regional Climate Modelling (NARCliM)

The NARCliM project is led by the NSW Government as an interjurisdictional partnership with the ACT, South Australia, Victoria and WA governments, National Computational Infrastructure, Murdoch University and the University of New South Wales. The project is informed by the National Partnership for Climate Projections working group participants from all leading climate and science agencies to ensure a consistent approach to future climate projections adaptation planning.

The latest generation of projections, known as NARCliM2.0, is based on the latest global climate models (Coupled Model Intercomparison Project – Phase 6) used in the Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Report (2021). NARCliM2.0 rigorously applies globally recognised best practice guidelines from the World Climate Research Program's Coordinated Regional Climate Downscaling Experiment (CORDEX). The design has also been informed by the National Partnership for Climate Projections working group, with participants from all key state and territory agencies and national environmental organisations.

NARCliM2.0 represents the first climate projections for south-east Australia at the convection-permitting 4 km resolution scale, providing unprecedented information about the potential future climate. NARCliM2.0 provides over 150 climate variables, modelled for 3 greenhouse gas emissions scenarios through to 2100. By applying CORDEX guidelines, NARCliM2.0 data are also available at 20 km resolution for Australasia, which includes New Zealand and parts of Indonesia and Pacific Islands.

3.16.2.2 Queensland

Multiple Queensland Government agencies share scientific information with the public, in a cooperative approach, through the Long Paddock website. For example, the website hosts Queensland Future Climate and the Drought and Climate Adaptation Program (already mentioned). Additionally, information is provided at multiple scales (including property level) to support land management decisions. For example, rainfall and pasture growth information is provided through applications including AussieGRASS and FORAGE.

The case study below presents a best practice example of cross-jurisdictional, First Nations co-designed adaptation planning in Queensland.

Case study: Cross-jurisdictional collaboration on First Nations co-designed climate adaptation

Best practice methods in developing a First Nations co-designed adaptation plan for K'gari World Heritage Area

K'gari is a World Heritage-listed sand island along the southeastern coast in the Wide Bay–Burnett region, Queensland, acknowledged for its outstanding natural values. Traditional knowledge and western science have come together to develop Australia's first Indigenous-led climate adaptation plan for a World Heritage Area. The plan is the result of a partnership between the Butchulla people, custodians of K'gari, the Australian Government's National Environmental Science Program Climate Systems Hub and the Queensland Government Department of Environment, Science and Innovation's World Heritage Team.

Day-to-day management of K'gari is managed by Queensland Parks and Wildlife Service, with the Queensland Government also providing state-wide coordination of World Heritage matters, policy and strategic planning. The Queensland Government also coordinates the K'gari World Heritage Advisory Committee with representatives from Butchulla people, community and scientific experts to provide input into matters of importance to the management of the World Heritage area. Butchulla native title bodies have Butchulla ranger programs.

The K'gari Climate Adaptation Plan is a pilot project that shows how responses to the risks of climate change can benefit from the knowledge and values of Traditional Ownership. Development of the plan included adapting the process outlined in the Australian Government's Climate Change Toolkit for World Heritage Properties in Australia, to be an Indigenous-driven process focused on cultural governance and engagement.

The climate adaptation plan was developed in response to the devastating 2019 bushfires. One of the key actions identified in the plan is right way for fire management, to trial cultural burns as a way of avoiding devastating bushfires. The plan also proposes ways to protect freshwater ecosystems by reducing visitation in the north of the island to manage the risk of introduced species as well as promoting use of eco-friendly products only on the island. The project successfully delivered an adaptation plan that was meaningful to the island's Traditional Owners, can inform future management tools, and provided actionable, achievable outcomes.

3.16.2.3 South Australia

South Australia is also a member of the Mediterranean Climate Action Partnership (MCAP) as detailed above. South Australia officially joined the MCAP in March of 2024 and attended the first Annual MCAP convening in Barcelona in June.

As outlined in sections 3.10 and 3.12, the South Australian Government supports Regional Climate Partnerships, which are regional, cross-sectoral groups delivering practical action to strengthen the climate resilience of their communities, economies and natural and built environments across the state. Partners include councils, regional organisations of councils, Regional Development Australia organisations, Landscape Boards and the South Australian Government.

References (Chapter 3)

DCCEEW 2021 (Department of Climate Change, Energy, the Environment and Water) (2021) *State of the Environment Report, 2021*, DCCEEW.

4 Information on financial, technology development and transfer and capacity-building support provided and mobilised under Articles 9–11 of the Paris Agreement

Key Points

- Australia is committed to delivering high-quality climate finance that responds to the needs of our development partners. Its climate finance supports countries in the region to strengthen their resilience to climate change impacts and achieve their renewable energy transition goals.
- Climate finance needs are large and growing. Australia is committed to mobilising climate finance from all sources as part of a collective global effort.
- Australia has strengthened its previous $2 billion climate finance commitment and expects to deliver $3 billion to the global goal over 2020-25.
- During the reporting period Australia provided and mobilised $1,043,928,425 in climate finance, representing a 56% increase from the previous reporting period.
- The majority of climate finance provided and mobilised by Australia between 2020-21 and 2021-22 was delivered through grants (86%) and supported adaptation action.
- Australia has doubled the amount of adaptation finance provided per year, from $96 million in 2018-19 to $239 million in 2021-22.
- Chapter 4 fulfils paragraphs 118–129 of the modalities, procedures and guidelines.

Structure

This chapter begins by setting out Australia's national circumstances and institutional arrangements related to its climate finance delivery and its processes to identify, track and report. It then provides the assumptions, definitions and methodologies that underly the climate finance delivered to its partner countries before reporting on the financial, technology development and capacity-building support provided during the 2021–22 reporting period. Examples of support provided by Australia are set out in case studies throughout the chapter. Annex III, which supports this chapter, is available on the UNFCCC website: First Biennial Transparency Reports.

Australia delivers high-quality climate finance that responds to the needs of its development partners, is mutually agreed with its development partners and aligns with national and regional plans. Australia's climate finance considers country-driven strategies and the unique operating environments in which it works. This means it prioritises grant-based funding for adaptation projects in the Pacific and is increasing blended finance options to leverage additional finance for mitigation and energy transition efforts in Southeast Asia.

Australia's climate finance provided and mobilised over the 2-year reporting period (2020–21 to 2021–22) was $1,043,928,425, an increase of 56% from the previous reporting period. This included:

- $609,769,734 in grants provided through bilateral, regional and other channels
- $71,111,498 in loans provided through bilateral, regional and other channels
- $236,877,193 in core contributions to multilateral channels
- $126,170,000 in mobilised private finance.

During the reporting period Australia's climate finance commitment was to provide $2 billion over 5 years from 2020 to 2025. Australia has now strengthened this commitment and is expecting to deliver $3 billion in climate finance by 2025. Australia has also doubled the amount of climate finance for adaptation it has provided per year: from $96 million in 2018–19 to $239 million in 2021–22 (excluding multilateral core contributions).

Table 4.1 Climate finance summary: 2020–21 and 2021–22

Climate Finance Summary – 2020–21 and 2021–22	Domestic currency			
	Climate-specific			
	Total	Mitigation	Adaptation	Cross-cutting
Contributions through multilateral channels	236,877,193.03	106,151,629.69	90,443,720.53	40,281,842.81
Contributions through bilateral, regional and other channels	680,881,232.00	149,448,435.00	445,745,555.98	85,687,241.02
Mobilised private finance	126,170,000.00	-	-	126,170,000.00
Total	**1,043,928,425.03**	**255,600,064.69**	**536,189,276.51**	**252,139,083.83**

4.1 National circumstances and institutional arrangements relevant to this chapter heading

4.1.1 Identify, track and report

The majority of Australia's climate finance is delivered through its development program. This is because Australia and its development partners know climate change and sustainable development are intrinsically linked. Climate change is having devastating effects on food security, water supply, energy shortages, supply chains, the frequency of cyclones and floods, conflict and displacement. These effects are compounded by many factors including gender inequality, living with a disability, vulnerability, debt and poverty. Embedding climate resilience and adaptation into broader development actions supports greater sustainability.

By delivering climate finance through its development program Australia tracks and assesses the quality of its climate initiatives through performance reporting frameworks. These frameworks are robust and focused on effective and efficient implementation to deliver high-quality outcomes. They clearly articulate what is measured and how, against agreed baselines. This will necessarily be different for each activity.

The systems and processes Australia uses to track and report the amount of climate finance provided is implemented by a specialist team in Australia's Department of Foreign Affairs and Trade (DFAT). Over the reporting period Australia assessed the proportion of climate finance in development investments on a case-by-case basis. Australia applies the OECD Development Assistance Committee (DAC) Rio policy markers (the Rio markers) to identify climate-related investments. This information is tracked in Australia's Aidworks database which has bespoke functionality to tag climate-related investments and collect information on the proportion of expenditure that addresses climate change according to the Rio markers.

