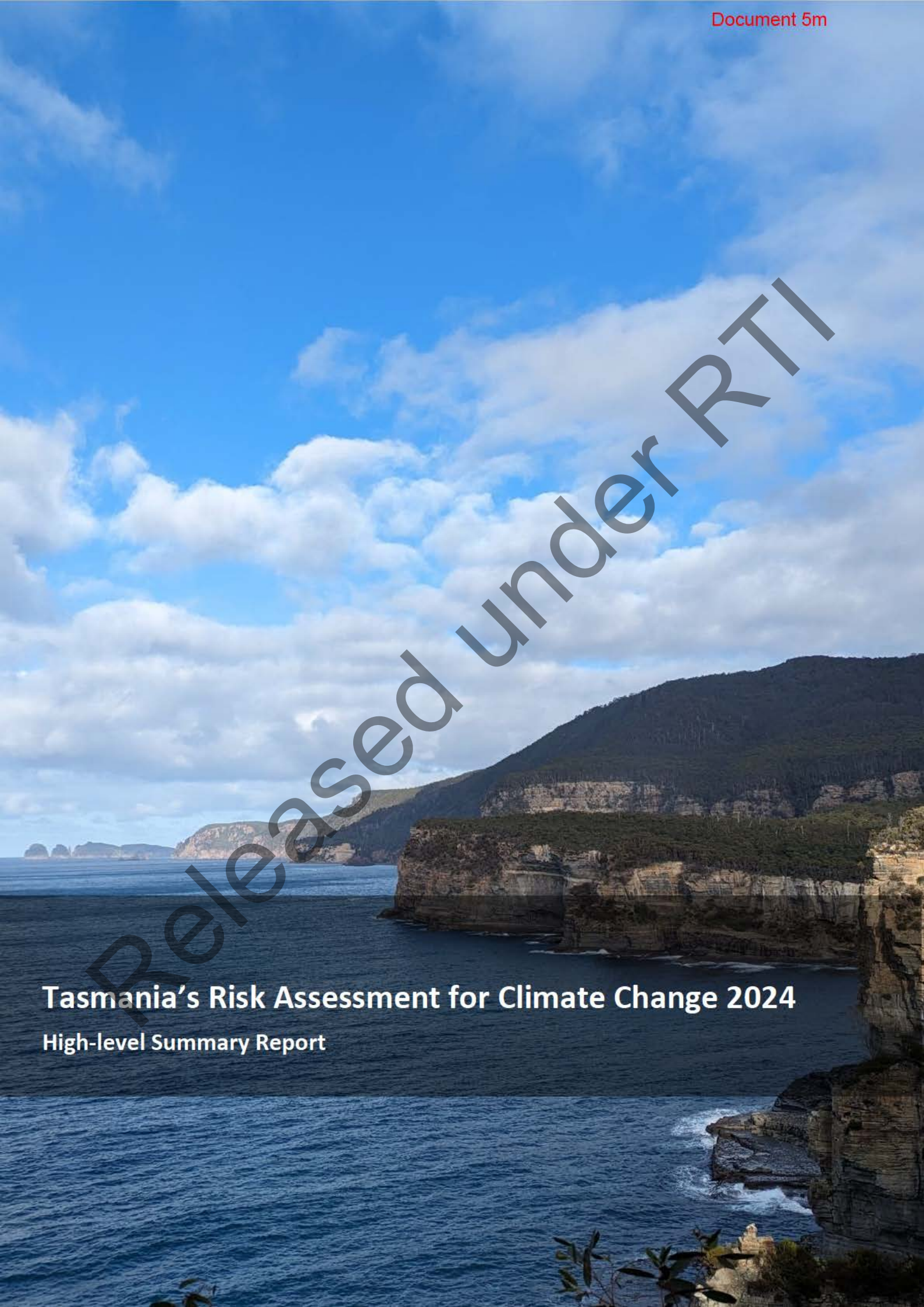

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Tasmania's Risk Assessment for Climate Change 2024

High-level Summary Report

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Context

Climate change presents both risks and opportunities for Tasmania.

Climate change is already affecting businesses, communities, the environment and the economy both globally and in Tasmania. To be a resilient state, Tasmania must understand the impacts of climate change over multiple timeframes. This will inform the state's adaptation priorities. These priorities must be reviewed regularly so that adjustments can be made as the climate worsens, impacts increase, or opportunities arise.

The *Climate Change (State Action) Act 2008*, requires climate change risks to be assessed every five years. This High-level Summary Report and accompanying Technical Report provide Tasmania's inaugural Risk Assessment for Climate Change 2024 (hereafter, '**the Risk Assessment**'), including consideration of:

- the latest and best available science on the projected impacts of climate change on Tasmania
- the risks associated with energy transition, including social and economic impacts
- the economic, social, and environmental implications of climate change and associated risks to Tasmanian communities, natural environments and ecosystems, and economic activity
- the impact of climate change on the health and wellbeing of Tasmanians and future generations.

The climate is rapidly changing

Climate hazards can occur on multiple timeframes - individual events to decadal changes. Strategic decision making becomes difficult amidst uncertainty, and past information alone cannot be relied upon to understand future climate conditions. Climate scenario analysis is undertaken in the Risk Assessment to assess future exposures and vulnerabilities to physical climate hazards and transition climate drivers.

How climate hazards and drivers are changing in the future

Below is a summary of physical and transition climate trends that will affect Tasmania. A full description can be found in Chapter 4 of the Risk Assessments Technical Report.

Physical climate trends

The impacts of climate change are already being felt in Tasmania. Over the past 10 years, the state has experienced significant and devastating impacts, such as prolonged dry periods, flooding, bushfires, and record marine heatwaves. Chronic climate hazards such as seasonal temperature change, sea level rise and changing rainfall patterns and acute trends (e.g., heatwaves, floods, bushfires, and coastal storm surge events) impact the natural environment, health and wellbeing of communities, the economy, the built environment and emergency management. Future physical climate trends include:

More frequent and/or intense periods of extreme heat, impacting health and wellbeing, energy and cooling, ecosystems and biodiversity, and economic disruptions associated with outdoor production. Overall, long-term increases in average temperatures. Changes will be greatest in the north-east, coastal regions and islands.

Projected decline in rainfall, on average, across the state (with potential increase in winter rain in southern/western regions in winter). Changes to seasonal rainfall patterns and total annual rainfall, impact the natural domain and disrupt natural water supply and hydropower. Rainfall patterns also impact all value domains particularly soil moisture, air quality, and transport.

Projected increases in the severity of acute extreme rain and flood conditions, particularly in the eastern half of the state. Increases in the intensity and frequency of flood and extreme events lead to major delays, disruptions, and damages. Acute extreme rainfall events will heighten erosion and sediment transport, deteriorating water quality and potentially fragmenting or reducing habitats for some species. This, in turn, can lead to increasing repair and insurance costs and impact biodiversity and ecosystems.

Increases in the severity of acute bushfire and wind conditions, particularly in the north of the state. This has direct health consequences and impacts emergency services preparedness and disaster reduction. Like all climate extreme impacts, the state's infrastructure (e.g., buildings, transport) is more prone to damages and disruptions, and insurance risks.

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As the planet warms, sea level rises and storm surge/ extreme wave events are projected to become more frequent and severe, with the greatest increases projected for Hobart, the east and northeast coastal regions. This may lead to the deterioration of coastal boundaries and associated losses across ecosystems, operations, and infrastructure along coastlines. As an island state that ships 99% of its freight by sea, Tasmania is highly vulnerable to climate related supply chain disruptions.

Continued warming of Tasmanian coastal waters and marine heatwaves (with the largest increases occurring in waters on the East and North-east coast), along with chronic increases to ocean acidity. This has the potential for major impacts on the natural environment including the destruction of marine ecosystems, the incursion of more northerly species, and associated impacts for ocean aquaculture, fisheries, and local communities.

Transition climate trends

In order to reduce the greatest impacts of climate change, the global economy must transition to a low emissions future. Action on climate change also creates opportunities for jobs and new industries. Tasmania will be impacted by the transition to a low emissions future directly through government emissions reduction targets and policies, and through private sector and community led efforts. Tasmania may also be impacted by global emissions reduction through export markets, globally linked economic activities such as tourism and education, and through supply chains. However, global studies show that well designed climate action leads to better health, more jobs, enhanced social inclusion and increased biodiversity (CDP, 2022). Future transition climate trends relevant to Tasmania include:

Emissions are projected to decrease for Australia. Tasmania has a legislated target of net zero emissions or lower by 2030. Under a low emissions future, emission reduction mechanisms and market forces mean the modelled shadow emissions price in Australia increases over time.

Under a low emissions scenario, capacity for renewable energy generation in Tasmania increases. The capital costs for renewable energy technology, such as wind and solar, continue to decrease. Tasmania is one of only a small number of jurisdictions across the world to operate with 100 per cent renewable energy generation (ReCFIT, 2020). Tasmania's renewable energy policy aims to harness natural resources, such as wind and hydropower, to support economic growth in Tasmania, reduce electricity prices and support the decarbonisation of the electricity sector in Australia. Additionally, Tasmania aims to become a hydrogen export hub supporting local industries and emissions reduction nationally and globally.

Resource efficiency and circularity within economies increases to support emissions reduction. Circular economy activities in Tasmania can create jobs in recycling, refurbishing, and remanufacturing sectors. This diversification may foster new business models such as product-as-a-service, sharing platforms, and remanufacturing hubs, which can reduce dependence on imports and keep resources within the community.

Energy efficiency improves under a low emissions future to support efficient resource use. The Tasmanian and Australian governments are investing $16.6 million in energy upgrades for more than 1,600 social housing properties (DCCEEW, 2024). These upgrades include the installation of heat pump hot water systems, insulation, draught proofing, LED lighting, and window glazing, which aim to reduce energy bills and improve living conditions for residents. Additionally, initiatives like the Tasmanian Government's Energy Saver Loan Scheme support broader energy efficiency measures across the state's housing stock, promoting the use of reverse cycle heating systems, solar hot water, and better insulation to further enhance energy performance and reduce costs for Tasmanian households.

Investments in carbon removal increase under a low emissions scenario, including land-based carbon sequestration. This has been an important method for carbon sequestration for Tasmania and presents opportunities for the state. Key strategies include reforestation, afforestation, and improved agricultural practices.

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Under a low emissions scenario, changes to market dynamics support emissions reduction favouring products and services with a low emissions footprint. Reputation is enhanced for jurisdictions and business that meet climate targets.

Introducing Tasmania's risk assessment for climate change

The Risk Assessment is the first state-level climate change risk assessment for Tasmania

The Risk Assessment identifies both risks and opportunities that result from physical and transition climate hazards and drivers, state geographical and socio-economic exposures and vulnerabilities, and includes the identification of associated existing climate actions in response. The Risk Assessment has been initiated by Renewables, Climate and Future Industries Tasmania (ReCFIT) and completed by Deloitte.

The Risk Assessment aims to:

- increase the understanding of how climate change is impacting Tasmania now and into the future
- identify Tasmania's physical and transition climate risks and opportunities to inform decision making
- inform Tasmania's priorities for climate adaptation to increase resilience
- inform other risk assessment activities, and Tasmanian Government policies and strategies including those related to emergency management, infrastructure, energy, health and wellbeing, land use planning, children and young people, and industry sectors.

The Risk Assessment is consistent with national and international approaches for assessing climate change risk

The Risk Assessment is aligned to an internationally recognised climate risk framework (Simpson, et al., 2021) that evaluates both individual drivers of climate risk/opportunity, and interactions between drivers, including complex interactions.

The framework defines risk as a combination of hazard, vulnerability, exposure, and response (Figure 1). Whilst previous climate-related studies may have evaluated these framework components individually or in limited combination, all four components have not previously been assessed collectively for Tasmania.

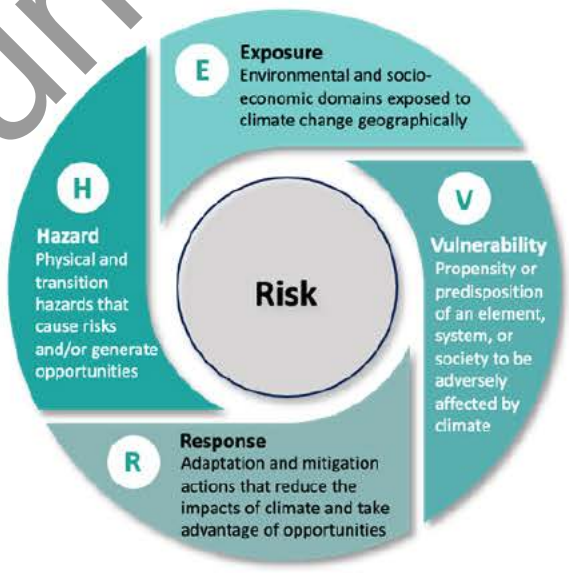

Figure 1: Climate Risk Framework and its four key components.

Complex risks

The drivers and impacts of climate change are complex in nature. This means cross-sectoral partnerships and planning can be valuable, and a single adaptation action can have benefits across multiple value domains. Complex climate risks and opportunities describe the interactions between multiple climate change hazards, exposures, and vulnerabilities. As climate impacts evolve, so too will the interactions of complex risk. Cascading impacts across interrelated risks will likely intensify and spread across multiple sectors as climate hazards become more severe and acute events occur more frequently. Additionally, physical and transition risks will influence each other (e.g., severe physical hazards and associated impacts may lead to heightened transition risk). Key interactions between different climate impacts for Tasmania have been highlighted throughout the Risk Assessment, where relevant.

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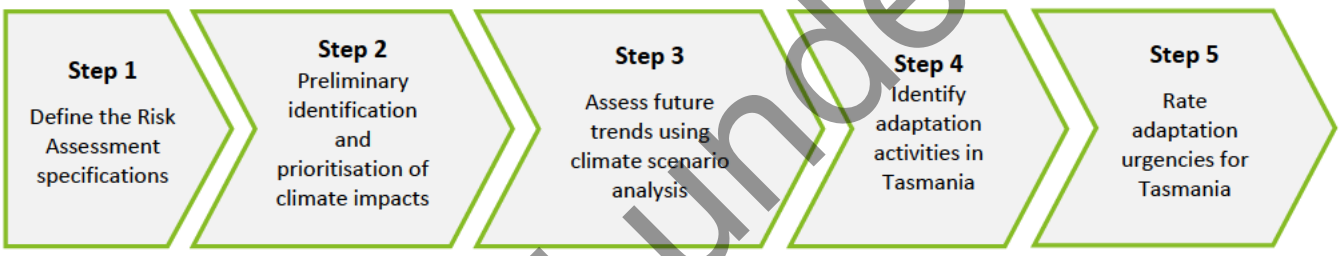
What the Risk Assessment does not include

The Risk Assessment provides a high-level assessment of the statewide climate related risks and opportunities, and the urgency of these over the next five years. It is not a granular assessment of individual risks and does not evaluate the effectiveness of existing actions. It does not recommend specific actions for implementation. Rather, it aims to inform the next steps, and provide a clearer picture of Tasmania's options for further adaptation to climate change. The Risk Assessment is designed to inform state scale decision making, and as such does not attempt to conduct a climate assessment for individual regions, economic sectors, organisations, or communities.

An overview of how the Risk Assessment was conducted

Below is an overview of how the Risk Assessment was conducted, including the climate scenarios used and the approach for evaluating risks. A full description of the methodology can be found in Chapter 2 of Tasmania's Risk Assessment for Climate Change Technical Report.



Defining the Risk Assessment specifications

Hazards context

Climate hazards and drivers are the changes associated with, or the result of, climate change, and are classified as either 'physical' or 'transition':

Climate scenarios are used to evaluate the future evolution of physical climate hazards and transition climate drivers. These scenarios represent possible futures under differing emissions pathways with varying levels of impact. Table 1 outlines the specifications for climate scenarios used for physical climate hazards. The choices for climate scenario sources are based on sources that are most widely adopted by all sectors, with a diverse range of distinct scenarios that can capture regional and sectoral representation, and sources that have transparent assumptions.

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Table 1: Summary of climate hazards and drivers, scenarios and time horizons

	Physical climate hazards	Transition climate drivers
Hazards/drivers	**Acute and chronic hazards:** • Temperature, extreme heat and frost • Rainfall, extreme rain and floods • Bushfires • Dry conditions and soil moisture • Storm surge and sea level rise • Marine temperature and heatwaves	**Policy and legal** • Emissions control mechanism • Renewable energy policy • Litigation for non-compliance • Trade exposure risk • Climate governance **Technology** • Resilience opportunities • Emissions reduction technology • Advances in energy and resource efficiency • Capital cost of new technology • Circular economy opportunities **Market** • Supply chain costs • Resource availability and demand • Demand for energy • Markets for existing goods and services • Trade exposure risk **Reputation** • Ability to meet climate targets • Social licence and public perception • Expectations and relationships with other jurisdictions
Climate scenarios	**High Emissions | SSP3-7.0** Global warming is 3 to 4°C by 2100 *Physical risks dominate, if emissions reduction is insufficient physical climate impacts will require higher level of adaptation response.* **Moderate Emissions | SSP2-4.5** Global warming 2 to 3°C by 2100; insufficient decarbonisation. *Intermediate emissions reduction, with emissions around current levels until 2050, then falling. Some physical climate risks, with transition risks higher after 2050.*	**Moderate emissions | NGFS - Nationally Determined Contributions; Tasmania Reference Case; AEMO Progressive Changes** **Low emissions** Global warming 2 to 3°C by 2100; insufficient decarbonisation. *Intermediate emissions reduction, falling slowly. Some physical climate risks, with transition risks higher after 2050.* **Low Emissions | NGFS – Net Zero 2050 and Tasmania Net Zero Target; AEMO Green Energy Export** Global warming 1.5°C by 2100 *Transition risks and opportunities dominate, transition risks require management to ensure a smooth transition pathway to a low emissions economy.*
Time horizons	A baseline (recent past) horizon was compared to three future time horizons • **Short term | 2030** • **Medium term | 2050** • **Long term | 2090**	A baseline (recent past) horizon was compared to two future time horizons: • **Short term | 2030** • **Medium term | 2050**

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Exposure context

The exposure component of the climate risk framework allows for exploration of *what* is exposed to the climate hazards. The exposure of physical and transition climate hazards varies widely in magnitude and direction of change across value domains and geographical regions.

Value domains

The Risk Assessment evaluates impacts of a changing climate on four connected value domains as a way to classify what is exposed to a changing climate. These domains are also the basis of the systems framework used for the Australian Government's National Climate Risk Assessment and align with those being used by other Australian jurisdictions in their jurisdiction-wide risk assessments.

Tasmanian regions

Physical climate hazards were assessed across Tasmania at a local government area (LGA) to region scale and transition hazards at a state scale. Climate exposures are assessed (when relevant) across onshore and offshore geographic regions (Figure 3), as follows:

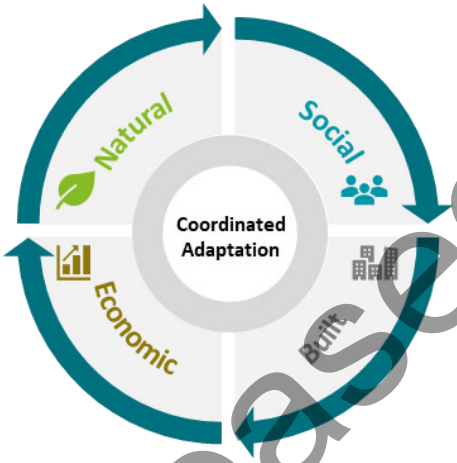

Figure 2: The four assessed value domains.

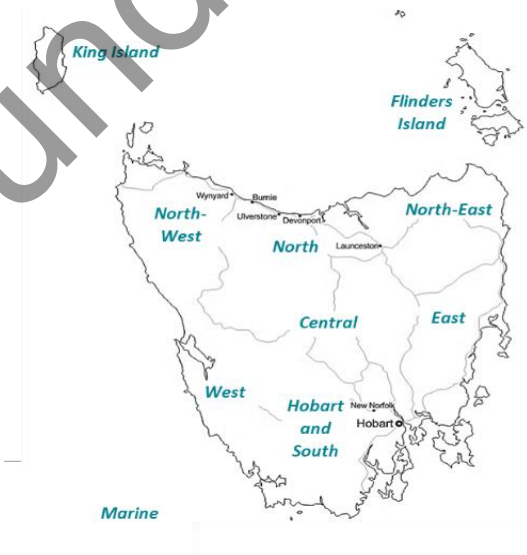

Figure 3: Map of geographic regions for the Risk Assessment.

Vulnerability and response context

The vulnerability component of the Risk Assessment enables the exploration of *why* the value domains and sub-domains are susceptible to climate hazards. Vulnerability can differ between regions, communities, populations, and individuals. Examples of vulnerabilities in Tasmania that can worsen exposure to some climate hazards include remote location (e.g., King Island) increasing vulnerability to disruption to supplies; elderly populations being more susceptible to extreme heat conditions; or aging infrastructure being more affected by severe weather.

The response component of the Risk Assessment explores the adaptation and risk mitigation actions undertaken at local to state levels in response to the identified climate risks. Adaptation actions already in place, including adaptation and resilience policies, programs, and tools, were identified through research and stakeholder engagement.

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Assessing adaptation urgency for Tasmania

Tasmania's Climate Change Action Plan 2023-25 (ReCFIT, 2023) includes an adaptation and resilience priority area to manage the risks and leverage the opportunities from climate change to support planning and decision making and build Tasmania's resilience to the impacts of climate change.

The Risk Assessment will inform the future climate adaptation action of the Tasmanian Government. It prioritises the climate risks and opportunities identified for the state based on adaptation urgency.

The criteria can be summarised as follows:

1. **Magnitude of consequence:** the potential magnitude of impact at a state level from the risk or opportunity, considered against an ascending scale of potential implications over time, for each value domain.
2. **Confidence:** the quality of the evidence, along with the level of agreement between studies and experts.
3. **Adaptation shortfall:** whether risks or opportunities are the subject of any adaptation activity that aims to manage the risk or opportunity either partially, or in full.

Adaptation urgency

Combined, these three criteria infer the adaptation urgency rating that indicates the degree to which action is needed in the next five years to reduce a risk or realise an opportunity from climate change. Urgency rating is used because it is transparent and can be understood and compared by policy makers and communities, across different policy areas. Risks and opportunities with the highest adaptation urgency rating are classified as Tier 1, then Tier 2 through to Tier 4.

The adaptation urgency rating indicates whether urgent adaptation action is needed for a particular risk or opportunity, particularly in the next five years, based on the evidence and analysis conducted in the Risk Assessment. The adaptation urgency rating is categorised into four tier ratings, these are described in Table 2.

Table 2: Description of adaptation urgency ratings

Adaptation urgency scale	
Tier 1 Ready to Act	New, stronger, or different government policies or implementation activities – over and above those already planned are needed in the next five years to reduce longer term climate risk or immediate significant climate risk and it is clear where this action should be directed.
Tier 2 Investigate then Act	Adaptation efforts are planned or underway; however, additional adaptation effort is required at a state level. It is unclear what the impacts are specifically or where action should be targeted, and further investigation is required (such as new studies or research) to fill evidence gaps and reduce uncertainty, to direct and underpin additional adaptation activity.
Tier 3 Continue to Monitor Current Actions	Current or planned levels of adaptation activity appear appropriate, but continued implementation of these policies and plans and a periodic review of these adaptation actions and consequent impacts on risk urgency is needed.
Tier 4 Monitor	The projected consequence to this risk is insignificant or minor in the short term and is not projected to exceed a moderate level by 2050. An adaptation urgency rating of this level indicates priority action is not required at this time. The evidence for these areas should be periodically reviewed, along with long-term monitoring of risk levels and adaptation activities so that further action can be initiated if necessary.

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Findings: Summary of top risks for Tasmania

While the summary table provides a snapshot of consequence levels in the short term, all the risk and opportunity statements will experience a progressive increase in their consequence rating as the frequency and intensity of acute climate events increases alongside the continued evolution of chronic climate changes and events across the state. This is true in all cases, regardless of the climate scenario applied.

Key findings about the assessment criteria and/or enhanced adaptation action across the state

1. The adaptation shortfall is rated as 'partial' for the majority of risk and opportunity impact statement profiles.

The Risk Assessment recognises that there are meaningful policies and strategies in place at a national and state level that are working to mitigate risk impacts and establish an enabling environment that fully realises relevant opportunities to the state that arise from climate change and the current transition. However, a partial shortfall has been provided for a majority of the risk and opportunity impact statement profiles after extensive research and consultation. This reflects the need for further investment into existing and future adaptation strategies and initiatives to both effectively manage risks and fully realise opportunities available to the state.

2. By 2090, many impact profiles have an extreme consequence rating.

Risk profiles with a projected extreme consequence rating for 2090 include risks to marine ecosystems and species, alpine ecosystems and species, social cohesion, insurability, ocean-based aquaculture and fisheries, health care and emergency services, and buildings and structures and transportation networks.

The impacts per value domain vary widely. For example, in the natural domain, environmental biomes may become significantly compromised and experience irreversible damages. In the social domain, connectedness may be broken, welfare, physical and mental health may be compromised, and key community services could be disrupted. In the economic domain this indicates the potential failure of a significant industry or sector. Finally, in the built domain buildings and structures may become uninhabitable.

Climate risk impact statements

All climate risks identified below urgently require more adaptation action in the next five years. These include risks to health care and emergency services, and to transport infrastructure, due to predicted extensive damage and readjustment costs. Risks related to transition drivers include ineffective or no action on emissions reduction limiting economic growth. Initial, but often insufficient, progress has been made to either investigate, discuss, or take action on these risks. The following physical and transition related risks are explored in more detail with individual risk profiles within Chapter 5 of the Technical Report. The Technical Report also includes Tier 3 and Tier 4 related risks.

Overall findings for Tier 1 and Tier 2 risks are summarised below, with further details risks by domain on the following pages.

Tier 1 ('Ready to Act') risks

- Overall: Of the impact statements identified by the Risk Assessment, 15 risk impact statements are rated as Tier 1 ('Ready to Act'), indicating that new, stronger, or different government action, over and above those underway or planned, is needed in the next five years, and it is clear where this action should be directed.
- Most Tier 1 risks relate to physical climate impacts, rather than transition related risks.
- Natural domain: All physical risks in the natural domain have a Tier 1 rating for urgency, and these are connected to 67% of the remaining risk and opportunity impact statements (i.e., 23 of 34 statements) across all value domains.
- Social domain: Climate change is already, and will continue, to impact communities and livelihoods. In the social domain physical safety, health and wellbeing, and social cohesion and community wellbeing are key areas impacted with a Tier 1 adaptation urgency rating.

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- Economic domain: Tasmania's food and supply chain networks are key areas of focus for risks with a Tier 1 adaptation urgency rating. Supply chains and distribution networks, the land-based primary sector, and ocean fisheries and aquaculture are all assessed as Tier 1 risks.
- Built domain: Many impacts in the built domain are rated to have a 'major' consequence by 2030. Risks to healthcare and emergency services, built infrastructure, and risks to transport networks have an adaptation urgency rating of Tier 1.

Tier 2 ('Investigate then Act') risks

- Overall, there are eleven Tier 2 risk requiring differing levels of effort to fill gaps in understanding and uncertainty, and to assess the need for additional adaptation uptake.
- Natural domain: One transition risk has a Tier 2 adaptation urgency rating, this is related to the impact of renewables on biodiversity, ecosystems and cultural heritage.
- Social domain: Two physical risks and one transition risk have a Tier 2 rating for adaptation urgency, and are related to mental health and wellbeing, cultural heritage, and social cohesion and health and wellbeing.
- Economic domain: Within the economic domain further information is needed to inform the adaptation response to four of the risks. Physical risks with an adaptation urgency rating of Tier 2 include risks to businesses and public organisation and risks to insurability, these risks are highly complex with interdependencies across domain. Tier 2 transition risks include risks from to supply chains, and costs to businesses associated with new technologies, as organisations adjust to a low carbon economy.
- Built domain: Risk from climate hazards impacting healthcare and emergency service, contaminated sites and stormwater and sewage systems require further investigation to develop a response to these risks.

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Natural domain risks

- All the physical risks within the natural domain have been rated as Tier 1. This is underpinned by the major and extreme consequences that will occur from evolving climate hazards in 2050 and onwards. In terrestrial environments and for native ecosystems, chronic temperature increase, more frequent and severe bushfires as well as more intense flooding events all threaten the health of ecosystems. Where ecosystems interact with the coast, erosion, sea level rise and storm surge events are particularly significant hazards, while ocean temperatures and acidification impact marine habitats.
- Inland water ecosystems will be impacted by chronic changes in rainfall, and well as extreme weather events such as more intense flooding and more frequent and severe bushfires.
- Marine and alpine ecosystems and species will experience the most severe consequences in 2090 under a high emissions scenario. This is driven by Tasmania's vulnerability to worsening marine heatwaves, and an expected significant reduction in climate suitable to support the alpine ecosystem.
- While there are a number of adaptation strategies directed towards the protection of specific components of Tasmanian ecosystems and species there is limited evidence of a coordinated management approach across all levels of government that considers evolving climate risks.
- Large-scale development of renewable energy may impact the natural domain, this risk requires further investigation to understand the potential impacts to species at risk (particularly migratory and endemic species of Tasmania), further investigation is needed to understand the risks and opportunities for action.

Table 3: Climate risks that require urgent adaptation action in the natural domain.

Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
N1	Risks to inland water ecosystems and species	Physical	Minor	Moderate	Moderate	Major	High	Partial	Tier 1: Ready to Act
N2	Risks to terrestrial ecosystems and species	Physical	Moderate	Moderate	Moderate	Major	High	Partial	Tier 1: Ready to Act
N3	Risks to coastal ecosystems and species (erosion-related risk)	Physical	Minor	Minor	Moderate	Major	High	Partial	Tier 1: Ready to Act
N4	Risks to marine ecosystems and species	Physical	Moderate	Moderate	Major	Extreme	Very High	Partial	Tier 1: Ready to Act
N5	Risks to native ecosystems and species	Physical	Moderate	Moderate	Major	Major	Very High	Partial	Tier 1: Ready to Act
N6	Risks to alpine ecosystems and species	Physical	Moderate	Moderate	Major	Extreme	High	Partial	Tier 1: Ready to Act

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Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
NT2	Risks related to renewable energy development	Transition	Minor	Moderate	Moderate	n/a	Low	Partial	Tier 2 Investigate then Act

Social domain risks

- While the risk to mental health is the only risk rated as a high adaptation shortfall, there are multiple initiatives at different levels of government addressing mental health challenges to the state. However, the Risk Assessment has not identified actions that address the risks to mental health directly associated with climate change. This risk has an adaptation urgency rating of Tier 2 as further investigation is needed to understand Tasmanian specific vulnerabilities that may exacerbate mental health impacts and where adaptation efforts should be targeted.
- Risks to social cohesion and community wellbeing will continue to worsen as climate events become more intense and more frequent. These events will also see greater risk of harm to physical safety, health, and wellbeing. As there is a strong understanding of these risks, it is clear where additional action can be implemented to reduce existing vulnerabilities in the state.
- It is important to recognise the Tier 2 rating for risks to cultural heritage. While there is an understanding of some of the ways in which climate change will impact cultural heritage, such as historical sites, there is a low level of confidence with regards to understanding the risks to Aboriginal cultural heritage. Additional engagement with Tasmanian Aboriginal communities is required to appropriately understand the exposures, vulnerabilities and existing response elements that inform this risk. In doing so, the state will be more informed to implement adaptation solutions that will help mitigate the complex risks that impact cultural heritage and help ensure that integral components of Aboriginal cultural heritage are appropriately protected, and that Aboriginal knowledge and expertise is incorporated into future adaptation decisions.
- Risks to social cohesion and health and wellbeing due to the inability of governance systems to manage climate risk has partial adaptation shortfall, as there are some state actions and institutions in place. However, there may be gaps in governance approach across all levels of government and there is the potential for mismatch between high-level policies and implementation.
- Population increase driven by renewable energy development may impact social cohesion and access to services. Key knowledge gaps exist in understanding how increased population growth may impact existing services. This includes location of population increases, and the gaps in level of services required.

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Table 4: Climate risks that require urgent adaptation action in the social domain.

Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
S1	Risks to social cohesion and community wellbeing	Physical	Moderate	Moderate	Major	Extreme	High	Partial	Tier 1: Ready to Act
S2	Risks to mental health and wellbeing	Physical	Moderate	Moderate	Major	Major	High	High	Tier 2 Investigate then Act
S3	Risks to physical safety, health, and wellbeing	Physical	Moderate	Moderate	Major	Major	High	Partial	Tier 1: Ready to Act
S4	Risks to cultural heritage	Physical	Moderate	Moderate	Major	Extreme	Low	Partial	Tier 2 Investigate then Act
ST1	Risks to social cohesion due to the inability of institutions and governance systems to effectively manage climate risks	Transition	Minor	Moderate	Major	n/a	High	Partial	Tier 1: Ready to Act
ST2	Risks to social cohesion, and health and wellbeing due to existing services being insufficient to meet the needs of a growing population (driven by renewable energy development and new industries that support emissions reduction in Tasmania).	Transition	Insignificant	Moderate	Major	n/a	Medium	Partial	Tier 2 Investigate then Act

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Economic domain risks

- Transition risks within the economic domain require further investigation to improve the overall confidence in the assessment of these risks. In doing so, further research will provide a clearer pathway for where actions that support the transition to a low carbon economy and implementation of new technology should be directed.
- Response action required to address the risk identified in the impact statements 'risks to businesses and public organisations' and 'risks to insurability' are complex. These risks have been rated as requiring further investigation before action can be taken.
- As insurance issues are of national and global concern, further investigation by industry leaders in this space is required to more clearly understand how the state should respond to reduce challenges such as rising unaffordability and under insurance and to understand the cascading impacts of this risk in order to ensure response actions are appropriate.
- Further investigation is required to identify the most appropriate and beneficial actions to manage risks to businesses and public organisations, given the high level of complexity within this risk. This risk is highly influenced by climate impacts across domains including access to resources, infrastructure, people, and disrupt supply and distribution networks. Understanding these interdependencies is required to implement effective response action.
- As climate impacts grow, additional action is required to improve the resilience of Tasmania to its international and national supply chains. Similarly, key primary industries both land-based, and marine, require ongoing additional action to ensure they remain profitable and sustainable in the future.

Table 5: Climate risks that require urgent adaptation action in the economic domain.

Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
E1	Risk to businesses and public organisations from extreme weather events	Physical	Minor	Moderate	Moderate	Major	High	Partial	Tier 2 Investigate then Act
E2	Risks to national and international supply/distribution networks due to extreme weather events	Physical	Moderate	Moderate	Major	Major	High	Partial	Tier 1: Ready to Act

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Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
E3	Risks to the insurability of businesses, public sector and private assets	Physical	Moderate	Moderate	Major	Major	Very High	Partial	Tier 2 Investigate then Act
E4	Risks to land-based primary sector	Physical	Minor	Moderate	Moderate	Major	Very High	Partial	Tier 1: Ready to Act
E5	Risks to ocean-based aquaculture and fisheries	Physical	Moderate	Moderate	Major	Major	Very High	Partial	Tier 1: Ready to Act
ET2	Risks to businesses and public organisations due to supply chain costs as organisations adjust to a low carbon economy.	Transition	Minor	Moderate	Major	n/a	Medium	Partial	Tier 2 Investigate then Act
ET3	Risks to business through the implementation of new technology to reduce emissions (including fugitive/ agriculture/ industrial/ fuel switching).	Transition	Minor	Moderate	Moderate	n/a	Medium	Partial	Tier 2 Investigate then Act

Built domain risks

- Increasing frequency and intensity of extreme weather, and long-term changes to the climate such as temperature and rainfall, are expected to impact healthcare and emergency services and stormwater and sewage systems. Impacts maybe significant in future years and further information in required before implementing responses. This includes understanding interrelated risks, the capacity and vulnerabilities across the state. These impact statements have an adaptation urgency rating of Tier 2: Investigate then Act.
- The built environment may be impacted by increased frequency and intensity of extreme weather (bushfires and floods), and by long-term sea-level rise. There impacts combined with existing vulnerabilities means that consequences may be major by 2030, and extreme by 2090. This risk has an adaptation urgency rating of Tier 1, with further state level action required to ensure a coordinated approach to manage risks to the built environment. Focus areas may include flooding, bushfire, and sea level rise.

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- Damage to the transportation network is projected to have major consequence by 2030, which may result in service disruptions due to loss of critical transportation infrastructure. Further state level action is required to respond to specific climate change impacts on Tasmania's transport network, including a coordinated approach across different levels of government.
- Given the aged nature of many of Tasmania's contaminated sites, it is unclear how resilient this infrastructure will be under a changing climate. Consequently, more investigation is required to understand what kind of adaptation actions may be required to improve the resilience of contaminated sites across the state.
- As an island state, the operation of Tasmania's ports and coastal infrastructure is of critical importance. While there is a lower level of confidence for this risk compared to other Tier 1 risks, the accelerating impact of rising sea levels emphasises the need for additional adaptation action as improvements to port infrastructure and coastal infrastructure can have long lead times for implementation.

Table 6: Climate risks that require urgent adaptation action in the built domain.

Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
B1	Risks to healthcare and emergency services	Physical	Major	Major	Major	Extreme	Medium	Partial	Tier 2 Investigate then Act
B2	Risks to the built environment due to climate extremes	Physical	Moderate	Major	Major	Extreme	High	Partial	Tier 1: Ready to Act
B3	Risks to contaminated sites due to extreme events and chronic climate impacts	Physical	Moderate	Moderate	Major	Major	High	Partial	Tier 2 Investigate then Act
B4	Risks to stormwater and sewerage systems due to extreme events and chronic climate impacts	Physical	Moderate	Moderate	Major	Major	High	Partial	Tier 2 Investigate then Act
B5	Risks to ports and coastal infrastructure	Physical	Minor	Moderate	Moderate	Major	Medium	Partial	Tier 1: Ready to Act
B6	Risks to transportation networks due to extreme events and chronic climate impacts	Physical	Moderate	Major	Major	Extreme	High	Partial	Tier 1: Ready to Act

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Findings: Top Opportunities for Tasmania

There are 11 priority opportunities that are rated with elevated adaptation urgency rating of either Tier 1 or Tier 2. Action within these areas can help Tasmania realise additional benefits to the state, above and beyond current initiatives. A significant proportion of the identified opportunities are *transition* climate opportunities. In the natural domain, improving water quality and biodiversity provides benefits across multiple ecosystems. In the social domain, resilience efforts across communities and regions provides avenues for greater social cohesion. In the Built and economic domains, opportunities for economic growth, infrastructure to support the circular economy, and lower mission transport that have ongoing benefits for emission reduction objectives. The following physical and transition related opportunities are explored in more detail with individual opportunity profiles within the Technical Report. The Technical Report also includes Tier 3 and Tier 4 related opportunities.

Overall findings for Tier 1 and Tier 2 risks are summarised below, with further details risks by domain on the following pages.

Tier 1 ('Ready to Act') opportunities

- There are seven priority opportunities that are rated as Tier 1: Ready to Act to realise benefits for the state.
- Tier 1 opportunities are mostly transition-based, with two impact statements that are physical climate based. Key areas where additional action could be taken to fully realise climate-related benefits to Tasmania include infrastructure development to support the circular, low emissions transport, increased participation in carbon markets, improving energy efficiency in low-income households, and supporting water quality and biodiversity.
- Natural domain: Improving water quality and biodiversity provides benefits across multiple ecosystems.
- Social domain: Energy efficiency improvements may provide financial and health and wellbeing benefits.
- Economic domain: There are two opportunities related to physical climate hazards, economic opportunities for land-based primary sector and ocean-based aquaculture and fisheries, where there may be opportunities to pivot towards climate tolerant practice. Increased carbon market participation also provides economic opportunities for Tasmania.
- Built domain: Opportunities related to transition drivers include infrastructure, and lower emissions transport have ongoing benefits for the transport networks and emissions reduction objectives.

Tier 2 ('Investigate then Act') opportunities

- There are four Tier 2 opportunity impact statements require differing levels of effort to fill gaps in understanding.
- Natural domain: Opportunities to support biodiversity through well-designed renewable energy development has some evidence, further investigation is required to understand solution that will most benefit Tasmania.
- Social domain: Opportunities in the social domain from adaptation and resilience drivers are less well evidenced than some opportunities, reflecting the need to for further research into responses that maximise social opportunities.
- Economic domain: Further information on the costs and opportunities for businesses for low emissions technologies requires further information to understand where remaining gaps exist that will allow economic opportunities across a diverse range of technology types.
- Built domain: No Tier 2 opportunities were identified in the built domain.