DFAT has developed detailed guidance to support accurate reporting and delivers training to program managers at overseas posts and across government on climate integration and Rio eligibility criteria. Data on other official flows is collected via an annual survey sent from DFAT to other government departments. DFAT also undertakes targeted engagement with key agencies that contribute to Australia's climate finance, including the Australian Centre for International Agricultural Research (ACIAR) and the Department of Climate Change, Energy, the Environment and Water (DCCEEW). DFAT also undertakes expert quality assurance of data inputs and prepares Australia's domestic and international climate finance reporting. More information on transparency arrangements and our accounting methodology is below.

4.1.2 Challenges and limitations

Australia respects the right of partner governments to determine their own priorities for sustainable development. During the reporting period COVID-19 was a major challenge and many partner governments reprioritised efforts and resourcing to focus on national responses to the pandemic. COVID's economic and health impacts disrupted both the development trajectories and limited the ability of partner countries to implement climate finance initiatives and climate-related plans like National Adaptation Plans (NAPs) and Nationally Determined Contributions (NDCs).

Case Study: Identifying, tracking and reporting climate finance in Fiji's budget support

In the reporting years, budget support made up 56% (2020–21) and 51% (2021–22) of Australia's total Official Development Assistance (ODA) to Fiji. This direct financing to government represents the partnership approach Australia and Fiji have and enables Fiji to determine and set its own priorities – including the extent to which national government expenditure addresses climate change. Australia provided Fiji with a budget support package over 2020 to 2023 of $223.5 million, of which 15.2% was counted by Australia as climate finance. In an environment where all governments were trying to mitigate the fiscal shock from COVID-19, Fiji progressed important foundational policies and legislation towards addressing climate change using this budget support.

Regarding tracking and reporting of the effectiveness and efficiency of this budget support, Australia relied on the monitoring and evaluation framework for the investment. The End of Program Outcomes were:

- progressing economic, social, and fiscal reforms
- harmonising with other donors
- supporting the Government of Fiji to recover from the impacts of COVID-19.

The climate-related elements of the investment were embedded in the first outcome and helped the Government of Fiji progress 44 policy actions, some of which were climate change-specific reforms.

Policy achievements by the Government of Fiji (2020–23)

- Passing the *Climate Change Act* and developing a strategic implementation framework for the Act.
- Approving the National Energy Policy.
- Developing a framework for climate change regulations.
- Approving a national ocean policy.
- Creating climateresilient standards for steel reinforcing materials.
- Approving a social assistance policy that responds to climate-related disasters.
- Partial privatisation of Energy Fiji Limited (formerly Fiji Electricity Authority) to incentivise more renewable generations (among other factors).

An independent evaluation found the investment was effective. It also found strong evidence that Australia's budget support, coupled with technical assistance, helped progress these Fiji-led reforms. While Australia's support helped, the evaluation found that the local leadership of the reforms – that policy actions were led by Fiji Ministries and were in areas Fiji policy makers wanted to progress – was a key to success. The evaluation is published on DFAT's website.

Australia's assessments of the impact and quality of development finance, including climate finance, is strengthened by the independent evaluation of programs. The evaluation of this activity found adequate evidence that Australia's budget support contributed to crowding in over $700 million in additional grants and concessional loans from multilateral development banks and enabled Fiji to increase government borrowing to fund the national budget.

Australia's and other partners' financing to Fiji avoided a possible currency devaluation by securing foreign currency inflow. Fiji's solid macroeconomic and debt management resulted in the IMF rating Fiji's level of debt distress as 'moderate' in 2023. The improvements to public policy and regulatory frameworks Fiji enacted with Australia's support have system-wide benefits that also support private climate financing and investment.

Case Study: Experience in strengthening public policy to incentivise private climate financing and investment in the Pacific

Pacific island countries are global leaders in integrating climate risk into financial decision making, a practice that is essential to economic, social and environmental sustainability. The Governance for Resilience (Gov4Res) project implemented by United Nations Development Programme works with Pacific island governments to develop systems for risk-informed approaches to public financial management and planning mechanisms, with particular attention to climate change, gender and social exclusion risks. This contributes to greater stability in the fiscal policy environments so countries can better leverage development finance for climate-resilient development across national, sectoral and sub-national levels. The program has led to improvements in absorptive capacity, allowing Pacific island governments to access more external finances through the Green Climate Fund and Adaptation Fund, which require specific standards of fiduciary controls and financial management capacity.

In Fiji, Gov4Res supported the Programme Development Unit (PDU) in the Climate Change Division of the Ministry of Economy by funding an embedded staff member. This staff member worked alongside partners such as the Commonwealth Secretariat's Climate Finance Adviser, which strengthened the structure of the PDU and led to it secure funding from previously untapped sources like the Seoul Initiative Network for Green Growth Secretariat and the Climate Ambition Support Alliance opportunity fund, among others.

Australia also supports the Pacific Financial Technical Assistance Centre (PFTAC), an IMF regional centre which provides technical assistance, training and capacity building to promote macrofinancial stability in Pacific island countries. PFTAC members are increasingly embedding climate change considerations into public financial management. PFTAC has developed a comprehensive range of tools and training modules to strengthen both the integration of climate considerations across public financial management activities, to strengthen systems and regulation in the financial sector to promote stability, and to improve investment settings. Capacity development activities directly respond to barriers to accreditation to multilateral development banks and multilateral climate funds, improving access to climate finance.

4.1.3 Transparency

Australia reports on its climate finance in 4 ways: to the UNFCCC, to the OECD DAC Creditor Reporting System (CRS), in Australia's annual ODA statistical report and on the DFAT website. Australia's financial year is from 1 July to 30 June but financial expenditure is converted into calendar years for OECD CRS reporting on development finance for climate and environment, to support comparability with other donors. Australia uses the best available international standards – the Rio markers – to assess the climate finance components of its ODA and non-ODA expenditure. The Rio markers enable consistent monitoring and statistical reporting of development finance flows targeting the themes of the Rio Convention, including climate change adaptation and mitigation.

Australia supports global efforts to develop international standards for climate finance accounting. As chair of the Umbrella Group, Australia facilitates coordination within UNFCCC negotiations, including on climate finance matters, and actively contributed to securing an outcome for the Enhanced Transparency Framework. Australia works productively within multilateral systems, including with the OECD and as a member of the UNFCCC Standing Committee on Finance, to enhance international standards on climate finance reporting.

4.1.4 Institutional arrangements to share technology and build capacity

Australia has several institutional arrangements that facilitate the sharing of Australian science and technology with countries in the IndoPacific region and globally. The Australian Centre for International Agricultural Research (ACIAR) progresses the science and practice of how to transform food systems and livelihoods that are under the most pressure to adapt, or where there are the greatest opportunities to achieve both adaptation and mitigation benefits in agriculture. Further information on ACIAR is in section 4.4.

Another Australian institution that collaborates internationally on solutions to climate change is Australia's national science agency, the Commonwealth Scientific and Industrial Research Organisation (CSIRO). Further information on the CSIRO is in section 4.4.

Institutional arrangements to provide capacity-building support is in section 4.5.

4.2 Underlying assumptions, definitions and methodologies

The data presented in this report details climate finance provided and mobilised by the Australian Government in financial years 2020–21 and 2021–22 (the Australian financial year runs from 1 July to 30 June). During this period Australia provided and mobilised $1,043,928,425 million in climate finance from multiple funding sources, including ODA and other official flows. Figures in this report are in Australian dollars. Australia has provided climate finance amounts in US dollars in tables III.1III.5 in Annex III (First Biennial Transparency Reports | UNFCCC). USD exchange rates are based on annual average currency conversion rates for the relevant financial year as published by the Australian Taxation Office: (2020–21: 0.7468; 2021-22: 0.7258).

This represents an increase of $374,255,378 compared to the climate finance provided by Australia in 2018–19 and 2019–20, highlighting progress made since the previous reporting period. Most of Australia's climate finance provided to developing countries was delivered through grants (86%), with the remainder delivered through loans (8%) and equity (7%). Most of the loans were to the private sector (81%), providing economic additionality without adding to sovereign debt. Australia also mobilised private finance of $126.17 million to developing countries. Detailed information on climate finance provided and mobilised by Australia during the reporting period, including on funding channels and financial instruments, is available at Tables III.1–III.5 in Annex III (First Biennial Transparency Reports | UNFCCC).

In recognition of the strong linkages between the goals of the Paris Agreement and sustainable development outcomes, Australia delivers the majority of its climate finance through ODA (88% during the reporting period). An additional $1.7 billion in ODA funding will be made available between 2022–27, which will include new spending for climate action through initiatives such as the $200 million Indonesia Climate and Infrastructure Partnership and Australia's $100 million foundational contribution to the Pacific Resilience Facility.

Australia considers its climate finance to be 'new and additional' on the basis that funding is provided annually through federal budget appropriations and there is no guarantee of funding availability in subsequent years. Australia reports climate finance once it has been transferred from the Australian Government to a recipient entity. The status of all climate finance provided by Australia is therefore disbursed rather than committed or announced. While all climate finance provided is disbursed, private finance mobilised is calculated on a commitment basis, per the financial close of the asset.

4.2.1 Eligibility requirements for identifying climate-specific support

Australia calculates its climate finance on a case-by-case basis at the end of each financial year. Details on this process are described in section 4.1. Australia's climate finance investments have each been assessed against Rio marker eligibility criteria and identified as having either a 'principal' or 'significant' climate objective.

Intent is a key consideration in identifying support as being climate-specific, and project documentation must show that climate-related activities are intentional rather than incidental. Simple and vague references to terms such as 'increased resilience', 'sustainable energy', 'green development' or 'the sustainable development goals' are, by themselves, insufficient evidence to qualify an investment as delivering climate finance.

While the Rio markers provide guidance for thematic tracking of climate adaptation and mitigation in development cooperation, they do not identify an approach for quantifying this expenditure. In line with most other climate finance providers, Australia has built on the Rio markers to develop its methodology for quantifying climate finance expenditure. Definitions and accounting rules applied by Australia are outlined at Tables 4.2 and 4.3.

Table 4.2 Eligibility criteria applied for identifying climate-specific support

Type of support	Definition and eligibility criteria
Adaptation	Investments which intend to reduce the vulnerability of human or natural systems to the current and expected impacts of climate change, including disasters, by maintaining or increasing resilience to climate change stresses, shocks and variability, and/or by helping reduce exposure to them. An adaptation activity is eligible to be counted as climate finance if: a. the climate change adaptation objective is explicitly identified in project documentation (for example, the investment helps to address or manage rising land and sea temperatures, rising sea levels, variable rainfall, more extreme weather events) b. the project contains specific measures targeting climate change adaptation.
Mitigation	Investments which promote efforts to reduce or limit greenhouse gas emissions or enhance greenhouse gas sequestration. A mitigation activity is eligible to be counted as climate finance if it contributes to one or more of the following: a. the mitigation of climate change by limiting emissions of greenhouse gasses, including gasses regulated under the Montreal Protocol; or b. protection and/or enhancement of greenhouse gas sinks and reservoirs; or c. integration of climate change in recipient countries' development planning and practice through strengthening institutions, capacity building, improving regulatory and policy frameworks or research; or d. helping partner countries meet their emissions reductions obligations under the United Nations Framework Convention on Climate Change.
Cross-cutting	Where investments support a mix of adaptation and mitigation, climate finance is split accordingly. However, where a split between adaptation and mitigation cannot be determined – for example, where a project is supporting the development of an integrated climate change action plan – then these activities can be classified as 'cross-cutting' climate finance.

Table 4.3 Scoring and accounting for principal and significant investments

Score	Definition	Accounting
Principal	Addressing climate change adaptation or mitigation is explicitly stated as the main objective of the investment and is fundamental to its design (i.e. the investment would not have been funded but for that objective).	If addressing climate change is a primary objective, 100 % of expenditure is counted as climate finance.

Score	Definition	Accounting
Significant	Addressing climate change is not the main driver of the investment but is identified as one of its objectives, with some activities designed to address climate change adaptation or mitigation (i.e. the investment has been formulated or adjusted to address climate adaptation or mitigation).	If addressing climate change is a secondary objective, between 1% and 99% of expenditure is counted as climate finance. The appropriate proportion estimated on a case-by-case basis and a default of 30% may be applied where a precise percentage cannot be estimated.
Not targeted	Addressing climate change adaptation or mitigation is not an investment objective.	If climate change is not intentionally targeted, no expenditure is counted as climate finance.

4.2.2 Type of support

Australia's climate finance is categorised by type of support using the criteria for adaptation, mitigation and cross-cutting, as outlined above at Table 4.2. During the reporting period 51% ($536,189,277) of Australia's climate finance targeted adaptation, 25% ($255,600,065) targeted mitigation and 24% ($252,139,084) was identified as cross-cutting.

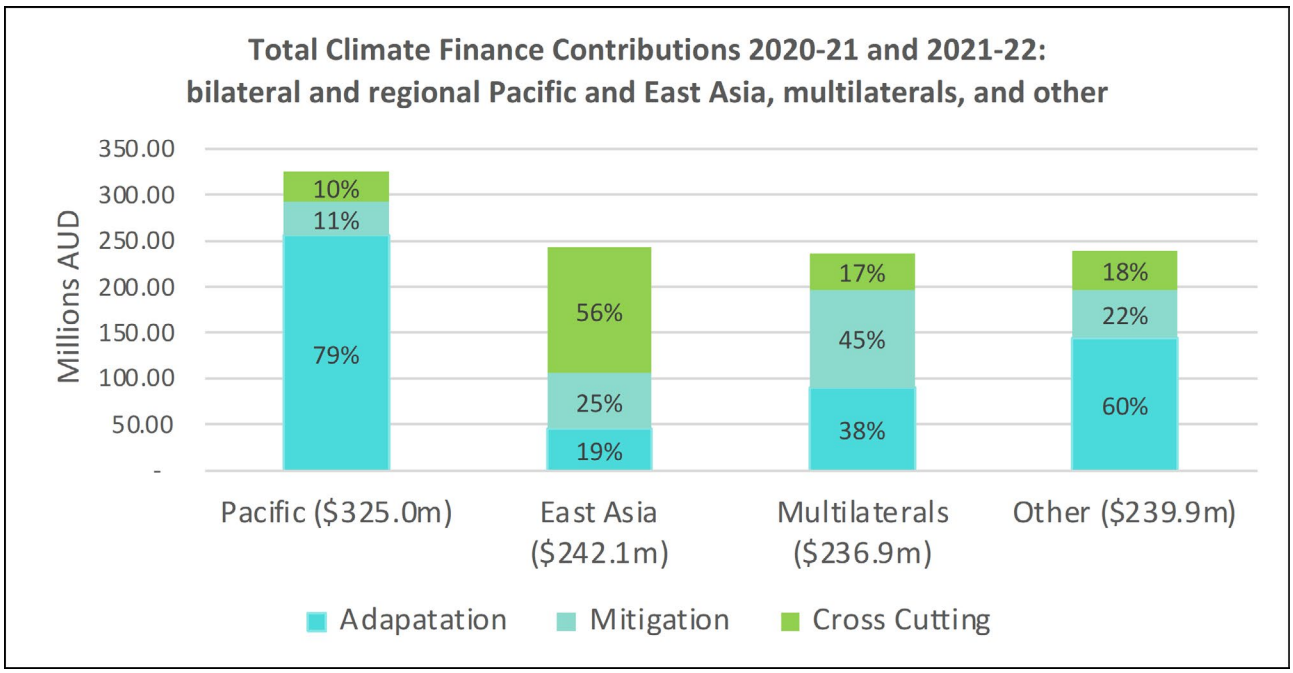

Figure 4.1 Total Climate Finance Provided and Mobilised over 2020–21 and 2021–22: bilateral and regional Pacific and East Asia, multilaterals and other, by type of support

4.2.3 Sector

Australia uses the OECD DAC/UNFCCC sector correspondence tables to classify investments by sector in UNFCCC reporting. These correspondence tables were introduced by the OECD DAC to improve the coherence, compatibility and comparability of sector information reported to the OECD and UNFCCC. The UNFCCC's six sectoral prompts (Energy, Transport, Industry, Agriculture, Forestry, Water and Sanitation) are prioritised. Investments which do not clearly fall within one of the six UNFCCC sectors are classified as 'Other' with additional qualifying information included in parenthesis. For more detail, Australia has provided the original CRS classification in the 'sub-sector' column of reporting tables (Table III.1 2021 and Table III.1 2022 of Annex III) (First Biennial Transparency Reports | UNFCCC).