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Natural domain opportunities

- 'Opportunities to support water quality and biodiversity' is the only opportunity in the natural domain with a Tier 1 adaptation urgency rating. Action on this opportunity can have multiple cascading benefits related risks across the natural domain and lead to flow on impacts in other domains.
- The opportunity related to the ability of renewable energy development to natural domain include ecosystem restoration opportunities to support biodiversity and water quality. Further investigation is required to understand implementation options and impact of some technologies on species specific to Tasmania. This risk has an adaptation urgency rating of Tier 2.

Table 7: Climate opportunities that would benefit from urgent adaptation action in the natural domain.

Risk ID	Priority Impact Statement	Theme	Confidence	Adaptation shortfall	Adaptation urgency rating
NT2	Opportunities related to renewable energy development	Transition	Low	Partial	Tier 2 Investigate then Act
NT4	Opportunities to support water quality and biodiversity	Transition	High	Partial	Tier 1: Ready to Act

Social domain opportunities

- The adaptation and resilience related opportunities - ST3 and ST4 - are relatively new focus areas for the state. Further investigation is encouraged to provide a clearer understanding of the best adaptation actions for Tasmania to realise these opportunities.
- One opportunity that can provide immediate benefits for vulnerable households in Tasmania is developing more energy efficient housing stock. This opportunity is supported by a very high confidence rating, and while there is already some responses underway, coverage is limited. Action within the next five years can help improve the physical, mental, and financial wellbeing of low income-households.

Table 8: Climate opportunities that would benefit from urgent adaptation action in the social domain.

Risk ID	Priority Impact Statement	Theme	Confidence	Adaptation shortfall	Adaptation urgency rating
ST3	Opportunities for increased skills and employment with business development for new and emerging industries that provide adaptation and resilience solutions.	Transition	Medium	Partial	Tier 2 Investigate then Act
ST4	Opportunities for social cohesion, health and wellbeing through adaptation and resiliency improvements, including across domain co-benefits.	Transition	Medium	Partial	Tier 2 Investigate then Act
ST6	Opportunity to improve financial wellbeing, and health and wellbeing through energy efficient housing for low-income households.	Transition	Very high	Partial	Tier 1: Ready to Act

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Economic domain opportunities

- There are two priority physical opportunities in this domain that have Tier 1 adaptation urgency. These are related to the land-based primary sector and ocean-based aquaculture fisheries sector. Additional action in the next five years will improve the resilience of the respective sectors and ensure these sectors can capitalise on the opportunities provided by a changing climate.
- There is an emerging opportunity for Tasmania to create access to new revenue streams from carbon markets. Action within the next five years can enable the state to support these opportunities for land holders, businesses, and individuals, supporting continued economic growth in the state.

Table 9: Climate opportunities that require urgent adaptation action in the economic domain.

Risk ID	Priority Impact Statement	Theme	Confidence	Adaptation shortfall	Adaptation urgency rating
E4	Opportunities to land-based primary sector	Physical	Very High	Partial	Tier 1: Ready to Act
E5	Opportunities to ocean-based aquaculture and fisheries	Physical	Very High	Partial	Tier 1: Ready to Act
ET3	Opportunities for business through the implementation of new technology to reduce emissions (including fugitive/ agriculture/ industrial/ fuel switching).	Transition	Medium	Partial	Tier 2 Investigate then Act
ET5	Opportunities for business through new revenue streams available from carbon markets	Transition	Very High	Partial	Tier 1: Ready to Act

Built domain opportunities

- There are two key transition related opportunities with a Tier 1 adaptation urgency rating. Opportunities for the built domain relate to the circular economy and opportunities for a lower emissions transport system. These opportunities require further action in the next five years to fully realise benefits.

Table 10 Climate opportunities that require urgent adaptation action in the built domain.

Risk ID	Priority Impact Statement	Theme	Confidence	Adaptation shortfall	Adaptation urgency rating
BT3	Opportunities for infrastructure development	Transition	High	Partial	Tier 1: Ready to Act
BT4	Opportunities for lower emissions transport system	Transition	Very high	Partial	Tier 1: Ready to Act

Informing adaptation responses

The Risk Assessment identified four key areas that will be critical for consideration as part of any adaptation response. These are that:

State-level coordination for local efforts is beneficial for effective adaptation: Stakeholders engaged through the Risk Assessment highlighted that multiple adaptation proposals, efforts and actions were occurring at local levels without appropriate information sharing and coordination. This can lead to inefficient use of resources and funding. Given that climate adaptation responses are often place-based, flexible coordination might help to share learnings and resources.

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Climate change is already, and will increasingly, threaten the health and wellbeing of Tasmanians: Climate risks are likely to exacerbate food and water security issues and increase pressure on infrastructure, transport and emergency services and other areas essential to human health and wellbeing. Coordination across strategies to address the intersection of climate change and health and wellbeing is vital for a thriving Tasmanian population. A deep dive into health, wellbeing, safety, emergency services access and how they will be impacted by climate change is critical.

Education is vital to successful climate adaptation and increased resilience for future generations: From individuals to a broader organisational level, climate literacy can be improved to enhance climate change awareness and inform decision making. Engagement for the Risk Assessment showed that awareness of the impacts of climate change was low across most stakeholder groups, which can hamper the effective consideration of climate risk in decision-making.

Development of, and investment in, additional data collection is required to better inform risk-based decision making. Data is integral to improving the accuracy of climate risk assessments, quantifying, and monitoring impacts, and informing cost-benefits for adaptation strategies. By prioritising the development and investment in comprehensive data systems, Tasmania can strengthen its capacity to address climate change impacts effectively and sustainably, ensuring long-term resilience and adaptive capacity across the state.

Looking forward for future statewide climate change risk assessments

Future work in the space involves undertaking more assessments at different levels of granularity, in order to improve understanding of climate risks and opportunities. Additional assessment can also incorporate evolution in the understanding of climate risk. These key principles for future work are outlined below.

- Tasmania is in a position to execute adaptation successfully, due to the potential for flexibility and agility in executing the implementation of climate adaptation and mitigation measures. In addition, knowledge sharing, data monitoring, and cost benefits related to climate could be communicated more widely beyond Tasmania to grow the economy and enhance access to adaptation technologies and methods.
- Develop detailed and more localised assessments to run alongside the state-level assessment, as the Risk Assessment provides a broad overview and may not capture detailed and localised variability. It was made clear across the assessment that multiple local adaptation efforts are underway, but not well coordinated at a state level. There is an opportunity for the state to improve monitoring and knowledge sharing gained from local and/or sector-specific climate assessments and successful adaptation implementation.
- The Risk Assessment should continue to be built upon in future iterations to create a more robust, comprehensive, and usable assessment, with potential alignment with other jurisdictions/national climate assessments. Future iterations should embed Tasmanian Aboriginal knowledge into the process from inception. As the assessment is conducted every five years, it is important that the methodology and data sets used are continually documented, upgraded, and aligned to current best practice.
- Continuous monitoring and alignment of climate risk considerations/methodologies with Australian jurisdictions and international examples. As there are further national and international climate risk assessments, there should be continued initiatives that balance the need for regional nuance with coordinated alignment to methodologies.

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References

CDP. (2022, October). *Protecting People and the Planet: Putting people at the heart of city climate action.* CDP. Retrieved from https://cdn.cdp.net/cdp-production/cms/reports/documents/000/006/567/original/CDP_Cities_Protecting_People_and_the_Planet.pdf?1665068434

DCCEEW. (2024, Janurary 18). Retrieved from Department of Climate Change, Energy, the Environment and Water: https://www.dcceew.gov.au/about/news/energy-efficiency-upgrades-tas-homes

ReCFIT. (2023, June). *Tasmania's Climate Change Action Plan 2023-25*. Retrieved from Climate Change Office: https://www.recfit.tas.gov.au/__data/assets/pdf_file/0008/497555/Tasmanias_Climate_Change_Action_Plan_2023-25.pdf

ReCFIT. (2024). *Tasmanian renewable energy action plan*. Retrieved from Renewables, Climate and Future Industries Tasmania: https://recfit.tas.gov.au/renewables/tasmanian_renewable_energy_action_plan

Simpson, N. P., Mach, K., Constable, A., Hess, J., Hogarth, R., Howden, M., . . . Trisos, C. H. (2021). A framework for complex climate change risk assessment. *One Earth, 4*(4), 489-501.

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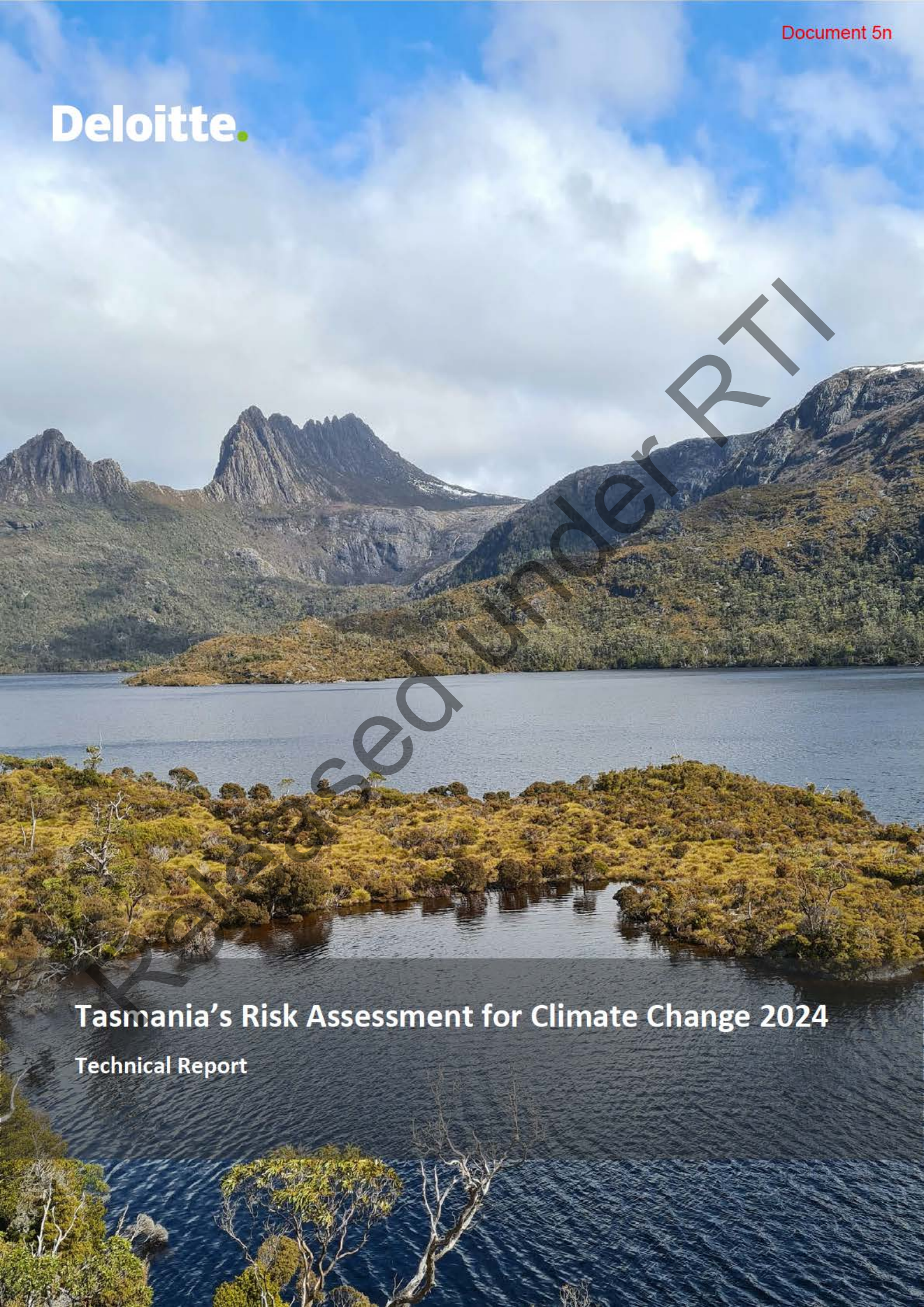

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Tasmania's Risk Assessment for Climate Change 2024

Technical Report

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Glossary

Term	Definition
Adaptation	Adjustment to actual or expected climate change and its effects. In human systems, adaptation seeks to moderate or avoid harm, or to take opportunities. Intervention may facilitate adjustment (IPCC, 2014).
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 (IPCC, 2014).
Aggregate risks	Aggregation occurs when risks with unrelated causes – including those not directly related to the climate – occur simultaneously.
Assets	Things of value, which may be exposed or vulnerable to a hazard or risk. Physical, environmental, cultural, or financial/economic element that has tangible, intrinsic or spiritual value (see taonga) (Ministry for the Environment, 2019).
Biodiversity	The variability among living organisms from terrestrial, marine, and other ecosystems. Biodiversity includes variability at the genetic, species and ecosystem levels (IPCC, 2014).
Cascading risks	One event or trend triggering others; interactions can be one way (e.g., domino or contagion effects) but can also have feedback; cascading risk is often associated with the vulnerability component of risk, such as critical infrastructure.
Climate	The narrow definition is the average weather. More rigorously, the statistical description of the mean and variability of quantities over months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system (IPCC, 2014).
Climate Change	A change in the state of the climate identified (e.g., through statistical tests) by changes or trends in the mean and/or the variability of its properties, and that persists for an extended period, typically decades to centuries. Includes natural internal climate processes or external climate forcings such as variations in solar cycles, volcanic eruptions, and persistent anthropogenic changes in the atmosphere or in land use (IPCC, 2014).
Climate Projections	The simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases (GHGs) and aerosols, generally derived using climate models. Climate projections are distinguished from climate predictions by their dependence on the emission/concentration/radiative forcing scenario, which is in turn based on assumptions about, for example, socio-economic and technological developments that may or may not be realised (IPCC, 2014).
Co-benefits	The positive effects a policy or measure for one objective might have on other objectives, irrespective of the net effect on overall social welfare. Often subject to uncertainty and depend on circumstances and implementation, among other factors. Also known as ancillary benefits (Ministry for the Environment, 2019).
Complex risk	Complex climate risks and opportunities describe the interactions between multiple climate change risks.
Compound Risk	Multiple risks that arise from the interaction of multiple hazards, which can be characterised by single extreme events or multiple coincident or sequential events that interact with exposed systems or sectors.
Confidence	A qualitative measure of the validity of a finding, based on the type, amount, quality and consistency of evidence (e.g., data, mechanistic understanding, theory, models, expert judgement) and the degree of agreement (Ministry for the Environment, 2019).
Consequence	The outcome of an event that may result from a hazard. It can be expressed quantitatively (e.g., units of damage or loss, disruption period, monetary value of impacts or environmental effect), semi-quantitatively by category (e.g., high, medium, low level of impact) or qualitatively (a description of the impacts) (adapted from Ministry of Civil Defence and Emergency Management (MCDEM, 2019). It is also defined as the outcome of an event affecting objectives (ISO/IEC 27000:2014 and ISO 31000: 2009) (Ministry for the Environment, 2019).
Deloitte	Deloitte refers to Deloitte Touche Tohmatsu. Deloitte was engaged by Renewables, Climate and Future Industries Tasmania to undertake this climate risk assessment.
Domain	A domain represents values, assets and systems that may be at risk from climate change. Four domains define the scope of The Risk Assessment and ensure that it has a statewide scope.

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Term	Definition
Drivers	The transition drivers that cause risks and/or generate opportunities in a changing climate. These are evaluated for the current and future climate via climate scenario analysis.
Emissions	The production and discharge of substances that are potentially radiatively active (i.e., absorb and emit radiant energy) in the atmosphere (e.g., greenhouse gases, aerosols) (Ministry for the Environment, 2019)
Exposure	The environmental and socio-economic communities or populations exposed to climate changes and where exposure exist now or in the future geographically across the state.
Greenhouse Gas	Gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. This property causes the greenhouse effect. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are the primary greenhouse gases in the Earth's atmosphere.
Hazard	The physical hazards that cause risks and/or generate opportunities in a changing climate. These are evaluated for the current and future climate via climate scenario analysis.
Impacts (consequences, outcomes)	The effects on natural and human systems of extreme weather and climate events, and of climate change that are a combination of climate hazards, exposure, and vulnerability. Generally, refers to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure due to the interaction of climate changes or hazardous climate events within a specific period, and the vulnerability of an exposed society or system (IPCC, 2014).
Intergovernmental Panel on Climate Change	Intergovernmental Panel on Climate Change – a scientific and intergovernmental body under the auspices of the United Nations.
Mitigation	A human intervention to reduce the sources or enhance the sinks of greenhouse gases (IPCC, 2014).
NCRA	National Climate Change Risk Assessment
Physical risk / opportunity	Climate-related risks or opportunities that are caused by hazards that are either acute climate events, often characterised by extreme weather or chronic long-term shifts in climate patterns that have direct impacts.
ReCFIT	Renewables, Climate and Future Industries Tasmania
Resilience	The capacity of social, economic, and environmental systems to cope with a hazardous event, trend, or disturbance by responding or reorganising in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation (IPCC, 2014).
Response	The adaptation and mitigation actions undertaken to reduce the consequence and likelihood of climate-related risks and take advantage climate-related opportunities.
Risk	The potential for consequences where something of value is at stake and where the outcome is uncertain, recognising the diversity of values. Risk results from the interaction of vulnerability, exposure, and hazard. Risk is more conventionally represented as probability or likelihood of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. It also refers to the potential, when the outcome is uncertain, for adverse consequences on lives, livelihoods, health, ecosystems and species, economic, social, and cultural assets, services (including environmental) and infrastructure (IPCC, 2014).
Transition risk / opportunity	Climate-related risks or opportunities associated with the policy, regulation, technology development, reputation, and/or market shift that arise as a result of goals to decarbonise.
Vulnerability	The propensity or predisposition of an element, system, or society to be adversely affected. This encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt (IPCC, 2022).

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Executive Summary

Tasmania's Risk Assessment for Climate Change

The rapidly changing climate presents both risks and opportunities for Tasmania. Climate change is already affecting businesses, communities, and the economy globally, including in Tasmania, requiring increased understanding of climate impacts over time and consideration of associated adaptation measures.

The *Climate Change (State Action) Act 2008* (the Act) sets the Tasmanian Government's legislative framework for action on climate change. The Act requires the preparation of a statewide climate change risk assessment by November 2024, and that it be updated every 5 years thereafter, and sets criteria to be considered in the delivery of the assessment. To be a resilient state, Tasmania must prepare for, adapt to and be flexible in the face of a changing climate. Tasmania's Risk Assessment for Climate Change 2024 (hereafter, 'the Risk Assessment') is the first ever full climate change risk assessment conducted for the state. It identifies both risks and opportunities that result from physical and transition climate hazards and drivers, state geographical and socio-economic exposure and vulnerabilities, and identification of associated climate actions in response.

The purpose of The Risk Assessment is to identify areas of physical and transition exposure and vulnerability over the coming decades across the state, to inform adaptation priorities that can be executed at local to state levels to enhance climate resilience. This statewide assessment will inform whole-of-state decision making, and as such does not attempt to conduct a climate assessment for individual regions, organisations, communities, localities, or sectors.

The Risk Assessment incorporates the matters that must be taken into account under Section 5(b) of the Act, including using the latest and best available science and projected impacts, consideration of risks associated with the energy transition, consideration of economic, social, and environmental implications of climate change, and assessment of the associated risks to Tasmanian communities, natural environments and ecosystems and economic activity. All these have direct and indirect climate-related impacts on the health and wellbeing of Tasmanians and future generations. The Risk Assessment was initiated by the Renewables, Climate and Future Industries Tasmania (ReCFIT) and completed by Deloitte.

Information and stakeholder input was gathered from July 2023 to August 2024 and includes past documentation, information release following this was not considered in this assessment. The assessment of climate impacts in this report was undertaken via two key phases:

First Pass Risk and Opportunity Assessment: In this phase preliminary physical and transition climate risks and opportunities for Tasmania were identified and prioritised. Key steps included:

1. Step 1 – Develop preliminary climate impact statements via desktop research
2. Step 2 – Stakeholder consultation to refine and help prioritise climate impact statements
3. Step 3 – Refine and prioritise climate impact statements

Detailed Risk and Opportunity Assessment: This phase involved an assessment of priority climate impacts and rating adaptation urgency using climate scenario analysis and deeper research on the priority impact statements. Key steps included:

1. Step 1 – Assess the future climate impacts for Tasmania
2. Step 2 – Determine the adaptation urgency for each of the 40 priority impact statements
3. Step 3 – Summarising the Risk Assessment in two key reports; both to be tabled in parliament

The climate is rapidly changing now and in the future

Climate impacts can occur within and across environmental and socio-economic areas. The Risk Assessment has categorised these areas into four value domains: **Natural**, **Social**, **Economic**, and **Built**. Interactions between climate impacts can be complex – either compounding hazards impacting individual or multiple value domains, cascading impacts across domains, or in association with non-climate related risks. Climate hazards are the drivers associated with or the result of climate change, classified as either 'physical' or 'transition'.

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Physical climate hazards

Physical hazards can be either:

- acute climate events characterised by extreme weather. These include bushfires, storms, marine- and land-based heatwaves, extreme rainfall, and flooding, or
- chronic long-term shifts in climate patterns that have direct impacts. These include long term changes in temperature and rainfall as well as sea level rise.

By 2030, with limited climate action, the following changes to Tasmania's physical climate are projected (see chapter 4.2 for further detail).

Table 1 Summary of physical climate hazards for Tasmania

Physical climate hazard	Model projections by 2030 under the high emission scenario (SSP3-7.0: limited climate action globally)	Trends and impacts for Tasmania
Chronic long-term temperature rise	Annual average temperature is projected to increase by up to 2.5°C.	Major impacts on the natural environment, health and wellbeing of communities, and threshold tolerance for the built environment and emergency management.
Chronic long-term rainfall and soil moisture change	The total annual rainfall is projected to decline by 7mm (state average). Soil moisture content is projected to decline by up to 3 - 5% across all horizons but increase by 3 - 6% in Hobart and the east of the state.	Changes in rainfall directly impacts the natural domain and causes disruptions to other value domains that are reliant on natural water supplies, as well as impacting soil moisture, air quality, and transport systems.
Increases in the severity of acute extreme heat conditions	Highest annual temperatures increase by up to 6.9ºC, with approximately 5 additional days per year over 30ºC, particularly for King Island, Flinders Island, and the State's northern regions.	More frequent and/or intense periods of extreme heat that impact health and wellbeing, energy and cooling, ecosystems and biodiversity, and economic disruptions associated with outdoor production.
Increases in the severity of acute extreme rain and flood conditions	Associated with inland flooding, extreme rain days (over 20mm in a day) will occur 21% more frequently (particularly in the eastern half of the state) and extreme rain intensity increases by up to 9% across the state.	Increases in the intensity and frequency of flood and extreme events lead to major delays, disruptions, and damages across all value domains, including increasing repair and insurance costs and impacts on biodiversity habitats and ecosystems.
Increases in the severity of acute bushfire and wind conditions	Models project up to an additional 5 days annually with favourable conditions for bushfire events, with up to 10% increase in bushfire intensity. Mean wind speeds and extreme wind gusts are projected to increase.	Increases in bushfire occurrence cause direct health consequences and impacts on emergency services preparedness and disaster reduction. Further, the state's infrastructure is more prone to damages and disruptions, and insurance risks.
Chronic long-term sea level rise and increases in acute extreme storm surge events	Sea levels are projected to rise by up to 10 cm by 2030. The 100-year storm surge event is projected to occur up to 1.4 times as frequently by 2030.	As the planet warms, the frequency and severity of sea level rise and storm surge/ extreme wave events increases, leading to the deterioration of coastal boundaries and associated losses across ecosystems, operations, and infrastructure along coastline.
Chronic long-term warming of Tasmania's waters and increases in ocean acidification	Sea surface temperature is projected to increase by up to 0.9ºC by 2030, with the largest increases occurring in waters on the East and North-east coast. Similarly, sea surface acidity is projected to steadily increase in waters around the state.	Ocean warming and increases in acidity lead to damage or destruction of marine ecosystems, the incursion of more northerly species, and associated impacts for ocean aquaculture, fisheries, and local communities.

Transition climate drivers

Transition drivers are the policy, regulation, technology development, reputation, and/or market shifts that arise as a result of decarbonisation goals. Emissions reduction and renewable energy policies will be a key driver of change under a low

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emissions scenario, impacting Tasmania in both positive and negative ways. By 2030, models project the following climate transition trends for Tasmania (see chapter 4.3 for further detail).

Table 2 Summary of transition drivers for Tasmania

Transition climate drivers	Model projections by 2030 under the moderate emission (NGFS NDC; AEMO Progressive Change) scenario and/or the low emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario	Trends and impacts for Tasmania
Changes to policy and legal drivers	Under the lower emission 1.5-degree future, the shadow emissions price[1] (used as a proxy to illustrate economic impacts) in Australia increases to A$221 by 2030. Emissions reduction and renewable energy policy will be a key driver of change under a low emissions scenario, impacting Tasmania in both positive and negative ways. Land based carbon sequestration in Australia increases under both low and moderate scenarios.	The global transition to a low emissions economy may see emissions price impacts on Tasmania's export commodities. Tasmania's renewable energy policy aims to harness natural resources to support economic growth in Tasmania, reduce electricity prices and support the decarbonisation of the electricity sector in Australia. Land use change in Australia has been an important method for carbon sequestration, contributing to the mitigation of greenhouse gas emissions.
Increases in uptake of renewable technologies that present opportunities	Technologies that promote emissions reduction and resource efficiency present opportunities for Tasmania across all domains. By 2030, national and global technology costs for solar reduce by around 42%. Wind related technology costs reduce by 30%, and the capacity for wind generation in Tasmania increases by 3 to 4 times the current capacity. Tasmania has the aim of establishing a significant hydrogen industry by 2030. Increase in hydrogen production in Tasmania is highest under a low emission scenario. Under a low emission scenario, energy efficiency measures reduce demand for electricity by 249 GWh by 2030. Under a moderate emission future, electricity demand is reduced by 143 GWh by 2030.	The Tasmanian Renewable Energy Target (TRET) is a key policy mechanism, which aims for 200% renewable energy generation by 2040. Supporting projects include Marinus Link and supporting transmission, Renewable Energy Zones, and Battery of the Nation. Tasmania is aiming to become a hydrogen export hub supporting local industries and emissions reduction nationally and globally. The Tasmanian and Australian Governments are investing A$16.6 million in energy upgrades for 1,600+ social housing properties.
Changes to markets and reputation associated with climate action / inaction	Circularity and sustainability are not mapped directly through scenario analysis metrics; however, they are likely to be highest under a low emission scenario (NGFS Net Zero 2050; AEMO Green Energy Export) where there are clear trends in resource efficiency and sector emissions reductions. Direct emissions from businesses and facilities may be managed through market dynamics. Under a low emissions scenario there will be greater focus on supply chain emissions. Regions that meet climate and renewable energy targets may attract reputational benefits.	A circular economy in Tasmania can create jobs in recycling, refurbishing, and remanufacturing sectors. This diversification may foster new business models such as sharing platforms, product-as-a-service, and remanufacturing hubs, which can reduce dependence on imports and keep resources within the community. Sectors with high electricity use could benefit from the low emissions intensity of Tasmania's electricity system. Tasmania has Net Zero emissions status, and whilst this does not impact emissions accounting at a business level, the Tasmanian economy may benefit from this status through reputation and branding. Tasmania aims to maintain Net Zero emissions status, which may have a positive impact on the state's brand for businesses in Tasmania.

[1] Australia does not currently have any economy-wide emissions control mechanisms in place. However, emissions reduction may be driven by further action such as emissions control mechanisms. Examples of emissions control mechanisms include broad emissions pricing or trading schemes, carbon taxes, and regulatory and reporting control mechanisms

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	Reputation is not mapped directly through scenario analysis metrics. Under a low emission scenario, it is expected that action on climate change will become increasingly important to both governments and businesses.	

Tasmania's highest rated climate risks and opportunities for adaptation urgency

Criteria to assess adaptation urgency for Tasmania

This Risk Assessment will inform the climate adaptation priorities for the Tasmanian Government by identifying the key climate risks and opportunities for the state, described by 40 priority impact statements. Whilst there is a focus on climate impacts for the next 5 years, adaptation measures often take longer to implement and/or are required now for consequences realised later in the 21st century.

The 40 priority impact statement profiles were assessed and rated for adaptation urgency using the criteria described in Section 5.2 Assessment Criteria. The adaptation shortfall is rated as 'partial' intentionally for all risk and opportunity impact statement profiles after extensive research and consultation. This reflects the need for effective monitoring of current responses to fully understand the state's adaptive capacity and where shortfalls may exist. Further investment into existing and future adaptation strategies and initiatives may also be required to both effectively manage risks and fully realise opportunities available to the state.

1. **Magnitude of consequence:** the potential magnitude of impact at a state level from the risk or opportunity, considered against an ascending scale of potential implications over time, for each value domain.
2. **Confidence:** the quality of the evidence, along with the level of agreement between studies and experts.
3. **Adaptation shortfall:** whether risks or opportunities are the subject of any adaptation activity that aims to manage the risk or opportunity either partially, or in full.

Adaptation urgency

Combined, these three criteria lead to the adaptation urgency rating that indicates the degree to which action is needed in the next five years to reduce a risk or realise an opportunity from climate change. An urgency rating scale is used because it is transparent and can be understood and compared by policy makers and communities, across different policy areas. Risks and opportunities with the highest adaptation urgency are classified as Tier 1, then Tier 2 through to Tier 4.

The adaptation urgency scale is categorised into four tier ratings:

- Tier 1: Ready to Act
- Tier 2: Investigate then Act
- Tier 3: Continue to Monitor Current Actions
- Tier 4: Monitor

Chapter 5.1 provides detail of the criteria and ratings used for the Risk Assessment.

Key findings about the assessment criteria and/or enhanced adaptation action across the state

1. The adaptation shortfall is rated as 'partial' for the majority of risk and opportunity impact statement profiles.

The Risk Assessment recognises that there are meaningful policies and strategies in place at a national and state level that are working to mitigate risk impacts and establish an enabling environment that fully realises relevant opportunities to the state that arise from climate change and the current transition. However, a partial shortfall has been provided for a majority of the risk and opportunity impact statement profiles after extensive research and consultation. This reflects the need for further investment into existing and future adaptation strategies and initiatives to both effectively manage risks and fully realise opportunities available to the state.

2. By 2090, many impact profiles have an extreme consequence rating.

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Risk profiles with a projected extreme consequence rating for 2090 include risks to marine ecosystems and species, alpine ecosystems and species, social cohesion, insurability, ocean-based aquaculture and fisheries, health care and emergency services, and buildings and structures and transportation networks.

The impacts per value domain vary widely. For example, in the natural domain, environmental biomes may become significantly compromised and experience irreversible damages. In the social domain, connectedness may be broken, welfare, physical and mental health may be compromised, and key community services could be disrupted. In the economic domain this indicates the potential failure of a significant industry or sector. Finally, in the built domain buildings and structures may become uninhabitable.

Top risks for Tasmania

Table 3 below lists the climate impact statements with a Tier 1 and Tier 2 adaptation urgency rating. Key reflections on these findings are below.

Tier 1 ('Ready to Act') risks

- Overall: Of the impact statements identified by the Risk Assessment, 15 risk impact statements are rated as Tier 1 ('Ready to Act'), indicating that new, stronger, or different government action, over and above those underway or planned, is needed in the next five years, and it is clear where this action should be directed.
- Most Tier 1 risks relate to physical climate impacts, rather than transition related risks.
- Natural domain: All physical risks in the natural domain have a Tier 1 rating for adaptation urgency, and these are connected to 67% of the remaining risk and opportunity impact statements (i.e., 23 of 34 statements) across all value domains.
- Social domain: Climate change is already, and will continue, to impact communities and livelihoods. In the social domain physical safety, health and wellbeing, and social cohesion and community wellbeing are key areas impacted with a Tier 1 adaptation urgency rating.
- Economic domain: Tasmania's food and supply chain networks are key areas of focus for risks with a Tier 1 adaptation urgency rating. Supply chains and distribution networks, the land-based primary sector, and ocean fisheries and aquaculture are all assessed as Tier 1 risks.
- Built domain: Many impacts in the built domain are rated to have a 'major' consequence by 2030. Risks to healthcare and emergency services, built infrastructure, and risks to transport networks have an adaptation urgency rating of Tier 1.

Tier 2 ('Investigate then Act') risks

- Overall, there are eleven Tier 2 risk requiring differing levels of effort to fill gaps in understanding and uncertainty, and to assess the need for additional adaptation uptake.
- Natural domain: One transition risk has a Tier 2 adaptation urgency rating, this is related to the impact of renewables on biodiversity, ecosystems and cultural heritage.
- Social domain: Two physical risks and one transition risk have a Tier 2 rating for adaptation urgency, and are related to mental health and wellbeing, cultural heritage, and social cohesion and health and wellbeing.
- Economic domain: Within the economic domain further information is needed to inform the adaptation response to four of the risks. Physical risks with an adaptation urgency rating of Tier 2 include risks to businesses and public organisation and risks to insurability, these risks are highly complex with interdependencies across domain. Tier 2 transition risks include risks from to supply chains, and costs to businesses associated with new technologies, as organisations adjust to a low carbon economy.
- Built domain: Risk from climate hazards impacting healthcare and emergency service, contaminated sites and stormwater and sewage systems require further investigation to develop a response to these risks.

A full table of priority impact statements is presented in chapter 5.3.1.

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Table 3 Summary of Tier 1 and Tier 2 risks for Tasmania

Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
NATURAL DOMAIN									
N1	Risks to inland water ecosystems and species	Physical	Minor	Moderate	Moderate	Major	High	Partial	Tier 1: Ready to Act
N2	Risks to terrestrial ecosystems and species	Physical	Moderate	Moderate	Moderate	Major	High	Partial	Tier 1: Ready to Act
N3	Risks to coastal ecosystems and species (erosion-related risk)	Physical	Minor	Minor	Moderate	Major	High	Partial	Tier 1: Ready to Act
N4	Risks to marine ecosystems and species	Physical	Moderate	Moderate	Major	Extreme	Very High	Partial	Tier 1: Ready to Act
N5	Risks to native ecosystems and species	Physical	Moderate	Moderate	Major	Major	Very High	Partial	Tier 1: Ready to Act
N6	Risks to alpine ecosystems and species	Physical	Moderate	Moderate	Major	Extreme	High	Partial	Tier 1: Ready to Act
NT2	Risks related to renewable energy development	Transition	Minor	Moderate	Moderate	n/a	Low	Partial	Tier 2 Investigate then Act
SOCIAL DOMAIN									
S1	Risks to social cohesion and community wellbeing	Physical	Moderate	Moderate	Major	Extreme	High	Partial	Tier 1: Ready to Act
S2	Risks to mental health and wellbeing	Physical	Moderate	Moderate	Major	Major	High	High	Tier 2 Investigate then Act
S3	Risks to physical safety, health, and wellbeing	Physical	Moderate	Moderate	Major	Major	High	Partial	Tier 1: Ready to Act
S4	Risks to cultural heritage	Physical	Moderate	Moderate	Major	Extreme	Low	Partial	Tier 2 Investigate then Act
ST1	Risks to social cohesion due to the inability of institutions and governance	Transition	Minor	Moderate	Major	n/a	High	Partial	Tier 1: Ready to Act

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Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
	systems to effectively manage climate risks								
ST2	Risks to social cohesion, and health and wellbeing due to existing services being insufficient to meet the needs of a growing population (driven by renewable energy development and new industries that support emissions reduction in Tasmania).	Transition	Insignificant	Moderate	Major	n/a	Medium	Partial	Tier 2 Investigate then Act
ECONOMIC DOMAIN									
E1	Risk to businesses and public organisations from extreme weather events	Physical	Minor	Moderate	Moderate	Major	High	Partial	Tier 2 Investigate then Act
E2	Risks to national and international supply/distribution networks due to extreme weather events	Physical	Moderate	Moderate	Major	Major	High	Partial	Tier 1: Ready to Act
E3	Risks to the insurability of businesses, public sector, and private assets	Physical	Moderate	Moderate	Major	Major	Very High	Partial	Tier 2 Investigate then Act
E4	Risks to land-based primary sector	Physical	Minor	Moderate	Moderate	Major	Very High	Partial	Tier 1: Ready to Act
E5	Risks to ocean-based aquaculture and fisheries	Physical	Moderate	Moderate	Major	Major	Very High	Partial	Tier 1: Ready to Act
ET2	Risks to businesses and public organisations due to supply chain costs as organisations adjust to a low carbon economy.	Transition	Minor	Moderate	Major	n/a	Medium	Partial	Tier 2 Investigate then Act

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Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
ET3	Risks to business through the implementation of new technology to reduce emissions (including fugitive/ agriculture/ industrial/ fuel switching).	Transition	Minor	Moderate	Moderate	n/a	Medium	Partial	Tier 2 Investigate then Act
BUILT DOMAIN									
B1	Risks to healthcare and emergency services	Physical	Major	Major	Major	Extreme	Medium	Partial	Tier 2 Investigate then Act
B2	Risks to the built environment due to climate extremes	Physical	Moderate	Major	Major	Extreme	High	Partial	Tier 1: Ready to Act
B3	Risks to contaminated sites due to extreme events and chronic climate impacts	Physical	Moderate	Moderate	Major	Major	High	Partial	Tier 2 Investigate then Act
B4	Risks to stormwater and sewerage systems due to extreme events and chronic climate impacts	Physical	Moderate	Moderate	Major	Major	High	Partial	Tier 2 Investigate then Act
B5	Risks to ports and coastal infrastructure	Physical	Minor	Moderate	Moderate	Major	Medium	Partial	Tier 1: Ready to Act
B6	Risks to transportation networks due to extreme events and chronic climate impacts	Physical	Moderate	Major	Major	Extreme	High	Partial	Tier 1: Ready to Act

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Top Opportunities for Tasmania

Table 4 below lists the climate opportunity impact statements with a Tier 1 and Tier 2 adaptation urgency rating.

Tier 1 ('Ready to Act') opportunities

- There are seven priority opportunities that are rated as Tier 1: Ready to Act to realise benefits for the state.
- Tier 1 opportunities are mostly transition-based, with two impact statements that are physical climate based. Key areas where additional action could be taken to fully realise climate-related benefits to Tasmania include infrastructure development to support the circular, low emissions transport, increased participation in carbon markets, improving energy efficiency in low-income households, and supporting water quality and biodiversity.
- Natural domain: Improving water quality and biodiversity provides benefits across multiple ecosystems.
- Social domain: Energy efficiency improvements may provide financial and health and wellbeing benefits.
- Economic domain: There are two opportunities related to physical climate hazards, economic opportunities for land-based primary sector and ocean-based aquaculture and fisheries, where there may be opportunities to pivot towards climate tolerant practice. Increased carbon market participation also provides economic opportunities for Tasmania.
  Built domain: Opportunities related to transition drivers include infrastructure, and lower emissions transport have ongoing benefits for the transport networks and emissions reduction objectives.

Tier 2 ('Investigate then Act') opportunities

- There are four Tier 2 opportunity impact statements require differing levels of effort to fill gaps in understanding.
- Natural domain: Opportunities to support biodiversity through well-designed renewable energy development has some evidence, further investigation is required to understand solution that will most benefit Tasmania.
- Social domain: Opportunities in the social domain from adaptation and resilience drivers are less well evidenced than some opportunities, reflecting the need to for further research into responses that maximise social opportunities.
- Economic domain: Further information on the costs and opportunities for businesses for low emissions technologies requires further information to understand where remaining gaps exist that will allow economic opportunities across a diverse range of technology types.
- Built domain: No Tier 2 opportunities were identified in the built domain.