4.2.4 Climate-related loans

The Australian Government provides climate-related loans directly to developing partner countries – to both governments and the private sector. Where loans are to sovereign entities, the climaterelated component is converted to an 'ODA grant-equivalent' value. This is derived using a formula developed by the OECD DAC which incorporates an assessment of various characteristics of the loan, including the interest rate, tenor and the recipient, to arrive at a figure representing the concessional value of the loan. Only the grant-equivalent amount is counted towards Australia's climate finance. Where loans are provided to the private sector or non-sovereign entities, the full value of the loan is counted, given its economic additionality. As part of our commitment to transparent climate finance reporting, Australia has included both the grant equivalent amount and the full value of sovereign loans in our reporting table (Table III.1 2022 of Annex III) (First Biennial Transparency Reports | UNFCCC).

4.2.5 Other non-grant finance mechanisms

Australia provides a range of non-grant finance options through intermediaries. Examples include the Australian Climate Finance Partnership, Australian Development Investments and the Private Infrastructure Development Group. Australia adopts an 'institutional approach' to count climate finance to these investment entities: a) counting the climate-relevant portion of grant funds transferred from the Australian Government and b) counting the climate portion of the attributable private finance mobilised.

4.2.6 Private finance mobilised

The private sector plays a critical role in mobilising finance for climate and meeting the goals of the Paris Agreement to make finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development. Australia's development partners in the IndoPacific region have identified renewable energy transition and climate-resilient investments as priorities.

Australia supports private sector investment in partner countries in two ways: by providing technical assistance to improve investment environments; and by providing public finance to de-risk and catalyse private sector investment, including by providing first loss finance and supporting guarantees. This support helps to overcome barriers associated with perceived investment risks, regulatory environments and limited awareness of private investment opportunities.

Australia uses OECD DAC methodology to calculate attributable private finance mobilised for all blended finance transactions. This methodology takes into account the amount of money invested, the position taken (for example, the riskiest tranche or a senior position) and the timing of the investment relative to other investors in the transaction. Any private finance mobilised through coinvestments or club deals is allocated between public investors to avoid double counting.

To ensure causal links between Australia's public interventions and mobilised private finance, prospective projects are evaluated on a case-by-case basis through each instrument's governance processes, which all require an assessment of additionality. This assessment ensures that projects are aligned with principals in the OECD guidance and that they meet the threshold of being mobilised because of official intervention. The point of measurement for counting private finance mobilised is at the commitment stage.

Australia distinguishes between public and private finance based on whether the risk and responsibility is borne by government agencies. The minimum standard for classifying finance as private is that the entity is executing a commercial investment strategy and is not reporting development finance. Entities are considered either wholly official or wholly private.

Australia has increased its efforts to use public financing to mobilise private sector investment since the last reporting period and its blended finance portfolio has matured, described below. Gov4Res and PTFAC are examples of work to improve investment environments, and are described in section 4.1.

During this reporting period Australia mobilised $126.17 million in private finance through the Australian Climate Finance Partnership (ACFP), a concessional financing facility managed by the Asian Development Bank and funded by the Australian Government. Private finance mobilised through Australia's investment in the ACFP was calculated using the OECD's collective investment vehicle approach. As Australia was the only party to invest in this vehicle all private finance mobilised was attributable to the Australian Government.

In 2021–22 Australia also provided $4.6 million in capital to the Private Infrastructure Development Group but mobilised finance was not reported during the period. Private finance was mobilised in the following financial year and will be captured in Australia's second Biennial Transparency Report.

4.2.7 Multilateral core contributions

A portion of Australia's climate finance is provided through core contributions to multilateral institutions, including multilateral development banks and financial mechanisms of the UNFCCC such as the Global Environment Facility. The amount of climate finance attributable to Australia's multilateral core contributions is calculated using the imputed multilateral shares for climate development finance, published annually by the OECD. The OECD estimates the percentage of climate-specific outflows from over 20 multilateral institutions and the type of climate support provided – adaptation, mitigation or both. Australia applies the OECD imputed multilateral shares to inflows to apportion the relevant share of climate finance from core contributions.

Australia also provides funding to other UN bodies such as the UN Development Programme, which are not included in the OECD imputed shares list but play an important role in delivering climate finance. Australia calculates 30% of this contribution as climate finance based on climate-specific shared partnership objectives to minimise the impacts of climate change on sustainable development and reduce the risk of climate change-induced humanitarian crises and biodiversity loss.

4.2.8 Assumptions, definitions and methodologies for technology development and capacity building

As part of ongoing efforts to improve the transparency and consistency of reporting on climaterelated development finance, the OECD DAC Working Party on Development Finance Statistics has developed a methodology to track technology development and capacity-building support. This methodology is publicly available on the OECD website. A high-level summary is provided at Table 4.4.

Table 4.4 Methodology to track capacity building and technology transfer

Capacity building	Technology transfer
1. Identify a baseline of activities which have been flagged as both FTC *and* Rio marker for adaptation or mitigation. 2. Include activities which meet the following criteria: – SDG 13.3 or 13.b. – SDG 17.9 and Rio markers for adaptation or mitigation. – Rio markers for adaptation or mitigation and listed DAC purpose codes, including education and training codes ending in *81, scientific research codes ending in *82, specific codes in support of policy institutional support in sectors highly relevant for climate action. DAC sector codes used to identify Capacity Building: 14010; 15110; 16030; 21010; 21011; 21013; 23110; 23111; 23112; 31110; 31210; 31310; 32110; 32210; 32310; 41010; 43030; 43040. – Specific climate-related codes: water resources conservation (14015) and meteorological services (15143). 3. Manual refinement.	4. Include all activities tagged with a Rio marker for adaptation or mitigation *and*: – scientific research codes ending in *82 – communications policy and administrative management (22010) – information and communication technology (22040). 5. Screen remaining Rio-marked activities to identify those pertaining to the five areas of technology transfer identified by the UNFCCC: – Innovation – Implementation – Enabling environment and capacity-building – Collaboration and stakeholder engagement – Support.

4.2.9 Addressing the needs and priorities of developing country parties

By delivering climate finance primarily through the development program, Australia can rely on the systems and processes that ensure country ownership and quality outcomes. Strategies that direct development programming reflect the needs and priorities of partner countries and direct the allocation of Australian resources where partner countries agree to the design and implementation of activities that address the effects of climate change.

The policy governing the development program during the reporting period was Partnerships for Recovery: Australia's COVID-19 Development Response.

4.2.10 Making finance flows consistent with the long-term goals for the Paris Agreement

Australia acknowledges the importance of Article 2.1c of the Paris Agreement, in which all parties committed to collectively make finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development. Australia supported our development partners to meet their own climate change ambitions. In Southeast Asia we supported activities that reduced emissions and supported country plans for green energy transitions, helping to meet those countries' NDCs. In the Pacific, where 89% of our bilateral and regional climate finance contributed to adaptation actions (classed as adaptation or cross-cutting), we supported country-led efforts on NAPs. Refer to Figure 4.1 above.

Australia's increased use of blended finance in the reporting period is supporting the shift for global financial flows to align with a future where temperature rise is kept below 1.5°C.

4.3 Financial support provided and mobilised (multilateral channels; bilateral, regional and other channels; and finance mobilised through public interventions)

4.3.1 Bilateral, regional and other channels

For detailed information on Australia's provision of climate finance through bilateral, regional and other channels please see Table III.1 2021 and Table III.1 2022 of Annex III (First Biennial Transparency Reports | UNFCCC).

Table 4.5 Summary of climate finance through bilateral, regional and other channels: 2020–21 and 2021–22

Contributions through bilateral, regional and other channels	Domestic currency			
	Climate-specific			
	Total	Mitigation	Adaptation	Cross-cutting
2020–21	266,688,733	30,336,460	207,140,059	29,212,214
Face value	-	-	-	-
Grant equivalent	266,688,733	30,336,460	207,140,059	29,212,214
2021–22	414,192,499	119,111,975	238,605,497	56,475,027
Face value*	57,338,498	55,311,471	2,027,027	-
Grant equivalent	356,854,001	63,800,504	236,578,470	56,475,027
Total	**680,881,232**	**149,448,435**	**445,745,556**	**85,687,241**

Note*: The sovereign loan appearing in both rows for 2021–22 has been removed from the Face value row in the summary table ($31,343,284) to ensure no double counting.

4.3.2 Multilateral channels

For detailed information on Australia's provision of climate finance through multilateral channels please see Table III.2 2021 and Table III.2 2022 of Annex III (First Biennial Transparency Reports | UNFCCC).

Table 4.6 Summary of core contributions through multilateral channels: 2020–21 and 2021–22

Core contributions through multilateral channels	Domestic currency				
	Core/general	Climate-specific			
		Total	Mitigation	Adaptation	Cross-cutting
2020–21	427,571,501	112,608,370	56,343,296	36,440,908	19,824,167
2021–22	386,668,836	124,268,823	49,808,334	54,002,813	20,457,676
Total	814,240,336	236,877,193	106,151,630	90,443,721	40,281,843

4.3.3 Information on finance mobilised through public interventions

For detailed information on Australia's provision of climate finance mobilised through public interventions please see Table III.3 2021 and Table III.3 2022 of Annex III (First Biennial Transparency Reports | UNFCCC).