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Table 4 Summary of Tier 1 and Tier 2 opportunities for Tasmania

Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
NATURAL DOMAIN									
NT2	Opportunities related to renewable energy development	Transition	n/a	n/a	n/a	n/a	Low	Partial	Tier 2 Investigate then Act
NT4	Opportunities to support water quality and biodiversity	Transition	n/a	n/a	n/a	n/a	High	Partial	Tier 1: Ready to Act
SOCIAL DOMAIN									
ST3	Opportunities for increased skills and employment with business development for new and emerging industries that provide adaptation and resilience solutions.	Transition	n/a	n/a	n/a	n/a	Medium	Partial	Tier 2 Investigate then Act
ST4	Opportunities for social cohesion, health and wellbeing through adaptation and resiliency improvements, including across domain co-benefits.	Transition	n/a	n/a	n/a	n/a	Medium	Partial	Tier 2 Investigate then Act
ST6	Opportunity to improve financial wellbeing, and health and wellbeing through energy efficient housing for low-income households.	Transition	n/a	n/a	n/a	n/a	Very high	Partial	Tier 1: Ready to Act
ECONOMIC DOMAIN									
E4	Opportunities to land-based primary sector	Physical	Minor	Moderate	Moderate	Major	Very High	Partial	Tier 1: Ready to Act

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Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
E5	Opportunities to ocean-based aquaculture and fisheries	Physical	Moderate	Moderate	Major	Major	Very High	Partial	Tier 1: Ready to Act
ET3	Opportunities for business through the implementation of new technology to reduce emissions (including fugitive/ agriculture/ industrial/ fuel switching).	Transition	Minor	Moderate	Moderate	n/a	Medium	Partial	Tier 2 Investigate then Act
ET5	Opportunities for business through new revenue streams available from carbon markets	Transition	n/a	n/a	n/a	n/a	Very High	Partial	Tier 1: Ready to Act
BUILT DOMAIN									
BT3	Opportunities for infrastructure development	Transition	n/a	n/a	n/a	n/a	High	Partial	Tier 1: Ready to Act
BT4	Opportunities for lower emissions transport system	Transition	n/a	n/a	n/a	n/a	Very high	Partial	Tier 1: Ready to Act

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Informing adaptation responses

The Risk Assessment identified four key areas that will be critical for consideration as part of any adaptation response:

- **State-level coordination for local efforts is beneficial for effective adaptation:** Stakeholders engaged through the Risk Assessment highlighted that multiple adaptation proposals, efforts and actions were occurring at local levels without appropriate information sharing and co-ordination. This can lead to inefficient use of resources and funding. Given that climate adaptation responses are often place-based, flexible co-ordination might help to share learnings and resources.
- **Climate change is already, and will increasingly, threaten the health and wellbeing of Tasmanians:** Climate risks are likely to exacerbate food and water security, place increased pressure on infrastructure, transport and emergency services, and other areas essential to human health and wellbeing. Coordination across strategies to address the intersection of climate change and health and wellbeing is vital for a thriving Tasmanian population. Undertaking a deeper analysis into health, wellbeing, safety, emergency services access and how they will be impacted by climate change is critical for informing future adaptation responses.
- **Education is vital to successful climate adaptation and increased resilience for future generations:** From individuals to a broader organisational level, climate literacy can be improved to enhance climate change awareness and inform decision making. Engagement for the Risk Assessment showed that awareness of the impacts of climate change was low across most stakeholder groups, which can hamper the effective consideration of climate risk in decision-making.
- **Development of, and investment in, additional data collection is required to better inform risk-based decision making.** Data is integral to improving the accuracy of climate risk assessments, quantifying and monitoring impacts, and informing cost-benefits for adaptation strategies. By prioritising the development and investment in comprehensive data systems, Tasmania can strengthen its capacity to address climate change impacts effectively and sustainably, ensuring long-term resilience and adaptive capacity across the state.

Addressing key areas of adaptation response through coordinated efforts, consideration of health and wellbeing impacts, enhanced education, and robust data collection will allow for effective responses increasing Tasmania's resilience in the face of escalating climate risks.

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Introduction

1.1 Context and scene setting

1.1.1 Global climate change

Climate change is impacting businesses, communities, the environment, the economy, and all aspects of life worldwide, including in Tasmania. This demands a greater understanding of the short-term and long-term effects of climate change, as well as the existing, planned, and priority adaptation measures needed to address these impacts.

The planet surface temperature has warmed by at least 1.1°C since the pre-industrial era around 1880 (NASA Earth Observatory, 2022) with several studies indicating the planet will exceed 1.5°C of warming in the next five years. At 1.5°C warming, the planet becomes at high risk of irreversible loss of the West Antarctic ice sheet, low-latitude coral reefs and multiple impacts in the Artic region (World Economic Forum, 2024; Liu, et al., 2023; Armstrong Mckay, et al., 2022). At 2°C of warming heat extremes will more often reach critical tolerance thresholds for biodiversity, agriculture, health, and thus the global economy.

According to the Intergovernmental Panel on Climate Change Sixth Assessment Report (IPCC, 2021), it is unequivocal that the observed warming experienced since 1850 is a consequence of greenhouse gas (GHG) emissions arising from human activity, with the rates of change in global mean temperature unprecedented in the last 2,000 years. For every incremental increase in GHGs, climate extremes will continue to increase, and a rapid reduction in GHG emissions are necessary to limit the extent of global warming for the coming decades.

The impacts of a warming planet have many different impacts across the world (IPCC, 2021), including:

- the water cycle has intensified, bringing more intense rainfall and associated flooding, and more intense droughts
- global sea level has increased by 0.20 m since 1901. Arctic sea ice reached its lowest level since at least 1850 and almost all the world's glaciers have been retreating synchronously since the 1950s
- hot extremes including heatwaves have become more frequent and intense across most land areas
- cold extremes have become less frequent and severe.

In Australia, land areas have warmed by 1.44°C since 1910. Heat extremes, including heatwaves, have increased in frequency and magnitude since the 1950s. Heat extremes are projected to increase in frequency and magnitude, including the exceedance of dangerous humid heat thresholds. Since the 1950s cold extremes have decreased in frequency for most regions except parts of Southern Australia, with projections indicating that these trends will continue (IPCC, 2021; Pitman, et al., 2021).

A significant decrease in precipitation has been observed across southern Australia during the cool season (April-October), particularly in southwest Western Australia since the 1970s. Projections indicate that short-duration rainfall will become more intense in the future. Rainfall associated with El Niño–Southern Oscillation (ENSO) weather patterns is expected to become more variable from 2050, leading to an increase in both very wet and very dry years compared to average rainfall years. Additionally, the southward shift of storm tracks is projected to continue contributing to cool season drying trends across southern Australia.

Climate projections tell us that ecological and agricultural droughts have increased across southern and eastern Australia. Under a 2°C global warming scenario, projected changes in evaporation may exacerbate drought conditions in these regions. There is medium confidence in these projections.

A warmer, drier climate provides more favourable conditions for bushfire weather. Since the 1950s, the frequency of extreme fire weather days has increased, and the fire season has become longer. The frequency and duration of fire weather events is projected to increase throughout Australia by 2050 for medium and high emissions scenarios.

As climate change continues to accelerate, so too does the cost of inaction. The World Economic Forum Global Risks Report (World Economic Forum, 2024) showed that half of the world's top ten economic risks in the coming decade are environmental, with extreme weather events ranked first.

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The IPCC AR6 (Pörtner, et al., 2022) highlighted that there are already natural (species extinction and mountain glacier retreat) and human (mortality and morbidity due to climate extremes) systems that have experienced irreversible climate impacts where adaptation is no longer feasible.

In Australia, the cost of inaction may total $1 trillion by 2050 (Deloitte, 2021) if there is a failure to adapt and adequately manage climate risks. The impacts of climate change have already been felt in Tasmania. Over the past 10 years, the state has experienced significant and devastating impacts including prolonged dry periods, flooding, bushfires, and record marine heatwaves.

In addition to the physical impacts of climate change, the world will experience risks and opportunities associated with the transition to a low emissions economy. These risks or opportunities may arise through policy and liability issues, the transition to an increase of renewable technology use, shifts in market demand associated with a changing climate, and reputational impacts due to climate action or inaction.

1.1.2 Adapting to a changing climate

To underpin responses to climate change there is a need to understand the risks and opportunities that it presents to Tasmania.

Adaptation is essential to ensure that Tasmania is prepared for the impacts and ongoing changes of climate change. Since maintaining Tasmania's net-zero emissions profile is not guaranteed in the future, appropriate adaptation measures will help mitigate the effects of climate change and ensure that Tasmania keeps pace with other states in its response to climate impacts. Adaptation is a shared responsibility, but often governments must set clear priorities to catalyse action, support industry to take its own appropriate adaptation action, and support community resilience.

In 2008, the Tasmanian Government took an important step in climate action response by establishing the state legislative framework for action on climate change in the *Climate Change (State Action) Act 2008* (the Act). In 2022, the Government amended this legislation in response to the third independent review of the Act. Included in the amendments is a requirement to deliver a statewide climate change risk assessment within two years of the commencement of the Act and to update the Risk Assessment every 5 years. The following table outlines how this Risk Assessment, the first of its kind for Tasmania, addresses the requirements of the Act:

Table 5: Alignment of the risk assessment to the requirements set out by the *Climate Change (State Action) Act 2008* (the Act)

What is required to be taken into account by the risk assessment	How the risk assessment addresses these requirements
• The latest and best available science on the projected impacts of climate change on Tasmania • The risks associated with energy transition, including social and economic impacts • The economic, social, and environmental implications of climate change and associated risks to Tasmanian communities, natural environments and ecosystems, and economic activity • The impact of climate change on the health and wellbeing of Tasmanians and future generations.	• Using CMIP6 climate change projections and best available transition scenario data to inform future scenarios. • Considering energy transition risks through transition risks and opportunities in the risk assessment • Using four domains to understand risks and opportunities: natural, social, economic and built • Considering long term impacts of climate change risks (out to 2090 for physical risks and 2050 for transition risks) and how these change over time.

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1.2 Tasmania's Risk Assessment for Climate Change

1.2.1 Purpose of the Risk Assessment

The Risk Assessment aims to identify areas of physical and transition exposure and vulnerability over the coming decades for the state and inform adaptation priorities for the state that can be managed to enhance climate resilience. Specifically, it aims to:

- Increase the understanding of how climate change is impacting Tasmania now and into the future
- Identify Tasmania's physical and transition climate risks and opportunities for consideration in decision making
- Inform Tasmania's priorities for climate adaptation to increase resilience
- Inform other risk assessment activities, and Tasmanian Government policies and strategies including those related to emergency management, infrastructure, energy, health and wellbeing, land use planning, children and young people, and industry sectors

Performing a climate change risk assessment enables the state to understand climate change-related risks and opportunities for Tasmania under various climate change scenarios and time periods. The Risk Assessment identifies areas that could be prioritised for adaptation action to improve the resilience of Tasmania's environment, economy and community to the impacts of climate change.

1.2.2 Overview of the Risk Assessment

The Risk Assessment is based on the widely adopted climate risk framework (Simpson, et al., 2021) and IPCC AR6 that is also applied to climate opportunities. This framework posits that a risk is made up of a combination of hazards, exposure and vulnerability and the associated adaptation responses. The Risk Assessment was carried out in two key steps (Table 6) using multiple research methods, including extensive literature review, stakeholder engagement and climate data analysis. Both physical and transition climate risks and opportunities (R&Os) were included in the Risk Assessment.

It is important to note that, as this is a statewide assessment aimed at informing state-scale decision making, it does not attempt to assess climate change risks for individual regions, organisations, systems (e.g. healthcare), communities, councils, or industry sectors.

The assessment of climate impacts and adaptation urgency in this report was undertaken via two key phases:

- In the First Pass R&O Assessment, desktop research was used to identify key climate impacts for the state, described in impact statements that encapsulate key climate hazards/drivers and associated impact in a system/sector in Tasmania. This was followed by stakeholder engagement to expand, confirm, and refine the impact statements. Outcomes of the first-pass R&O assessment were provided to ReCFIT in an interim report, which provided a summary of literature review and stakeholder engagement and listed the prioritised climate impact statements for Tasmania to be further explored in the detailed R&O assessment.
- In the Detailed R&O Assessment stage, climate scenario analysis was conducted using leading practice climate models and scenarios. Further desktop research and stakeholder consultation were carried out to evaluate the availability and extent of existing adaptation measures in response to the evolving climate impacts on the State.

Analysis from both phases of the Risk Assessment process has formed the content of this Technical Report and the associated high-level Summary Report.

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Table 6: Description of the two phased approach to the Risk Assessment process

1. First Pass R&O Assessment June to December 2023	2. Detailed R&O Assessment January to June 2024
Preliminary prioritisation of climate impacts: *Identify and prioritise preliminary physical and transition climate risks and opportunities (R&Os) for Tasmania*	***Deep dive assessment of priority climate impacts and rating adaptation urgency*** *using climate scenario analysis and deeper research on the priority impact statements developed in the First Pass R&O Assessment*
Step 1 – Develop preliminary climate impact statements via desktop research • 60+ research sources from government and industry were assessed for climate change impacts related primarily to Tasmania. • 45 preliminary narrative statements were developed for consultation. **Step 2 – Stakeholder consultation to refine and help prioritise climate impact statements** • 4 workshops across the state with over 95 stakeholders across a diverse range of government and non-government sectors. • Multiple follow-up stakeholder interviews and survey responses. **Step 3 – Refine and prioritise climate impact statements** • A comprehensive list of 88 climate impact statements was developed. • Stakeholder voting, scientific and sectoral expertise, and further research used to **preliminarily prioritise 40 impact statements for Tasmania**.	**Step 1 – Assist the future climate exposure for Tasmania** • Quantitative and qualitative climate scenario analysis undertaken to quantify and qualify the future changes in hazards driving impacts to the state out to 2050 (transition) and 2090 (physical) under low, moderate and/or high emission scenarios. **Step 2 – Determine the adaptation urgency of each of the 40 priority impact statements** • 2 workshops engaging over 50 stakeholders on climate adaptation options and progress for Tasmania + supporting interviews. • A further 250+ research sources documenting climate impacts and adaptation for Tasmania. • Incorporating research and stakeholder evidence to rate the magnitude of consequence over time, identify existing/planned adaptation measures and assess adaptation urgency, based on varying levels of supporting evidence. **Step 3 – Summarising the Risk Assessment in two key reports; to be tabled in Parliament** • **Technical Report (this report)** with a stronger focus on the detailed methodology, and • **High-level Summary** presenting key findings.

1.2.3 Links between the Risk Assessment and other Climate Change Office (CCO) projects

Tasmania's Risk Assessment for Climate Change will act as a key input in shaping a range of policies and strategies developed by the Tasmanian Climate Change Office, along with other Tasmanian Government agencies. In line with the *Climate Change (State Action) Act 2008* (the Act), a climate change risk assessment is to be conducted at the state level at least every 5 years. The findings from each Risk Assessment will guide the government's approach to managing climate-related risks and implementing adaptation measures. The risk and opportunity related measures identified in this risk assessment will inform the 5-yearly Emissions Reduction and Resilience Plans produced by the CCO for the targeted sectors of energy, transport, agriculture, waste, land use and land use change, forestry, and industrial processes and product use. This Risk Assessment will also inform the next climate change action plan, which is also a 5-yearly requirement under the Act.

1.2.4 Links between the Risk Assessment and the National Climate Risk Assessment

This Risk Assessment was developed at the same time as the National Climate Risk Assessment (NCRA), conducted by the Australian Government's Department of Climate Change, Energy, the Environment and Water (DCCEEW) in partnership with the Australian Climate Service. The NCRA provides a national overview of climate risks, focusing on critical systems like infrastructure, health, agriculture, and the environment. The specifications for the Tasmanian Risk Assessment highlighted the value of a cohesive approach to managing climate risks across different levels of governance in Australia. The proposed methodological factors for the national-level assessment were a key consideration in scoping the specification for this Risk Assessment. Where possible, the Tasmanian Risk Assessment methodology aligns local and regional data with national data sources. It also takes a comparable and complimentary approach with the national-level assessment, to leverage connection points, enable best practice, and provide scope for learnings in future iterations.

Whilst the two assessments will be released around the same time, they are not directly comparable and will appropriately have noticeable differences, given they have different aims, purposes and data inputs. However, it is expected the themes identified will be broadly aligned. They also have important similarities, such as the emphasis on transparency, stakeholder engagement, and the use of robust scientific data to inform policymaking and resilience-building initiatives.

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The Tasmanian Government is committed to working with the Australian Government and other jurisdictions on future iterations of Tasmania's Risk Assessment as capacity for, and progression of, jurisdiction-level climate risk assessments in Australia continues to evolve.

1.3 Overview of this report

1.3.1 Target audience for this report

This report is primarily intended to support the Tasmanian Government and key stakeholders to inform adaptation priorities for the future. It is a technical report that has a strong focus on data and a detailed methodology. The accompanying high-level summary report provides a broad summary and will support the needs and interests of a broader audience, including those who are time poor and are looking for a bird's eye view of future challenges. Both reports describe the changing climate and adaptation priorities for Tasmania.

It is important to note that this report considers climate risks from a statewide perspective, and considers regions and domains impacted by those risks or opportunities within Tasmania.

Communities, businesses, and individuals are encouraged to use this Risk Assessment to better understand their relevant climate risk, opportunities, and potential areas for further analysis or adaptation efforts. While it is not expected that this Risk Assessment will replace the need for the assessment of climate risks at a sector, system or regional level, it is expected that it will be useful in informing more granular assessments where it is not specific enough to meet needs.

1.3.2 Outline of this report

This report details the Risk Assessment and identifies existing adaptation efforts, to help inform future adaptation planning by the Tasmanian Government and other relevant stakeholders. A summary of each chapter of this report is presented in Table 7:

Table 7: Report outline for Tasmania's Risk Assessment for Climate Change

Chapter	Description of content
Chapter 1: Introduction	This chapter presents the overview of the background and objectives of the Risk Assessment report, and how the report is structured.
Chapter 2: Methodology	The methodology chapter will outline the approach taken to different elements of this report. This includes approaches to the literature review, the climate risk framework used, the stakeholder engagement process, climate impact statements, climate scenario analysis, and the identification of climate adaptation priorities. Assumptions and limitations of the project will also be identified.
Chapter 3: Prioritising climate impacts for Tasmania	This chapter Provides a summary of all climate change risks and opportunities included in this report as well as the process used to identify and validate these risks and opportunities.
Chapter 4: Future trends and complex impacts	This chapter will examine how physical and transition climate hazards will evolve under different climate scenarios out to 2030, 2050 and (physical only) 2090, relative to current exposure levels. The complex interactions and cascading impacts associated with these hazards is also illustrated.
Chapter 5: Informing adaptation priorities for Tasmania	This chapter provides profiles for the priority climate impact statements across the natural, built, economic and social domains. This includes an overview of the hazard, exposure and vulnerability which determine the consequence rating for each risk. Current adaptation and resilience actions in response to these key climate change risks and opportunities are outlined, and the sectors or areas that are potentially accountable or responsible to respond to these risks. The adaptation urgency rating considers the consequence and adaptation response to provide an indication of the next steps for consideration.

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Chapter 6: Conclusions	The final chapter of the report will include a summary of the report, and findings to inform consideration of future climate adaptation action by the Tasmanian Government.
References	Citations in this report

1.3.3 What this report does not cover

While this report provides comprehensive analysis of statewide adaptation urgency for the next five years, the report does not recommend adaptation actions or provide a shortlist of risks for priority action. Rather, it aims to inform the Tasmanian Government and other entities' consideration of future adaptation actions by providing a clearer picture of the risks and opportunities Tasmania faces in grappling with climate change. As noted above, this report does not replace the need for localised or sector-specific risk assessments at a more granular level.

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2 Methodology

This chapter summarises the approach for the Risk Assessment, including:

- Section 2.1: Robust selection and prioritisation of inputs into the Risk Assessment
- Section 2.2 to 2.6: The climate risk framework and its four components that underpin the Risk Assessment.

Additional methodology details are provided in the **Technical Appendix**.

2.1 Methodology overview

The methodology for this Risk Assessment is based on international best practice including a climate-specific risk framework recommended in IPCC AR6 (IPCC AR6, 2021). A similar process has also been applied to climate opportunities. This chapter explains the four framework components (hazard, exposure, vulnerability, and response) in more detail, including the method for assessing each framework component in this Risk Assessment.

Under the methodology, the hazards, exposure and vulnerability applicable in the Tasmanian context are explored to identify and define climate risks and opportunities within each value domain, which are then prioritised based on further research and stakeholder inputs.

The impact statements that result from the above methodological assessment are then considered against the following adaptation assessment criteria:

- magnitude of consequence, which considers the degree of impact of the hazards, exposure and vulnerability
- current level of adaptation activity related to a risk or opportunity (response)
- the confidence in the evidence, which considers the type, quality, amount and consistency of the evidence and the degree of agreement between evidence.

These ratings are then used to establish an adaptation urgency rating for each risk or opportunity.

The climate risk framework used to inform the adaptation criteria assessment is designed to clearly identify the different factors influencing each risk or opportunity, and to enable effective consideration of areas for potential prioritisation for future adaptation activity.

2.1.1 Climate Risk Framework

The Risk Assessment explores risks and opportunities through the Simpson et. al climate risk framework, which has four components - hazard, exposure, vulnerability, and response:

- hazards include both the physical and transition drivers that cause risks and/or generate opportunities in a changing climate. These are evaluated for the current and future climate via climate scenario analysis (findings in Chapter 4)
- exposure is the climate changes the environmental and socio-economic domains are exposed to and where exposure exists now or in the future across the State
- vulnerability is the propensity or predisposition of an element, system, or society to be adversely affected. This encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt (IPCC, 2022).
- response is the adaptation and mitigation actions being undertaken that may reduce the consequence of a climate-related risk or enable the uptake of a climate-related opportunity.

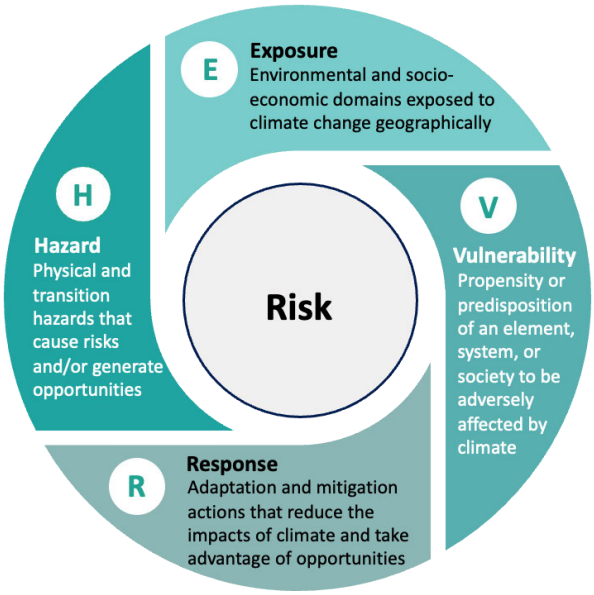

Figure 1: Climate Risk Framework and its four key components assessed in this report.

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Risks can arise and evolve from multiple causes, exposure, and vulnerability (e.g., existing conditions and susceptibilities). The direct and indirect drivers and potential consequences / impacts associated with risks should be considered when planning the response (e.g., mitigations, adaptation) to single and/or multiple risks (i.e., complex risks). This framework is also applicable for climate-related opportunities.

The framework defines risk as a combination of **hazard, vulnerability, exposure, and response** (Figure 1). Whilst previous climate-related studies may have evaluated these framework components individually or in limited combination, all four components have not previously been assessed collectively for Tasmania.

The four components of the climate risk framework, and the rating methodology used towards adaptation urgency for climate risks and opportunities, are described in further detail in the following subsections.

The technical details of the assessment methodology are explained further in the **Technical Appendix**.

2.1.2 Consideration of complex risks

2.1.2.1 Defining complex climate risks

The drivers and impacts of climate change are complex in nature. This means cross-sectoral partnerships and planning can be valuable, and a single adaptation action can have benefits across multiple value domains. Complex climate risks and opportunities describe the interactions between multiple climate change hazards, exposure, and vulnerability. Physical and transition risks influence each other (e.g., severe physical hazards and associated impacts may lead to heightened transition risk and vice versa).

There are three types of complex risks (Simpson, et al., 2021): compounding, cascading, and aggregate. Compounding climate risks are those associated with multiple hazards, whereas cascading climate risks are those associated with multiple impacts. Aggregate risks occur when a climate risk is associated with a risk unrelated to climate. The Risk Assessment assesses impact statements individually and also considers the interrelationships between different impact statements. Understanding the nature of risk complexity can support prioritisation of adaptation actions.

Table 8: Categories of complex risks.

Risk Type	Definition	Example
Compound	Risks that arise from the interaction of hazards, which can be characterised by single extreme events or multiple coincident or sequential events that interact with exposed systems or sectors.	A flood event caused by extreme rainfall fall on river catchments that were still saturated from earlier wet seasons. The event was started by extreme rainfall from a low-pressure trough. Additionally, onshore winds resulted in elevated sea levels along parts of the coastline. This hindered the drainage of the flood waters into the ocean, exacerbating the impact of the rainfall.
Cascade	One event or trend triggering others; interactions can be one way (e.g., domino or contagion effects) but can also have feedback; cascading risk is often associated with the vulnerability component of risk, such as critical infrastructure.	A bushfire event results in increased soil erosion. Health and property is impacted by the wildfires, and subsequently erosion impacts river ecosystems, property, and human wellbeing.
Aggregate	Aggregation occurs when risks with unrelated causes – including those not directly related to the climate – occur simultaneously.	An economic transition to higher levels of renewable energy using a renewable energy target (requiring increased transmissions to support generation), causes an increase in electricity prices in the short term. At the same time reduced hydro dam levels (or low level of other resources for generation) due to drought/weather conditions is increasing electricity prices. When aggregated, the impact to electricity prices is greater.

2.1.2.2 Approach to identifying and assessing complex risks in the Risk Assessment

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Adaptation actions to address the identified risks and opportunities for Tasmania will need to consider related hazards and impacts across all domains. Throughout the Risk Assessment, complex risks were assessed by:

- describing complex risks at the value domain level through the impact statements that are comprised of multiple hazards, exposure and vulnerability in Chapter 3 (i.e., cascading and compounding risks and opportunities)
- illustrating cascading impacts in Chapter 4 in the future trends assessment, where impacts across each domain are illustrated for individual hazards / drivers (i.e., illustrating cascading impacts)
- rating adaptation urgency for priority impact statements in the Chapter 5.

2.2 Hazards: Physical and transition

2.2.1 Hazards context

Climate hazards are the drivers associated with or the result of climate change, and are classified as either 'physical' or 'transition':

- physical hazards can be either acute climate events, often characterised by extreme weather, or chronic long-term shifts in climate patterns that have direct impacts
- transition drivers are the policy, regulation, technology development, reputation, and/or market shift that arise as a result of goals to decarbonise.

The Risk Assessment has adopted the physical and transition categories from the Taskforce for Climate-related Financial Disclosures (TCFD), the most widely adopted framework for assessing and reporting on physical and transition climate-related risks and opportunities (TCFD, 2023). This framework has recently been integrated into the International Sustainability Standards Board (ISSB) international climate standards, nature frameworks, and the national Australian Accounting Standards Board (AASB) climate standards. The TCFD framework categorises physical and transition hazards and drivers into six categories that are used in the Risk Assessment for alignment to international leading practice (Table 9). Also included is a transition opportunity category associated with energy and resource efficiency.

Table 9: The physical and transition hazards and drivers assessed, available climate scenarios, horizons including data sources and granularity.

Hazard /Driver	Sub-theme	Definition	Specific Hazard/Driver	
PHYSICAL HAZARDS	**Acute**	*From increasing intensity and/or frequency of extreme weather events*	• Storm surge • Bushfire • Extreme rain and floods	• Extreme heat • Dry spell • Frost
	Chronic	*From longer-term changes in the climate*	• Precipitation • Temperature	• Soil moisture • Sea level rise • Sea surface temperature
TRANSITION DRIVERS	**Policy and Legal**	*From existing and emerging policies, programs and regulations to address climate change*	• Emissions control mechanism (such as emissions price) • Emissions reduction policy • Renewable energy policy	• Litigation for non-compliance • Trade exposure risk • Climate governance
	Technology	*From emerging technologies to support the global transition to low emissions*	• Resilience opportunities through technology • Investment opportunities to enable future technology	• Advances in energy and resource efficiency • Capital cost of new technology • Circular economy opportunities
	Market	*From changing supply and demand as economies reaction to climate change*	• Increased supply chain costs • Changes in resource availability and demand	• Increased demand for renewable energy • Changes to markets for existing goods and services

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	Reputation	*From shifting public sentiment on climate change*	• Enhanced reputation due to increased renewable energy and Net Zero emissions	• Social licence and public perception • Expectations and relationships with other jurisdictions

These hazards can occur over multiple timeframes ranging from a single event or decision, to decades into the future. Physical and transition hazards and drivers and impacts are interlinked, having the capacity to influence one another both positively and negatively. A lack of policy and legal action may exacerbate chronic physical impacts of climate change over a long-time horizon, while the impacts of acute climate change such as greater frequency in extreme weather events can shift the public sentiment towards greater climate urgency.

2.2.2 Climate scenario analysis overview

2.2.2.1 Purpose of climate scenario analysis

Strategic decision making becomes difficult amidst uncertainty, and past information alone cannot be relied upon to understand future climate impacts. Climate scenarios provide a structured way of thinking through and making strategic choices despite the uncertainty. Climate scenarios are not predictions, however - they describe a range of possibilities for the future.

The Risk Assessment uses globally applicable climate scenarios developed by major bodies such as the Intergovernmental Panel for Climate Change (IPCC) and Network for Greening the Financial System (NGFS). These sector-agnostic climate scenarios describe how hazards evolve under planetary climate changes such as warming and emission increases and are leading practice choices made in collaboration with key stakeholders.

2.2.3 Components required for climate scenario analysis

Climate scenario analysis is a technical process, supported by qualitative literature where quantitative estimates of the changing climate are unavailable. The key method components required to estimate future changes in physical and transition hazards and drivers are:

- geographic boundary for the analysis of climate data (namely Tasmania and surrounding waters)
- choice of climate scenarios that explore how Tasmania is impacted by planetary changes in climate
- choice of time horizons (individual years and/or periods) to compare the future climate to the recent past
- climate model data and metrics (Technical Appendix 7.1).

2.2.4 Selection of climate scenarios

The choices for climate scenario sources are based on sources that are most widely adopted by all sectors, with a diverse range of distinct scenarios that can capture regional and sectoral representation, and sources that have transparent assumptions. The climate scenarios assessed cover three types of planetary futures, as summarised in Table 10**.**

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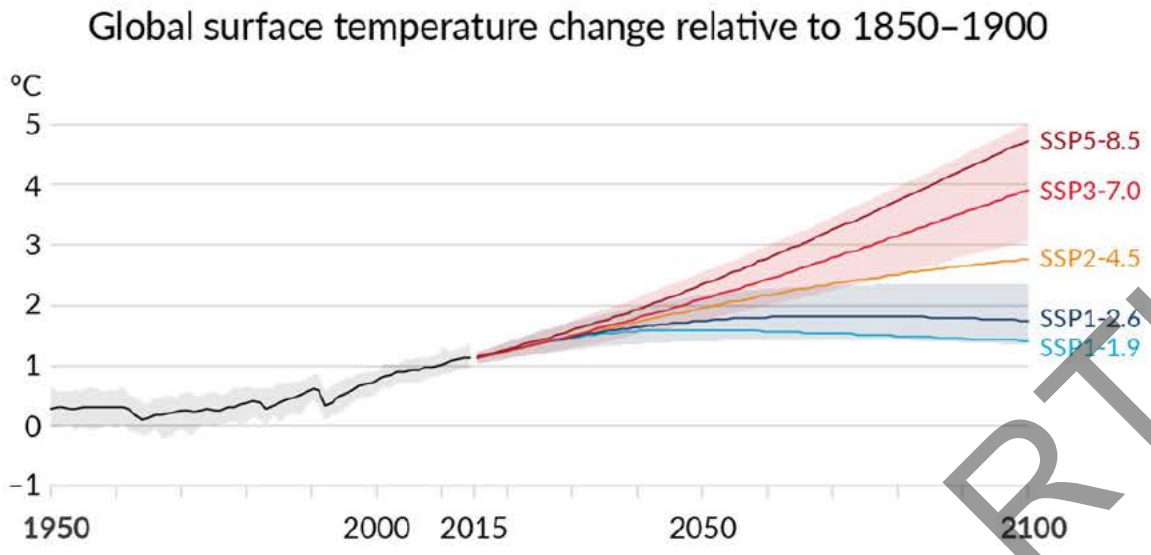

Figure 2: Global surface temperature change 1950-2100 as a difference to the 1850-1900 baseline period (IPCC AR6).

Table 10: Selected climate scenarios for the Risk Assessment with a brief description of changes at a global scale. SSP = Shared Socio-economic Pathways; NGFS = Network for Greening the Financial System; AEMO = Australian Energy Market Operator.

Scenario ambition and global warming at 2100	Modelled scenarios	Overview
High Emissions *(Physical risks dominate; global warming is 3 to 4ºC by 2100)*	• **Physical:** SSP3-7.0	***Baseline of how global emissions would evolve*** *if governments and markets make no changes to their existing policies and investments in low emissions technologies*
Moderate Emissions *(Insufficient decarbonisation; global warming 2 to 3ºC by 2100)*	• **Physical:** SSP2-4.5 • **Transition:** NGFS - Nationally Determined Contributions; Tasmania Reference Case; AEMO Progressive Changes	***Emissions are curbed based on existing policies and announced commitments,*** *including Nationally Determined Contributions, but fall short of meeting the Paris Agreement targets*
Low Emissions *(Transition risks and opportunities dominate; global warming 1.5ºC by 2100)*	• **Transition:** NGFS – Net Zero 2050; Tasmania Net Zero Target; AEMO Green Energy Export	***Ambitious emission reduction scenario*** *to meet the Paris Agreement, marked by global collaboration by governments, society, and industry to lead steep decarbonization*

2.2.4.1 Physical climate scenarios

Two Shared Social Pathways (SSP) scenarios were chosen for the physical climate scenario analysis. The Intergovernmental Panel on Climate Change Sixth Assessment Report (IPCC AR6) (IPCC, 2021) use five Shared Socio-economic Pathways (SSPs) that examine how global society, demographics and economics might change over the next century (Hausfather, 2018).

The physical scenario analysis assumed that the current climate represents a world close to 1.5ºC, and focused on two climate futures:

1. a future where current national targets and policies are met globally, and
2. a future with limited climate action to understand the extent of climate risk.

Many past and current climate assessments use a worst-case scenario climate future SSP5-8.5 as the highest physical climate scenario. Here, the SSP3-7.0 scenario was chosen in alignment with upper scenario choices at the national and

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jurisdictional level (as detailed in the Climate projections Roadmap for Australia, 2023). The reason for this is that there are a range of emission reduction actions being implemented globally making the higher emission pathway less likely.

The National Climate Risk Assessment has used Global Warming Levels as scenarios that can reach their warming thresholds at various times. In contrast, the Risk Assessment uses scenarios that are compared for the same time horizons (e.g., 2030). Both approaches can be related by global warming values along the scenario pathways.

2.2.4.2 Transition climate scenarios

The transition drivers were assessed using a combination of state scenarios, national and global socioeconomic models for moderate and low emission futures from the Network for Greening the Financial System (NGFS, 2024), and Australian Energy Market Operator (AEMO, 2023) scenario suites.

The transition climate scenarios focused on two climate futures, namely:

1. a future with ambitious efforts to decarbonise operations and value chains; global warming is limited to 1.5°C and nations together meet the Paris Agreement, and
2. a future with delayed decarbonisation and mitigation efforts (e.g., one where current national climate targets and policies for emission reduction are met).

It is worth noting that the draft Australian Accounting Standards Board climate disclosure standards 2023 (AASB, 2023) state that a transition scenario that represents future planetary warming of 1.5°C or less is to be included in climate scenario analysis.

2.2.5 Climate time horizons

To assess physical climate change risks and opportunities, the Risk Assessment assessed a baseline (recent past) horizon and three future time horizons (2030, 2050 and 2090). For transition risks and opportunities, a baseline horizon and two future horizons of 2030 and 2050 were assessed. Further details are provided in Table 11 below.

Table 11: Time horizons assessed in the Risk Assessment.

Climate theme	Baseline horizon	Future time horizons
PHYSICAL	• **1980 to 2014** (storm surge and sea level rise) • **1976 to 2005** (soil moisture) • **1995 to 2014** (all other metrics)	• **Short term 2030** (2020 to 2039 averaged) • **Medium term 2050** (2040 to 2059 averaged) • **Long term 2090** (2080 to 2099 averaged)
TRANSITION	• **2022**	• **Short term 2030** (single year) • **Medium term 2050** (single year)

The physical time horizons have an additional future horizon (2090) to capture changes in chronic impacts across the 21st century. The analysis of physical time horizons is the average of 20-year periods around the nominated horizon, as per leading practice to ensure climate signals are not solely inter-annual variability. Conversely, transition scenarios are underpinned by short term socio-economic decisions, and consequently the time horizons represent single years.

2.3 Exposure: Value domains and Geographical regions

2.3.1 Exposure context

The exposure component of the climate risk framework allows for exploration of *what* is exposed to the climate hazards. The exposure of physical and transition climate hazards varies widely in magnitude and direction of change across value domains and geographical regions. The climate scenario analysis (Chapter 4.1) highlights key regions of exposure to physical and transition hazards and drivers in the current and future climates.

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2.3.1.1 Value domains

The Risk Assessment evaluates impacts of a changing climate on Tasmania across four connected value domains that identify what is exposed to a changing climate. These domains also form the basis of the systems framework used for Australian Government's National Climate Risk Assessment and broadly align with those being used by other Australian jurisdictions.

The four value domains were divided into sub-domains, as described in the table below.

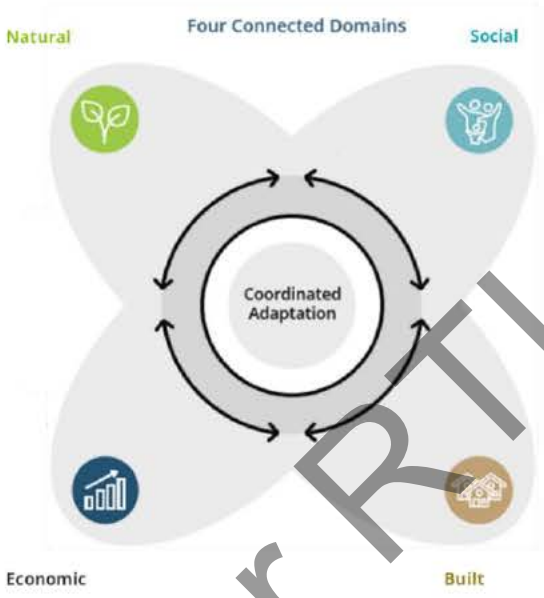

Figure 3: The Risk Assessment Value Domains

Table 12: Description of each of the four value domains and examples of the subdomains included within each.

Domain	Description	Subdomains
Natural	The landscapes, seascapes, forest and woodlands, ecosystems, and diverse plant and animal life within Tasmania and its oceans	Biodiversity, coasts, inland water, land, marine, natural heritage
Social	Tasmanian people, their communities, their culture and cultural values, Aboriginal communities and their culture, institutions, governance, support systems and their interactions	Culture, employment and financial wellbeing, health and wellbeing, housing, indigenous culture, values and principles, skills and education, social cohesion, social welfare services, sports, and recreation
Economic	The production and consumption of goods, productivity, industry, financial systems, and the economy	Agriculture, forestry and fishing, banking and finance, charities and not-for-profits, construction, education and training, government sector, healthcare and social assistance, insurance, manufacturing, mining, services (including tourism), small to medium enterprises, trade sector
Built	Human-made surroundings, structures and any supporting infrastructure created using material, spatial and human resources to facilitate life, health, work and play, infrastructure systems, including digital	Buildings and structures, cities and towns, communications and ICT, education infrastructure, emergency services, energy, flood and coastal defences, food and grocery assets, health care and medical assets, transport, utilities

Climate change impacts these four value domains and their sub-domains in different ways across the state. Recognising spatial variability of climate change and its impacts, this report also factors in consideration of Tasmania's different geographic regions.

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2.3.1.2 Geographical exposure regions

In the Risk Assessment, physical climate hazards were assessed across Tasmania at a LGA to region scale, and transition drivers at a state scale. Climate exposure is assessed (when relevant) with reference to onshore and offshore geographic regions, as follows:

- **Tasmania main island:** the state is divided into North (central, east, and west), South (the greater Hobart region and west), Central and East
- **King Island and Flinders Island** are distinguished from the main island as they experience different climate impacts and have different requirement for and access to adaptation options
- **the marine region** has been included given its criticality to Tasmania through biodiversity and supporting the economy.

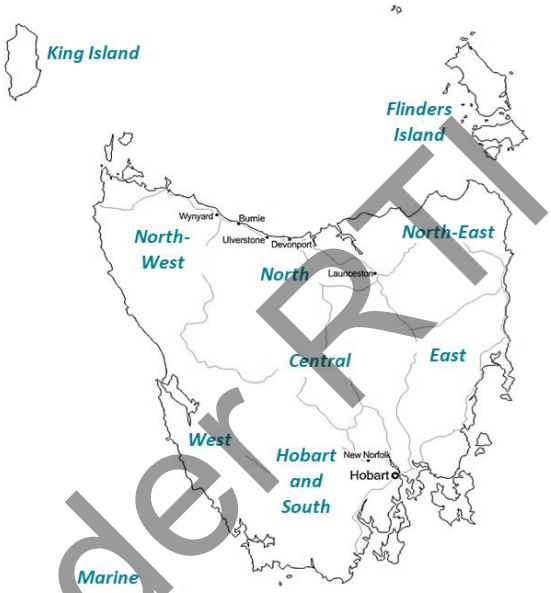

Figure 4: Map of geographic regions referred to throughout the report

The division of land and marine regions within the assessment is aligned with widely adopted definitions for Tasmania and surrounding waters. On land, the Risk Assessment is focused into groupings of LGAs (e.g., 'Central' includes Central Highlands, Northern Midlands, and Southern Midlands). The assessment of aquatic ecosystems for marine and coastal waters for the Risk Assessment is based on the mesoscale bioregionalisation (meso-regions) detailed in the Integrated Marine and Coastal Regionalisation of Australia (IMCRA v4.0) framework (Commonwealth of Australia, 2006). Full details of the exposure regions can be found in the Technical Appendix.

2.4 Vulnerability: Vulnerability to a changing climate

2.4.1 Vulnerability context

The vulnerability component of the climate risk framework allows for exploration of *why* the value domains and sub-domains are susceptible to climate hazards. Vulnerability can differ between regions, communities, populations and individuals.

Vulnerability is related to other (non-climate related) factors that may make an individual, system or community more susceptible to a climate hazard or transition driver. For example, workers who work outdoors are likely to be particularly vulnerable to an increase in heatwave days into the future. Additionally, industries that rely on these workers are also likely to be economically vulnerable to heatwave days due to flow on effects.

Examples of vulnerability that can worsen the exposure of certain values to climate hazards in Tasmania are:

- being located on a remote island (e.g., King Island) increases vulnerability to disruption of delivery of food, supplies and materials compared to the Tasmanian main island
- elderly populations, and those with some chronic health issues, being more susceptible to extreme heat conditions
- inadequate resources for coastal management (land and ecosystem habitats) may worsen impacts of coastal erosion associated with storm surge
- poorly maintained roads and other critical infrastructure may be more vulnerable to flooding.

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Caveat: In the Risk Assessment, it is important to note that the climate hazards that are modelled out into the future (i.e., climate scenario analysis for the exposure of regions across the state). However, all other aspects of the assessment are based on current day and historical information.

2.4.2 Identifying climate-related vulnerability

In the Risk Assessment, Tasmanian-specific vulnerabilities were initially identified through desktop analysis. These were then further investigated through the stakeholder consultation sessions (workshops and interviews) to refine and contextualise the nuance across different systems and regions within Tasmania.

Examples of vulnerability identified include aging infrastructure, remote communities and age groups (e.g., youth), increasing demand on energy and water services, existing issues associated with invasive species, the major role of agriculture, aquaculture and forestry in the Tasmanian economy, connection to Country that can impact culture / heritage, and remote community accessibility.

These vulnerabilities and many others are detailed in the priority climate impact statements.

2.5 Response: Identifying adaptation activities

2.5.1 Response context

The response component of the climate risk framework explores the adaptation and mitigation actions undertaken at state levels in response to the climate hazards, exposure, and vulnerability.

Adaptation responses can include a range of options, such as policies, strategies, and plans, as well as engineering solutions, capacity building and investment. *Tasmania's Climate Change Action Plan 2023-25* includes an Adaptation and Resilience Priority Area intended to "manage the risks and take advantage of the potential opportunities from climate change" to support planning and decision making and build Tasmania's resilience to the impacts of climate change.

Sometimes, adaptation actions can have unintended negative consequences that result in increased risk or vulnerability. This is known as maladaptation. There are also potential limits to adaptation where it may not be possible to adapt to a particular impact of climate change. This highlights the importance of quickly identifying adaptation priorities and then take effective implementation action, to then enable the best possible adaptation outcomes for the state.

2.5.2 Identifying existing adaptation measures in Tasmania

Any adaptation actions including adaptation and resilience policies, programs, and tools already in place were identified through:

- **Desktop research:** Desktop research was conducted using publicly available documents, and where possible additional internal government documents were used to establish an understanding of current adaptation measures. In addition, where appropriate information included in the First Pass phase of the Risk Assessment was used to determine additional adaptation measures which existed to address specific impacts of climate change.

- **Stakeholder engagement:** Workshops were conducted with key stakeholders with expertise in each value domain to validate and build on research into existing adaptation measures. These workshops provided valuable insights into the practical implementation and impact of adaptation actions currently in place. The workshops also aimed to gather input and feedback on the adaptation urgency rating of impact statement and adaptation priorities for Tasmania. Throughout this process, over 100 stakeholders were engaged ensuring practical experience and expertise was incorporated in identifying adaptation measures. When identifying adaptation measures currently in place, research was limited to sources of information specifically applicable to Tasmania. The list of sources and types of sources is provided in the Technical Appendix.

These two lines of evidence provided a list of existing adaptation measures, as described below.

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2.5.3 Caveats in evaluating adaptation shortfall

The adaptation shortfall rating for each statement reflects whether any current or recent adaptation measures have been identified in relation to that climate risk or opportunity.

- The research conducted for this review was primarily based on desktop research and stakeholder consultation. As such, it may not encompass an exhaustive list of every adaptation measure currently in place in Tasmania.
- This review only considers activities that have recently been or are actively being implemented and does not include planned or future programs. Consequently, whilst effort was made to capture a comprehensive picture of current adaptation measures, there may be relevant initiatives that were not identified or included in this analysis.
- The assessment of adaptation activities does not attempt to assess the effectiveness or appropriateness of the adaptation activities identified in managing the climate risk.
- It is important to note that an implemented climate adaptation measure can also exacerbate exposure or vulnerability to climate changes if it is inappropriate or ill-targeted, which can lead to maladaptation or unexpected negative consequences.

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3 Assessing climate impacts for Tasmania

3.1 Summary of climate impacts on Tasmania

The impacts of climate change on Tasmania result from a combination of climate hazards, exposure, and vulnerability. These impact statements may represent risks, opportunities, or both, which is why they are termed 'impact statements' rather than 'risk statements'.

This chapter includes:

- the process for development of Tasmania's impact statements through research and stakeholder inputs
- the full list of impact statements per value domain, including highlighting priority impact statements.

The impact statements identified through desktop research and stakeholder engagement can be categorised into physical and transition climate-related themes across different value domains (Figure 5). The summary in Figure 5 shows that climate is impacting all domains, and that climate presents both risks and opportunities for the State.

Localised or sector specific risk assessments may cover similar themes at a more granular level. These themes can be described in more detail for individual communities, government departments and businesses as they evaluate their own climate-related priorities.

	Natural	Social	Economic	Built
RISKS	▪ **Acute & Chronic:** Inland water, terrestrial, alpine, marine and native ecosystems & species. ▪ **Technology:** Renewable energy development impacting the environment.	▪ **Acute & Chronic:** Individual mental health & wellbeing, social cohesion and community wellbeing. ▪ **Acute & Chronic:** Physical safety, health and wellbeing. ▪ **Acute & Chronic:** Cultural heritage (including Aboriginal). ▪ **Policy & legal:** Risks to health and wellbeing, and social cohesion due to poor governance and increased population associated renewable energy development.	▪ **Acute & Chronic:** Land and marine based primary sectors (agriculture, forestry, fisheries, viticulture). ▪ **Acute:** Insurability of, and damage to, businesses, and public sector and private assets. ▪ **Acute:** National and international supply/distribution networks. ▪ **Policy & Legal:** Slow, ineffective / no climate action. ▪ **Market:** Risks to businesses and public organisations due to supply chain costs in a low emission market.	▪ **Acute & Chronic:** Built environment damages, healthcare & emergency services, transportation networks, sanitation & sewage systems, contaminated sites, ports & coastal infrastructure.
OPPORTUNITIES	▪ **Technology:** Optimise waste systems. ▪ **Policy & Legal:** Support water quality and biodiversity programs through carbon market participation. ▪ **Technology:** Renewable energy development impacting the environment.	▪ **Policy & Legal:** Increased skills and employment for adaptation and emission reduction climate jobs. ▪ **Policy & Legal:** Social cohesion, health and wellbeing through resilience improvements. ▪ **Technology:** Opportunity to improve financial wellbeing, and health and wellbeing through energy efficient housing for low-income households.	▪ **Acute & Chronic:** Land and marine based primary sectors (agriculture, forestry, fisheries, viticulture). ▪ **Policy & Legal / Technology:** Opportunities for economic growth via renewable energy supply. ▪ **Policy & Legal:** Opportunities for business through new revenue streams / offset schemes. ▪ **Technology:** Businesses implementing new technology to reduce emissions.	▪ **Policy & Legal:** Public and active transport emission reduction. ▪ **Policy & Legal:** Flexibility within electricity infrastructure from increased renewable energy generation. ▪ **Technology:** Infrastructure (and transport) development to reduce emissions and support a circular economy.

Figure 5: Summary of climate-related risk and opportunity themes for Tasmania.

3.2 Climate impact statements methodology

Each climate impact statement describes a climate risk and/or opportunity, categorised by value domain and physical/transition climate theme. The types of impacts per domain include, for example:

- **Natural**: impacts on the environment and ecosystems.
- **Social**: impacts on people's health, safety, and wellbeing; impacts on community and cultural values, including community displacement, isolation and cohesion, protection of cultural values.

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- **Economic**: impacts such as direct damage/loss of assets and/or interrupted business activity, indirect industry, or employment impacts.
- **Built:** impacts on the ability to maintain core functions and service delivery, such as critical infrastructure and services, essential services.

Information and stakeholder input was gathered from July 2023 to August 2024 and includes past documentation, information released following this was not considered in this assessment. The process undertaken to identify and prioritise the impact statements for Tasmania involved the following steps:

- *Step 1:* Initial identification of climate impacts for Tasmania via desktop research, summarised into a large set of climate impact statements.
- *Step 2:* The impact statements were explored, expanded on, refined, and prioritised through extensive stakeholder consultation, resulting in 88 impact statements.
- *Step 3:* Building on the outcomes of the first two steps, 40 climate impact statements were finalised, with approximately 10 in each value domain. These were prioritised as most impactful to the state (acute and chronic combined). These priority statements are evaluated further in Chapter5 to help inform adaptation priorities for Tasmania.

Caveat: This report looks across domains, scenarios, horizons, and geographical regions to help inform adaptation priorities at the state level. The impact statements focus the report but are not a detailed and comprehensive overview of all possible climate impacts impacting each domain. Individual organisations, government departments, research bodies, and community groups will likely have a more in-depth understanding of granular impacts associated with climate change.

3.2.1 Step 1: Initial identification of climate impacts for Tasmania via desktop research

Climate risks and opportunities for Tasmania were categorised by value domain, as well as physical and transition risk and opportunity themes. An indicative future trend for each statement was identified, based on the research findings. Literature sources were prioritised as per Figure 26 and were predominately sourced from government strategies, research reports, and other credible forms of documentation and information. The literature sources in the desktop research that supported the initial climate impact statements for the state were selected based on the following criteria and are listed in the Technical Appendix.

Literature sources include:

- literature that explicitly mentioned physical hazards and/or transition drivers for Tasmania
- sources that are recent (typically within the past 5 to 10 years)
- a range of sources that covered climate impacts across the four domains
- credible sources (e.g., Tasmanian government department reports, local council reports, and peer-reviewed literature)
- key global resources to ensure wider methods and impacts alignment (e.g., IPCC reports, New Zealand and UK climate risk assessment reports).

3.2.2 Step 2: First pass stakeholder consultation to prioritise climate impacts for Tasmania

Multiple stakeholder groups were engaged through late 2023 and early 2024. Stakeholder sessions included workshops (up to 36 participants in each workshop, across government, local government, and industry), surveys, and one-on-one interviews. Stakeholders across all regions in Tasmania and associated with all four value domains were consulted as part of the process**.**

The objectives of the stakeholder consultation were to:

- inform key stakeholders about the statewide climate change risk assessment
- discuss and confirm preliminary climate impact statements in the four key value domains and the connections between these statements
- hear valuable insights from stakeholders' areas of interest and how the understanding of climate change impacts that may affect that area may be improved.

The outcomes of the first pass desktop research and stakeholder consultation supported the remainder of the Risk Assessment by helping to expand, confirm, and prioritise the climate impact statements for evaluating adaptation

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actions. The stakeholder consultation activities provided critical insights into the impacts on climate change across the state to support interpretation of the hazards over time and existing adaptation actions.

3.2.3 Step 3: Climate impact statements for Tasmania

Stakeholder voting, scientific and sectoral expertise, and further research used to prioritise 40 impact statements for Tasmania. The prioritised list of narrative statements was developed with consideration of the following:

Stakeholder Consultation – outputs from the prioritisation activity run in the stakeholder consultation sessions were considered alongside written input (stakeholder survey and emails). Stakeholders also provided additional documentation that addressed some of the initial knowledge gaps.

- **Research** – a review of the available literature on climate change impacts, response frameworks that manage the impacts and any climate scenario analysis relevant to Tasmania.
- **Scientific Expertise** – our scientific and technical expertise, combined with a detailed understanding of the assessment methodology and criteria allowed us to assess the suitability of narrative statements. Considerations include:
    - Whether the drivers and impacts are supported by evidence, within Tasmania or in other regions
    - Understanding of the magnitude of impact in the Tasmanian context

The following tables in Chapter 3.3 illustrate the full list of impact statements by value domain. The priority statements, **shown in blue shading** are explored in further detail in chapter 5.

3.3 Long list of climate impact statements per value domain

3.3.1.1 Climate impact statements for the natural domain

Table 13: Natural domain climate impact statements

R/O	Climate Theme	Risk Type	Impact Statement
R	Physical	Acute	Risks to inland water ecosystems and species (lakes and riverine) due to changes in extreme weather events (extreme rain and floods, bushfires, extreme heat, storms) affecting water availability, water quality, soil erosion and sediment transport.
		Chronic	Risks to inland water ecosystems and species (lakes and riverine) due to changes in chronic rainfall and temperature, drought conditions affecting water availability, water quality, soil erosion and sediment transport.
R	Physical	Acute	Risks to terrestrial ecosystems and species due to extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) causing the fragmentation of, damage to, or loss of habitats and leading to ecosystem shifts/changes.
		Chronic	Risks to terrestrial ecosystems and species composition/stability due to changes in chronic rainfall and temperature, drought conditions, water availability and evaporation impacting resilience and leading to ecosystem shifts/changes.
R	Physical	Acute	Risks to coastal ecosystems and species (beaches, sand-dunes, wetlands, and estuaries) due to extreme weather events (storm surge) causing the fragmentation of, damage to, or loss of habitats and leading to ecosystems shifts/changes.
		Chronic	Risks to coastal ecosystems and species (beaches, sand-dunes, wetlands, and estuaries) due to ongoing sea level rise causing the fragmentation of, damage to, or loss of habitats and leading to ecosystem shifts/changes.
R	Physical	Acute	Risks to marine ecosystems and species due to acute hazards (marine heat waves) affecting nutrient availability and growing conditions, species composition, resilience/recovery and leading to ecosystem shifts/changes.
		Chronic	Risks to marine ecosystems and species due to chronic changes (ocean temperature, acidification, oceanic mixing) affecting nutrient availability and growing conditions, species composition, resilience/recovery and leading to ecosystem shifts/changes.
R	Physical	Chronic	Risks to native ecosystems and species due to chronic temperature/precipitation changes enhancing biosecurity risks through the spread, survival and establishment of invasive species, pests, pathogens, and diseases.
R	Physical	Chronic	Risks to alpine ecosystems and species composition due to changes in chronic rainfall and temperature, snow cover and drought conditions.
R	Transition	Technology	Risks due to the mining of critical minerals impacting biodiversity, inland water, terrestrial ecosystems, marine ecosystem, and natural heritage.
R/O	Transition	Policy & Legal	Risks and opportunities due to renewable energy development impacting terrestrial biodiversity and natural heritage
O	Transition	Policy & Legal	Opportunities to optimise waste systems to reduce impacts on the environment, including reducing waste to landfill, improved collection, and increased recyclability for products.

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O	Transition	Policy & Legal	Opportunities to support improved water quality and biodiversity through carbon market participation and projects with co-benefits.
R	Physical	Chronic	Risks to ecosystem services (including natures ability to clean air and water, decompose waste material and pollinate plants) due to changes in chronic rainfall and temperature resulting in changes to/loss of ecosystem services.
R	Physical	Chronic	Risks to carbonate-based marine organisms due to increased ocean acidification from rising atmospheric CO_2 concentrations.
R	Physical	Chronic	Risks to threatened and endangered species that rely on Tasmania's offshore islands (i.e., Bruny, Maria, Hunter, Macquarie, etc...) for survival, but are threatened by sea level rise, changes to terrestrial and marine habitats, and decline in ecosystem productivity.
R/O	Physical	Acute	Risks to natural heritage (natural features, ecosystems, landscapes, geomorphology, and biological diversity) due to extreme weather events (storms, extreme rain, floods, and bushfires).
		Chronic	Risks and opportunities to natural heritage (natural features, ecosystems, landscapes, geomorphology, and biological diversity) due to changes in chronic rainfall and temperature.
R	Transition	Policy & Legal	Risks due to hydrogen industry development impacting biodiversity, inland water, and marine ecosystems.
O	Transition	Policy & Legal	Opportunities to support improved biodiversity, water quality and air quality through urban greening.

3.3.1.2 Climate impact statements for the social domain

Table 14: Social domain climate impact statements

R/O	Climate Theme	Risk Type	Impact Statement
R	Physical	Acute	Risks to social cohesion and community wellbeing due to extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) that displace or isolate individuals, families, and communities.
R	Physical	Acute	Risks to mental health and wellbeing due to changes in extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) causing trauma and impacting identity, autonomy, wellbeing/belonging.
		Chronic	Risks to mental health and wellbeing due to ongoing sea level rise, changes in chronic rainfall/temperature causing trauma and impacting identity, autonomy, wellbeing/belonging.
R	Physical	Acute	Risks to physical safety, health, and wellbeing due to changes in extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) impacting heatwaves, water availability, natural resource (food and materials) quality/accessibility and the spread of diseases.
		Chronic	Risks to physical safety, health, and wellbeing due to changes in chronic rainfall/temperature impacting heatwaves, water availability, natural resource (food and materials) quality/accessibility and the spread of diseases.
R	Physical	Acute	Risks to cultural heritage including Aboriginal cultural heritage due to changes in extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) impacting sites.
		Chronic	Risks to cultural heritage including Aboriginal cultural heritage due to ongoing sea level rise impacting sites.
R	Transition	Policy & Legal	Risks to social cohesion due to the inability of institutions and governance systems to manage climate risks.
R	Transition	Policy & Legal	Risks to social cohesion, and health and wellbeing due to existing services being insufficient to meet the needs of a growing population (driven by renewable energy development and new industries that support emissions reduction in Tasmania).
O	Transition	Policy & Legal	Opportunities for increased skills and employment with business development for new and emerging industries that provide adaptation and resilience solutions.
O	Transition	Policy & Legal	Opportunities for social cohesion, health and wellbeing through adaptation and resilience actions, including across domain co-benefits.
O	Transition	Policy & Legal	Opportunities for increased skills and employment with renewable energy development and new industries.
O	Transition	Technology	Opportunities to improve financial wellbeing, and health and wellbeing through energy efficient housing for low-income households.
R	Physical	Acute	Risks that emergency services (SES, medical, firefighting, police) and management systems become overwhelmed due changes in extreme weather events (bushfires, floods, storms and storm surge), both within state and simultaneous/overlapping events across other states limiting the availability to borrow resources (i.e. fire fighters and equipment from interstate).

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R	Physical	Acute	Risks to health and wellbeing from poor air quality due to extreme weather events (bushfires, storms, and extreme heat) and an increase in favourable meteorological conditions (i.e., heat waves, temperature inversions and atmospheric stagnation) for extreme air pollution (i.e., high ozone, nitrous oxides and particulates/smoke).
R	Transition	Policy & Legal	Risk that adaptation policies aren't implemented, sustained, or are insufficient due to political disagreements, or that impacts are exacerbated (all domains) due to inadequate planning, response policies and frameworks.
R	Transition	Policy & Legal	Risks to social cohesion through development of renewable energy project without social licence.
R	Transition	Reputation	Risks and opportunities to financial wellbeing due to public perceptions on climate action in Tasmania impacting businesses.

3.3.1.3 Climate impact statements for the economic domain

Table 15: Economic domain climate impact statements

R/O	Climate Theme	Risk Type	Impact Statement
R	Physical	Acute	Risks to businesses and public organisations due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) affecting assets, resources, site access and supply/distribution networks.
R	Physical	Acute	Risks to national and international supply/distribution networks due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) leading to disruptions and delays.
R	Physical	Acute	Risks to the insurability of businesses, public sector, and private assets due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge).
		Chronic	Risks to the insurability of businesses, public sector, and private assets due to chronic changes in temperature, precipitation, and ongoing sea level rise.
R/O	Physical	Acute	Risks to land-based primary sector (agriculture, forestry, viticulture) productivity due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms) damaging crops/produce, impacting availability and prices.
		Chronic	Risks and opportunities to land-based primary sector (agriculture, forestry, viticulture) productivity due to changes in chronic rainfall, temperature and drought conditions impacting water availability, growing season length, and growing conditions.
R/O	Physical	Acute	Risks to ocean-based aquaculture and fisheries due to acute hazards (marine heat waves) affecting nutrient availability and growing conditions, species composition and the spatial distribution of fish stocks, along with growing conditions/productivity/health of aquaculture sites.
		Chronic	Risks and opportunities to ocean-based aquaculture and fisheries due to changes in chronic temperature, ocean temperature and acidification impacting the spatial distribution of fish stocks, operations, along with growing conditions/productivity/health of aquaculture sites.
R	Transition	Policy & Legal	Risks of slow, ineffective or no action to support emissions reduction within Tasmania limiting business's ability to respond to emissions reduction requirements limiting economic growth.
R	Transition	Market	Risks to businesses and public organisations due to supply chain costs as organisations adjust to a low carbon economy.
R/O	Transition	Technology	Risks and opportunities for business through the implementation of new technology to reduce emissions (including fugitive/agriculture/industrial/fuel switching).
O	Transition	Policy & Legal	Opportunities for economic growth through increased renewable energy generation.
O	Transition	Policy & Legal	Opportunities for business through new revenue streams available from carbon markets.
R/O	Physical	Acute	Risks and opportunities posed by migration to Tasmania from other countries and Australian states.
R/O	Physical	Chronic	Risks to tourism due to seasonality changes, with potential knock-on effects to social, natural, economic domains. Impacts and opportunities to tourism from broader geopolitical climate change impacts (i.e., political, and social unrest in other countries due to food insecurity and water stress).
R	Transition	Policy & Legal	Risks to economic growth due to delayed adaptation and maladaptation as a result of knowledge gaps and under-investment in capacity building.
R	Transition	Policy & Legal	Risks to financial market stability due to geopolitical risks and climate risks.
R	Transition	Policy & Legal	Risk of legal implications for government and businesses due to inadequate/misaligned adaptation policies and measures.
R	Transition	Policy & Legal	Risks and opportunities to productivity from carbon price, including trade risks associated with international carbon prices.
R	Transition	Policy & Legal	Risks to economic activity and business productivity as high emissions asset are retired.
R/O	Transition	Technology	Risks and opportunities for investment, access to capital and productivity for business in new and emerging industries that provide adaptation and resilience solutions.

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R/O	Transition	Market	Risks and opportunities for businesses as consumer preferences and purchasing requirements shift towards a low carbon economy.
O	Transition	Policy & Legal	Opportunities for economic growth from new industries through hydrogen market participation.

3.3.1.4 Climate impact statements for the built domain

Table 16: Built domain climate impact statements

R/O	Climate Theme	Risk Type	Impact Statement
R	Physical	Acute	Risks to health care and emergency services availability due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms) causing a rise in event-related emergency and health issues.
R	Physical	Acute	Risks to the built environment (buildings/structures) due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms).
		Chronic	Risks to the built environment (buildings/structures) due to changes in chronic temperature, precipitation, and ongoing sea level rise.
R	Physical	Acute	Risks to contaminated sites (landfills, mining areas, polluted land) due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) and causing damage and increased capital expenditure.
		Chronic	Risks to contaminated sites (landfills, mining areas, polluted land) due to changes in chronic temperature, precipitation, and ongoing sea level rise.
R	Physical	Acute	Risks to stormwater and wastewater due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) causing damage and increased flow.
		Chronic	Risks to stormwater and wastewater due to changes in chronic precipitation and ongoing sea level rise causing damage and increased flow.
R	Physical	Acute	Risks to ports and coastal infrastructure due to extreme weather events (storm surge, winds, storms).
		Chronic	Risks to ports and coastal infrastructure due to ongoing sea level rise.
R	Physical	Acute	Risks to transportation networks (roads/railways/airports) due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, winds).
		Chronic	Risks to transportation networks (roads/railways/airports) due to changes in chronic temperature, precipitation, and ongoing sea level rise.
O	Transition	Policy & Legal	Opportunities for public and active transport reducing emissions, with associated co-benefits for individuals and some businesses.
O	Transition	Policy & Legal	Opportunities for improved flexibility for energy generation from increased renewable energy generation.
O	Transition	Technology	Opportunities for infrastructure development to increase circular economy.
O	Transition	Technology	Opportunities to reduce transport emissions through introduction of more low emissions vehicles.
R	Physical	Acute	Risks to digital and telecommunications infrastructure due to increased intensity and frequency of extreme weather events (extreme heat, extreme winds, storms, and lightning) impacting the physical mediums through which telecommunications and internet traffic flows (cables, satellites, microwaves, and mobile technology).
R	Physical	Acute	Risks to electricity infrastructure (hydroelectricity, wind farms, distribution networks) due to increased intensity and frequency of extreme weather events (bushfires, floods, extreme rain, storms, winds) causing damage and increased capital expenditure.
		Chronic	Risks to electricity infrastructure (hydroelectricity, wind farms, distribution networks) due to changes in chronic temperature and precipitation affecting water availability, reduced efficiency, and increased capital expenditure.
R	Physical	Chronic	Risks to subterranean and surface infrastructure from land subsidence resulting from chronic temperature and rainfall changes, increased drought conditions and the potential overextraction of groundwater aquifers.
R/O	Physical	Acute	Risks and opportunities to future urbanisation that future urbanisation combined with physical climate changes that could amplify or diminish physical risks (i.e., urban heat island effect, surface runoff and reduced infiltration leading to flooding), impact pollution, sanitation, and health-related conditions.
R	Transition	Policy & Legal	Risks to electricity system reliability and security from increasing renewable energy generation.
R	Transition	Technology	Risks due to increased electricity demand from duel switching impacting the generation, and transition and distribution networks.
O	Transition	Policy & Legal	Opportunities for infrastructure improvement through investment in low emissions technology.
O	Transition	Policy & Legal	Opportunities for improved climate resilience of cities and towns by the inclusion of sustainability principles in regulations, standards, and building codes that improves efficiency requirements.
O	Transition	Technology	Opportunities for energy efficiency improvements to economise and lower the demand for energy.
O	Transition	Technology	Opportunities to improve water infrastructure through improved water recycling technology implementation

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4 Future trends and complex impacts

4.1 Summary of future climate physical and transition projections

The purpose of this chapter is to provide the data and evidence-based evolution of physical and transition climate hazards and drivers that are important for the State. These projections form a key part of the rationale used when defining the consequence ratings of each impact statement. The summary findings are in Table 17 and Table 18 below.

Table 17: Summary of future physical climate projections for Tasmania by 2030 under the SSP3-7.0; high emission scenario.

Physical climate hazard	Model projections by 2030 under the high emission SSP3-7.0 scenario[1]	Trends and impacts for Tasmania
Chronic long-term temperature rise	Annual average temperature is projected to increase by up to 2.5°C.	Chronic warming impacts seasonal temperature and rainfall patterns, and drives acute changes (e.g., heatwaves, bushfire risk), that will have major impacts on the natural environment, health and wellbeing of communities and thresholds for the built environment and emergency management.
Chronic long-term rainfall and soil moisture change	The total annual rainfall is projected to decline by 7mm (state average), driven mainly by increases across southern and western regions during winter, but decreases across the remainder of the State. Soil moisture content is projected to decline by up to 3 to 5per cent in Launceston and the north-west of the state across all horizons but increase by 3 to 6per cent in Hobart and the east of the state.	A warmer state can change seasonal rainfall patterns and total annual rainfall, leading to direct impacts on the natural domain and disruptions to other domains that are reliant on natural water supplies. Rainfall patterns also impact all value domains, as well as soil moisture, air quality, and transport.
Increases in the severity of acute extreme heat conditions	Highest annual temperatures increase by up to 6.9ºC, with approximately 5 additional days annually over 30ºC annually, particularly for King Island, Flinders Island, and the State's northern regions.	More frequent and/or intense periods of extreme heat that impacts health and wellbeing, energy and cooling, ecosystems and biodiversity, and economic disruptions associated with outdoor production.
Increases in the severity of acute extreme rain and flood conditions	Associated with inland flooding, extreme rain days (over 20mm in a day) will occur 21per cent more frequently (particularly the eastern half of the State) and extreme rain intensity increases by up to 9per cent across the State.	Increases in the intensity and frequency of flood and extreme events lead to major delays, disruptions and damages across all value domains, including increasing repair and insurance costs and impacts on biodiversity habitats and ecosystems.
Increases in the severity of acute bushfire and wind conditions	Models project up to an additional 5 days annually with favourable conditions for bushfire events, with up to 10per cent increase in bushfire intensity. Mean wind speeds and extreme wind gusts are projected to increase during the 21st century, particularly across LGAs in the north of the state and the islands.	Increases in bushfire occurrence have direct health consequences and impact emergency services preparedness and disaster reduction. Further, like all climate extremes, increased risk of bushfires means the State's infrastructure (e.g., buildings, transport) is more prone to damages and disruptions, and insurance risks.
Chronic long-term sea level rise and increases in acute extreme storm surge events	Sea levels are projected to rise by up to 10 cm by 2030. Sea level rise is not uniform around the Tasmanian coastline with the greatest increases projected for LGAs in Hobart, and the east and northeast. The 100-year storm surge event (typically 2.1 to 3.2 m high) along the Tasmanian coastline is projected to occur up to 1.4 times as often by 2030.	As the planet warms, sea level rises and storm surge/ extreme wave events are becoming more frequent and severe, leading to the deterioration of coastal boundaries and associated losses across ecosystems, operations, and infrastructure along coastlines.

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Physical climate hazard	Model projections by 2030 under the high emission SSP3-7.0 scenario[1]	Trends and impacts for Tasmania
Chronic long-term warming of Tasmania's waters and increases in ocean acidification	Sea surface temperature is projected to increase by up to 0.9ºC by 2030, with the largest increases occurring in waters on the East and North-east coast. Similarly, sea surface acidity is projected to steadily increase in waters around the State.	Continued warming of Tasmanian coastal waters and marine heatwaves, along with chronic increases to ocean acidity, are having major impacts on the natural environment including the destruction of marine ecosystems, the incursion of more northerly species, and associated impacts for ocean aquaculture, fisheries, and local communities.

[1] Findings for physical climate projections under the SSP2-4.5; moderate emission scenario are also presented within this Chapter.

Table 18: Summary of future transition climate projections for Tasmania.

Transition climate drivers	Model projections by 2030 under a low emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario	Trends and impacts for Tasmania
Changes to policy and legal driver	Under the lower emission 1.5-Cdegree future, the shadow emissions price[2] in Australia increases to A$ 221 by 2030, compared to A$ 31 by 2030 under a future aligned to current targets and policies. Sectors with high emissions such as agriculture, mining, and manufacturing are exposed to emissions reduction policies.	The global transition to a low emissions economy may see emissions price impacts on Tasmania's export commodities. For example, those that are fossil-fuel based, emission-intensive, and/or closely linked to a high emissions sector with close substitutes, may be subject to carbon border adjustment mechanisms, or be replaced by commodities produced with lower emissions intensity.
	Emissions reduction and renewable energy policy will be a key driver of change under a low emissions scenario, impacting Tasmania in both positive and negative ways.	Tasmania's renewable energy policy aims to harness natural resources, such as wind and hydropower, to support economic growth in Tasmania, reduce electricity prices and support the decarbonisation of the electricity sector in Australia.
	Land based carbon sequestration in Australia increases under both low and moderate scenarios. Under the lower emission scenario, land-based carbon sequestration increases by over 150per cent.	Land use change in Australia has been an important method for carbon sequestration, contributing to the mitigation of greenhouse gas emissions. Key strategies include reforestation, afforestation, and improved agricultural practices.
Increases in uptake of renewable technologies	Technologies that promote emissions reduction and resource efficiency present opportunities for Tasmania across all domains.	The Tasmanian Renewable Energy Target (TRET) is a key policy mechanism, which aims for 200per cent renewable energy generation by 2040. Supporting projects include Marinus Link and associated supporting transmission, Renewable Energy Zones, and Battery of the Nation.
	By 2030, technology costs nationally to globally for solar reduce by around 42per cent. Wind related technology costs reduce by 30per cent, and the capacity for wind generation in Tasmania increases by 3 to 4 times the current capacity.	Tasmania is aiming to become a hydrogen export hub supporting local industries and emissions reduction nationally and globally.
	Tasmania has the aim of establishing a significant hydrogen industry by 2030. Increase in hydrogen production in Tasmania is highest under a low emission scenario, where hydrogen production increases to around 2000 tonnes by 2030. Under a moderate emission future, hydrogen production increases to around 1000 tonnes by 2030.	The Tasmanian and Australian governments are investing A$16.6 million in energy upgrades for more than 1,600 social housing properties. These upgrades include the installation of heat pump hot water systems, insulation, draught proofing, LED lighting, and window glazing, which aim to reduce energy bills and improve living conditions for residents. Additionally, initiatives like the Energy Saver Loan Scheme support broader energy efficiency measures across the State's housing stock, promoting the use of
	Energy efficiency measures in Australia are highest under a low emission scenario where energy	

[2] Australia does not currently have any economy-wide emissions control mechanisms in place. However, emissions reduction may be driven by further action such as emissions control mechanisms. Examples of emissions control mechanisms include broad emissions pricing or trading schemes, carbon taxes, and regulatory and reporting control mechanisms

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Transition climate drivers	Model projections by 2030 under a low emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario	Trends and impacts for Tasmania
	efficiency measures reduce demand for electricity by 249 GWh by 2030. Under a moderate emission future, reduced demand for electricity is 143 GWh by 2030.	reverse cycle heating systems, solar hot water, and better insulation to further enhance energy performance and reduce costs for Tasmanian households.
Changes to markets and reputation associated with climate action / inaction	Circularity and sustainability are not mapped directly through scenario analysis metrics; however, they are likely to be highest under a low emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario where there are clear trends in resource efficiency and sector emissions reductions. Direct emissions from businesses and facilities may be considered market dynamics, under a low emissions scenario there will be greater focus on emissions through supply chain. This will favour businesses that are able to decarbonise, while penalising businesses with high emissions. Where regions are able to meet climate and renewable energy targets reputation may be enhanced. This will be more evident in a low emissions scenario, where there is greater awareness and action to reduce emissions. Reputation is not mapped directly through scenario analysis metrics. It is likely under a low emission scenario action on climate change will become increasingly important to both governments and businesses in their procurement and business strategies	A circular economy in Tasmania can create jobs in recycling, refurbishing, and remanufacturing sectors. This diversification may foster new business models such as product-as-a-service, sharing platforms, and remanufacturing hubs, which can reduce dependence on imports and keep resources within the community. Tasmania's electricity system has a low emission intensity, creating market opportunities for sectors with high electricity use, where the network can support increased demand. Tasmania has Net Zero emissions status, and whilst this does not impact emissions accounting at a business level, the Tasmanian economy may benefit from this status through reputation and branding. Tasmania aims to maintain Net Zero emissions status, which may have a positive impact on Tasmania's brand.

Climate scenario analysis examines the temporal evolution of climate hazards, highlighting both positive and negative impacts, whether they occur individually or in cascading sequences. Hazards are examined considering their impacts across the four key domains identified for this Risk Assessment.

The remainder of this chapter is laid out as follows for physical and transition hazard/driver themes:

- Context on why for the hazard/driver, significance of the hazard/driver and high-level impacts.
- Summary of climate model projections out to 2030 and 2050 (physical and transition) / 2090 (physical only) including geospatial mapping.

For selected hazards, a cascading impacts illustrative diagram is provided to show links between the hazard and the key consequence themes from the climate impact statements.

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4.2 Physical climate hazards

4.2.1 Temperature and frosty conditions

4.2.1.1 Rising temperature

Annual mean temperatures in Tasmania have increased by 1.1°C since 1910 (Climate Change in Australia, 2021), or approximately 0.1°C per decade since the 1950s. This rise is lower than the average for Australia of 0.16°C per decade (Grose, et al., 2010a). The coldest temperature on record in Tasmania is -14.2°C in Liawenee in August 2020 (BOM, 2024b).

Chronic warming impacts seasonal temperature and rainfall patterns, and drives acute events (e.g., heatwaves, bushfire risk), that will have major impacts on the natural environment, wellbeing of communities, and threshold tolerance for the built environment and emergency management (Figure 6). This presents both risks and opportunities to all value domains, with the greatest impacts felt on the economic and natural domains through worsened growing conditions for native vegetation, agriculture, and forestry.

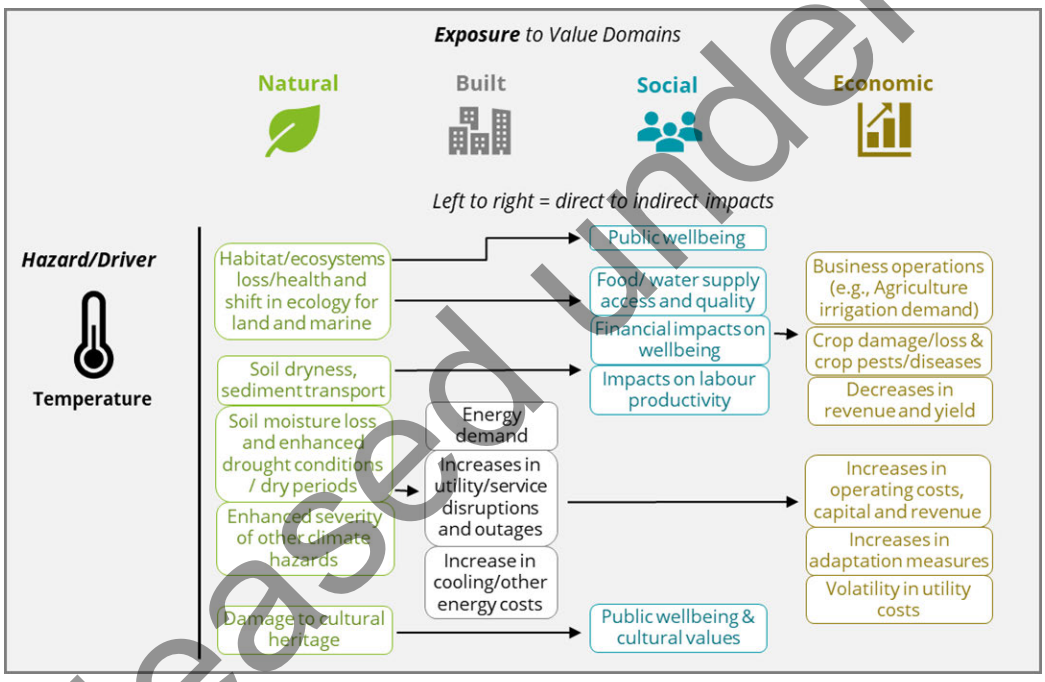

Figure 6: Cascading diagram illustrating example flow-on impacts driven by changes in temperature, based on the impact statements.