Table 4.7 Summary of private finance mobilised through public interventions: 2020–21 and 2021–22

Private finance mobilised	Domestic currency			
	Climate-specific			
	Total	Mitigation	Adaptation	Cross-cutting
2020–21	-	-	-	-
2021–22	126,170,000	-	-	126,170,000
Total	**126,170,000**	**-**	**-**	**126,170,000**

4.4 Support provided for technology development and transfer

Australia has several programs and institutional arrangements that focus specifically on developing technologies to address issues related to climate change and programs that translate Australian technological advances into developing country contexts. This necessarily involves the integration of traditional knowledge and practice in recognition that sustainable development and long-term impacts are dependent on local ownership, and that countries must drive their own development agendas.

For detailed information on Australia's support for technology development and transfer, refer to Table III.4 2021 and Table III.4 2022 of Annex III (First Biennial Transparency Reports | UNFCCC).

Case study: Efforts to encourage private sector investment

Australia's Business Partnerships Platform (BPP) supports partnerships between the Australian Government and the private sector in developing countries to create both development impact and sustainable commercial returns. The businesses it supports create new products and services to improve lives by de-risking and scaling green investments.

Since 2016 the BPP has created 75 partnerships and partnered with 147 organisations across the private sector, social business, NGOs and academic institutions in 19 countries across Asia, Africa and the Pacific. The program identifies endogenous technologies and assists the local organisation which has developed or taken forward the technology to expand by attracting additional investment.

In Nepal building materials are highly pollutant and responsible for generating 37% of Nepal's CO_2 emissions. BPP helped local entity Build Up Nepal Engineering to scale up the production of affordable, safe and eco-friendly bricks. The entity helped rural entrepreneurs (primarily low-income families, women, migrants and youth) to start and build microconstruction companies by provided them with brick-making machines, training and support.

Case study: Innovation and support for different stages of the technology cycle

The Science and Technology for Climate program implemented by CSIRO and the Australian National University brought together leading Australian scientists with development partners in the Indo-Pacific to trial or scale up innovative technology to address the effects of climate change. The program had high tolerance for risk, in recognition that Australia's development program needed to provide space for emerging technologies to be tested in developing country contexts.

Trials included exploring how new technologies might be integrated with traditional knowledge and endogenous science. In Samoa CSIRO supported increased farm productivity by developing diverse taro-based farming systems. In Tonga scientists from the Australian National University trialled zero-emission desalination technology based on solar-driven thermodiffusion for agricultural use. In TimorLeste a coalition of scientists and engineers trialled new water filtration systems for households to address continuing supply issues of potable water that are exacerbated by the effects of climate change. In TimorLeste and Fiji scientists, practitioners and local communities developed adaptive responses to manage the impacts of climate on fisheries resources. In Bangladesh and India Australian scientists collaborated with national research institutes to take climate-smart technologies – such as salt-tolerant, high-yield rice and zero-tillage vegetables – developed in Australia and trialled their implementation in the Ganges Delta.

Case Study: Endogenous capacities and technology to forecast weather

The Climate and Oceans Support Program in the Pacific (COSPPac) enhances the capacity of Pacific islands to manage and mitigate the impacts of climate vulnerability and tidal events. Pacific island communities have a long history of coping with extreme weather events and climate vulnerability by reading the signs in their natural environment. Traditional methods of weather and climate prediction are based on the behaviour of plants and animals, temperature and rainfall, and the movements of the sun and stars. There are concerns these traditional skills are disappearing, in part due to the impact of land use and climate change on traditional indicators.

COSPPac combines this traditional knowledge with conventional forecasts to generate knowledge products to improve weather forecasting, decision making, risk management and disaster prevention. COSPPac and the national meteorological services of Niue, Samoa, Solomon Islands and Vanuatu have documented traditional knowledge used for weather forecasting to produce an integrated forecast which uses both traditional knowledge and western data. The traditional knowledge collected will also be used as a tool for communicating climate messages to local communities.

Case study: Innovation and collaborative approaches to research and development

The Australian Centre for International Agricultural Research (ACIAR) works with international partners to foster and implement global research collaborations that support development in agriculture, fisheries and forestry. Their climate change program progresses the science and practice of how to transform food systems and livelihoods that are under the most pressure to adapt to or reduce greenhouse gas emissions. The program translates sciences that often seem conceptual into tangible projects and pathways for change.

In the reporting period ACIAR, in cooperation with national research partners, supported community-based fisheries management and aquaculture management in the Pacific, and trialled and implemented fisheries technology in Southeast Asia to protect fishing livelihoods and boost river health and food security. An activity in the Mekong Delta increased the production and profitability of saline-affected crop production systems.

ACIAR has supported more than 1,500 agricultural research for development projects over 40 years, with more than 400 partners in 40 different countries. ACIAR also manages the Pacific Agricultural Scholarships and Support and Climate Resilience Program, which provides scholarships and support to postgraduate students in the Pacific. Students studying in the fields of agriculture, forestry and fisheries are supported to research agricultural problems.

Case study: Knowledge products

The Australia–Pacific Climate Partnership is an enabling program that supports Pacific governments with networks, partnerships, knowledge and development assistance to build greater resilience to climate change and disasters. One of 3 end-of-program outcomes was that 'Australian-supported climate change information is relevant and influential'.

The partnership provided technical advice, expertise and resources to help practitioners:

- understand climate change-related health impacts to bring sustained improvements in population health
- interpret climate change projections and their impacts on agriculture and tourism to build economic resilience
- design infrastructure to mitigate against energy, food and water insecurity.

The Climate Wise website hosts country factsheets, risk assessments, good practice guides and a calendar of learning events such as a Climate Knowledge Brokers training program. It hosts a range of outreach tools, including animations that interpret climate and disaster information in specific sectors, country risk profiles and sector-specific briefs. It has facilitated a Community of Practice group for Pacific climate knowledge brokers and an Australia Pacific Climate Alumni network. It has developed educational resources for primary and secondary students across the region, and an experiential learning program for secondary schools to learn about climate adaptation. It also supported the development of a short film highlighting women's roles in climate action, produced by Shifting the Power Coalition.

4.5 Capacity-building support provided

Capacity building has been an integral principle of Australia's sustainable development programming for many decades. Integrating climate finance within the development program ensures that solutions to climate impacts are considered holistically within partner country's sustainable development plans. During the reporting period, Australia's development program was guided by Partnership for Recovery: Australia's COVID-19 Development Response. This policy placed a strong focus on the localisation of Australia's assistance through partner government systems and local organisations, ensuring efforts (including those implementing climate finance activities) were informed by local knowledge, support local priorities and needs, and contribute to local capacity and accountability. One of 3 pillars of this policy was stability, which included the commitment to 'support countries to maintain health and educated populations that were food and water secure, and resilient to threats such as climate change'.

In addition to weaving capacity-building into development activities as a key element of sustainability, Australia has a range of specific capacity building programs, including scholarships, short courses and the provision of technical assistance to strengthen organisational and institutional capacity.

For detailed information on Australia's capacity-building support, refer to Table III.4 2021 and Table III.4 2022 of Annex III (First Biennial Transparency Reports | UNFCCC).

Case study: Responding to capacity building needs identified by developing country parties

Australian Water Partnership (AWP) is a flexible mechanism for Australia to respond to the needs and priorities of governments in the Indo-Pacific region on their climate-resilient water resource management practices. Since 2019 there have been 70 AWP activities across the Mekong subregion, with a total value of $17 million.

In Cambodia AWP built irrigation capacity within the national government through the introduction of new approaches to irrigation performance measurement, and at the sub-national level strengthened inclusive governance for water resources management through a training program with district governments. In Vietnam AWP supported the development of legislation, river basin management, modernisation of irrigation systems and urban water management.

In Thailand AWP increased the capacity of Thai officials to monitor water quality in its reservoirs and learn about alternative water allocation systems to enable equitable access to water among agricultural users. AWP members are also working with Thai counterparts reviewing Flood Forecasting and Warning Systems and working with new River Basin Committees. In Laos Australian technical experts worked alongside counterparts in the Department of Water Resources to prepare a Sustainable Groundwater Management Plan for the Sekong Province, potentially benefitting 132,000 people.

Case study: Capacity building in the development program

Climate Resilient by Nature, implemented by Worldwide Fund for Nature (WWF), supports a portfolio of community-led nature-based solutions to address climate change in the Indo-Pacific. The program has a Knowledge Hub that supports collaboration between implementation partners to share lessons and best practice.