Increases in average temperature are likely to impact ecosystem health and productivity across the state, this in turn is likely to impact current agricultural, forestry, aquacultural and fishery practices (Department of Primary Industries, Parks, Water and Environment, 2021). Potential risks include an increase in the ranges, quantities and consequences of pests, diseases, and invasive species. At the same time, there is an opportunity for new crop types to thrive in warmer conditions (e.g. certain wine grapes).

Temperature influences many physical climate hazards and transition policy issues, meaning that there are multiple compounding hazards. Hazards associated with rising temperatures include extreme heat conditions, drought, and bushfires.

Including King Island and Flinders Island, the recent temperature average for Tasmania is modelled as 11.3°C (1995 to 2014 model average across the State). The regions (LGAs) with the highest annual mean temperature are Flinders Island, King Island, Launceston (George Town), North-east (Dorset), and North-West (Devonport). The regions (LGAs) with the highest summer temperatures are Flinders Island, Launceston (George Town, West Tamar), King Island, and North-east

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(Dorset). The regions with the lowest winter temperatures are Central (Central Highlands, Southern Midlands), Launceston (Meander Valley), South (Derwent Valley), and North-west (Kentish).

There is a very clear statewide warming trend that increases over time, particularly impacting the LGAs closest to the coast and the islands (Figure 7).

Under a moderate emission SSP2-4.5 future, the annual average temperature is projected to warm by up to 0.6°C by 2030, 1.1°C by 2050, and 1.9°C by 2090. The greatest increases are projected for summer and autumn.

Under the higher emission SSP3-7.0 scenario, the average annual temperature is projected to rise by up to 2.5°C by 2030, 3.1°C by 2050, and 4.6°C by 2090. The regions (LGAs) with the greatest increases by 2050 are King Island, Flinders Island, East (Tasman, Glamorgan-Spring Bay), and North-west (Circular Head).

Figure 7: Future change in annual mean temperature by 2030 (top), 2050 (middle), and 2090 (bottom) under SSP2-4.5 (left) and SSP3-7.0 (right) scenarios compared to the 1995-2014 historical baseline. Units are °C.

4.2.1.2 Extreme heat

Long term chronic temperature rise is associated with more frequent and/or intense periods of extreme heat. Extreme temperatures have the potential to cause major impacts across all value domains (Tasmanian Policy Exchange at the University of Tasmania, 2021), including disruption to ecosystems by stressing native flora and fauna, reductions in agricultural yields and quality, posing a health risk to populations through heat related illness, and a strain on infrastructure such as transport, water and energy supply. Health impacts are also associated with labour productivity (e.g., heat stress in the workplace).

Tasmania's geography can act as a temperature moderator, as no point is more than 115km from the coast and temperatures are moderated by the surrounding sea (ACE CRC, 2010). However, extreme temperatures have still been observed with 41.8°C recorded in Hobart in January 2013, 39.0°C in Launceston in January 2009 and the state record of 42.2°C in Scamander in January 2009 (Johnston, 2022). An example of aggregate risk for temperature rises and extreme heat conditions is the management of emergency and health services. A recent study found that ambulance dispatches in

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Tasmania increase by approximately 34per cent during extreme heatwaves (Campbell, et al., 2021). The state will likely experience similar strains on the provision of emergency services under future warming.

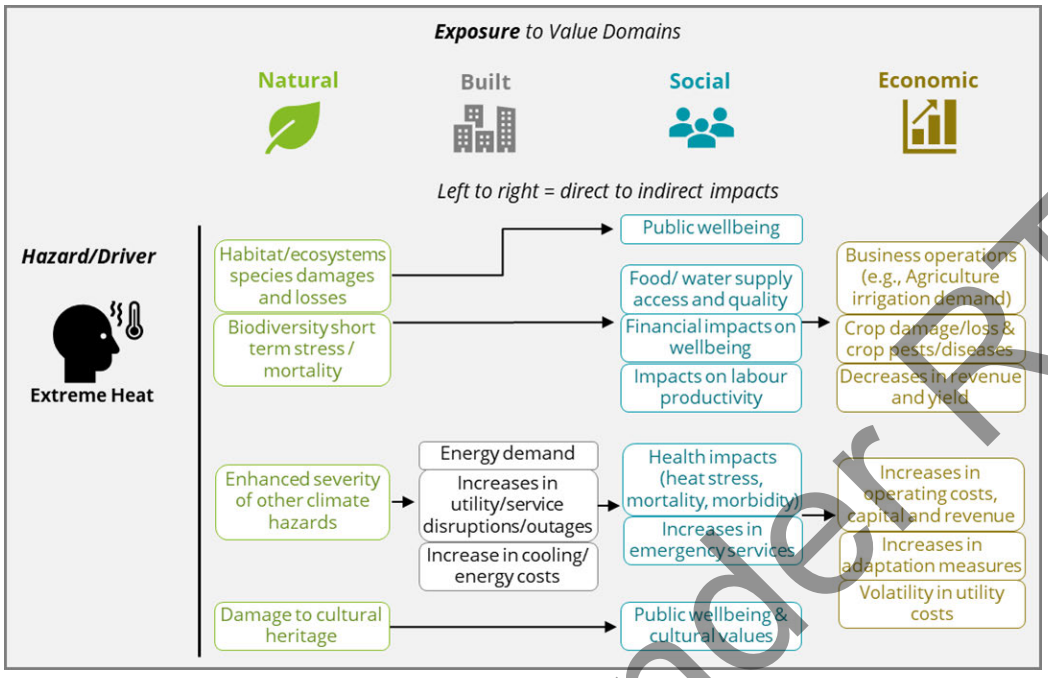

Figure 8: Cascading diagram illustrating example flow-on impacts driven by increases in extreme heat conditions, based on the impact statements.

The regions with the warmest annual temperatures are in the northern half of the State. Under the moderate emissions SSP2-4.5 scenario, the hottest annual temperatures across the state increase by up to 0.7°C by 2030, 1.2°C by 2050, and 2.1°C by 2090. Under the higher emission SSP3-7.0 scenario, the highest annual temperatures are projected to increase by up to 6.9°C by 2030, 7.7°C by 2050, and 9.3°C by 2090. The regions (LGAs) with the greatest increases by 2050 are King Island, Flinders Island, North-west (Circular Head), and North-East (Break O'Day, Dorset).

Instances of heatwave-like days are less common in Tasmania compared to other jurisdictions. In the future under SSP2-4.5, the occurrence of days where the maximum temperature exceeds 30°C increases minimally (Figure 9). In contrast, under the higher emission SSP3-7.0 scenario, days over 30°C annually are projected to increase by up to 5 days by 2030, 6 days by 2050, and 11 days by 2090. The regions (LGAs) with the greatest increases by 2050 are King Island, Flinders Island, Launceston (George Town), North-east (Dorset), and North-west (Devonport). While Tasmania is generally cooler than other Australian States and Territories, a rise in relative temperatures may still act as a climate shock to those who may be most vulnerable, including the elderly, individuals with limited access to cooling, and children.

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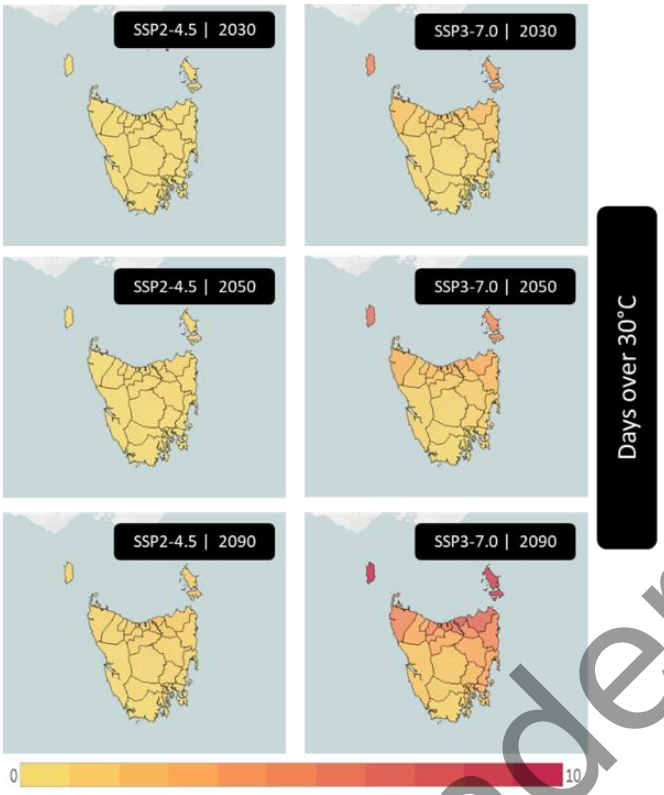

Figure 9: Future change in days over 30°C by 2030 (top), 2050 (middle), and 2090 (bottom) under SSP2-4.5 (left) and SSP3-7.0 (right) scenarios compared to the 1995-2014 historical baseline. Units are additional days per year.

4.2.1.3 Frost

Rising temperatures are also associated with warmer winters and fewer frosts. This could reduce demand for winter heating, lowering stress for those who cannot afford electricity (fuel poverty). Reduced instances of frost also benefit agriculture, viticulture, and forestry due to a lower risk of frost related damage and longer growing season, potentially allowing for greater crop and pasture yields, and the ability to grow new crop species (Tasmanian Institute of Agriculture, 2012).

In the future, the projected instances of frost days decrease, associated with a warming climate. The regions (LGAs) where frost instances reduce the most are those where frost days are highest in the current climate, namely Central (Central Highlands, Northern Midlands), Launceston (Meander Valley), North-west (Kentish), and South (Derwent Valley).

Under the SSP2-4.5 scenario, Frost days are projected to decrease by up to 6 days annually by 2030, 11 days by 2050, and 16 days by 2090, compared to the recent modelled past 8 days on average annually for the State. Under the higher emission SSP3-7.0 scenario, frost days are projected to decrease by up to 12 days annually by 2030, 16 days by 2050, and 23 days by 2090.

4.2.2 Rainfall and dry conditions

The total annual rainfall, seasonal rainfall patterns and the number of days of rain annually are assessed here as rainfall-related proxies. Total annual rainfall in Tasmania ranges from more than 3,000 mm on the west coast, to less than 500mm on the east coast (Tozer, et al., 2018). Hobart, the state capital, is the second driest capital city nationally with Adelaide the only state capital that is drier. The greater Hobart region and the similarly dry second largest city (Launceston) account for about half the state population. Since 1975 Tasmania has experienced a reduction in total annual rainfall and a change in seasonal variability, with the greatest reductions occurring in autumn (Grose, et al., 2010a).

Rainfall trends have the potential to affect all value domains through impacts to water resources and supply, agricultural productivity, ecosystem health, and human health and well-being (Figure 10). Additionally, reduced rainfall can lead to low soil-moisture and drought conditions that dry out vegetation making them more vulnerable to pests, diseases and

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bushfires. Unlike temperature, rainfall does not increase linearly over time due to the dependencies of rainfall on multiple metrics, such as temperature.

Flooding refers to the inundation of normally dry land and can be classified into different types (e.g., pluvial/urban floods, flash floods, river floods, and coastal floods) depending on the area where the flooding occurs, and the driving processes involved (Nied, et al., 2014). Apart from coastal flooding, which is typically caused by short-term increases to water levels due to storm surges and extreme sea level events, most floods are caused by changes to surface runoff and streamflow following extreme rainfall events. An area's susceptibility to flooding largely depends on the ability of natural and artificial drainage systems to cope with extreme rainfall, when the capacity of these systems is exceeded, flooding occurs. Due to this link, changes to the intensity and frequency of extreme rainfall are typically used as a proxy for inferring future flood risk. In addition to the frequency and intensity of extreme rainfall, the main factors that influence flooding include soil moisture content, surface gradients, land use type, vegetation cover, surface permeability, and river and catchment engineering. Very intense rainfall, combined with a high proportion of impermeable surfaces greatly increases the risk for flooding. For this reason, urban areas are particularly susceptible, especially when there is inadequate stormwater drainage and management.

The sectors most at risk to changes in rainfall include agriculture, forestry, energy and biodiversity. Each of these sectors are vulnerable to reductions in rainfall, agriculture because it impacts the ability to grow crops or feed for livestock, forestry because some tree species experience a reduction in growth and consequently wood production under water stress, energy production, including hydroelectricity and hydrogen, because they require a plentiful supply of water to function and water stress is associated with reduced production, and biodiversity because many organisms cannot adapt to drought conditions which decrease habitats, food availability, and water resources.

Tasmania's water availability is at risk from reductions to total annual rainfall, seasonal rainfall, and the number of rain days. The major catchment areas for TasWater (TasWater, 2024) drinking water sources generally fall in the same regions where climate projections indicate a decrease to total annual rainfall (Figure 11). Summer rainfall for 2023/24 was approximately 16 per cent below the 1961-1990 average for Tasmania as a whole. However, parts of the south-east and north-west experienced rainfall in the lowest 10 per cent on record (BOM, 2024c). The low summer rainfall has led to the recent introduction of water restrictions to Orford and Triabunna (TasWater, 2024a) and impacted agricultural productivity on King Island with farmers unable to grow enough grass to support livestock (Kloser & Miller, 2024).

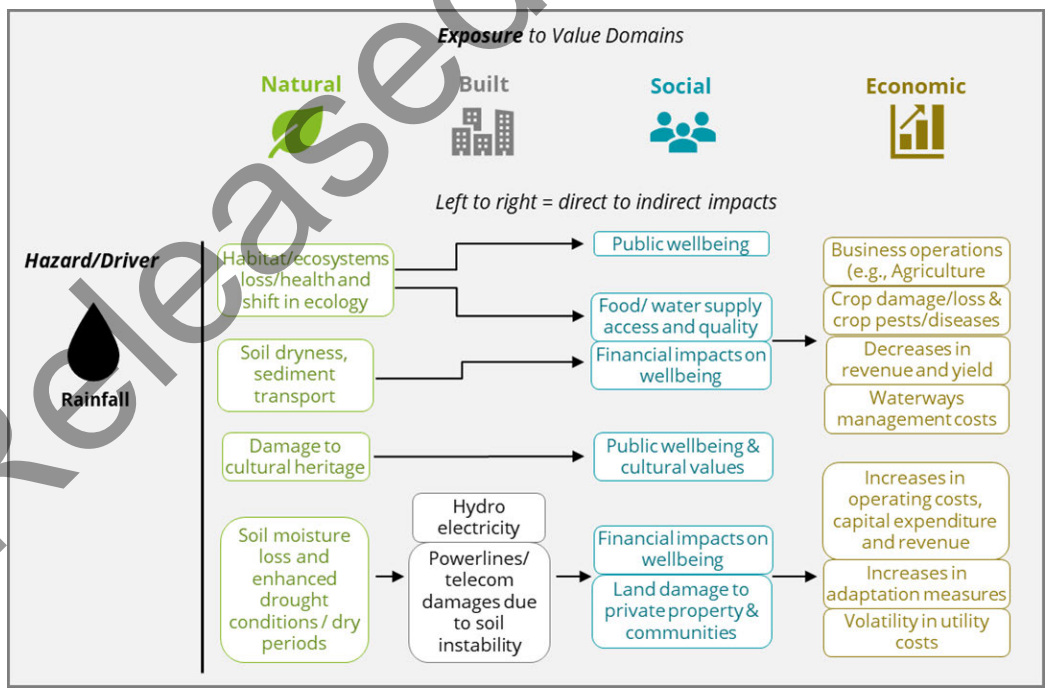

Figure 10: Cascading diagram illustrating example flow-on impacts driven by changes in rainfall, based on the impact statements.

The baseline total annual rainfall is 917mm with 152 rain days a year (1995 to 2014 modelled average across the State). The west coast is the wettest part of the state with the most rain days and the highest total annual rainfall, with most of

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the rainfall occurring during winter. In contrast, the east coast is the driest part of the state with the fewest rain days and the lowest total annual rainfall.

Projections indicate that Tasmania is likely to experience a reduction in rainy days and changes to total annual rainfall (Figure 12). Significant changes are also projected to the future seasonal and regional pattern of rainfall across Tasmania. These findings are consistent with Climate Futures for Tasmania (Grose, et al., 2010)

The greatest rainfall reductions are likely to occur in alpine regions over 800m where relative warming is greatest (Grose, et al., 2019). Soil dryness is likely to increase due to reduced rainfall and increased evaporation, with the largest absolute changes occur in the wettest regions (more water to evaporate) and the largest relative changes in drier regions (smaller changes have bigger impact) (Tasmanian Policy Exchange at the University of Tasmania, 2021).

Under a moderate emission SSP2-4.5 future, total annual rainfall is projected to change by -15 to +13 mm by 2030, -43 to +30 mm by 2050, and -53 to +43 mm by 2090. Total annual rainfall increases across the south and east but decreases across the remainder of the State. The number of rain days per year decrease by up to 4 days by 2030, 6 days by 2050, and 9 days by 2090. The decline in rain days per year occurs across all regions.

Under the higher emission SSP3-7.0 scenario, total annual rainfall is projected to change by -15 to +14 mm by 2030, -27 to +36 mm by 2050, and -97 to +58 mm by 2090. Total annual rainfall increases in the south but decreases across the remainder of the State. The number of rain days per year decrease by up to 4 days by 2030, 7 days by 2050, and 18 days by 2090. The decline in rain days per year occurs across all regions.

Under both scenarios, the greatest increases are projected for southern and western parts of the state during winter and the greatest decreases for north-west Tasmania during spring. The regions (LGAs) with the greatest increases by 2050 are South (Huon Valley, Derwent Valley), Hobart (Kingsborough, Clarence), East (Tasman, Sorell). The regions (LGAs) with the greatest decreases by 2050 are King Island, and North-west (Central Coast, Waratah-Wynyard, Burnie, Kentish, Circular Head), and Launceston (Meander Valley).

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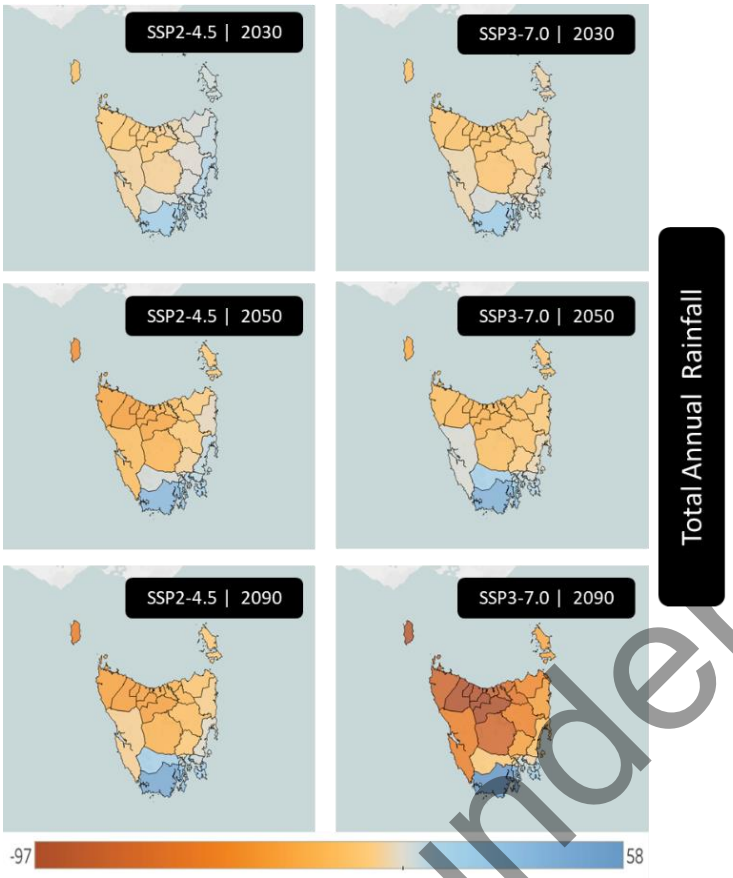

Figure 11: Future change in total annual rainfall by 2030 (top), 2050 (middle), and 2090 (bottom) under SSP2-4.5 (left) and SSP3-7.0 (right) scenarios compared to the 1995-2014 historical baseline. Units are additional days mm per year (oranges indicate reduced rainfall).

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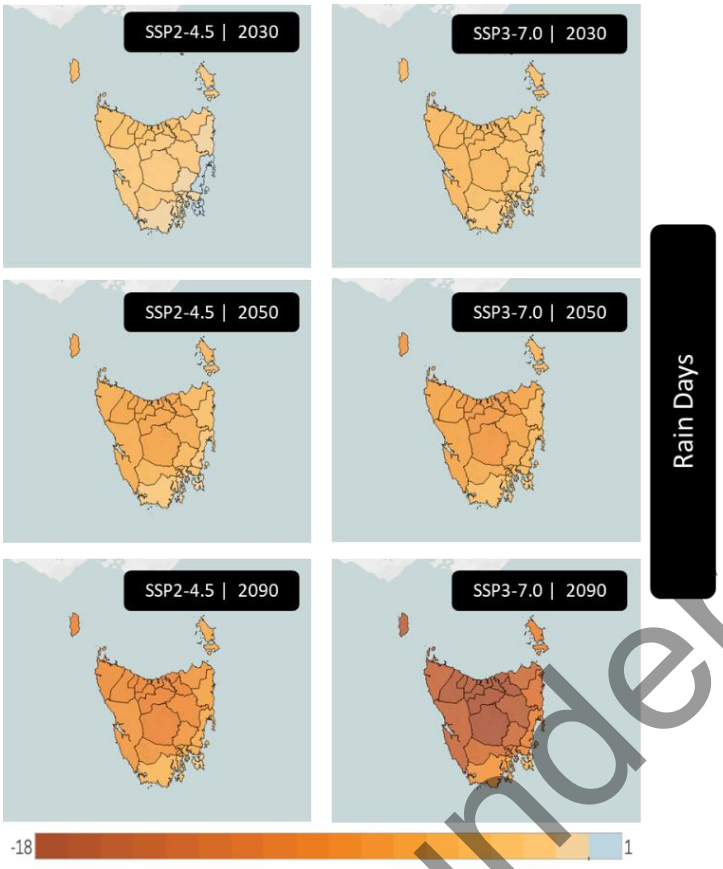

Figure 12: Future change in the numbers of rain days per year by 2030 (top), 2050 (middle), and 2090 (bottom) under SSP2-4.5 (left) and SSP3-7.0 (right) scenarios compared to the 1995-2014 historical baseline. Units are the change in days per year (oranges indicate a decrease).

Due to data availability, soil moisture content is assessed using the 5 km climate projections from the Australian Water Outlook (AWO, 2021) using Representative Concentration Pathways (associated with the IPCC AR5). Here soil moisture content is defined as the median annual water content in the top 1 m of soil.

The hydrological model used by the AWO produces a soil moisture dataset on a 5 km grid. The climate inputs that drive this model (temperature, rainfall, wind speed, and solar radiation), were derived using statistically downscaled outputs of a regional climate model (RCM) and four Global Climate Models (GCMs) operating at ~50 km and ~150 km grid resolutions respectively. It should be noted that the downscaling algorithm used to produce the climate inputs may not get the Tasmanian terrain correct, leading to biases in the data. This could be rectified by dynamically downscaling the climate inputs using an RCM at a higher resolution. However, this is out of scope for the risk assessment.

The modelled historical soil moisture content is 54 per cent on average for the state for 1976 to 2005. Regions (LGAs) with the highest soil moisture content are West (West Coast), North-west (Waratah-Wynyard, Kentish), and South (Huon Valley, Derwent Valley). Those with the lowest soil moisture content are King Island, Hobart (Clarence, Brighton), Flinders Island, and Central (Southern Midlands).

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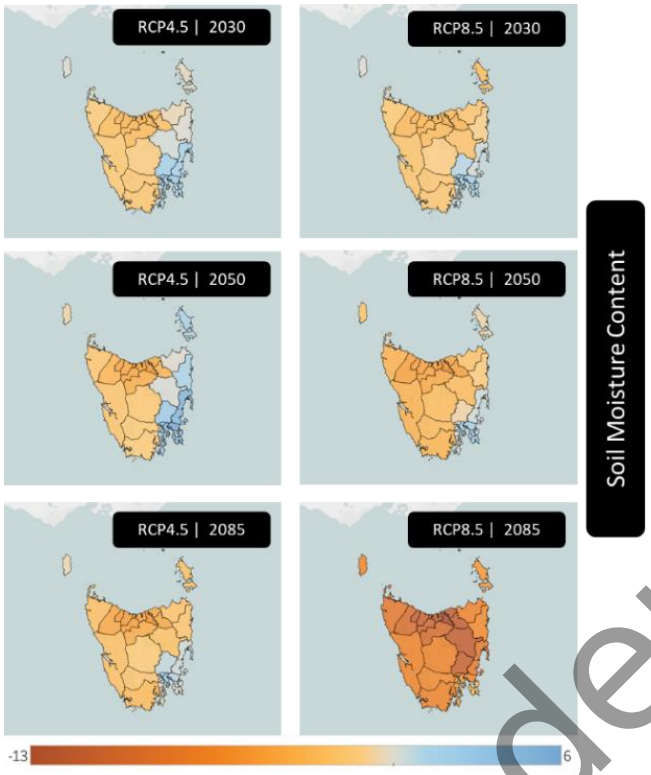

Figure 13: Future percent change in soil moisture content by 2030 (top), 2050 (middle), and 2085 (bottom) under RCP4.5 (left) and RCP8.5 (right) scenarios compared to the 1976-2005 historical baseline. Units are per cent.

Under a moderate emission RCP4.5 scenario, soil moisture is projected to decline in some regions by up to 3 to 5 per cent across all horizons and increase in other regions by up to 3 to 6 per cent. East and Hobart regions experience the greatest increases in soil moisture, and Launceston and North-west the greatest decreases.

Under the higher emission RCP8.5 scenario, the decreases in soil moisture are similar in magnitude to the moderate emission RCP4.5 scenario however the distribution is more widespread. Another key difference is that by 2090 no regions have an increase in soil moisture with declines of up to 13 per cent projected across the State. The regions with the greatest declines are Launceston (West Tamar, Launceston), and North-west (Latrobe, Burnie, Central Coast). Soil moisture is extremely important as it provides the main water source for plant growth and impacts the partitioning of water between evaporation and runoff, this in turn influences surface temperatures and affects the distribution of clouds and precipitation (Robock, 2003).

A deficit in soil moisture is often connected to drought conditions, leading to reduced growth rates and water stress in plants with negative impacts for native vegetation, agriculture, viticulture and forestry. Soil moisture also acts as a modulator for flooding by determining how much precipitation is absorbed by soils and how much flows into streams and rivers. Soils with depleted soil moisture after drought conditions can generally absorb more precipitation before soils saturate. Recently, the low summer rainfall for 2023/24 decreased soil moisture and increased evaporative stress across much of Tasmania and the Bass Strait Islands (BOM, 2024a), this has in turn impacted agricultural productivity (Kloser & Miller, 2024), and led to the Tasmanian Government offering financial assistance (Tasmanian Government, 2024).

The “Millennium Drought” (2001-2009) was the worst drought on record for much of southeast Australia and was characterised by lower-than-average rainfall leading to severe soil moisture deficits, reduced streamflow’s and depleted groundwater. This in turn had severe consequences for ecosystems, the economy, and society (van Dijk, et al., 2013).

Like rainfall trends, the soil moisture varies across the state under the two climate scenarios. Much of western Tasmania experiences both a decline in rainfall and decline in soil moisture in coming decades, and the trends are largest under the higher emission scenario and further into the future. However, an increase in annual rainfall does not necessarily overlap with regions of increased soil moisture. This is because changes in soil moisture involve not only changes to annual rainfall, but changes in the number of rain days, rainfall intensity, and surface evapotranspiration. Evapotranspiration is

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just as important as rainfall as it affects water losses from the surface to the atmosphere. Increasing temperatures are likely to increase evapotranspiration across all seasons in Tasmania.

4.2.2.1 Extreme rain and floods

As air temperatures warm, the atmosphere is able to hold more moisture, about 7 per cent more per 1°C of warming (Bao, et al., 2017), which increases the risk of heavier rainfall and flooding events. These extreme rain and flood events are often driven by the type of weather system, with the most damaging events in Tasmania typically caused by East Coast Lows (Pook, et al., 2010). There is the potential for significant impacts across all value domains (Figure 14), including the potential to endanger public wellbeing and cause significant damage to infrastructure, buildings, economic productivity, key services and ecosystems.

Flooding occurs frequently and is widespread across much of Tasmania. However, the north-east and parts of the north-west are particularly exposed (Tasmanian Policy Exchange at the University of Tasmania, 2021). The June 2016 floods (AIDR,2016) affected two-thirds of Tasmania's LGAs, with significant impacts to riverine ecosystems, agricultural land and private property. Recovery costs were estimated at over $180 million (AIDR, 2016). More recently, the mid-October 2022 rain and flood events that caused over $736 million in insurance losses across Tasmania, NSW and Victoria combined (Insurance Council of Australia, 2023a).

Flooding can lead to saturation of soil, but similarly very low soil moisture can lead to wider distribution of flood waters at surface levels, due to some soils becoming hydrophobic when very dry. This is particularly the case in dry eucalypt forests where oils in the leaf litter contain hydrophobic organic compounds that can coat soil particles (Bailey, 2012) and may cause the soils to initially repel water increasing the likelihood for flash flooding. Flooding that results from extreme rainfall is the prevailing cause of weather-related disruption to transport networks. This is particularly the case for roads in urban areas where the greater proportion of impermeable surfaces prevent water infiltration into the soil and increases the risk of flash flooding. Flooding can cause direct impacts to road networks (such as physical damage to roads) or indirect impacts (such as disruptions to traffic flow) that disrupts transport and in turn impacts societal functioning through disruptions to businesses, supplies chains, emergency services and the potential isolation of communities.

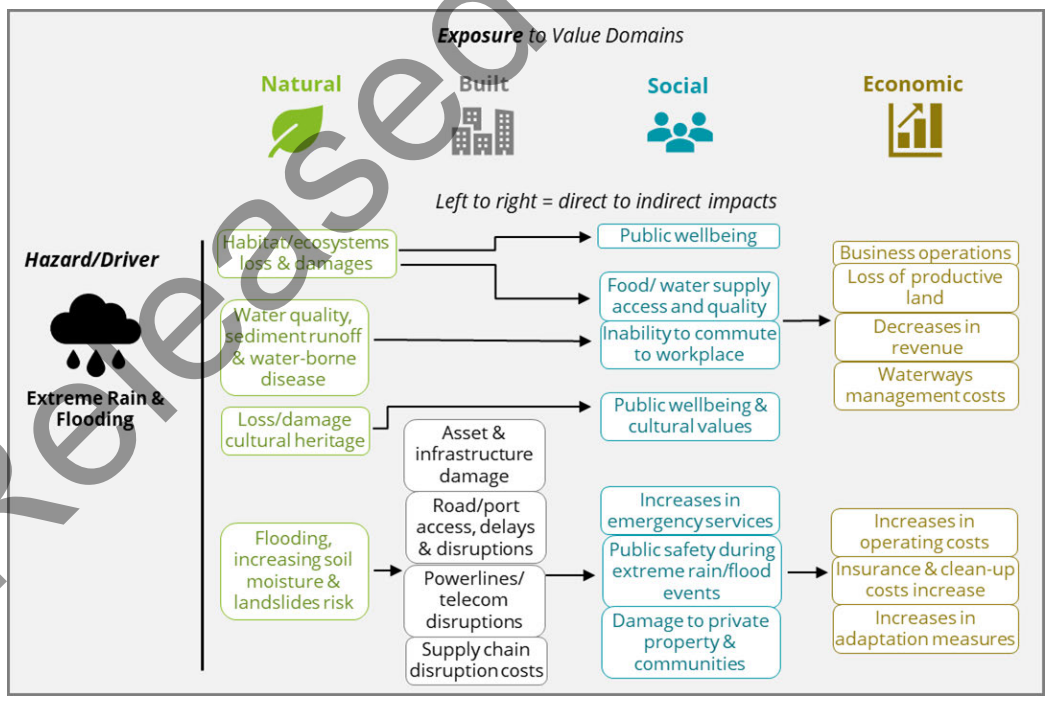

Figure 14: Cascading diagram illustrating example flow-on impacts driven by changes in extreme rain / flooding, based on the impact statements.

In this report, the wettest day in a year (maximum rainfall in a day) and number of extreme rain days per year exceeding over 20mm in a day are used as proxies for extreme rainfall. For the recent past (1995 to 2014 average), climate models estimate up to 40mm in a day as the wettest day rainfall in a year, and up to 13 extreme rain days annually. LGAs with the

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most extreme rain days are West (West Coast), North-west (Waratah-Wynyard, Burnie, Kentish), and South (Derwent Valley).

In the future, models project that the intensity of the wettest day rainfall increases across the state, with the largest trends occurring under the higher emission scenario (SSP3-7.0) and further into the future (Figure 15). Under a moderate emission SSP2-4.5 scenario, the wettest day rainfall is projected to increase by up to 11 per cent across the state by 2030 and 2050, and 16 per cent by 2090. Under a high emission SSP3-7.0 scenarios, the wettest day rainfall annually is projected to increase by up to 9 per cent by 2030, 12 per cent by 2050, and 20 per cent by 2090. The regions (LGAs) with the greatest increases by 2050 are North-East (Break O'Day), Hobart (Brighton), North-west (Burnie, Central Coast), and Central (Central Highlands).

In contrast, the frequency of extreme rain days increases more on the eastern side of the state than the western side (Figure 16). Under a moderate emission SSP2-4.5 scenario, model project up to 31 per cent more frequent extreme rain days annually by 2030, 33 per cent by 2050, and 40 per cent by 2090. Under the higher emission SSP3-7.0 scenario, model project up to 21 per cent more frequent extreme rain days annually by 2030, 28 per cent by 2050, and 51 per cent by 2090. The regions (LGAs) with the greatest increases by 2050 are North-East (Break O'Day), Hobart (Brighton), North-west (Burnie, Central Coast), and Central (Central Highlands). Unlike temperature, rainfall doesn't increase linearly over time and extreme rainfall events are typically caused by weather systems such as thunderstorms, low pressure troughs and east coast lows. Future changes to the frequency of these events are complex and determined by a multitude of factors (including changes to wind patterns, evaporation and cloud cover). The result is that the greatest increases to extreme rain frequency may not necessarily occur under a higher emissions scenario (SSP3-7.0).

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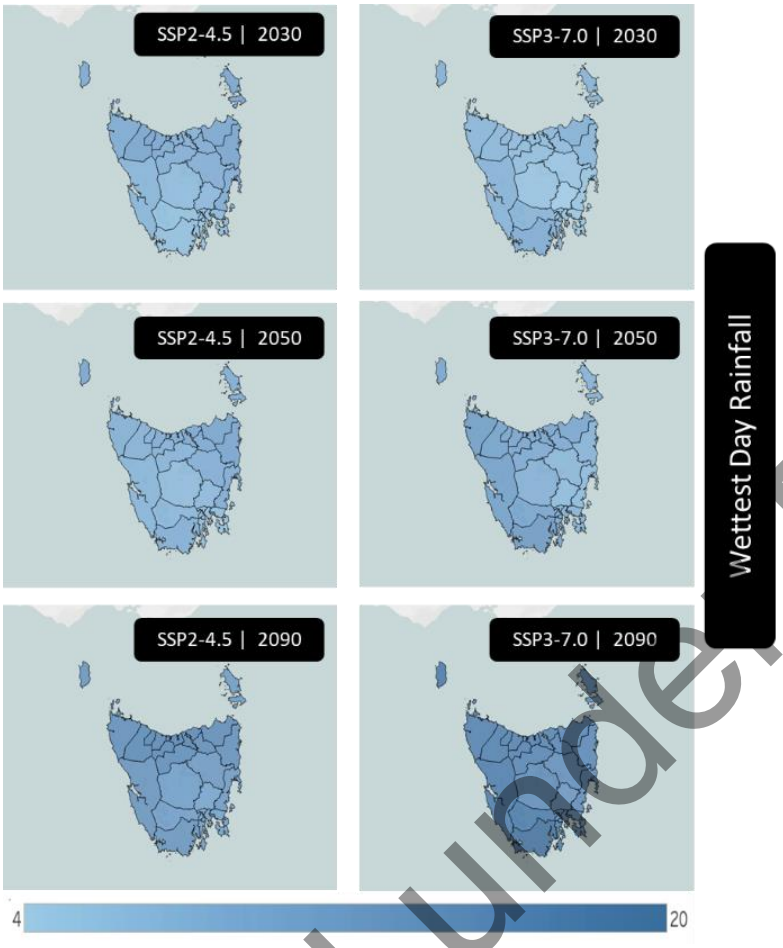

Figure 15: Future change in wettest day rainfall by 2030 (top), 2050 (middle), and 2090 (bottom) under SSP2-4.5 (left) and SSP3-7.0 (right) scenarios compared to the 1995-2014 historical baseline. Units are mm.

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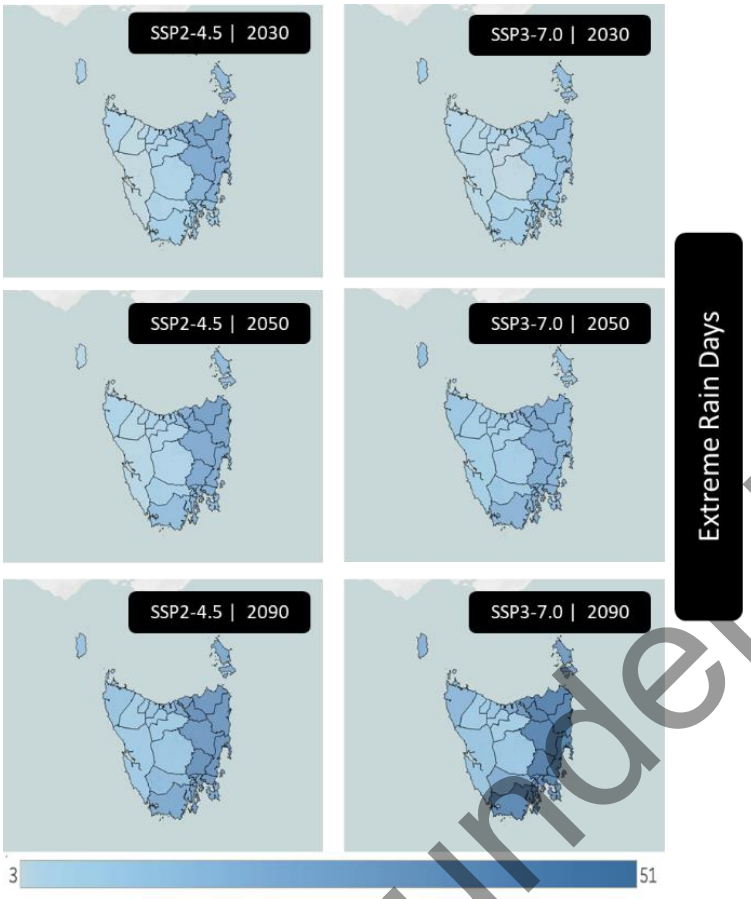

Figure 16: Future change in extreme rain days over 20mm by 2030 (top), 2050 (middle), and 2090 (bottom) under SSP2-4.5 (left) and SSP3-7.0 (right) scenarios compared to the 1995-2014 historical baseline. Units are additional days per year.

4.2.3 Bushfires

As a consequence of rising temperatures and decreasing precipitation, particularly during El Nino and drought years, together with increasing wind speeds, fuel loads and incidence of ignition sources such as dry lightning strikes, the conditions favourable to bushfires in Tasmania are projected to increase (Tasmanian Policy Exchange at the University of Tasmania, 2021). Bushfires present a major risk for Tasmania with approximately 98% of the state's landmass designated as bushfire-prone by the Tasmanian Fire Service (Tasmanian Fire Service, 2024). The state capital Hobart is one of the most bushfire prone cities in Australia due to the extensive bushland reserves that are located in and around the city (City of Hobart, 2022), while Future climate projections indicate that Tasmania will experience a steady increase in fire danger up to 2050, with around 40 per cent more very high fire days and a longer fire season (Climate Change in Australia, 2021). By 2100, the fire risk doubles, impacting twice the area, twice as often. Impacts related to this affect all value domains, including damage to vulnerable ecosystems (alpine, rainforest and coastal heathlands), infrastructure, buildings and industries, increases to operating and maintenance costs, along with community exposure to hazardous conditions and poor air quality (State Emergency Service, 2022). More frequent and extreme bushfires, along with a hotter and drier climate, may limit vegetation regrowth (Fairman, et al., 2019), impacting the carbon carrying capacity of Tasmania's forests (May B, 2012), and promote the release of soil carbon in some landscapes, such as peatlands (Carroll, et al., 2023), potentially creating substantial carbon emissions and undermining efforts to mitigate climate change. For Tasmania, a state that is heavily reliant on stored carbon to meet net zero, this may create transition risks where Tasmania is reliant on Net Zero status for reputation and market advantages (Point Advisory, 2021).

Since the 1990s Tasmania has seen an increase in fire activity and cumulative area burned due to fires ignited by lightning storms (Styger, et al., 2018). There have been three significant fire seasons in Tasmania this century, occurring in the summers of 2012/13, 2015/16 and 2018/19 (Bowman, et al., 2022).

The summer of 2018-19 saw one of the hottest and driest summers on record and led to devastating bushfires across southwest Tasmania ignited by dry lightning strikes. The fires burned over 210,00ha between late December and early

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March overwhelming fire services, destroying vulnerable ecosystems, forestry resources and cultural assets, and exposing communities to smoke and poor air quality resulting in poor health outcomes. The economy was impacted through losses to the tourism, viticulture, forestry and apiary industries (Keating & Handmer, 2021). Bushfires can also cause disruptions to transport networks due to unsafe conditions (e.g., fire and heavy smoke) and blockages (e.g., fallen trees) that disrupt businesses, their supply chains and essential services, such as the delivery of medical supplies, food and water.

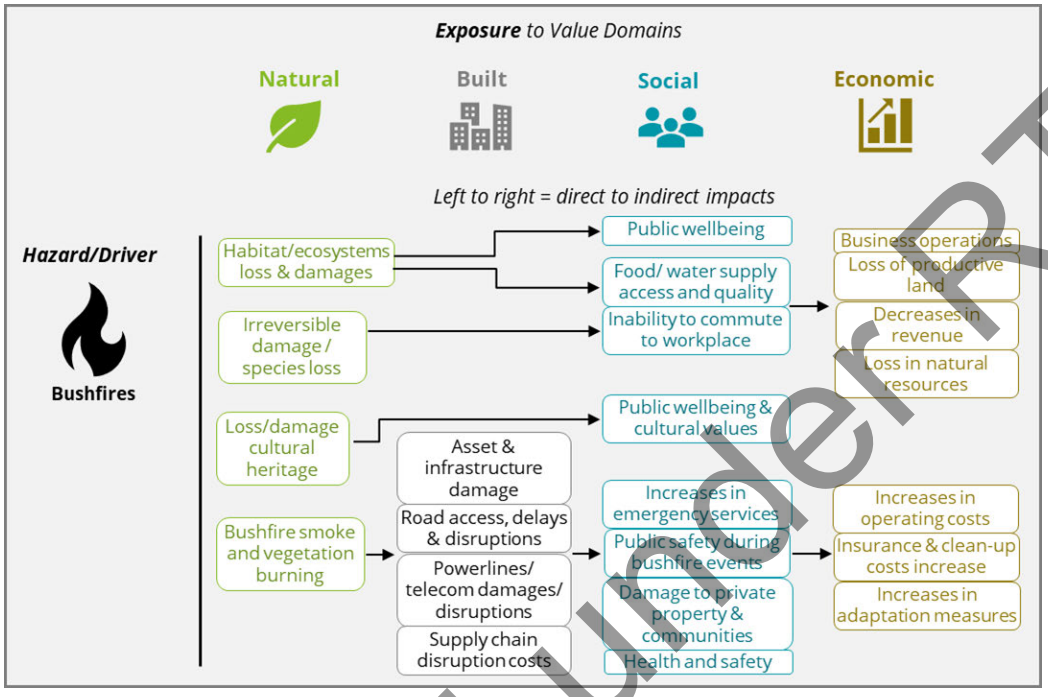

Figure 17: Cascading diagram illustrating example flow-on impacts driven by changes bushfire occurrence, based on the impact statements.

Changes to future bushfire conditions can be assessed via fire weather metrics, such as the Fire Weather Index (FWI) (van Wagner & Pickett, 1985), that are based on meteorological parameters including temperature, rainfall, wind speed, and relative humidity. For the Risk Assessment, fire weather intensity is defined as the 95th percentile of the FWI, and fire weather frequency is defined as the number of days where the FWI exceeds the 95th percentile for the reference period (1950-2014). It should be noted that the metrics used here assess changes to the meteorological parameters that determine fire weather, but due to their coarse resolution climate models are unable to assess other parameters that determine bushfire likelihood such as fuel loads, fuel moisture, ignition sources, and topography.

For the recent past (1995 to 2014 average), climate models estimate an average of 18 extreme fire weather days annually and an average 95th percentile FWI index of 10 across the State. Regions (LGAs) with the most extreme fire weather days are East (Glamorgan-Spring Bay, Sorell), and Hobart (Clarence, Hobart, Brighton). The highest fire weather intensity occurs in the North-east (Dorset, Break O'Day), Launceston (Launceston, George Town), and East (Glamorgan-Spring Bay). Although western Tasmania is predominantly forested and subsequently contains far higher fuel loads, it is also the wettest region of Tasmania and consequently has a lower risk of bushfires than the eastern and southern regions that have less tree cover but are the driest regions.

In the future, models project that both the frequency of extreme fire weather days and intensity of the 95th percentile FWI index increases across the state, with the largest increases occurring under the higher emission scenario (SSP3-7.0) and further into the future (Figure 19).

Under a moderate emissions scenario (SSP2-4.5), extreme fire weather days are projected to increase by up to 4 days by 2030, 9 days by 2050, and 15 days by 2090. Under the higher emissions scenario (SSP3-7.0), extreme fire weather days are projected to increase by up to 5 days by 2030, 11 days by 2050, and 30 days by 2090. Regions (LGAs) with the greatest increases by 2050 are Hobart (Brighton, Clarence, Hobart, Glenorchy), and Central (Southern Midlands).

Under a moderate emissions scenario (SSP2-4.5), the 95th percentile FWI index is projected to increase by up to 7 per cent by 2030, 15 per cent by 2050, and 26 per cent by 2090. Under the higher emissions scenario (SSP3-7.0), the 95th percentile FWI is projected to increase by up to 10 per cent by 2030, 20 per cent by 2050, and 47 per cent by 2090.

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Regions (LGAs) with the greatest increases by 2050 are North-east (Break O'Day), Hobart (Brighton), North-west (Burnie, Central Coast), and Central (Central Highlands).

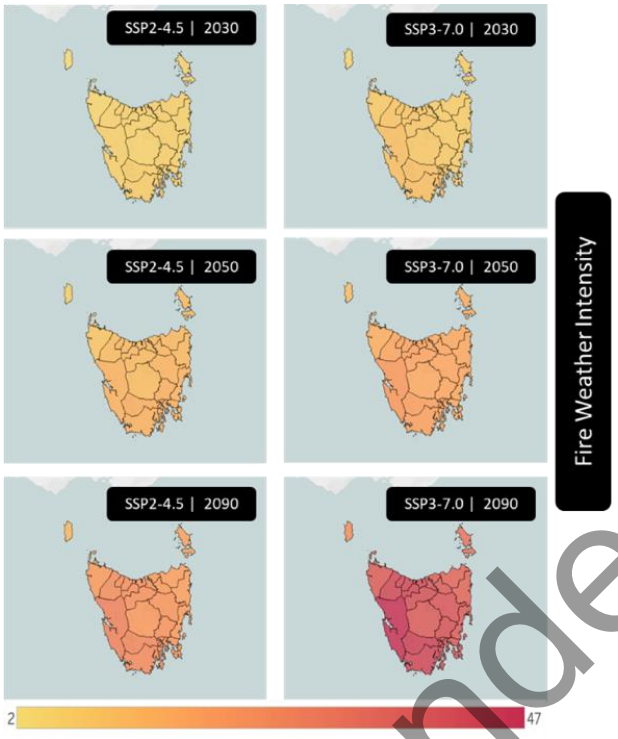

Figure 18: Future percent change in fire weather intensity by 2030 (top), 2050 (middle), and 2090 (bottom) under SSP2-4.5 (left) and SSP3-7.0 (right) scenarios compared to the 1995-2014 historical baseline. Units are per cent.

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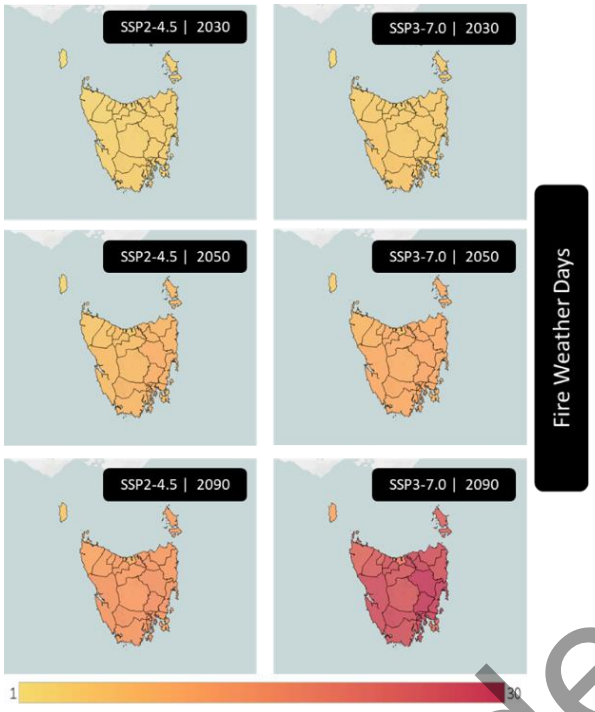

Figure 19: Future change in fire weather days by 2030 (top), 2050 (middle), and 2090 (bottom) under SSP2-4.5 (left) and SSP3-7.0 (right) scenarios compared to the 1995-2014 historical baseline. Units are additional days per year.

4.2.4 Storms and extreme winds

Changes to the frequency and intensity of thunderstorms and extreme winds can damage buildings and infrastructure, impact economic activity and transportation, pose a hazard to human health and threaten social cohesion. Thunderstorms and extreme winds can significantly intensify extreme wave heights, while lightning strikes provide the primary ignition source for bushfires.

Wind-related hazards generally occur from two different phenomena, thunderstorms and synoptic storms (East Coast Lows, Southern Ocean Polar Lows). The Built domain has varying levels of risk influenced by building age, building type, and the quantity of older structures. Impacts on human health typically occur from wind-borne debris, or severe damage to buildings that harms the occupants sheltering inside.

In October 2022, a storm brought a combination of extreme winds, high waves and heavy rainfall, causing extensive flooding in northern Tasmania and forcing the suspension of shipping operations at the Port of Devonport (TasPorts, 2022). As an island state, ports act as an integral component of Tasmania's functioning, with Devonport the busiest port, managing over half of Tasmania's imports and exports and providing a vital transport link to mainland Australia.

Lightning strikes can cause damage to the built environment, transportation and infrastructure, impact human health and safety through injuries to the nervous system and asthma (Yair, 2018), can directly damages trees, and are the primary ignition source for bushfires in Tasmania (Styger, et al., 2018).

Future climate projections indicate that the 90th percentile mean 10m wind speed will increase by more than 15 per cent during the winter, spring and summer seasons by 2070. There is also likely to be a small increase in the frequency of extreme wind gusts during the 21st century. The biggest increases in both mean wind speed and extreme wind gusts occur in northern Tasmania, particularly across both Flinders and King Islands (Checet, et al., 2012).

Extreme winds can have severe detrimental effects on the agricultural, viticulture and forestry sectors as wind gusts frequently strip leaves, flowers and fruit from plantings, flatten grass crops such as wheat, break branches, and uproot trees.

Lightning activity is projected to increase by approximately 10 per cent for every 1°C temperature rise (Williams, 2005), due to an increase in favourable synoptic weather systems that trigger convection leading to thunderstorms (Romps, et al., 2014). Research suggests that the likelihood of dry lightning strikes in Tasmania is increasing (Love, et al., 2016). Dry

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lightning occurs when a thunderstorm forms, but unlike in normal thunderstorms, the majority of rain evaporates before reaching the ground (Marris, 2016). Rising temperatures are increasing evaporation rates in Tasmania, causing the landscape to dry out. When dry lightning strikes dry vegetation, it provides the ignition source that sparks a bushfire. Dry lightning strikes were the leading cause of bushfires during the 2015-16 (ReCFIT, 2016) and 2018-19 fire seasons (Keating & Handmer, 2021). Extreme wind gusts can also make bushfires worse by fanning the flames that increases the fires intensity (Dowdy, et al., 2009) causing the fire to spread faster across the landscape, or by carrying hot embers long distances and starting subsequent spot fires (BOM, 2024). The bushfires in Dunalley and elsewhere in Tasmania in January 2013 were made worse by hot, windy conditions and caused $89 million in insurance costs, primarily through impacts to buildings, electricity infrastructure and primary production (AIDR, 2013).

4.2.5 Sea level rise and storm surge

The Risk Assessment evaluates the impacts of future sea level rise that is projected to accelerate around the Tasmanian coastline.

Approximately half of Tasmania's residential properties are within 1km of the coast (Department of Premier and Cabinet, 2016). Measurements indicate that sea levels around Tasmania have risen at an average rate of 2.1 ± 0.2 mm/year for the period 1966 to 2009, increasing to an average of 3.1 ± 0.6 mm/year for the period 1993 to 2009 (McInnes, et al., 2016). The higher the sea level, the more risk low-lying coastal areas and coastal infrastructure faces from a range of impacts, particularly when coupled with other extreme events such as the increased risk of more damaging storms and rainfall extremes. This can exacerbate coastal erosion threatening community wellbeing and damaging infrastructure, buildings and ecosystems, and may decrease the ability of rivers to drain out to sea.

Rising sea levels and storm intensity are associated with more frequent storm surge and events and extreme wave heights. Storm surge and extreme wave height events that can increase the risk of flooding that damages coastal infrastructure, provides a hazard to human health and threatens coastal ecosystems and species. Storm surges are exacerbated by low pressures systems, such as storms and East Coast Lows, which significantly intensify extreme wave heights. Recent storm surge events have caused flooding and erosion risks across the value domains including damage to coastal ecosystems and cultural heritage, coastal infrastructure and public wellbeing (State Emergency Service, 2022).

Shoreline changes are natural processes that take place over a range of time scales, but localised coastal erosion can be exacerbated by human activities along the coast and within river catchments (i.e., construction of sea walls, land reclamation, dredging, and river damming) that act in combination with natural processes. Coastal erosion is often worst where poor coastal management practices have been undertaken (such as the inappropriate design, building, or maintenance of counter measures) that subsequently moves the effects onto adjacent shores. Coastal erosion can also be exacerbated by the compounding effects of multiple climate hazards, such as extreme rain that increases river flow and landward flooding while the coast is simultaneously impacted by storm surges. Climate change also introduces emerging risks around coastal land erosion and land ownership, particularly where land sizes change due to the erosion.

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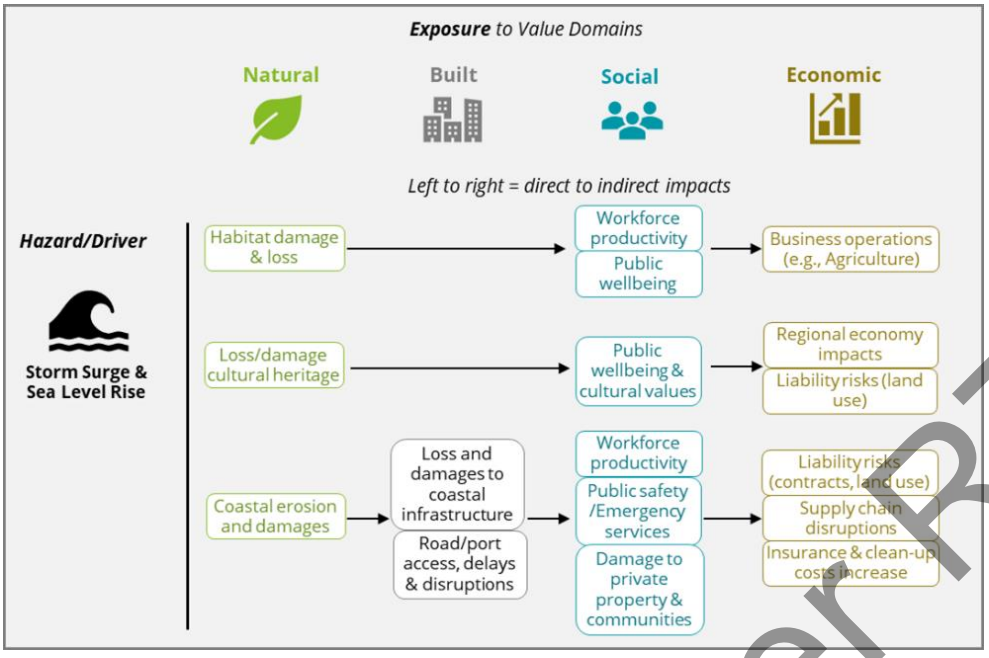

Figure 20: Cascading diagram illustrating example flow-on impacts driven by changes in storm surge and sea level rise, based on the impact statements.

Sea level rise is not uniform around the Tasmanian coastline due to spatial variations in coastal geomorphology, and oceanic/atmospheric drivers (Department of Premier and Cabinet, 2016). Under a moderate emission SSP2-4.5 scenario, climate models project that relative sea level (i.e., future sea level rise relative to the (1980-2014) baseline) will rise by up to 10 cm by 2030, 21 cm by 2050, and 46 cm by 2090. Under the higher emission SSP3-7.0 scenario, sea level is projected to rise by up to 10 cm by 2030, 22 cm by 2050, and 57 cm by 2090. Thus, it is not until about 2050 that there is a major divergence in the magnitude of climate projections for sea level rise. The regions (LGAs) with the greatest increases by 2050 are East (Sorell, Glamorgan-Spring Bay, Tasman), North-east (Break O'Day), and Hobart (Brighton).

In the Risk Assessment, storm surge events are assessed by focusing on a 1-in-100-year storm surge event that is typically 2.1 to 3.2 m high along the Tasmanian coast; largest in the North-west (Kentish, Latrobe, Burnie, Central Coast), and Launceston (Meander Valley) regions. A 1-in-100year event means that there is a 1 per cent chance the event will occur in any single year. Under a moderate emission SSP2-4.5 scenario, climate models project that the 100-year storm surge event has a return period of 75 years by 2030 (occurs 1.3 times more often), 23 years by 2050 (4 times more often), and 3 years by 2090 (33 times more often).

Under the higher emission SSP3-7.0 scenario, the ocean temperature is considerably warmer and sea level rise is greater. Under this scenario, the 100-year storm surge events are projected to have a return period of 74 years by 2030 (occurs 1.4 times as often), 19 years by 2050 (occurs 5 times as often), and 2 years by 2090 (occurs 50 times more often). The regions (LGAs) with the most frequent storm surge return period by 2050 are North-east (Break O'Day), East (Glamorgan-Spring Bay), Flinders Island, North-west (Waratah-Wynyard), and Hobart (Hobart, Kingborough).

These major changes in sea level rise and storm surge and extreme wave height frequency have been well documented in the past, and strongly indicate that coastal adaptation and/or migration of infrastructure, communities and assets is likely to be increasingly necessary in the coming decades.

4.2.6 Coastal and marine

The oceans make up 70 per cent of planet Earth's surface. The majority of heat and CO_2 emitted to the atmosphere due to global warming has been taken up by the world's oceans, leading to increasing sea surface temperatures, ocean acidity (reducing their pH), environmental flows and wind regimes (Lida, et al., 2020).

Tasmania is internationally recognised for its wild fisheries and aquaculture which form a major component of the Tasmanian economy, with an estimated worth $1.18bn in 2020-21 (ABARES, 2022). The state also boasts seven marine reserves and 14 different marine conservation areas that are major draw for marine tourism (Tasmanian Parks and

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Wildlife Service, 2024), and make Tasmania one of the best locations in the world for marine research with Hobart the location of the Institute for Marine and Antarctic Studies (IMAS) at UTAS and CSIRO's Marine National Facility.

The Risk Assessment evaluates coastal and marine hazards by assessing trends in sea surface temperature and ocean acidity. These drivers increase the risk of acute marine heatwaves, leading to deterioration and destruction of marine environments, including giant kelp forests and reefs, increases incursion rates of more northerly species, and impacts to economic activity through decreases in the size, production and health of species (e.g., abalone, salmon and lobster) that are important to ocean aquaculture and marine fisheries. Ocean acidification brings impacts to calcium carbonate based marine organisms and phytoplankton negatively impacting marine ecosystems and the communities that depend on them.

There has been a strong long-term warming trend in Tasmanian waters, which is currently 2-3 times greater than the global average rate (Holbrook & Bindoff, 1997), resulting in the Tasman Sea becoming a global warming hotspot (Earth Systems and Climate Change Hub, 2021). Warming off the east coast and in the north-east region has been exacerbated by the observed extension of the East Australian current (Ridgway, 2007) and has been attributed to an increase in severe marine heatwaves in recent years (Oliver, et al., 2017). Currently, severe marine heatwave events, such as those observed in 2017-18, are expected to occur approximately once every 20-years (Meyer, et al., 2021).

Existing studies assessing future changes to sea surface temperature and the occurrence of marine heatwaves in Tasmanian waters have used the previous generation of physical climate scenarios, namely RCPs associated with the IPCC AR5. Future climate projections from these studies indicate a steady increase in both annual and seasonal average sea surface temperatures around Tasmania across the 21st Century (Grose, et al., 2010a). Increases to sea surface temperature are greatest in the east and north-east regions, largely due to the southward extension of the East Australian Current (EAC) bringing warmer water further south, leading to enhanced warming in these regions (Ridgway, 2007; Oliver & Holbrook, 2014; Oliver, et al., 2015). Ocean acidification is projected to continue, increasing risks to calcium carbonate based marine organisms and phytoplankton. The frequency of severe marine heatwave events is expected to remain rare under a low emission scenario (RCP2.6), occurring approximately once every 15 years by 2100. However, under a high emission scenario (RCP8.5), severe marine heatwaves occur almost every year by 2060 (Meyer, et al., 2021). Under a High Emissions scenario (RCP8.5) the ocean off eastern Tasmania is likely to be in a permanent marine heatwave state by 2080 (Earth Systems and Climate Change Hub, 2021).

Due to data availability, sea surface temperature and sea surface acidity are assessed using 1° (~100 km) CMIP6 climate projections from the IPCC WGI Interactive Atlas (IPCC, 2021). Climate models estimate the sea surface temperature in Tasmania waters is an average of 15.1°C annually. Sea surface temperatures are typically warmer on the north-east and east coast. The meso-regions with the highest sea surface temperatures are Twofold Shelf, Flinders, Freycinet, Central Bass Strait, and Otway.

Under a moderate emission SSP2-4.5 scenario, sea surface temperature is projected to increase by up to 0.8°C by 2030, 1.5°C by 2050, and 2.1°C by 2090. Under the higher SSP3-7.0 scenario, sea surface temperature is projected to increase by up to 0.9°C by 2030, 1.8°C by 2050, and 3.6°C by 2090. The greatest increases to sea surface temperatures occur along the north-east and east coast. The meso-regions with the greatest increases are Twofold Shelf, Freycinet, Bruny, Flinders, and Boags.

For the recent past (1995-2014), climate models estimate that Tasmanian waters have an average sea surface acidity of 8.10 pH units, with sea surface acidity is fairly consistent across Tasmanian waters and meso-regions.

Under a moderate emission scenario (SSP2-4.5), sea surface acidity is projected to increase by 0.7 per cent (-0.07 pH units) by 2030, 1.3 per cent (-0.11 pH units) by 2050, and 2.2 per cent (-0.18 pH units) days by 2090. Under the higher emission scenario (SSP3-7.0), is projected to increase by 0.8 per cent (-0.07 pH units) by 2030, 1.7 per cent (-0.14 pH units) by 2050, and 3.5 per cent (-0.28 pH units) days by 2090. Changes to sea surface acidity continue to remain consistent across Tasmanian waters and meso-regions.

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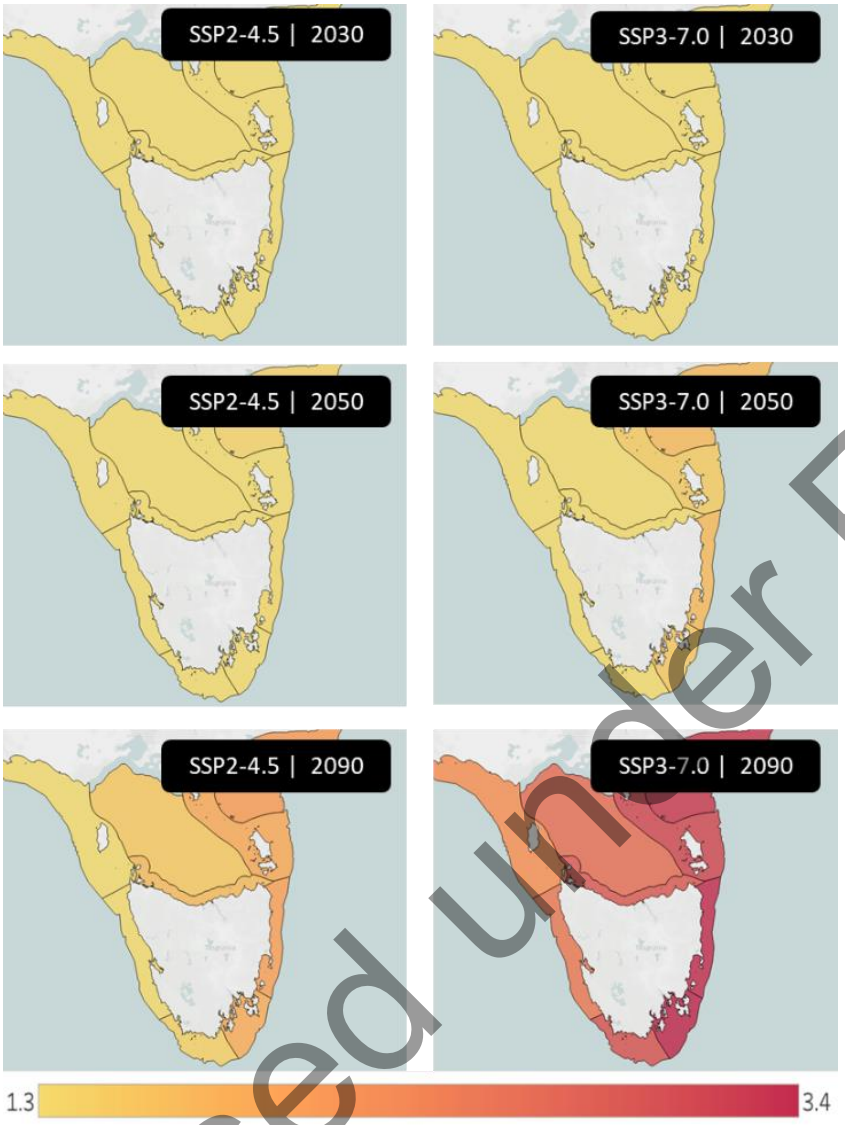

Figure 21: Future change in average sea surface temperature by 2030 (top), 2050 (middle), and 2085 (bottom) under SSP2-4.5 (left) and SSP3-7.0 (right) scenarios compared to the 1995-2014 historical baseline. Units are °C.

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4.3 Transition climate drivers

4.3.1 Policy and legal

4.3.1.1 Emissions reduction policy

Emissions reduction policy can often be quantitatively assessed using scenario emissions prices and emissions, with exposure related to emissions projections, targets, geographic location and associated regions and countries through trade.

Tasmania has an emissions target of net zero, or lower, from 2030. Additional targets that support emissions reduction in Tasmania include (ReCFIT, 2023):

- reducing food waste by 50 per cent
- 100 per cent electric government fleet vehicles by 2030
- 200% renewable energy production (from 2020 levels) by 2040)
- significant production of hydrogen by 2030.

This sits within the context of Australian climate policy with a national target of 43 per cent reduction below 2005 levels by 2030. Mechanism to support this target include the Australian Carbon Credit Unit (ACCU) Scheme and the Safeguard Mechanism (DCCEEW, 2024a). The Federal Government is targeting 82 per cent renewable electricity by 2030 which is supported by programs such as the Capacity Investment Scheme (DCCEEW, 2024b).

Emissions control mechanisms usually include regulatory, economic, or voluntary mechanisms to reduce emissions. Emissions reduction policies can present risk or opportunities to businesses that are impacted. Regulatory and economic measure can place financial burdens on businesses that have higher emissions. Voluntary schemes may offer opportunities such as subsidies for reducing emissions, carbon sequestration or purchasing sustainable technologies (Parry, et al., 2012).

Modelling used for the Risk Assessment does not provide granular regional information to understand whether Tasmania will maintain net zero emissions in 2030 and 2050. There are several factors that may influence this such as any changes to land use policy, the impact of bushfire, and the health of Tasmania's forests. Research suggests that increased frequency of bushfires in the future may negatively impact the long-term carbon carrying capacity of Tasmania's forests (May B, 2012). Similarly, drought conditions have been linked to a decline in soil carbon, and overall carbon carrying capacity of some vegetation type (Department of Primary Industries, Parks, Water and Environment, 2010a). There is limited research linking climate change impacts on retention of Tasmania's net zero status explored in the scenarios used for the Risk Assessment.

Tasmanian businesses are influenced by emissions reduction scenarios for Australia, representing additional burden to sectors that are not currently considered net zero emissions under schemes such as the Safeguard Mechanism. Under the lower emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario, emissions in Australia reduce by around 50 per cent by 2030, and reach net zero by 2050. Under a moderate emission (NGFS NDC; AEMO Progressive Change) scenario, emissions in Australia reduce by around 50 per cent by 2030, and reach net zero by 2050.

4.3.1.2 Emissions control mechanisms

Australia does not currently have any economy-wide emissions control mechanisms in place. However, emissions reduction may be driven by further action such as emissions control mechanisms. Examples of emissions control mechanisms include broad emissions pricing or trading schemes, carbon taxes, and regulatory and reporting control mechanisms.

This Risk Assessment uses a modelled shadow emissions price as an indicator for the impact of government policy for emissions reduction. A higher level of ambition to mitigate climate change translates into higher emissions prices. For clarity, the term emissions price will be used for current price of emissions in Australia, represented by Australian Carbon Credit Units (ACCUs), impacting businesses through the Safeguard Mechanism and Australian Carbon Credit Unit Scheme. The term shadow emissions price will be used to describe modelled future emissions prices. Models suggest that a marked increase in the shadow emissions price would be needed in the next decade to incentivise a transition towards net zero by 2050.

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Emissions in Australia are currently priced through the Australian Carbon Credit Unit Scheme, where ACCUs (sourced through sequestration and emissions reduction projects) are surrendered for compliance and voluntary purposes. Demand for ACCUs driven by 3 primary sources: Carbon Abatement Contracts, Safeguard compliance, and voluntary emissions reduction targets. In 2023 the price of ACCUs on the spot market fluctuated between A$24.00 and A$39.25 (Clean Energy Regulator, 2024).

Under the lower emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario, the shadow emissions price in Australia increases to AA$ 221 by 2030, and A$ 2727 by 2050. Under a moderate emission (NGFS NDC; AEMO Progressive Change) scenario, the shadow emissions price in Australia is around A$ 31 by 2030, and A$ 91 by 2050.

Tasmania may also be impacted by international emissions prices. Tasmania's economic growth is dependent on export markets, with key destinations including China, the United States, and Southeast Asia. The top export commodities with export value exceeding A$ 3,000 million for the FY23 were zinc, aluminium, iron ore, fish and other ores (DFAT, 2023).

The global transition to a low carbon may see emissions price impacts on Tasmania's export commodities. For example, those that are fossil-fuel based, emission-intensive, and closely linked to a high emissions sector with close substitutes, may be subject to emissions border adjustment mechanisms, or be replaced by commodities produced with lower emissions intensity.

4.3.1.3 Renewable energy policy

Australia's renewable energy policy focuses on accelerating the transition to sustainable energy sources to reduce emissions associated with the electricity sector. Key policy mechanisms include the Large-scale Renewable Energy Target (LRET), which mandates that 33,000 gigawatt-hours of electricity come from renewable sources by 2020, continuing to 2030 (Clean Energy Regulator, 2024c). Additionally, substantial investments are being made in solar, wind, and hydroelectric projects, supported by government incentives and funding programs such as the Clean Energy Finance Corporation and the Australian Renewable Energy Agency (DCCEEW, 2024). The recent introduction of the Capacity Investment Scheme further underscores Australia's commitment by incentivizing the development of new renewable energy generation and storage, ensuring a stable and secure energy supply as electricity sector decarbonises (DCCEEW, 2024b). These efforts align with Australia's commitment to international climate agreements and aim to foster innovation, economic growth, and energy security.

The development of renewable energy in Australia has seen growth in capacity across wind and solar generation. Renewable fuel sources such as hydro and bioenergy also contribute to renewable energy generation in Australia. In 2022 wind energy contributed around 30 GWh (10 per cent of total generation), growing 150 per cent compared with 2015 generation. Large-scale solar and rooftop solar contributed around 14 GWh and 17 GWh respectively (5 per cent and 6 per cent of total generation). Overall, renewable energy contributed 32 per cent of total generation in Australia in 2022, compared with 14 per cent in 2015 (DCCEEW, 2023b).

Tasmania's renewable energy policy aims to harness natural resources, such as wind and hydropower, to support economic growth in Tasmania, reduce electricity prices and support the decarbonisation of the electricity sector in Australia. The Tasmanian Renewable Energy Target (TRET) is a key policy mechanism in Tasmania, which aims for 200 per cent renewable energy generation by 2040. Projects that may support Australia's transition to renewable energy and achieve the TRET include Marinus Link and associated supporting transmission infrastructure, Renewable Energy Zones, and Battery of the Nation (ReCFIT, 2022). Additionally, Tasmania aims to become a hydrogen export hub supporting local industries and emissions reduction nationally and globally (Department of State Growth, 2020).

Tasmania is one of only a small number of jurisdictions across the world to operate with 100 per cent renewable electricity generation (ReCFIT, 2024b). Hydro power remains the main source of generation in Tasmania's energy system, providing over around 9000 MWh of generation in 2022 (80 per cent of state generation). Wind energy has increased its share of generation contributing around 1600MWh of generation in 2022 (15 per cent). Solar energy, though small compared to hydro and wind, is growing steadily, with rooftop solar installations increasing. Additionally, Tasmania utilises a small amount of large-scale solar and bioenergy (DCCEEW, 2023b).

The transition of the electricity sector to renewable energy has impacted electricity prices in Australia. In addition, other market factors have also impacted electricity prices. Over the past five years, electricity prices in the National Electricity Market (NEM) have experienced significant volatility. From 2019 to 2020, prices were relatively stable but began to rise sharply in 2021. This increase was driven by various factors, including higher demand, increased costs for coal and gas, and constraints in the supply of generation capacity. The year 2022 saw large increases in prices, due to a combination of

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high fuel costs, outages in coal-fired power stations, and extreme weather conditions exacerbating supply shortages. In 2023, there was some moderation in prices, largely due to improved generation availability and a decline in global fuel prices. However, prices remained above pre-2021 levels, reflecting ongoing volatility and structural changes in the energy market. These included a continued shift towards renewable energy sources and the phasing out of aging coal plants, which while improving long-term sustainability, contributed to short-term price fluctuations (AER, 2023; IEA, 2024).

There are clear increases in renewable energy generation in Tasmania under both a low emissions scenario and moderate emission scenario.

Under the lower emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario, the capacity of wind generation in Tasmania increases to 5.5 GW by 2030. Total hydro capacity is modelled to increase by 390 MW, while utility scale storage increases by 320 MW.

Under both the lower emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario and moderate emission (NGFS NDC; AEMO Progressive Change) scenario, electricity prices increase by around 20 per cent by 2030. By 2050, electricity prices have reduced by a greater amount under the lower emission scenario, a reduction of around 26 per cent compared with 2022 prices.

4.3.1.4 Resilience and adaptation policy

Australia has several key programs addressing climate adaptation and resilience. The National Climate Resilience and Adaptation Strategy (NCRAS) aims to better anticipate, manage, and adapt to climate change impacts. It focuses on enhancing leadership, improving climate information, and assessing adaptation progress. The strategy includes substantial investment in infrastructure and community resilience, such as the $3 billion climate finance commitment and initiatives to support vulnerable communities. The NCRAS will be replaced with the National Climate Risk Assessment and the National Adaptation Plan upon their completion (expected in late 2024) to guide effective adaptation practices across the nation.

Adaptation and resilience measures in Tasmania are likely to cost more under a moderate emission scenario and physical climate risks increase. Adaptation and resilience measures are most likely to be effective under a low emissions scenario. Tasmania is still impacted by physical climate risk under a Net Zero 2050 scenario, however limiting global warming will increase the effectiveness and social and environmental impacts of adaptation and resilience measures.

4.3.1.5 Policies affecting land use

Historically, land use change in Australia has been a source of emissions due to forest harvesting and extensive land clearing. In recent years this trend has reversed, and Australia's land sector has become a carbon sink, contributing to the mitigation of greenhouse gas emissions. Key strategies include reforestation, afforestation, and improved agricultural practices. Reforestation projects involve planting trees on previously cleared or degraded forest land and afforestation projects involve planting trees on land that was not previously forested to capture atmospheric carbon dioxide. These projects are particularly effective in creating carbon sinks through native vegetation, enhancing biodiversity, and restoring ecosystems. Additionally, improved soil management practices in agriculture, such as reduced tillage and crop rotation, have been implemented to increase soil organic carbon, further aiding in carbon sequestration (CSIRO, 2022; Bryan, et al., 2015).

The Australian government supports these efforts through initiatives like the Australian Carbon Credit Unit (ACCU) Scheme, which provides financial incentives for projects that sequester carbon. This includes carbon farming practices that not only store carbon but also deliver environmental and social co-benefits, such as improved soil health and increased farm productivity (Clean Energy Regulator, 2024b).

Tasmania has 79 active land-based projects registered under the ACCU Scheme; eight projects have received ACCUs for carbon sequestration. The projects in Tasmania cover a range of activities aimed at reducing greenhouse gas emissions and sequestering carbon. These include afforestation/reforestation, soil carbon enhancement, and improved forest management practices (Clean Energy Regulator, 2024a).

Land based carbon sequestration in Australia increases under both a moderate (NGFS NDC; AEMO Progressive Change) and low emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario. Under a moderate emission (NGFS NDC; AEMO Progressive Change) future, land-based carbon sequestration increases by over 150 per cent by 2030 and 280 per cent by 2050. Under the lower emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario, land-based carbon sequestration increases by over 150 per cent by 2030 and 300 per cent by 2050.