Under the Knowledge Hub WWF designed a learning program to explore the question: how can carbon projects be developed to deliver benefits for Pacific communities? This learning program explores approaches to the design and implementation of high-integrity carbon market projects. Through facilitated discussions between carbon market experts and development practitioners a variety of implementation approaches have been explored and lessons shared.

Outcomes from this learning program include: new carbon project collaborations between experienced project developers and NGOs unfamiliar with voluntary carbon markets, principles for high-integrity carbon projects in the Pacific disseminated widely and an exploration of the role that development actors can play in these markets.

4.6 Facilitating improved reporting and transparency over time

Australia is committed to continuous improvement of its reporting and, to the extent possible, identifying and regularly updating and including information on areas of improvement.

To this end Australia's first BTR has responded to encouragements from the technical expert review of Australia's 8th national communication and Australia's 5th Biennial Report. In response, section 4.2.6 reports on Australia's efforts to scale up private investment in mitigation and adaptation activities and the role of non-grant finance mechanisms. This refers to the United Nations Framework Convention on Climate Change Report on the technical review of the 8th National Communication and the technical review of the 5th Biennial Report of Australia, Table I.3, No.3 and Table II.3, No.3, United Nations, 4 June 2024.

In addition, section 4.3.3 reports on private financial flows leveraged by bilateral climate finance towards mitigation and adaptation activities in non-Annex I Parties. This refers to the United Nations Framework Convention on Climate Change Report on the technical review of the 8th National Communication and the technical review of the 5th Biennial Report of Australia, Table I.3, No.2 and 3, United Nations, 4 June 2024. Finally, Australia has amended its BTR reporting to clarify that all technology transfer activities reported were undertaken by the public sector (Table III.4 2021 and Table III.4 2022 of Annex III) (First Biennial Transparency Reports | UNFCCC). This refers to the United Nations Framework Convention on Climate Change Report on the technical review of the 8th National Communication and the technical review of the 5th Biennial Report of Australia, Table I.3, No.4, United Nations, 4 June 2024.

Refer to Chapter 2, section 2.15 for further examples of Australia's improved reporting and transparency.

Abbreviations and acronyms

Term	Definition
AAP	Adaptation Action Plan (Victoria)
ABARES	Australia Bureau of Agricultural and Resource Economics and Sciences
ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
ACCU	Australian Carbon Credit Unit
ACFP	Australian Climate Finance Partnership
ACIAR	Australian Centre for International Agricultural Research
ACS	Australian Climate Service
ACT	Australian Capital Territory
AEIC	Australian Energy Infrastructure Commissioner
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AFMA	Australian Fisheries Management Authority
AIM	Agriculture Innovation Mission
AIMR	Australia's Identified Mineral Resources
ANAO	Australian National Audit Office
ANGA	Australia's National Greenhouse Accounts
ANREU	Australian National Registry of Emissions Units
ANZSIC	Australia-New Zealand Standard Industry Classification
APS	Australian Public Service
APY	Aṉangu Pitjantjatjara Yankunytjatjara (APY) Lands
ARENA	Australian Renewable Energy Agency
ARP	Aboriginal Ranger Program (WA)
ASFI	Australian Sustainable Finance Institute
AWP	Australian Water Partnership
BHP	Broken Hill Propriety Company Ltd
BITRE	Bureau of Infrastructure and Transport Research Economics
BoM	Bureau of Meteorology
BPP	Business Partnerships Platform
BTR	Biennial Transparency Report
CAfN	Climate Adaptation for Nature (ACT)
CaLD	Culturally and linguistically diverse
CCAM	Climate Change Adaptation Modelling (WA)

Term	Definition
CC Act	*The Climate Change Act 2022*
CCS	Carbon capture and storage
CEFC	Clean Energy Finance Corporation
CER	Clean Energy Regulator
CFI Act	Carbon Farming Initiative Act 2011
CHAS	Coastal Hazard Adaptation Strategies (QLD)
CH_4	Methane
CIRMP	Critical Infrastructure Risk Management Program
CIS	Capacity Investment Scheme
CMIP6	Coupled Model Intercomparison Project Phase 6
CO_2	Carbon dioxide
CORDEX	Coordinated Regional Climate Downscaling Experiment
CoP	Conference of the Parties
COSPPac	Climate and Oceans Support Program in the Pacific
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
COVID-19	Coronavirus disease of 2019
CRF	Climate Risk Framework (WA)
CROMP	Climate Risk and Opportunity Management Program
CRP	Climate Resilience Program
CRT	Common Reporting Table
CSI	Climate Science Initiative (WA)
CSC	Climate Science Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTF	Common Tabular Format
CVA	Climate Vulnerability Assessment
DAFF	Department of Agriculture, Fisheries and Forestry
DAP	Disaster Adaptation Plan (NSW)
DCCEEW	Department of Climate Change, Energy the Environment and Water
DEECA	Department of Energy, Environment and Climate Action (Victoria)
DER	Distributed Energy Resources (WA)
DFAT	Department of Foreign Affairs and Trade
DISR	Department of Industry, Science and Resources
DITRDCA	Department of Infrastructure, Transport, Regional Development, Communication and the Arts
DKIS	Darwin Katherine Interconnected System
DRF	Disaster Ready Fund
DWER	Department of Water and Environmental Regulation (WA)

Term	Definition
ECMC	Energy and Climate Ministerial Council
EMM	Environment Ministers Meeting
EPA	Environment Protection Authority (NSW)
ERA	Economic Regulatory Authority
ERAC	Emissions Reduction Assurance Committee
ESC	Energy Savings Contribution (ACT)
EV	Electric Vehicle
FOGO	Food Organics and Garden Organics (ACT)
FMP	Forest Management Plan (WA)
FullCAM	Full Carbon Accounting Model
GDP	Gross Domestic Product
GEMS Act	The Greenhouse and Energy Minimum Standards Act 2012
GHG	Greenhouse gas
GW	Gigawatts
GWh	Gigawatt hours
HCFC	Hydrochlorofluorocarbons
HFCs	Hydrofluorocarbons
IA	Impact Analysis
IAC	Indigenous Advisory Committee
ICAO	International Civil Aviation Organisation
IEP	Integrated Energy Plan (ACT)
IMO	International Maritime Organisation
IPA	Indigenous Protected Area
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial processes and product use
IRP	Indigenous Rangers Program
ITMOS	Internationally Transferred Mitigation Outcomes
IVA	Integrated Vulnerability Assessments
kt	Kilo tonnes
LCLF	Low-carbon liquid fuels
LIDAR	Light detection and ranging
LGAQ	Local Government Association of Queensland
LNG	Liquid natural gas
LPG	Liquid petroleum gas
LTESA	Long term energy service agreements (NSW)
LULUCF	Land Use, Land use change and Forestry

Term	Definition
MCAP	Mediterranean Climate Action Partnership
MERI	Monitoring, Evaluation, Reporting and Improvement
MERNAP	Maritime Emissions Reduction National Action Plan
MPG	Modalities, procedures and guidelines
Mt CO_2-e	Million tonnes of carbon dioxide equivalent
MW	Megawatts
N_2O	Nitrous oxide
NA	Not applicable
NAP	National Adaptation Plan
NARCliM	NSW and Australian Regional Remote Climate Modelling
NatHERS	Nationwide House Energy Rating Scheme
NCC	National Construction Code
NCRA	National Climate Risk Assessment
NDC	Nationally Determined Contribution
NEL	National Electricity Law
NEM	National Electricity Market
NEMA	National Emergency Management Agency
NERL	National Energy Retail Law
NESP	National Environmental Science Program
NETP	National Energy Transformation Partnership
NEWS	National Energy Workforce Strategy
NF_3	Nitrogen trifluoride
NGA	National Greenhouse Accounts
NGER	National Greenhouse and Energy Reporting
NGL	National Gas Law
NIR	National Inventory Report
NO	Not occurring
NPCP	National Partnership for Climate Projections
NRF	National Reconstruction Fund
NRFC	National Reconstruction Fund Corporation
NSW	New South Wales
NT	Northern Territory
NVES Act	New Vehicle Efficiency Standard Act 2024
NWIS	North West Interconnected System
NZEA	Net Zero Economy Authority
NZEC	Net Zero Economy Committee