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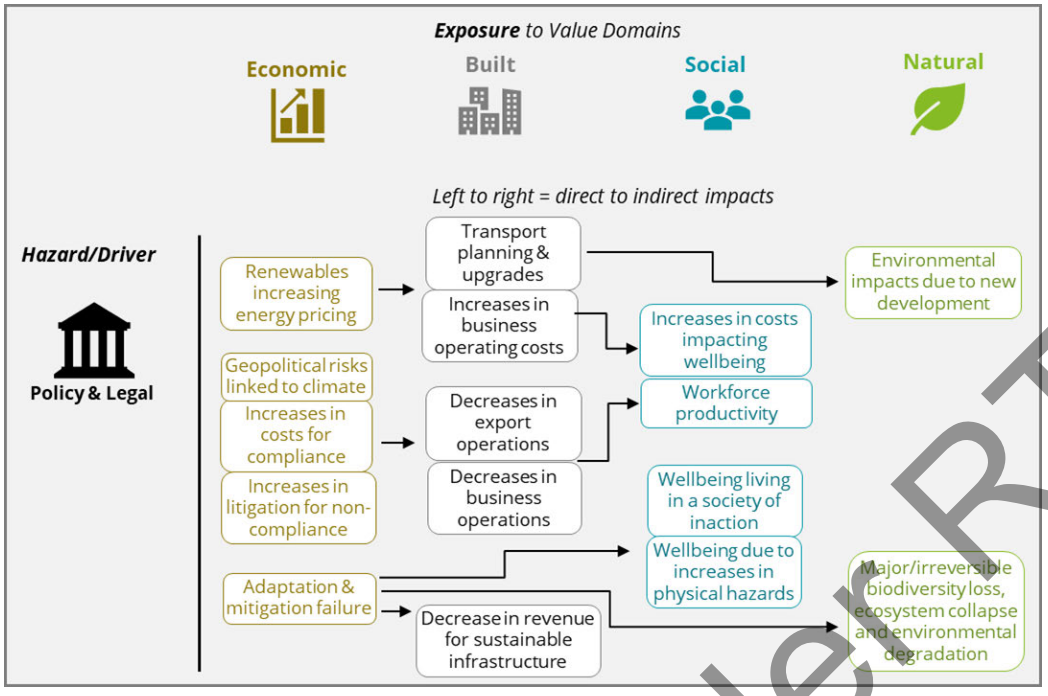

Figure 22: Cascading diagram illustrating example flow-on impacts driven by changes in climate-related policy and legal drivers, based on the impact statements.

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4.3.2 Technology

4.3.2.1 Technology cost - Solar PV

In recent years, the cost of solar PV technology has declined. In 2023, global solar module prices dropped by almost 50 per cent year-on-year due to a substantial increase in manufacturing capacity, which is expected to reach 1,100 GW by the end of 2024. This increase in production has created high supply compared with demand, reducing prices further. Wholesale prices for solar modules are projected to fall to around $0.10 per watt by the end of 2024, a decrease compared to previous years (IEA, 2023c; IEA-PVPS, 2023; IRENA, 2023).

The decrease in costs is largely attributed to technological advancements, economies of scale, and increased competition, particularly from China, which has the highest level of supply globally. Despite regional variations and some countries imposing import duties to protect local industries, the overall trend indicates that solar PV is becoming increasingly cost-competitive. This cost reduction enhances the attractiveness of solar PV for both large-scale utility projects and smaller, distributed systems (IRENA, 2023).

Under both the lower emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario and moderate emission (NGFS NDC; AEMO Progressive Change) scenario, technology costs for solar continue to reduce. By 2030, modelled capital costs under both scenarios reduce by around 42 per cent. By 2050, modelled capital costs under both scenarios reduce by around 62 per cent. This is predominately due to technology advancements, economies of scale, and increased competition which are more agnostic to policy settings which drive variation in other metrics across scenarios.

4.3.2.2 Technology cost - Wind

In recent years, the cost of wind energy technology has declined, making it more competitive in the energy market. As of 2022, the average levelized cost of wind energy was around A$32 per MWh, with some regional variations. This cost reduction is primarily driven by technological advancements such as larger turbines, taller towers, and longer blades, which have improved the efficiency and performance of wind power plants (Energy Markets & Policy, 2023; IEA, 2023d).

Under both the lower emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario and moderate emission (NGFS NDC; AEMO Progressive Change) scenario, technology costs for wind continue to reduce. By 2030, modelled capital costs

under both scenarios reduce by around 30 per cent. By 2050, modelled capital costs under both scenarios reduce by around 52 per cent.

4.3.2.3 Rooftop solar

Over the past five years, the adoption of rooftop solar in Australia has increased. The total installed capacity of rooftop solar systems is now over 23 GW by the end of 2023 (Australian PV Institute, 2024; Clean Energy Regulator, 2024d). This growth has been driven by several factors, including a reduction in the cost of solar PV systems, government incentives, and rising electricity prices. The average system size for residential installations has also grown, reflecting consumers' desire to maximize their energy independence and savings (Clean Energy Regulator, 2024).

Government policies, such as feed-in tariffs and rebates, have played a role in increasing the uptake of rooftop solar. At the Federal Government level, the Small-scale Renewable Energy Scheme (SRES) provides incentives to households and businesses installing rooftop solar (Clean Energy Regulator, 2024e). State-specific initiatives in Tasmania include interest free loans for eligible systems installed by Tasmanian households, small businesses and community organisations under the Energy Saver Loan Scheme.

Along with trends towards larger systems many households are opting to include battery storage solutions, which allow excess solar energy to be stored and used during non-sunny periods, enhancing the overall efficiency of solar PV systems (IEA-PVPS, 2023).

There are very clear increases in renewable energy in Tasmania under both a low emission scenario and moderate emission scenario.

Under the lower emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario, the capacity of rooftop solar in Tasmania increases to 710 MW by 2030. By 2050, the capacity of rooftop solar in Tasmania increases to 2.040 MW.

4.3.2.4 Hydrogen

Hydrogen technology is under development globally as a potential low emissions fuel replacement in many hard to abate sectors. This growth is evident in the expansion of the hydrogen market, with countries worldwide investing in hydrogen technologies. Interest is primarily in "green" hydrogen, produced through electrolysis powered by renewable sources like wind and solar. There is also interest in "blue" hydrogen, derived from natural gas with carbon capture and storage (CCS). Applications for hydrogen span several high emissions sectors including transportation, marine, Antarctic and natural gas supplementation and industrial processes like steel and cement production.

According to recent reports, the cost of producing green hydrogen from renewable sources has fallen by approximately 50 per cent since 2015, reaching around A$3-A$7 per kilogram in regions with high renewable energy resources (BloombergNEF, 2023). Additionally, analysis indicates that electrolyser costs have declined by 40 per cent since 2014, with further reductions expected as manufacturing scales up and technology improves (IRENA, 2020).

Australia is increasing generation from renewable energy resources particularly solar and wind, positioning it well to develop a hydrogen industry. Australia and Tasmania may be able to participate in the hydrogen economy as a major exporter of green hydrogen, with proximity to hydrogen markets in Asia, such as Japan and South Korea and established relationships with European markets. Supported by government initiatives like the National Hydrogen Strategy and investments in hydrogen infrastructure and research, Australia is starting to see the development of pilot projects with applications in the transportation and industrial sectors (DCCEEW, 2024d).

Tasmania has the aim of establishing a significant hydrogen industry by 2030. This is supported through funding from the Australian Government's Clean Hydrogen Industrial Hubs program and the Tasmanian Government (ReCFIT, 2024a).

Increase in hydrogen production in Tasmania is highest under the lower emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario. Under the lower emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario hydrogen production increases to around 2000 tonnes by 2030 and 21 000 tonnes by 2050. Under a moderate emission (NGFS NDC; AEMO Progressive Change) future, hydrogen production increases to around 1000 tonnes by 2030 and 4000 tonnes by 2050.

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4.3.2.5 Energy efficiency

The energy efficiency of existing housing stock in Tasmania presents significant challenges. Many homes were built before the introduction of modern energy efficiency standards. The average energy efficiency rating of existing homes in Australia is only 1.7 stars compared to 6.1 for new homes (TasCOSS, 2022). This results in high energy consumption and costs for residents in older buildings. Some energy consumers have very limited control over the efficiency of the buildings they occupy and their fixed appliances, for example where they are renters or low-income households. In Tasmania these households account for a significant share of total occupied dwellings. 2021 Census data show that private rentals (i.e. excluding public housing authority, community housing schemes etc.) were around 20 per cent of housing stock in Tasmania (ABS, 2022).

Australia's energy efficiency policies focus on reducing energy consumption and enhancing productivity across various sectors. The National Energy Productivity Plan (NEPP) aims for a 40 per cent improvement in energy productivity by 2030, achieved through measures like the Greenhouse and Energy Minimum Standards (GEMS) and the triennial National Construction Code updates (DCCEEW, 2023). The government is also investing A$1.6 billion for energy-saving upgrades in homes and businesses, prioritising social housing and community energy projects (DCCEEW, 2023c). Additionally, the National Electric Vehicle Strategy supports the transition to electric vehicles, including the installation of fast-charging infrastructure (IEA, 2023b).

The Tasmanian and Australian Governments are investing A$16.6 million in energy upgrades for more than 1,600 social housing properties. These upgrades include the installation of heat pump hot water systems, insulation, draught proofing, LED lighting, and window glazing, which aim to reduce energy bills and improve living conditions for residents. Additionally, initiatives like the Energy Saver Loan Scheme support broader energy efficiency measures across the state's housing stock, promoting the use of reverse cycle heating systems, solar hot water, and better insulation to further enhance energy performance and reduce costs for Tasmanian households (Homes Tasmania, 2024).

Support for energy efficiency in Tasmania is available through the Energy Saver Loan Scheme and Business Energy Efficiency Scheme (ReCFIT, 2023a; ReCFIT, 2024). Support to improve energy efficiency in Tasmania is also available with A$16.6 million in funding available from the Federal Government (Homes Tasmania, 2024). Other states such as Victoria, New South Wales and South Australia have certificate schemes incentivising energy efficiency improvements in residential and commercial buildings (AEMO, 2023b).

Energy efficiency impacts are only measured in the AEMO ISP modelling at the national level. It is likely that energy efficiency in Tasmania will improve in line with national average. Energy efficiency measures in Australia is highest under a low emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario. Under a moderate emission (NGFS NDC; AEMO Progressive Change) future, energy efficiency measure reduce demand for electricity by 143 GWh by 2030 and 600 GWh by 2050. Under the lower emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario energy efficiency measures reduce demand for electricity by 249 GWh by 2030 and 1034 GWh by 2050.

4.3.2.6 Supporting adaptation activity

Technology is currently being implemented to address climate risks globally, nationally and within Tasmania. Current technology is often utilised to manage past and present-day severe weather but may be more broadly utilised to manage increased prevalence of severe weather and chronic changes to weather patterns in the future. Technology utilised includes advanced weather monitoring systems, climate resilient infrastructure (such as flood mitigation or storm surge protection), nature-based solutions (which utilise natural process to slow and dampen the impact of severe weather), smart agriculture (optimisation of water use and crop resilience) and energy solutions (such as distributed energy systems) (UNFCC, 2024; The World Bank, 2020).

4.3.2.7 Electric vehicles

Electric vehicles (EVs) significantly reduce emissions through multiple mechanisms. EVs reduce emissions from the transport sector by eliminating tailpipe pollutants, with the added benefit of improving urban air quality and lowering noise pollution. Overall, EVs are more energy-efficient compared to internal combustion engine vehicles. When used in regions with a high proportion of renewable energy they can lower the overall emissions from vehicles (IEA, 2023). Additionally, advancements in battery technology and vehicle-to-grid capabilities support energy storage and grid stability (IEEE, 2023).

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The Australian Government has implemented several incentives to promote the adoption of electric vehicles, aiming to reduce costs, improve charging infrastructure, and support environmental goals. One of the primary incentives is the Electric Car Discount Scheme, which includes an exemption from Fringe Benefits Tax (FBT) for eligible EVs priced below the luxury car tax threshold for fuel-efficient cars (set at A$84,916 for 2023-24). This exemption makes EVs more attractive for employers and employees as part of salary packaging. Additionally, some EVs are exempt from the 5 per cent import tariff, reducing the purchase cost of imported EVs (DCCEEW, 2023a).

The government has introduced several grants and funding programs to support the uptake of EVs. The Driving the Nation Program, administered by the Australian Renewable Energy Agency (ARENA), builds upon the Future Fuels Fund and provides grants to support the rollout of EV charging infrastructure and the adoption of EVs, particularly for commercial fleets (ARENA, 2024). The Clean Energy Finance Corporation (CEFC) offers competitive loans and financing options for businesses and organizations to purchase EVs and install related infrastructure (CEFC, 2024). The Australian Government has also set targets to increase the proportion of EVs in its fleet (DCCEEW, 2023a).

Under the Instant Asset Write-Off scheme, businesses can claim an immediate deduction for the business portion of the cost of an eligible EV, subject to certain thresholds and conditions. This provision helps reduce the upfront cost of EVs for businesses, encouraging them to transition to cleaner vehicles (DCCEEW, 2023a).

There are currently around 3,900 EVs registered in Tasmania (Department of State Growth, 2024). Increase in EVs in Tasmania is highest under a lower emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario. Under a moderate emission (NGFS NDC; AEMO Progressive Change) future, EVs increase to around 7,000 by 2030 and reduce emissions by around 238,000 tonnes of CO_2 by 2050. Under the lower emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario EVs increase to around 11,000 by 2030 and reduce emissions by around 511,000 of CO_2 by 2050.

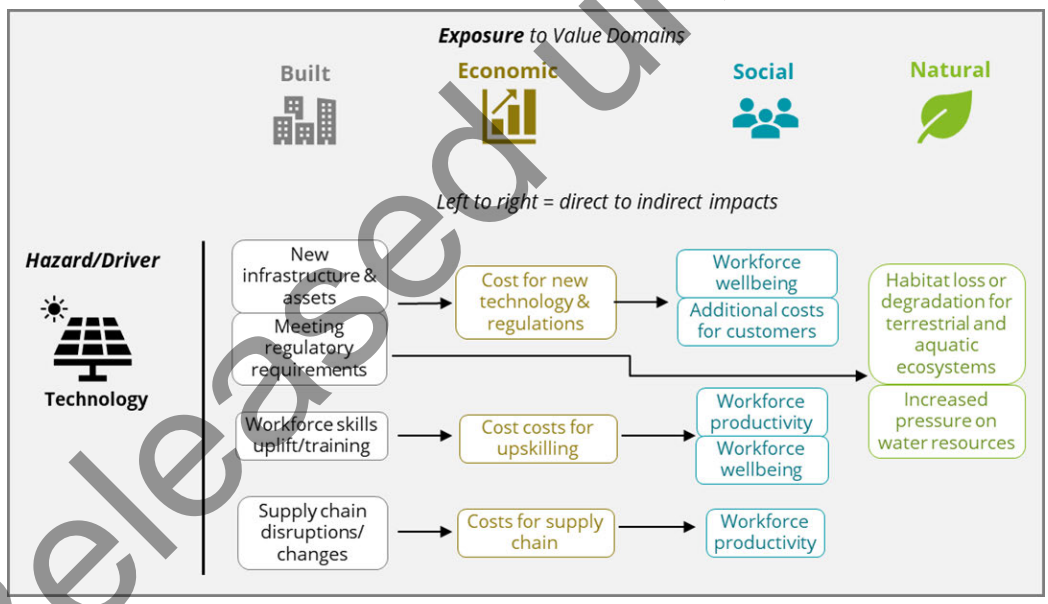

Figure 23: Cascading diagram illustrating example flow-on impacts driven by changes in climate-related technologies, based on the impact statements.

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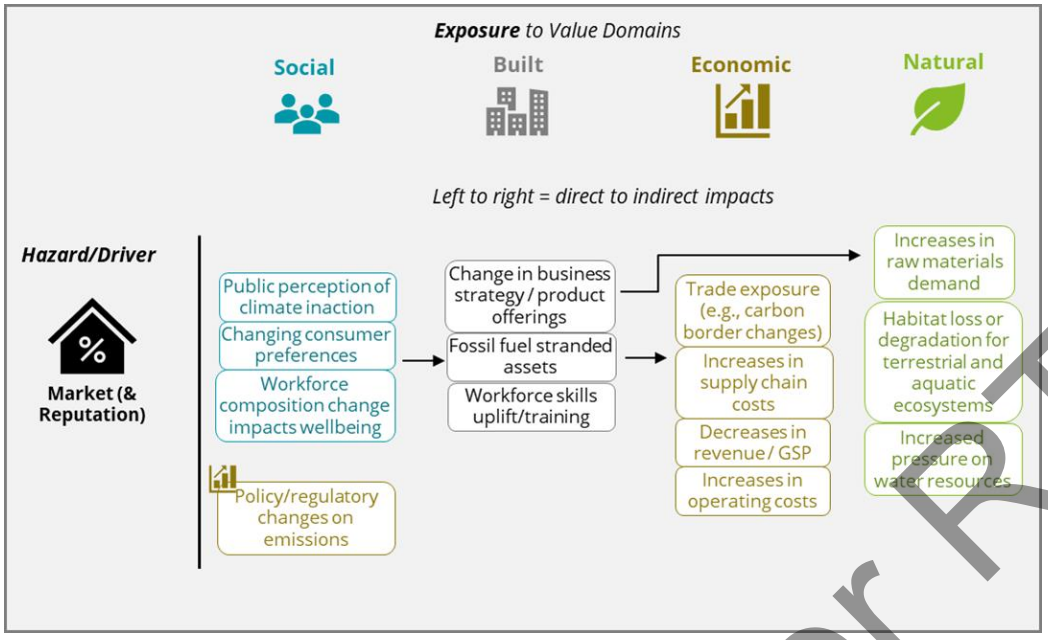

Figure 24: Cascading diagram illustrating example flow-on impacts driven by changes in climate-related market and reputation drivers, based on the impact statements.

4.3.3 Market Mechanisms

4.3.3.1 Circular economy

A circular economy offers an approach to sustainability that benefits emissions reduction, the economy, communities, and the environment. A circular economy reduces the volume of waste that ends up in landfills, decreasing methane emissions from decomposing organic waste streams. Using resources more efficiently lowers the need for new raw materials, again reducing emissions and environmental impacts associated with extraction, processing, and transportation of goods (Australia's Chief Scientist, 2024).

For the Tasmanian economy, a circular economy can create jobs in recycling, refurbishing, and remanufacturing sectors. This diversification may foster new business models such as product-as-a-service, sharing platforms, and remanufacturing hubs, which can reduce dependence on imports and keep resources within the community (Tasmanian Waste and Resource Recovery Board, 2023). Sustainable waste management benefits health and wellbeing through reduced pollution and waste, contributing to cleaner air, water, and soil. Pollution reduction through efficient resource use and better waste management contributes to cleaner ecosystems and waterways (CSIRO, 2021).

Circularity and sustainability are not mapped directly through scenario analysis metrics; however, they are likely to be highest under a low emission (NGFS Net Zero 2050; AEMO Green Energy Export) scenario where there are clear trends in resource efficiency and sector emissions reductions.

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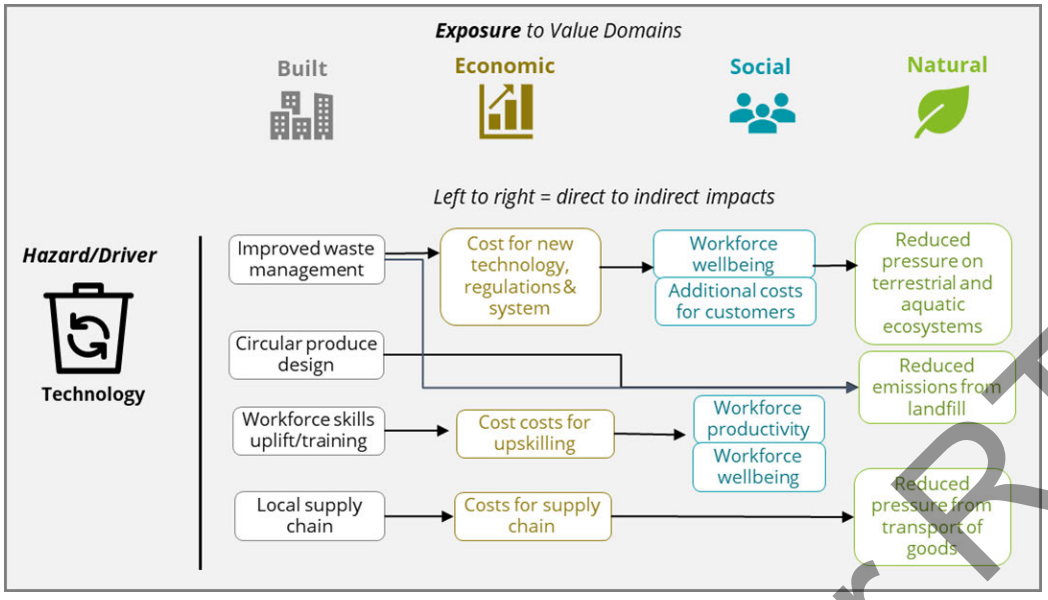

Figure 25: Cascading diagram illustrating example flow-on impacts driven by a move to a circular economy, based on the impact statements.

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5 Informing adaptation priorities for Tasmania

This chapter provides an overview of the adaptation urgency assessment, and includes:

- an overview of the adaptation assessment criteria, which provides the methodology for evaluating adaptation urgency of impact statements and therefore adaptation action
- a guide to interpret the impact statement profiles with detailed information on the profile layout and associated research that informed the assessment
- a summary of the impact statements, synthesising the key findings and insights that will provide input for policy makers, stakeholders, and others developing adaptation activities and plans
- the 40 detailed impact statement profiles for Tasmania. Each includes consequence, exposure, vulnerability, adaptation shortfall and adaptation urgency ratings which are based on robust desktop research and stakeholder inputs for the current and future climate.

5.1.1 Impact profile layout overview

Each profile contains the following layout, where the upper greyed section provides overview information and scoring, and the bottom half of the profile provides the supporting detailed evidence.

Table 19: Impact profile layout

<table>
<tr><th colspan="5">Statement ID(s): Theme</th></tr>
<tr><td colspan="5">The individual climate impact statement/s
Where relevant, the acute and chronic impact statements for the same impact are combined into a single profile to avoid duplication of evidence.</td></tr>
<tr><th colspan="3">Consequence (Risk only)</th><th colspan="2">Confidence</th><th>Adaptation shortfall</th><th>Adaptation urgency</th></tr>
<tr><td colspan="3">Current:
Rating (physical / transition) for the current climate</td><td colspan="2" rowspan="2">Overall rating
Taken as the average or highest combination of the Agreement and Evidence ratings</td><td rowspan="2">Adaptation shortfall rating</td><td rowspan="2">Adaptation urgency Tier rating</td></tr>
<tr><td>2030
Rating (physical/ transition)</td><td>2050
Rating (physical/ transition)</td><td>2090
Rating (physical only)</td></tr>
<tr><td colspan="3"></td><td>Agreement</td><td>Evidence</td><td></td><td></td></tr>
<tr><th colspan="7">Risk/Opportunity summary and associated impact statements</th></tr>
<tr><td colspan="7">Summary:
The risk/opportunity summary provides an overview of the hazards, exposure and vulnerability for the impact statement being profiled. The detailed summary is provided in the next table cell.

The related impact statements are provided to show interconnections between the profile impact statement and other impacts for Tasmania, indicating a breadth of connectivity. This is not an exhaustive list and only includes the prioritised statements.</td></tr>
<tr><th colspan="7">Justification and evidence</th></tr>
<tr><td colspan="7">Current context:
The recent past exposure of value domains and their subdomains to the physical / transition hazard/driver(s). Hazards and key geographic regions are bolded.
Future context:
The future (out to 2100 for physical; out to 2050 for transition) exposure of value domains and their subdomains to the physical / transition hazard/driver(s). Hazards and key geographic regions are bolded. The vulnerabilities and impacts to hazard exposure are integrated into the description. Future trends are based on scenario analysis (Section 3) and other available evidence.

Existing adaptation responses
Existing adaptation responses collected from desktop research and/or stakeholder consultation. These can be existing policies with adaptation plans related to the impact statement and/or adaptation actions / initiatives underway.</td></tr>
</table>

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Justification of adaptation urgency rating

Justification of adaptation urgency provides a summary of key rating and assessment of rating in relation to Figure 27 adaptation urgency categorisation workflow. Justification is structured as follows:

- **Magnitude of consequence in 2030**
- **Future magnitude of consequence in 2050 and 2090**
- **Confidence rating**
- **Adaptation shortfall**
- **Overall adaptation urgency rating**

5.2 Assessment criteria

A key objective of the Risk Assessment is to inform future climate adaptation action by the Tasmanian Government by providing a comparative rating of the adaptation urgency of the climate risks and opportunities identified for the state, with a particular focus on those that can be influenced by action within the next 5 years.

The adaptation urgency of each priority impact statement is qualitatively rated, informed by desktop research and stakeholder consultation, using the following criteria:

1. **Magnitude of consequence**: the potential magnitude of impact at a state level from the risk or opportunity, considered against an ascending scale of potential implications over time, for each value domain.
2. **Confidence:** the quality of the evidence, along with the level of agreement between studies and experts.
3. **Adaptation shortfall: reflects** whether risks or opportunities are the subject of any adaptation activity that aims to manage the risk or opportunity either partially, or in full.

Adaptation urgency

Combined, these three criteria make up the adaptation urgency rating that indicates the degree to which action is needed in the next five years to reduce a risk or realise an opportunity from climate change. An urgency rating scale is used because it is transparent and can be understood and compared by policy makers and communities, across different policy areas. Risks and opportunities with the highest adaptation urgency are classified as Tier 1, then Tier 2 through to Tier 4.

5.2.1 Magnitude of consequence

The magnitude of consequence indicates the extent of the impact of the risk or opportunity, at a state level, based on its physical or transition hazard or driver, and exposure and vulnerability factors. The criteria below describe the level of impact in the context of each value domain (Table 20).

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Table 20: Tasmania's Risk Assessment for Climate Change Magnitude of consequence criteria

Consequence level				
Negligible No significant change in impact at a state scale – can be handled through business-as-usual; or some local or regional impacts requiring no specialised management	**Minor** Some minor impacts at the state scale that could be addressed through local or regional management and adaptation processes	**Moderate** Significant impacts at the state scale, of interest to Tasmanian agencies to control and respond to.	**Major** Major impacts at the state scale, of high interest to Tasmanian agencies to quickly control and respond to.	**Extreme** Extreme impacts at the state scale (or in multiple Tasmanian regions), of heightened interest to Tasmanian agencies to urgently control or respond to. May be of interest to Tasmanian partners or financial or insurance institutions.
Natural domain				
• Indistinguishable impacts on ecosystems and access and availability of water resources. • Negligible impact on natural land and coastal areas.	• Temporary localised or minor effects on ecosystems and/or species and availability of water resources. • Short-term loss/minor decline in the ecological integrity/ stability to a small minority of land and coastal areas.	• Sustained localised or shorter-term regional on ecosystems and/or species and availability of water resources. • Sustained localised or shorter-term regional change in the ecological integrity/ stability of high-value protected natural areas (including marine protected areas).	• Widespread alteration of ecosystems and/or species at regional scales leading to significant ecosystem instability and/or species declines and compromised water resources. • Regional/medium term reduction in the ecological integrity/stability of most of land and coastal areas.	• Significant, irreversible, and widespread alteration of ecosystems and/or species resulting in major ecosystem instability, serious loss of species and significantly compromised access and availability to water resources. • Major and widespread instability in land and coastal areas.
Social domain				
• No discernible changes to health, safety and wellbeing, social welfare and housing of community members, education, employment, and/or community services. • Temporary disruption, no permanent dispersal or loss of connectedness, minor damage to cultural assets/ delays to culturally important events.	• Limited to no impact on health, safety and wellbeing, social welfare, and housing of community members. • Isolated and short-term disruption to education, employment, and/or community services. • Minor impact on patterns of daily activity and behaviour. • Connectedness damaged, some recovery resources needed, some damage of cultural assets, delay, or reduced scope of culturally important events.	• Moderate lasting impacts on health, safety and wellbeing, social welfare, and housing of community members. • Moderate disruption to education, employment, and/or community services. • Moderate impacts on patterns of daily activity and behaviour. • Connectedness broken, significant recovery resources needed, damage of cultural assets, delayed culturally important events.	• Prolonged disruption to health, safety and wellbeing, social welfare, and housing of community members. • Prolonged disruption to education, employment, and/or community services. • Major impacts on patterns of daily activity and behaviour. • Connectedness significantly broken, extraordinary recovery resources needed, widespread damage/loss of cultural assets, postponed events.	• Health, safety and wellbeing, social welfare and housing of community members is significantly compromised across the region. • Permanent disruption to education, employment, and/or community services. • Patterns of daily activity and behaviour unable to continue. • Community ceases to function effectively/ widespread and permanent loss of cultural assets, culturally important activity cancelled.

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Consequence level				
Negligible No significant change in impact at a state scale – can be handled through business-as-usual; or some local or regional impacts requiring no specialised management	**Minor** Some minor impacts at the state scale that could be addressed through local or regional management and adaptation processes	**Moderate** Significant impacts at the state scale, of interest to Tasmanian agencies to control and respond to.	**Major** Major impacts at the state scale, of high interest to Tasmanian agencies to quickly control and respond to.	**Extreme** Extreme impacts at the state scale (or in multiple Tasmanian regions), of heightened interest to Tasmanian agencies to urgently control or respond to. May be of interest to Tasmanian partners or financial or insurance institutions.
Economic domain				
• Limited economic losses of asset value compared to gross product produced. • Inconsequential industry or business sector disruption.	• Decline of economic activity and/or loss of asset value compared to gross product produced. • Significant industry or business sector disruption, resulting in short-term (< 1 year) profit reductions.	• Decline of economic activity and/or loss of asset value compared to gross product produced. • Significant industry or business sector disruption, resulting in medium-term profit reductions.	• Decline of economic activity and/or loss of asset value compared to gross product produced. • Significant structural adjustment required by identified industry to respond and recover.	• Decline of economic activity and/or loss of asset value compared to gross product produced. • Failure of a significant industry or sector in area of interest.
Built domain				
• Insignificant infrastructure disruption to service/road infrastructure. • Negligible damage to commercial, health, service oriented (e.g., schools, community centres) and residential buildings.	• Isolated and short-term disruption to service/road infrastructure. • No permanent damage, some minor restoration work required to commercial, health, service oriented (e.g., schools, community centres) and residential buildings.	• Many short-term disruptions to services/road infrastructure. • Damage recoverable by maintenance and minor repair to commercial, health, service oriented (e.g., schools, community centres) and residential buildings. Some buildings are uninhabitable.	• Widespread short-to-medium term disruptions to services/road infrastructure. • Extensive infrastructure damage requiring major repair to commercial, health, service oriented (e.g., schools, community centres) and residential buildings. A significant number of buildings are uninhabitable.	• Widespread, long-term service disruption; significant permanent damage and/or complete loss to services/road infrastructure. • Many commercial, health, service oriented (e.g., schools and community centres) and residential buildings are uninhabitable. • Majority of government and non-commercial buildings are deemed uninhabitable.

5.2.2 Confidence rating

The confidence rating used in the Risk Assessment aligns with the approach of both the IPCC AR5 and AR6 reports and is based on Mastrandrea et al. (2010). For each risk and opportunity, the Risk Assessment qualitatively considers the type, amount, quality and consistency of evidence and the level of agreement between studies and experts. Items taken into consideration when evaluating the quality of evidence and agreement within the scientific community are as follows:

Evidence

- Types of evidence include mechanistic or process understanding, underlying theory, model results, observational and experimental data, and formally elicited expert judgment.
- The amount of evidence available can range from small to large, and that evidence can vary in quality.

Evidence can also vary in its consistency. This is the extent to which it supports single or competing explanations of the same phenomena, or the extent to which projected future outcomes are similar or divergent.

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Agreement

- The level of agreement is a measure of the consensus across the scientific community on a given topic and not just across an author team. It indicates the degree to which a finding follows from established, competing, or speculative scientific explanations.
- Agreement is not equivalent to consistency. Whether or not consistent evidence corresponds to a high degree of agreement is determined by other aspects of evidence such as its amount and quality - evidence can be consistent yet low in quality.

Table 21: Confidence rating matrix, adapted from (Mastrandrea, et al., 2010)

Agreement →			
	High agreement Low evidence	High agreement Medium evidence	**High agreement** **High evidence**
	Medium agreement Low evidence	Medium agreement Medium evidence	Medium agreement High evidence
	Low agreement Low evidence	Low agreement Medium evidence	Low agreement High evidence

Evidence (type, amount, quality, consistency) →

Overall Confidence Rating

Very Low	*Low*	*Medium*	*High*	*Very High*

A robust evidence base for the Risk Assessment

The Risk Assessment is informed by a range of inputs including:

- national and international best practice and widely adopted frameworks, thresholds, and criteria
- climate related inputs from Tasmanian stakeholders
- credible and publicly available data and information, particularly Tasmanian related.

Stakeholder input was gathered mainly at two critical points during the Risk Assessment: first, for assessing climate impacts (see Summary of climate impacts on Tasmania 3.1), and second, for identifying adaptation actions and priorities (3.2.2).

The data, information sources, and stakeholder inputs were prioritised based on the diagram shown below (Figure 26)

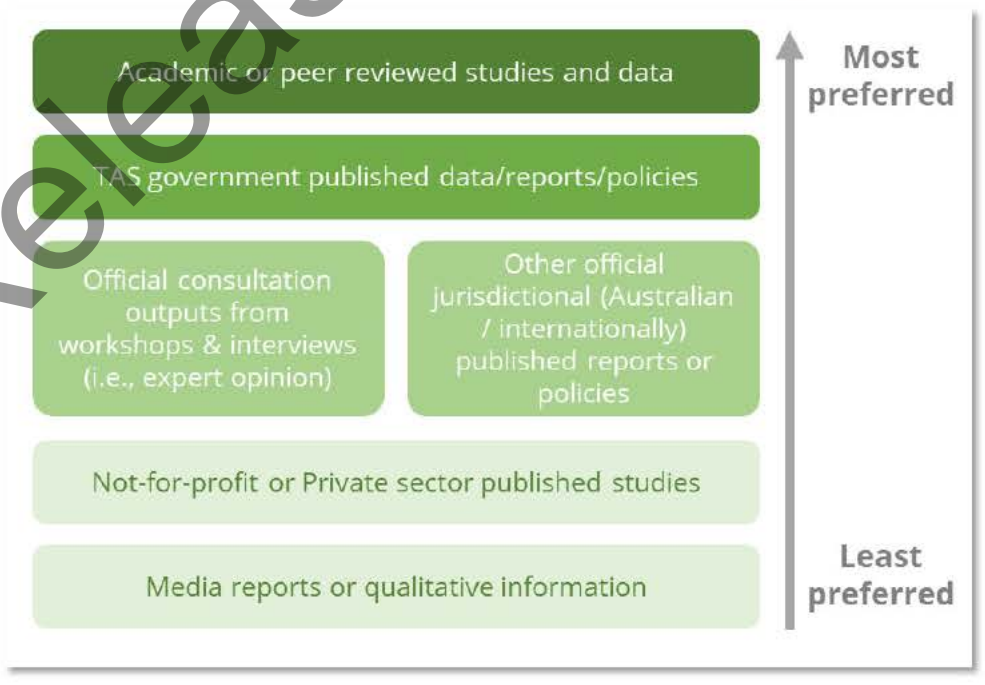

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Figure 26: Evidence hierarchy used in prioritising information sources.

5.2.3 Adaptation shortfall

The purpose of the adaptation shortfall criteria is to assess whether there are adaptation activities in place that aim to manage or address the risk or opportunity. While adaptation can vary in depth, this assessment focuses on whether the adaptation actions exist and their intended purpose, not on judging their effectiveness or duration.

Table 22: Adaptation shortfall criteria

	Low adaptation shortfall	Partial adaptation shortfall	High adaptation shortfall
Risks	Policy, strategy, or plan in place with clear objective and actions that are intended to reduce the specific risk, across a range of future warming scenarios and time horizons. Identified approaches are at multiple levels (e.g., state-level policies supplemented by additional local level approaches).	Policy, strategy, or plan in place, but no clear objective, or only partly addresses the specific risk. Identified approaches may not be at multiple levels (e.g., some local level approaches but no state approach). OR Policy strategy or plan in place, but only commits to managing risk for at least 2°C warming pathway, or does not consider future uncertainty.	No policy, strategy, or plan in place to reduce risk or an overall lack of evidence to reduce the risk.
Opportunities	Opportunity is or can be fully realised in the absence of further government intervention OR the enabling environment is in place to fully realise the opportunity.	Opportunity will NOT be fully realised in absence of government intervention and only some elements of the enabling environment are in place.	Opportunity will NOT be fully realised in absence of government intervention and no elements of the enabling environment are in place.

5.2.4 Adaptation urgency

The adaptation urgency for each of Tasmania's key climate risks and opportunities is based on the combined ratings of consequence, confidence, and adaptation shortfall.

The adaptation urgency rating indicates whether urgent adaptation action is needed for a particular risk or opportunity, particularly in the next five years, based on the evidence and analysis conducted in the Risk Assessment.

Table 23: Adaptation urgency rating definitions

Adaptation urgency rating scale	
Tier 1 Ready to Act	New, stronger, or different government policies or implementation activities – over and above those already planned are needed in the next five years to reduce longer term climate risk or immediate significant climate risk and it is clear where this action should be directed.

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Tier 2 Investigate then Act	Adaptation efforts are planned or underway; however, additional adaptation effort is required at a state level. It is unclear what the impacts are specifically or where action should be targeted, and further investigation is required (such as new studies or research) to fill evidence gaps and reduce uncertainty, to direct and underpin additional adaptation activity.
Tier 3 Continue to Monitor Current Actions	Current or planned levels of adaptation activity appear appropriate, but continued implementation of these policies and plans and a periodic review of these adaptation actions and consequent impacts on risk urgency is needed.
Tier 4 Monitor	The projected consequence to this risk is insignificant or minor in the short term and is not projected to exceed a moderate level by 2050. An adaptation urgency rating of this level indicates priority action is not required at this time. The evidence for these areas should be periodically reviewed, along with long-term monitoring of risk levels and adaptation activities so that further action can be initiated if necessary.

The adaptation urgency rating scale has been applied to each of the priority climate impact statements in Sections 5.5.1, 5.6, 5.7, and 5.8 to help inform future adaptation priorities for the State.

5.2.5 Applying the assessment criteria

In order to apply the assessment criteria consistently across all impact statements, a stepwise approach was developed (Figure 27). By assessing each impact statement across all four domains through this workflow, each impact statement was subsequently categorised into an adaptation urgency tier. Key questions used in the diagram highlight the context and nuance of each adaptation urgency tier.

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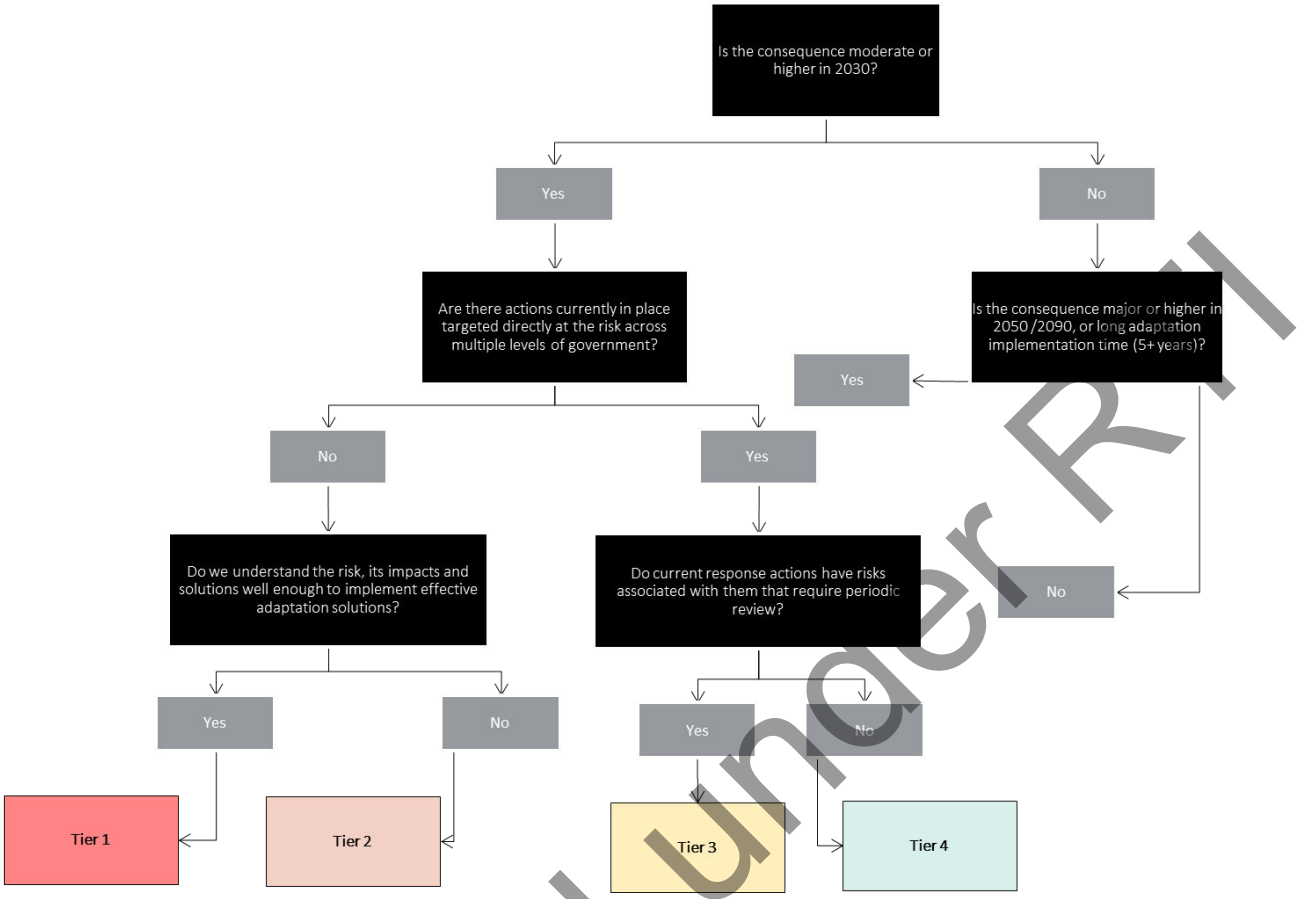

Figure 27: Adaptation urgency categorisation workflow

5.3 How to interpret the impact statement profiles

This section provides a summarised view of the prioritised impact statements, including their ratings for consequence over specific time periods, the confidence and adaptation shortfall ratings, and resulting adaptation urgency rating. The scoring for the impact statements viewed together, shows the overall priorities for the State.