Term	Definition
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
OECD CRS	Organization for Economic Cooperation and Development Creditor Reporting System
OECD DAC	Organization for Economic Cooperation and Development Assistance Committee
OECM	Other effective area-based conservation measures
OIA	Office of Impact Analysis
PFCs	Perfluorocarbons
PCCC	Pacific Climate Change Centre
PFTAC	Pacific Technical Assistance Centre
PJ	Petajoules
Q-CAS	Queensland Climate Adaptation Strategy 2017-2030
Q CRC	Queensland Climate Resilient Councils
QTMP	Queensland Train Manufacturing Program
QTRIP	Queensland Transport and Roads Investment Program
RAC	Refrigeration and air-conditioning
RETAs	Renewable Energy Trade Agreements
REZ	Renewable Energy Zone
SA	South Australia
SAF	Sustainable Aviation Fuel
SAP	Sector Adaptation Plan (WA)
SDMP	State Disaster Mitigation Plan (NSW)
SEQ	South East Queensland
SERS	Sectoral emissions reduction strategy (WA)
SF_6	Sulphur hexafluoride
SHEPI	Commonwealth Social Housing Energy Performance Initiative
SME	Small and Medium Enterprise
SLA	Suburban Land Agency (ACT)
SPG	Sustainable Productivity Growth
SPP	State Planning Policy (WA)
SPREP	Secretariat for Pacific Regional Environment Programme
SWIS	South West Interconnected System
the Authority	The Climate Change Authority
TMR	Transport and Main Roads (Queensland)
TRET	Tasmania Renewable Energy Target
TSRA	Torres Strait Regional Authority
TWWHA	Tasmanian Wilderness World Heritage Area

Term	Definition
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UNHARMED	Unified Natural Hazard Risk Mitigation Exploratory Decision-Making Tool (WA)
WA	Western Australia
WAM Scenario	With Additional Measures' Scenario
WM Scenario	With Measures' Scenario
WEM	Wholesale Electricity Market
WWF	Worldwide Fund for Nature
ZEV	Zero Emissions Vehicle (Queensland)

Glossary

Term	Definition
Abatement	A reduction in atmospheric greenhouse gases through emissions avoidance or removal and sequestration of carbon from the atmosphere.
Agriculture sector emissions	Emissions from agricultural activities, including livestock and farm management. In Australia, enteric fermentation is the main source of agriculture emissions.
Adaptive capacity	The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.
Anthropogenic	In the context of greenhouse gases, emissions that are produced as the result of human activities.
Australian Carbon Credit Units (ACCU)	Units issued by the Clean Energy Regulator representing one tonne of carbon dioxide equivalent (t CO_2-e) stored or avoided by projects under Australia's carbon crediting scheme.
Australian financial year	The financial year is a time period of 12 months that starts on 1 July, with the last day occurring the following year on 30 June (e.g. Australian financial year 1990 covers the period 1 July 1989 to 30 June 1990). As key data sources are compiled on a financial year basis, Australia's National Inventory Report of emissions is also reported on a financial year basis.
Black Summer bushfires	A severe bushfire event over the 2019–20 Australian summer, with fires burning simultaneously across multiple Australian states and territories. The Black Summer bushfires burned more than 24 million hectares, destroyed more than 3,000 buildings and killed 33 people.
Carbon dioxide removal (CDR)	Carbon dioxide removal (CDR) refers to technologies, approaches, and practices that remove CO_2 directly from the atmosphere and store this CO_2 through organic and inorganic chemical reactions in the ocean, land surface or below ground. Some of these technologies store CO_2 in underground geological formations.
Carbon capture and storage (CCS)	Carbon capture and storage (CCS) involves the capture of CO_2 from industrial processes (e.g. cement production) and resource extractive processes (e.g. natural gas processing) and storing it underground, thus preventing it from entering the atmosphere. In this process, captured CO_2 is compressed, transported by pipeline, ship, rail or truck, and injected into deep geological reservoirs. Typically, CO_2 is stored at depths of more than one kilometre underground.
Carbon capture and use (CCU)	Carbon capture and use (CCU) refers to a range of applications through which CO_2 is captured and used either directly (i.e. not chemically altered) or indirectly (i.e. transformed) in some processes or to create products. CO_2 is used directly in the food and beverage industry and indirectly in the production of urea, a feedstock for fertilisers.
Carbon dioxide equivalent (CO_2-e)	A measure used to compare different greenhouse gases based on their contribution to radiative forcing. Parties to the UNFCCC and Paris Agreement are required to report emissions on a carbon dioxide equivalent basis, currently usings global warming potential (GWP) values over a 100-year time horizon set out in the Intergovernmental Panel on Climate Change Fifth Assessment Report.
Carbon farming	The process of changing agricultural practices or land use to increase the amount of carbon stored in the soil and vegetation (sequestration) and to reduce greenhouse gas emissions from livestock, soil or vegetation
Carbon neutral	A balance between emissions and removals of greenhouse gasses from the atmosphere.
Carbon sink	Natural or manufactured systems that absorb and store carbon from the atmosphere, including trees, plants and the oceans

Term	Definition
Circular economy	A way of delivering nature positive outcomes, lifting economic productivity, and supporting Australia's net zero commitments – through the sustainable and efficient use of resources in the economy
Anthropogenic climate change	A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.
Australia's emission projections	Australia's emissions projections, published annually, are estimates of Australia's future greenhouse gas emissions. They provide an indicative assessment of how Australia is tracking against its emissions reduction targets.
Climate adaptation	The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm, or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.
Climate change mitigation	A human intervention to reduce the sources of, or enhance the sinks for, greenhouse gases.
Climate change risks	The physical risks from the changing climate and the transition risks associated with developments that may (or may not) occur in the process of adjusting towards a lower-carbon economy.
Climate finance	Climate finance refers to local, national or transnational financing—drawn from public, private and alternative sources of financing—that seeks to support mitigation and adaptation actions that will address climate change.
Climate models	A numerical representation of the climate system that simulates the transfer of energy and materials through the climate system.
Country	The Indigenous concept of everything within an interconnected cultural landscape, including the land or sea itself; the plants and animals within it; the history, culture and traditions associated with it; and the connections between people and the landscape. Country is a distinct geographic, cultural and ecological space that is common to a specific Indigenous people, group of peoples or local community, and to which they are connected. Country contains complex ideas about law, place, custom, language, spiritual belief, cultural practice, material sustenance, family and identity.
Critical mineral	Critical minerals are metallic or nonmetallic materials that are essential to our modern technologies, economies, and national security, and whose supply chains are vulnerable to disruption.
Downscaling	The process by which coarser-resolution global climate model outputs are translated into finer-resolution climate information to better account for regional climatic influences, such as local topography
ENSO (El Nino Southern Oscillation)	Climate phenomena that affects weather across the globe. ENSO is the oscillation between El Nino and La Nina conditions. El Niño refers to the extensive warming of the surface of the central and eastern tropical Pacific Ocean, which leads to a major shift in weather patterns across the Pacific. El Niño conditions are associated with below average rainfall across much of eastern Australia. The La Niña phase is characterised by cooler-than-average sea surface temperatures in the central and eastern tropical Pacific Ocean. La Niña conditions are associated with higher than average winter, spring and early summer rainfall over much of Australia
Emissions budget	A cumulative amount of emissions that can be emitted, e.g. 4,000 Mt CO_2-e during a specified time period, e.g. 2021–30.
Emissions intensity	A measure of the amount of emissions associated with a unit of output – for example, emissions per unit of gross domestic product or electricity production.
Enteric fermentation	The process in animals by which gases, including methane, are produced as a by-product of the microbial fermentation associated with digestion of feed

Term	Definition
Fire weather conditions	Climatic conditions that affect the risk of bushfires. High temperatures, low rainfall and humidity, and high winds increase the fire risk.
First Nations	A generic term for Indigenous peoples of any country. In Australia, the term refers to Aboriginal and Torres Strait Islander people; however, the term is not limited to Indigenous peoples of Australia and can be used to describe Indigenous peoples from other countries (e.g. Canada). First Nations should always be capitalised in recognition of First Nations Peoples distinct cultural, historic, spiritual and community identities.
Forest degradation	A direct, human-induced activity that leads to a long-term reduction in forest carbon stocks
Forest Fire Danger Index (FFDI)	A measure of fire weather calculated from observations of temperature, rainfall, humidity, and wind speed.
Fugitive Emissions	Fugitive emissions involve the release of non-combustion, greenhouse gases arising from the production and delivery of fossil fuels. Fugitive emissions from solid fuels arise from the production, transport and handling of coal, and emissions from decommissioned mines and coal mine waste gas flaring. Fugitive emissions from oil and gas extraction, production and transport involve venting, flaring, leakage, evaporation and storage losses. Fugitive emissions from carbon dioxide transport and storage arise from the transport, injection and storage of carbon dioxide associated with carbon capture and storage activities.
Full Carbon Accounting Model (FullCAM)	A calculation tool for modelling Australia's greenhouse gas emissions from the land sector. FullCAM is used in Australia's National Greenhouse Accounts for the land use, land-use change and forestry sectors
Greenhouse gas	Any gas (natural or produced by human activities) that absorbs infrared radiation in the atmosphere, leading to warming effects. Greenhouse gases include carbon dioxide, methane and nitrous oxide
Indian Ocean Dipole (IOD)	A climate pattern affecting the Indian Ocean. The IOD is a major contributor to the variability of rainfall over Australia. A positive phase of the IOD is associated with drier conditions in the Australian region and a negative phase with increased rainfall
Indigenous Rangers	Indigenous Australians who combine Traditional Ecological and Cultural Knowledge with conservation training to protect and manage their land, sea and culture, and maintain an enduring connection to Country. Many rangers are employed in Indigenous Protected Areas, which are areas of land and sea Country managed by Indigenous groups in accordance with Traditional Owners' objectives that contribute to the protection of the nation's biodiversity and cultural heritage. Indigenous ranger projects were introduced by the Australian Government in 2007 as part of the Working on Country program.
Industrial Processes and Product Use (IPPU)	Includes emissions from chemical feedstocks, reductants, carbonates and HFCs, which are used in refrigerants and air conditioning
Intergovernmental Panel on Climate Change (IPCC)	The United Nations body for assessing the science related to climate change. The IPCC prepares comprehensive reports about the state of scientific, technical and socio-economic knowledge on climate change, its impacts and future risks, and options for reducing the rate at which climate change is taking place. It also produces methodology reports to provide guidelines for the preparation of greenhouse gas inventories.
Land use, land-use change and forestry (LULUCF)	The greenhouse gas inventory sector covering emissions and removals from land and forests caused by human activities. This sector does not include emissions from livestock or fertilisers applied to croplands, which are covered by emissions reported for the agriculture sector.
Maladaptation	Actions that may lead to increased risk of adverse climate-related outcomes, including via increased GHG emissions, increased vulnerability to climate change, or diminished welfare, now or in the future. Maladaptation is usually an unintended consequence.

Term	Definition
Marine heatwave	A period when sea surface temperatures are in the top 10% of temperatures recorded for that location at that time of year for 5 or more days.
Megawatt hours	Megawatt (MW) is a unit of measurement for power or how much energy can be delivered per unit of time; and a megawatt hour (MWh) is a unit of measurement of energy, equivalent to 1 MW of power supplied/consumed for 1 hour.
Millennium Drought	Between 1997 and 2009 much of southern Australia experienced a prolonged period of dryness. Conditions were particularly severe in the densely populated southeast and southwest. The Murray–Darling Basin and virtually all the southern cropping zones were severely affected.
Million tonnes (Mt)	One million tonnes. The unit commonly used to express Australia's national greenhouse gas emissions.
Climate change mitigation	A human intervention to reduce the sources of, or enhance the sinks for, greenhouse gases.
Montreal Protocol	The Protocol on Substances that Deplete the Ozone Layer, adopted in 1987. It controls the consumption and production of chemicals, such as chlorofluorocarbons, that destroy stratospheric ozone and are also potent greenhouse gases. The Protocol was amended in 2016 to control and phase down consumption and production of hydrofluorocarbons (HFCs) which are one of the gases included in the Paris Agreement.
National Cabinet	A forum for the Prime Minister, premiers and chief ministers to meet and work collaboratively on issues of national significance. The Australian Government, and state and territory governments individually remain responsible for implementation in their jurisdictions of decisions arising from National Cabinet
National Greenhouse and Energy Reporting scheme (NGER scheme)	The NGER scheme is established by the National Greenhouse and Energy Reporting Act 2007 (NGER Act) and is a single national framework for reporting and disseminating company information about greenhouse gas emissions, energy production, energy consumption and other information specified under NGER scheme legislation. NGER scheme data are a key input into calculating Australia's emissions from the energy, industrial processes and product use and waste sectors.
National Inventory Report (NIR)	An inventory of Australia's national greenhouse gas emission and removal estimates. The NIR is prepared in accordance with UNFCCC and Paris Agreement rules and guidance, including Intergovernmental Panel on Climate Change emission estimation guidelines, to fulfil Australia's international emissions reporting obligations under those treaties. The report also forms a part of Australia's National Greenhouse Accounts.
Nationally Determined Contributions	Under the Paris Agreement, Parties are required to submit Nationally Determined Contributions every five years. NDCs are the vehicle for parties' mitigation commitments. Developed countries are required to submit economy-wide emissions reduction commitments, with developing countries to move towards these over time.
Net zero emissions	Net zero is achieved when human-induced greenhouse gas emissions are balanced by human removal of them from the atmosphere.
Paris Agreement	An international agreement adopted in 2015. Under the Paris Agreement, the global temperature goal is to keep warming to 'well below' 2°C compared with preindustrial levels, and to 'pursue efforts to limit the temperature rise to 1.5°C'.
Safeguard mechanism	A legislated scheme that requires Australia's largest greenhouse gas emitters, or 'safeguard facilities', to keep their net emissions below an emissions limit (a baseline)
Sea-level rise	Sea-level change (sea-level rise / sea-level fall) is a change to the height of sea level, both globally and locally (relative sea-level change) at seasonal, annual, or longer time scales due to: a change in ocean volume as a result of a change in the mass of water in the ocean (e.g., due to melt of glaciers and ice sheets); to changes in ocean volume as a result of changes in ocean water density (e.g., expansion under warmer conditions), and to changes in the shape of the ocean basins and changes in the Earth's gravitational and rotational fields, and local subsidence or uplift of the land.

Term	Definition
Direct emissions (scope 1 emission)	Direct (or scope 1) emissions are produced from sources within the boundary of an organisation and as a result of that organisation's activities and are calculated at the point of emission release.
Indirect emissions (Scope 2 emissions)	Scope 2 emissions are indirect emissions which occur outside of the boundary of an organisation from the generation of electricity, heating, cooling or steam that is consumed by the organisation. They are physically produced by the burning of fossil fuels (coal, natural gas, etc.) at the power station to create the electricity.
Scope 3 emissions	Scope 3 emissions are indirect emissions other than Scope 2 emissions. They occur outside of the boundary of an organisation or process as a result of its actions. Scope 3 emissions may occur upstream, such as the emissions generated in the extraction and production of fossil fuels, or downstream, such as the emissions from transport of products.
Sequestration	Carbon sequestration is the process of capturing and storing atmospheric greenhouse gases. Greenhouse gases can be stored in biological ecosystems, marine ecosystems, underground geological formations or in manufactured products.
Stationary energy emissions	Stationary energy includes emissions from the direct combustion of fuels for energy purposes, predominantly from the electricity generation, manufacturing, mining, residential and commercial sub-sectors.
Statutory authority	A body created by Australian Government legislation that is a separate legal entity from the government and has the power to hold money on its own account
Traditional Owner	A First Nations person with ongoing ancestral, spiritual, and cultural connections and relationships with Country. Traditional Owners have cultural responsibilities to care for, maintain, and protect their Country. Traditional Owners may have specific rights and protections to associated with their connection to their Country under various federal and state legislations. Traditional Owners are key decision makers for their Country.
Transport sector emissions	The transport sector includes emissions from the direct combustion of fuels in transportation by road, rail, domestic aviation and domestic shipping, as well as combustion of fuels for the transportation of gas by pipeline. The main fuels used for transport in Australia are automotive gasoline (petrol), diesel oil, aviation turbine fuel (jet fuel) and liquefied petroleum gas (LPG).
United Nations Framework Convention on Climate Change (UNFCCC)	The UNFCCC is a Rio Convention, one of two opened for signature at the Rio Earth Summit in 1992. The Convention supports the global response to climate change, with the ultimate aim of preventing dangerous human interference with the climate system. It has near-universal membership, with the 198 countries that have ratified the Convention called Parties to the Convention.
With Additional Measures Scenario	Concept used in Australia's Emissions Projections. A 'with additional measures' scenario encompasses the impacts of implemented, adopted and planned policies and measures on projected greenhouse gas emissions.
Waste sector emissions	The waste sector covers greenhouse gas emissions from waste disposal and treatment systems. The majority of emissions within Australia's waste sector are from solid waste disposal, followed by wastewater treatment and discharge. Emissions from waste incineration and biological treatment of solid waste are minor sources of emissions. Waste emissions are predominantly methane, generated from anaerobic decomposition of organic matter. Small amounts of carbon dioxide are generated through the incineration of solvents and clinical waste and nitrous oxide through the decomposition of human wastes.
'With Measures' Scenario	A 'with measures' scenario encompasses the impacts of currently implemented and adopted policies and measures on projected greenhouse gas emissions.


THE BALANCE OF OPPOSITES