The section also presents the individual impact statement profiles, which detail current and future exposure and vulnerability factors, and the association with other impacts for the state for each priority risk and opportunity.

5.3.1 Framework for research that informed the criteria ratings

Every effort has been made to capture an accurate picture of climate change related risks, opportunities and adaptation activity at a state level for Tasmania, within the time constraints for the Risk Assessment project.

Research and scoring for the profiles are governed by the following framework:

- **Hazard/driver trends:** Future climate hazard/driver trends were based on the climate scenario analysis findings in Section 2.2 that includes geographic hotspots.
- **Data sources:** A range of resources was used to support the risk summary and adaptation measures (e.g., government, peer reviewed, council, and other documentation). Research examples of impacts and vulnerability were selected to support key points. The desktop research is not intended to be a detailed literature review and is aimed at providing a broad overview of the issue.
- **Conflicts and uncertainty:** If research for an impact statement was conflicting (e.g., in direction of impact trend, or different hotspot regions) then this was factored into the Confidence rating.

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- **For the Consequence rating:**
    - If the Statement covers both a risk and an opportunity, the consequence rating is applicable to the 'risk' only.
    - If the Statement is an opportunity only, then there is no consequence rating as the opportunity would provide a positive benefit rather than a negative consequence.
- **Adaptation shortfall ratings** are informed by published literature and/or key stakeholder inputs on past or current adaptation activity that is clearly funded and going to progress.
- The **adaptation urgency rating** is a combined rating incorporating all other ratings to reflect the urgency of action for that impact statement.

5.3.1.1 General limitations

- **Limited data sources:** There are impact statement profiles with limited qualitative and/or quantitative data for impacts and adaptation/opportunity efforts. Where there was insufficient information quantity or quality of information relating to Tasmania, national or globally relevant resources were considered. These gaps have been highlighted within the Risk Assessment and can therefore inform areas for future research and investment.

- **Adaptation benefits:** There is an overall lack of understanding of the benefits and outcomes of climate-related opportunities, which may lead to maladaptation and/or insufficient implementation time for adaptation measures to realise these opportunities. The uncertainty of adaptation success and the risk of maladaptation is not captured in the Risk Assessment. Additionally, actions that constitute climate adaptation have a diverse breadth. Consequently, actions may sometimes not be recognised as "adaptation actions", making their implementation difficult to capture within the Risk Assessment.

5.4 Summary of impact statement profiles and findings

While the summary table provides a snapshot of consequence levels in the short term, all the risk and opportunity statements will experience a progressive increase in their consequence rating as the frequency and intensity of acute climate events increases alongside the continued evolution of chronic climate changes and events across the State. This is true in all cases, regardless of the climate scenario applied.

5.4.1.1 Key findings about the assessment criteria and/or enhanced adaptation action across the state

1. **The adaptation shortfall is rated as 'partial' for the majority of risk and opportunity impact statement profiles.**

- The Risk Assessment recognises that there are meaningful policies and strategies in place at a national and state level that are working to mitigate risk impacts and establish an enabling environment that fully realises relevant opportunities to the state that arise from climate change and the current transition. However, a partial shortfall has been provided for a majority of the risk and opportunity impact statement profiles after extensive research and consultation. This reflects the need for further investment into existing and future adaptation strategies and initiatives to both effectively manage risks and fully realise opportunities available to the state.

2. **By 2090, many impact profiles have an extreme consequence rating**.

- Risk profiles with a projected extreme consequence rating for 2090 include risks to marine ecosystems and species, alpine ecosystems and species, social cohesion, insurability, ocean-based aquaculture and fisheries, health care and emergency services, and buildings and structures and transportation networks.
- The impacts per value domain vary widely. For example, in the natural domain, environmental biomes may become significantly compromised and experience irreversible damages. In the social domain, connectedness may be broken, welfare, physical and mental health may be compromised, and key community services could be disrupted. In the economic domain this indicates the potential failure of a significant industry or sector. Finally, in the built domain buildings and structures may become uninhabitable.

3. **Half the impact statements are rated as Tier 1 ('Ready to Act') risks/opportunities.**

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- **There are 20 'Tier 1' impact statement profiles across all domains for physical and transition risks and/or opportunities.** This finding indicates that new, stronger, or different government action, over and above those underway or planned, is needed in the next five years, and it is clear where this action should be directed.
- **All six physical risk impact statements in the natural domain have a Tier 1 rating for adaptation urgency.** This suggests that all ecosystems and at-risk species within Tasmania require new, strong or different government action over and above those already planned, lowering the level of risk to exposed ecosystems and species in the next five years.
- **All physical risks in the natural environment are rated as Tier 1 and these risks are connected to over two thirds (67 per cent) of the impact statements across other domains (i.e., 23 of 34 statements).** All physical hazards will impact multiple aspects of the natural domain.
- **Climate change is already, and will continue, to impact livelihoods.** In the social domain, cultural heritage, social cohesion and community wellbeing are key priorities rated with a Tier 1 adaptation urgency.
- **Many impacts in the built domain are rated to have a 'major' consequence by 2030,** particularly risks to healthcare and emergency services, built infrastructure, and risks to transport networks.
- **Tasmania's food and supply chain networks require urgent adaptation.** In the economic domain, risks to supply chains and distribution networks, the land-based primary sector, and ocean fisheries and aquaculture are all assessed as Tier 1 risks. Tier 1 transition risks include risks to social cohesion, and risks from supply chain costs as organisations adjust to a low carbon economy.
- Most **Tier 1 risks relate to physical climate impacts**, rather than transition related risks.
- **Tier 1 opportunities are mostly transition-based**, with two impact statements that are physical climate based. Key areas where additional action could be taken to fully realise climate-related benefits to Tasmania include infrastructure development to support the circular, low emissions transport, increased participation in carbon markets, improving energy efficiency in low-income households, and supporting water quality and biodiversity.
- There are **7 priority opportunities** that are rated as Tier 1: Ready to Act.
- **Natural domain**: All physical risks in the natural domain have a Tier 1 rating for adaptation urgency, and these are connected to 67% of the remaining risk and opportunity impact statements (i.e., 23 of 34 statements) across all value domains. Opportunities relate to improving water quality and biodiversity provides benefits across multiple ecosystems.
- **Social domain**: Climate change is already, and will continue, to impact communities and livelihoods. In the social domain physical safety, health and wellbeing, and social cohesion and community wellbeing are key areas impacted with risks that are Tier 1 adaptation urgency rating. One opportunity is has an adaptation urgency of Tier 1, this is the opportunity energy efficiency improvements may provide financial and health and wellbeing benefits.
- **Economic domain**: Tasmania's food and supply chain networks are key areas of focus for risks with a Tier 1 adaptation urgency rating. Supply chains and distribution networks, the land-based primary sector, and ocean fisheries and aquaculture are all assessed as Tier 1 risks. There are two opportunities related to physical climate hazards, economic opportunities for land-based primary sector and ocean-based aquaculture and fisheries, where there may be opportunities to pivot towards climate tolerant practice. Increased carbon market participation also provides economic opportunities for Tasmania.
- **Built domain**: Many impacts in the built domain are rated to have a 'major' consequence by 2030. Risks to healthcare and emergency services, built infrastructure, and risks to transport networks have an adaptation urgency rating of Tier 1. Opportunities related to transition drivers include infrastructure, and lower emissions transport have ongoing benefits for the transport networks and emissions reduction objectives.

4. Around a quarter of the impact statements are rated as Tier 2 ('Investigate then Act')

- **The 12 Tier 2 impact risk and opportunity statements require differing levels of effort** to fill gaps in understanding and uncertainty, and to assess the need for additional adaptation / opportunity uptake.
- **Natural domain**: One transition risk has a Tier 2 adaptation urgency rating, this is related to the impact of renewables on biodiversity, ecosystems and cultural heritage. Opportunities to support biodiversity through well-designed renewable energy development has some evidence, further investigation is required to understand solution that will most benefit Tasmania.
- **Social domain**: Two physical risks and one transition risk have a Tier 2 rating for adaptation urgency, and are related to mental health and wellbeing, cultural heritage, and social cohesion and health and wellbeing. Opportunities in the social domain from adaptation and resilience drivers are less well evidenced than some opportunities, reflecting the need to for further research into responses that maximise social opportunities.

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- **Economic domain**: Within the economic domain further information is needed to inform the adaptation response to four of the risks. Physical risks with an adaptation urgency rating of Tier 2 include risks to businesses and public organisation and risks to insurability, these risks are highly complex with interdependencies across domain. Tier 2 transition risks include risks from to supply chains, and costs to businesses associated with new technologies, as organisations adjust to a low carbon economy. Further information on the costs and opportunities for businesses for low emissions technologies requires further information to understand where remaining gaps exist that will allow economic opportunities across a diverse range of technology types.
- **Built domain**: Risk from climate hazards impacting healthcare and emergency service, contaminated sites and stormwater and sewage systems require further investigation to develop a response to these risks. No Tier 2 opportunities were identified in the built domain.

Table 24 summarises the assessment results for all 40 impact statements.

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Table 24: Summary of consequence, adaptation shortfall, evidence confidence, and adaptation urgency ratings for the 40 state priority climate impact statements.

Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
NATURAL DOMAIN									
N1	Risks to inland water ecosystems and species	Physical	Minor	Moderate	Moderate	Major	High	Partial	Tier 1: Ready to Act
N2	Risks to terrestrial ecosystems and species	Physical	Moderate	Moderate	Moderate	Major	High	Partial	Tier 1: Ready to Act
N3	Risks to coastal ecosystems and species (erosion-related risk)	Physical	Minor	Minor	Moderate	Major	High	Partial	Tier 1: Ready to Act
N4	Risks to marine ecosystems and species	Physical	Moderate	Moderate	Major	Extreme	Very High	Partial	Tier 1: Ready to Act
N5	Risks to native ecosystems and species	Physical	Moderate	Moderate	Major	Major	Very High	Partial	Tier 1: Ready to Act
N6	Risks to alpine ecosystems and species	Physical	Moderate	Moderate	Major	Extreme	High	Partial	Tier 1: Ready to Act
NT1	Risks to natural domain from the mining of critical minerals	Transition	Minor	Minor	Moderate	n/a	Medium	Partial	Tier 4 Monitor
NT2	Risks and opportunities related to renewable energy development	Transition	Minor	Moderate	Moderate	n/a	Low	Partial	Tier 2 Investigate then Act
NT3	Opportunities to optimise waste systems	Transition	n/a	n/a	n/a	n/a	High	Partial	Tier 3: Continue to Monitor Current Actions
NT4	Opportunities to support water quality and biodiversity	Transition	n/a	n/a	n/a	n/a	High	Partial	Tier 1: Ready to Act
SOCIAL DOMAIN									
S1	Risks to social cohesion and community wellbeing	Physical	Moderate	Moderate	Major	Extreme	High	Partial	Tier 1: Ready to Act

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Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
S2	Risks to mental health and wellbeing	Physical	Moderate	Moderate	Major	Major	High	High	Tier 2 Investigate then Act
S3	Risks to physical safety, health and wellbeing	Physical	Moderate	Moderate	Major	Major	High	Partial	Tier 1: Ready to Act
S4	Risks to cultural heritage	Physical	Moderate	Moderate	Major	Extreme	Low	Partial	Tier 2 Investigate then Act
ST1	Risks to social cohesion due to the inability of institutions and governance systems to manage climate risks	Transition	Minor	Moderate	Major	n/a	High	Partial	Tier 1: Ready to Act
ST2	Risks to social cohesion, and health and wellbeing due to existing services being insufficient to meet the needs of a growing population (driven by renewable energy development and new industries that support emissions reduction in Tasmania).	Transition	Insignificant	Moderate	Moderate	n/a	Medium	Partial	Tier 2 Investigate then Act
ST3	Opportunities for increased skills and employment with business development for new and emerging industries that provide adaptation and resilience solutions.	Transition	n/a	n/a	n/a	n/a	Medium	Partial	Tier 2 Investigate then Act

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Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
ST4	Opportunities for social cohesion, health and wellbeing through adaptation and resiliency improvements, including across domain co-benefits.	Transition	n/a	n/a	n/a	n/a	Medium	Partial	Tier 2 Investigate then Act
ST5	Opportunity for increased skills and employment with renewable energy development and new industries	Transition	n/a	n/a	n/a	n/a	Very High	Partial	Tier 3: Continue to Monitor Current Actions
ST6	Opportunity to improve financial wellbeing, and health and wellbeing through energy efficient housing for low-income households.	Transition	n/a	n/a	n/a	n/a	Very high	Partial	Tier 1: Ready to Act
ECONOMIC DOMAIN									
E1	Risk to businesses and public organisations	Physical	Minor	Moderate	Moderate	Major	High	Partial	Tier 2 Investigate then Act
E2	Risks to national and international supply/distribution networks	Physical	Moderate	Moderate	Major	Major	High	Partial	Tier 1: Ready to Act
E3	Risks to the insurability of businesses, public sector and private assets	Physical	Moderate	Moderate	Major	Major	Very High	Partial	Tier 2 Investigate then Act
E4	Risks and opportunities to land-based primary sector	Physical	Minor	Moderate	Moderate	Major	Very High	Partial	Tier 1: Ready to Act
E5	Risks and opportunities to ocean-based aquaculture and fisheries	Physical	Moderate	Moderate	Major	Major	Very High	Partial	Tier 1: Ready to Act
ET1	Risks of slow, ineffective or no action on emissions	Transition	Minor	Major	Extreme	n/a	Medium	Partial	Tier 3: Continue to

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Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
	reduction limiting economic growth								Monitor Current Actions
ET2	Risks to businesses and public organisations due to supply chain costs as organisations adjust to a low carbon economy.	Transition	Minor	Moderate	Major	n/a	Medium	Partial	Tier 2 Investigate then Act
ET3	Risks and opportunities for business through the implementation of new technology to reduce emissions (including fugitive/ agriculture/ industrial/ fuel switching).	Transition	Minor	Moderate	Moderate	n/a	Medium	Partial	Tier 2 Investigate then Act
ET4	Opportunities for economic growth through renewable energy supply.	Transition	n/a	n/a	n/a	n/a	Very High	Partial	Tier 3: Continue to Monitor Current Actions
ET5	Opportunities for business through new revenue streams available from carbon markets	Transition	n/a	n/a	n/a	n/a	Very High	Partial	Tier 1: Ready to Act
BUILT DOMAIN									
B1	Risks to healthcare and emergency services	Physical	Major	Major	Major	Extreme	Medium	Partial	Tier 2 Investigate then Act
B2	Risks to the built environment	Physical	Moderate	Major	Major	Extreme	High	Partial	Tier 1: Ready to Act
B3	Risks to contaminated sites	Physical	Moderate	Moderate	Major	Major	High	Partial	Tier 2 Investigate then Act

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Risk ID	Priority Impact Statement	Theme	Consequence rating (Current)	Consequence rating (2030)	Consequence rating (2050)	Consequence rating (2090)	Confidence	Adaptation shortfall	Adaptation urgency rating
B4	Risks to stormwater and sewerage systems	Physical	Moderate	Moderate	Major	Major	High	Partial	Tier 2 Investigate then Act
B5	Risks to ports and coastal infrastructure	Physical	Minor	Moderate	Moderate	Major	Medium	Partial	Tier 1: Ready to Act
B6	Risks to transportation networks	Physical	Moderate	Major	Major	Extreme	High	Partial	Tier 1: Ready to Act
BT1	Opportunities for public and active transport	Transition	n/a	n/a	n/a	n/a	Very high	Partial	Tier 3: Continue to Monitor Current Actions
BT2	Opportunities for improved flexibility within electricity infrastructure	Transition	n/a	n/a	n/a	n/a	Very High	Partial	Tier 3: Continue to Monitor Current Actions
BT3	Opportunities for infrastructure development	Transition	n/a	n/a	n/a	n/a	High	Partial	Tier 1: Ready to Act
BT4	Opportunities for lower emissions transport system	Transition	n/a	n/a	n/a	n/a	Very high	Partial	Tier 1: Ready to Act

The remainder of this Chapter contains the 40 individual impact statement profiles, presented by value domain.

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5.5 Detailed climate impact statements for the natural domain

5.5.1 Natural domain - Physical risks

In the natural domain, physical climate risks are expected to impact inland, terrestrial, coastal, marine, native and alpine ecosystems and species. There are also risks and opportunities associated with renewable energy development, waste and water. There are a total of 10 priority risk and opportunity statements; 6 for physical and 4 for transition themes.

5.5.1.1 N1 Risks to inland water ecosystems and species

N1: Risks to inland water ecosystems and species

- **PHYSICAL - ACUTE:** Risks to inland water ecosystems and species (lakes and riverine) due to changes in extreme weather events (extreme rain and floods, bushfires, extreme heat, storms) affecting water availability, water quality, soil erosion and sediment transport.
- **PHYSICAL - CHRONIC:** Risks to inland water ecosystems and species (lakes and riverine) due to changes in chronic rainfall and temperature, drought conditions affecting water availability, water quality, soil erosion and sediment transport.

Consequence			Confidence		Adaptation shortfall	Adaptation urgency
Current: Minor			Overall: High		Partial	Tier 1: Ready to Act
2030 Moderate	2050 Moderate	2090 Major	Agreement: High	Evidence: Medium		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Extreme rain and floods:** Current (West and North-west), Future (North and East)
- **Chronic rainfall and drought:** Current (East), Future (North-west and Islands).

Key vulnerabilities: Sensitivity to changes in water quality, fragmentation and loss of habitats, increased exposure to predication, threatened species more susceptible to changes and damage.

Climate risk summary:
Current climate risks are expected to have **minor consequences** on inland water ecosystems and species at the state scale as they are **already vulnerable** to pressure from human activities. Climate change is likely to result in **moderate consequences** by 2030 and 2050, and **major consequences** by 2090 due to projected increases in chronic temperatures and the frequency/intensity of extreme rainfall events that will further increase **vulnerability**. The **confidence** supporting this is **high,** as there is **medium scientific evidence** and a **high level of agreement** within the available evidence. Evidence both globally and in Australia indicates that climate drivers are creating conditions that aquatic species are poorly adapted to, and that future conditions are likely to exceed the tolerance levels of some species. There is limited evidence regarding aquatic species endemic to Tasmania. The current adaptation measures are largely provided through national and state legislation and regional/local scale management plans. Current state level actions provide a coordinated approach to managing chronic climate risks to inland water ecosystems and species. However, further state level action is required to incorporate acute climate impacts. As a result, **the adaptation shortfall has been rated as partial**. The adaptation urgency has been rated as **Tier 1: Ready to Act** highlighting the imminent action required to manage the risk.

Related impact statements:

- **Natural:** Terrestrial ecosystems (N2), native ecosystems (N5), alpine ecosystems (N6), mining (NT1), renewable energy development (NT2), waste systems (NT3), water quality and biodiversity (NT4)

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- **Social:** Cultural heritage (S4)
- **Economic:** Land-based primary sector (E4)
- **Built:** Stormwater and sewage systems (B4)

Justification and evidence

Inland water ecosystems (lakes and riverine) are vulnerable to changes in flows rates and variability, that impact water quality through the transport of sediment, nutrients, and other contaminants. Inland water ecosystems are already under pressure from human activities including agriculture, urbanisation, and hydro-power generation. Chronic risks from reduced water availability and higher temperatures will increase the degradation of inland water ecosystems and compromise the viability of some species. Acute extreme rainfall events will heighten erosion and sediment transport, deteriorating water quality and potentially fragmenting or reducing habitats for some species.

Current context

- Inland water ecosystems and species are threatened by both acute and chronic climate events. Chronic changes in precipitation may impact water availability and water quality. Gradual and ongoing changes to rainfall and temperature potentially result in lower soil moisture, increased drought conditions, reduced stream and river flows and vegetation drying out. Increases to the intensity and frequency of extreme rainfall events will likely lead to increased surface runoff, soil erosion and sediment transport. Increased bushfire activity potentially impacts water quality through a reduction in vegetation cover leading to increased runoff and erosion, impacting water quality through increased ash and sediment inputs.
- There is evidence of localised impacts to aquatic ecosystems following extreme events. For example, bushfires near Lake Vera, Western Tasmania, initially altered vegetation cover in the surrounding terrestrial environment. However, subsequent rainfall resulted in surface runoff and sediment transport that washed material into the aquatic environment causing impacts to nutrient loads, water acidity, and restrictions to light availability (Beck, et al., 2019).
- Since 1975 Tasmania has experienced a reduction in total annual rainfall and a change in seasonal variability, with the greatest reductions occurring in autumn (Grose et al., 2010). Total annual rainfall in Tasmania ranges from more than 3,000 mm on the west coast, to less than 500mm on the east coast (Tozer et al., 2018). Reduced total annual rainfall in King Island has been noted to impact some wetlands, lagoons, and streams (Department of Primary Industries, Water and Environment, 2003; Department of Primary Industries, Water and Environment, 2002).
- River health in Tasmanian catchments is assessed using the Tasmanian River Condition Index (TRCI) and the Australian River Assessment System (AUSRIVAS). TRCI examines four key components of river condition including: aquatic life (fish, macro-invertebrates, algae), hydrology (low flow, floods, seasonal flow, overbank flow), physical form (channel, bank, bed material and flow type), and streamside zone (riparian vegetation) (Department of Natural Resources and Environment, 2022). Together these components determine the ecological condition of rivers and streams, which can also be assessed through the sampling of aquatic macroinvertebrates under the AUSRIVAS methodology. As aquatic macroinvertebrates are sensitive to changes in habitat and water quality, their presence or absence provides an indicator of ecological condition.

Future context

- The severity and frequency of these climate hazards is projected to increase as the century progresses, with the largest increases in severity of hazards projected under a high emission scenario (SSP3-7.0).
- The greatest increase to drought conditions and reduced rainfall are projected for the central plateau (all seasons), and west coast (summer). These areas are likely to be impacted by reduced river flows, increasing the vulnerability of ecosystems to heightened water temperatures, reduced dissolved oxygen concentrations and a deterioration in water quality resulting from reduced mixing.
- The greatest increases in rainfall intensity and frequency are projected for the south-west and north-east. These areas are likely to be impacted by increases to peak river flows, potentially enhancing channel erosion, sediment transport, river instability, incision, and braiding.
- Increasing severity of physical hazards will likely affect inland water ecosystems and species through impacts to river health and ecological conditions brought about by increased water temperatures, changes to sediment transport, and potential declines in water quality following extreme events (such as bushfires).

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The most vulnerable locations will be those without some level of adaption measures to protect against future exposure.

- Changes to the natural hydrological regime may create conditions that exceed the tolerance levels of some aquatic and riparian species. This has the potential to fragment and reduce habitats, compromising the viability of some species. A reduction in rainfall and longer periods of drought may increase exposure of aquatic species to predators. Reduced stream flows can lower surrounding groundwater levels, threatening riparian vegetation. Reductions in vegetation can consequently reduce surrounding habitat and lead to erosion into streams and rivers (Department of Primary Industries, Parks, Water and Environment, 2010a).

Existing adaptation responses

- **National and state level legislation and actions:** National Water Quality Management Strategy, Guidelines for Fresh and Marine Water Quality, State Policy on Water Quality Management 1997, Implementing Adaptation to Climate Change in Terrestrial and Freshwater Natural Environments in Tasmania, Natural Heritage Strategy for Tasmania (2013-2030), Rural Water Use Strategy (RWUS)
- **Regional/local scale responses:** Mersey River Catchment Water Management Plan and Lake Sorell and Crescent Water Management Plan.
- **National and state methodologies for assessing river health and ecological conditions:** such as Tasmanian River Condition Index (TRCI) and the Australian River Assessment System (AUSRIVAS).

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** Climate impacts are projected to have a moderate impact to inland water ecosystems and species by 2030. This will likely be driven by changes in temperature, including extreme heat events, as well as changes in precipitation rates and more intense extreme rain events. Each of these changes will impact the flow rate and species viability, which in turn will negatively impact the health and quality of these ecosystems. Consequence is projected to remain moderate in 2050, and increase to major in 2090, as climate risks increase in intensity and frequency and cascading impacts have an additional effect on inland water ecosystems and species.
- **Confidence – High:** The confidence in the assessment of this risk is high. This is driven by the high level of agreement, particularly relating to how changing climate hazards will push some aquatic species beyond tolerance thresholds. There is also a medium level of evidence.
- **Adaptation shortfall – Partial:** There is National and state legislation and regional- and local-scale action in place to provide a coordinated approach regarding the management and protection of these ecosystems and the species that reside in them to chronic climate risks. However, further state level action is required to mitigate future changes to acute climate risks to inland water ecosystems and species. As a result, this creates a partial shortfall.
- **Adaptation urgency - Tier 1: Ready to Act**. Further state level action is required to identify the most vulnerable regions and species, and to ensure a coordinated legislative approach that produces beneficial management actions for acute risks to inland water ecosystems and species. This is particularly pertinent given the projected increases in the intensity, frequency, and cascading impacts of climate driven events such as extreme heat and extreme rainfall.

5.5.1.2 N2 Risks to terrestrial ecosystems and species

N2: Risks to terrestrial ecosystems and species

- **PHYSICAL - ACUTE:** Risks to terrestrial ecosystems and species due to extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) causing the fragmentation of, damage to, or loss of habitats and leading to ecosystem shifts/changes.
- **PHYSICAL - CHRONIC:** Risks to terrestrial ecosystems and species composition/stability due to changes in chronic rainfall and temperature, drought conditions, water availability and evaporation impacting resilience and leading to ecosystem shifts/changes.

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Consequence			Confidence		Adaptation shortfall	Adaptation urgency
Current: Moderate			Overall: High		Partial	Tier 1: Ready to Act
2030 Moderate	2050 Moderate	2090 Major	Agreement	Evidence		
			High	Medium		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Bushfires:** Current (East and South), Future (North and Central)
- **Chronic temperature:** Current (North-east, North-west, Islands), Future (Coast and Islands)
- **Chronic rainfall and drought:** Current (East), Future (North-west and Islands).

Key vulnerabilities: Sensitivity to changes in temperature and rainfall, shifts in species preferred niche/range, shifts in behaviour and physiology, fragmentation, and loss of habitats, threatened species more susceptible to changes and damage.

Climate risk summary:
Terrestrial impacts encompass all land-based ecosystems (e.g., alpine, lowland grassland, coastal, and agricultural land). Note some are explored in more detail in other impact statements. **Current climate risks are expected to have moderate consequences** for terrestrial ecosystems and species at the state level due to rising temperatures pushing species outside their preferred temperature niches, increasing mortality rates. Extreme weather events like bushfires may cause irreversible damage to ecosystems through habitat and life loss. Climate change is likely to result in **moderate consequences by 2030 and 2050, and major consequences by 2090** due to projected increases in chronic temperatures and the frequency/intensity of extreme weather events, further increasing species' vulnerability. The **confidence** supporting this assessment is **high,** as there is **medium evidence** and a **high level of agreement** within the available evidence. Evidence indicates that climate drivers are already causing substantial impacts through natural disturbances and creating conditions that terrestrial species and ecosystems are poorly adapted to. Current adaptation measures are largely provided through national and state legislation and regional/local management plans. However, there is no coordinated statewide plan for managing terrestrial ecosystems and species that considers future climate impacts. Therefore, **adaptation shortfall has been rated Partial**. The adaptation urgency has been rated as **Tier 1: Ready to Act** highlighting that the current level of response is insufficient to address the risk.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), risks to coastal ecosystems (N3), native ecosystems (N5), alpine ecosystems (N6), mining (NT1), renewable energy development (NT2)
- **Social:** Mental health and wellbeing (S2), physical safety and wellbeing (S3), cultural heritage (S4)
- **Economic:** Businesses and public organisations (E1), land-based primary sector (E4)
- **Built:** Stormwater and sewage systems (B4), transport networks (B6)

Justification and evidence

Current context

- Terrestrial species are already changing due to climate. Plant species have been migrating southward (Southern Hemisphere) due to temperature increases. (Webstoy, et al., 2024) This has cascading consequences such as new species outcompeting current species within the new temperature zones (Paquette & Hargreaves, 2021). In the Southern Hemisphere, the southern limit is effectively determined by a species' tolerance to cooler temperatures (Paquette & Hargreaves, 2021) meaning rising minimum temperatures for optimal growth limit the viability of existing species. Tall eucalypt forests are an example of

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terrestrial species already under threat, as rising temperatures that exceed historical temperature ranges have caused a decline in forest productivity (Wardlaw, 2024).

- Rising temperatures mean that terrestrial species need to either adapt to warmer climates or become endangered/extinct locally (Corlett & Westcott, 2013). For example, species are more likely to migrate where possible (Parmesan & Yohe, 2003). However, Tasmania is the southern limit for Australian ecosystems meaning there is nowhere for these species to migrate.

Future context

- Species in high altitude areas are facing habitat reduction due to increasing temperatures and declining snow coverage. Habitats most at risk are those in alpine and sub alpine regions (Climate Commision, 2013).
- Button grass moorlands are an extremely flammable peatland variety that are home to endemic species on the west coast of Tasmania. These peatlands are also one of the most effective storages of global carbon. Increasing severe fire weather conditions and expected increasing fire intensity will affect numerous aspects of this ecosystem, including the release of substantial amounts of stored carbon (Department of Primary Industries, Parks, Water and Environment, 2010a).
- Increased temperatures will likely cause the increased incidence of pests, disease, and pathogens. As an island state, Tasmania benefits from a much lower risk of mainland terrestrial species migration. However, temperature changes will see species migration within Tasmania, threatening existing ecosystem composition in affected areas (Department of Primary Industries, Parks, Water and Environment, 2010a).

Existing adaptation response

- **National and state level legislation and actions:** Implementing Adaptation to Climate Change in Terrestrial and Freshwater Natural Environments in Tasmania, Bushfires and Climate Change Research Project, Natural Heritage Strategy for Tasmania (2013-2030).
- **Regional/local scale responses:** TWWHA Management Plan 2016, TWWHA Natural Values Climate Change Adaptation Strategy 2021-2031, TWWHA Fire Management Plan.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** Climate impacts are projected to have a moderate impact to terrestrial ecosystems and species by 2030. This will likely be driven by changes in temperature, pushing species past established temperature niches and increasing species mortality. An increase in the number of extreme weather events, such as bushfires, is also likely to see substantial habitat and species life loss. Consequence is projected to remain moderate in 2050, and increase to major in 2090, as climate risks increase in intensity and frequency. Cascading impacts have an additional effect on terrestrial ecosystems and species.
- **Confidence – High:** The confidence in the assessment of this risk is high, which is strongly driven by the high level of agreement as to how climate impacts create natural disturbances and conditions that existing species are poorly adapted too. There is also a medium level of evidence.
- **Adaptation shortfall – Partial:** While there is national and state legislation, as well as regional and local scale actions regarding the management and protection of these ecosystems and the species that reside in them, there is no coordinated approach to mitigating future climate risks to terrestrial ecosystems and species. This creates a partial shortfall.
- **Adaptation urgency - Tier 1: Ready to Act.** Further state level action is required to ensure a coordinated approach to manage future risks to terrestrial ecosystems and species, given the projected increases in intensity, frequency, and cascading impacts of climate driven events.

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5.5.1.3 N3 Risks to coastal ecosystems and species

N3: Risks to coastal ecosystems and species

- **PHYSICAL - ACUTE:** Risks to coastal ecosystems and species (beaches, sand-dunes, wetlands, and estuaries) due to extreme weather events (storm surge) causing the fragmentation of, damage to, or loss of habitats and leading to ecosystem shifts/changes.
- **PHYSICAL - CHRONIC:** Risks to coastal ecosystems and species (beaches, sand-dunes, wetlands, and estuaries) due to ongoing sea level rise causing the fragmentation of, damage to, or loss of habitats and leading to ecosystem shifts/changes.

<table>
<tr><th colspan="3">Consequence</th><th colspan="2">Confidence</th><th>Adaptation shortfall</th><th>Adaptation urgency</th></tr>
<tr><td colspan="3">Current: Minor</td><td colspan="2" rowspan="2">Overall: High</td><td rowspan="3">Partial</td><td rowspan="3">Tier 1: Ready to Act</td></tr>
<tr><td rowspan="2">2030
Minor</td><td rowspan="2">2050
Moderate</td><td rowspan="2">2090
Major</td></tr>
<tr><td>Agreement</td><td>Evidence</td></tr>
<tr><td></td><td></td><td></td><td>High</td><td>Medium</td><td></td><td></td></tr>
</table>

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Storms:** Current (North), Future (North and Islands)
- **Storm surge:** Current (North-west), Future (North-east, East)
- **Sea level rise:** Future (East and North-east)

Key vulnerabilities: Erosion and tidal inundation, fragmentation and loss of coastal habitats, saltwater intrusion, migrating and threatened species most susceptible to changes and damage.

Climate risk summary:

Sea level rise and storm surge events are currently expected to have **minor consequences** on coastal ecosystems and species. This rating is projected to continue to **2030**. After 2030, sea level rise is projected to accelerate and extreme storm surge events are projected to become more frequent, which will **increase vulnerability** due to the decline in habitable areas. As a result, the consequence is rated **moderate** by **2050** and **extreme** by **2090**. The **confidence** supporting this assessment is **high,** as there is **medium evidence** and a **high level of agreement** within the available evidence. There is considerable evidence that climate drivers are likely to reduce the availability of coastal habitats, threating the survival of species and leading to increased migration. Current adaptation measures are largely provided through national and state legislation and regional/local scale management plans. However, there is not a coordinated statewide plan for managing coastal water ecosystems and species that factors in future climate impacts. Therefore, **adaptation shortfall** has been rated **partial.** The adaptation urgency has been rated as **Tier 1: Ready to Act** as the current shortfall in adaptation and eventual major consequence require more and new adaptation measures to address the risk.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), risks to terrestrial ecosystems (N2), native ecosystems (N5), renewable energy development (NT2)
- **Social:** Mental health and wellbeing (S2), physical safety and wellbeing (S3), cultural heritage (S4)
- **Economic:** Businesses and public organisations (E1), land-based primary sector (E4), fisheries and aquaculture (E5),
- **Built:** Stormwater and sewage systems (B4), transport networks (B6)

Justification and evidence

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Current context

- Coastal ecosystems are vulnerable to climate change through coastal inundation and erosion that causes the fragmentation, damage, or loss of habitats. Coastal ecosystems are already under pressure from human activities including coastal developments and land-use changes that clear vegetation, heighten erosion, and reduce water quality, directly impacting the availability of coastal habitats. Chronic risks from ongoing sea level rise include increases to flooding and erosion, shifting sand dunes and beaches, and the deteriorating water quality of estuaries, lagoons, and coastal wetlands. Sea level rise also increases the risk from acute storm surge events that are likely to increase in frequency, putting additional stress on coastal ecosystems through heightened erosion and sediment transport. This is likely to reduce the availability of coastal habitats, potentially leading to the landward migration of some species, while threatening the survival of species that are restricted to the coastal zone.
- Over 25 per cent of the Tasmanian coastline is at risk from inundation and erosion, sand dune mobility, rock falls and slumping as a result of sea level rise and storm surge associated with climate change. Several species of shorebirds and small terns have been identified as at risk at the Tasmanian coast.
- Sea levels around Tasmania have risen at an average rate of 2.1 ± 0.2 mm/year for the period 1966 to 2009, increasing to an average of 3.1 ± 0.6 mm/year for the period 1993 to 2009. (McInnes, et al., 2016)
- The 1-in-100-year storm surge events are typically 2.1 to 3.2 m high along the Tasmanian coast. The most severe storm surge events are likely to occur in the North-west (Kentish, Latrobe, Burnie, Central Coast), and Launceston (Meander Valley) regions.

Future context

- In the future, sea levels are projected to rise by up to 10 cm by 2030, 22 cm by 2050 and 57 cm by 2090. The largest increases are projected in the high emission scenario. The regions with the greatest increases of sea level rise by 2050 are East (Sorell, Glamorgan-Spring Bay, Tasman), North-East (Break O'Day), and Hobart (Brighton).
- The 1-in-100-year storm surge events are projected to increase in frequency and occur every 74 years by 2030, every 19 years by 2050 and every 2 years by 2090. The regions with the most frequent storm surge return periods by 2050 are North-east (Break O'Day), East (Glamorgan-Spring Bay), Flinders Island, North-west (Waratah-Wynyard), and Hobart (Hobart, Kingborough).
- Increasing severity of sea level rise and increasing frequency of extreme storm surge events will likely have a negative impact on coastal ecosystems and species in the future. This is due to flooding and erosion, reduced water quality, sediment deposition, shifting sand dunes, and increased migration and/or an increased mortality rate of some coastal species. Sea level rise may also lead to the expansion of wetlands and lagoon areas. This will likely pose a direct risk to coastal ecosystems, including dunes, estuaries, salt marshes, dry coastal vegetation, beaches, and coastal cliffs, threatening the survival of many species that are restricted to these coastal zones.

Existing adaptation response

- **National and state level legislation and actions:** Implementing Adaptation to Climate Change in Terrestrial and Freshwater Natural Environments in Tasmania, Natural Heritage Strategy for Tasmania (2013-2030), Tasmanian State Coastal Policy 1996, Tasmanian Coastal Adaptation Pathways Project.
- **Regional/local scale responses:** STCA Regional Strategy – Adapting to a changing coastline in Tasmania.

Justification of adaptation urgency rating

- **Consequence – Minor in 2030 but Major in 2050/2090:** Climate impacts are projected to have a minor consequence to coastal ecosystems and species by 2030. While sea level rise will have a minor impact in the short term, this impact will quickly evolve, becoming of **moderate consequence** in **2050**, and of **major consequence** in **2090**. Additionally, as sea levels rise at an accelerating rate, the associated storm surges will increase in frequency and intensity, leading to the decline in coastal habitats, and increased migration of coastal species.

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- **Confidence – High:** The confidence in the assessment of this risk is high, which is strongly driven by the high level of agreement as to how sea level rise and storm surges diminish coastal habitats and negatively affect coastal species. There is also medium level of evidence.
- **Adaptation shortfall – Partial:** While there is national and state legislation, as well as regional and local scale actions regarding the management and protection of these ecosystems and the species that reside in them, there is no coordinated approach to mitigating future climate risks to coastal ecosystems and species. As a result, this creates a partial shortfall.
- Adaptation urgency - Tier 1: **Ready to Act.** Further state level action is required to provide a coordinated approach to manage future risks to coastal ecosystems and species, given the rate of sea level rise and associated increase in storm surge frequency and intensity.

5.5.1.4 N4 Risks to marine ecosystems and species

N4: Risks to marine ecosystems and species

- **PHYSICAL – ACUTE:** Risks to marine ecosystems and species due to acute hazards (marine heat waves) affecting nutrient availability and growing conditions, species composition, resilience/recovery and leading to ecosystem shifts/changes.
- **PHYSICAL – CHRONIC:** Risks to marine ecosystems and species due to chronic changes (ocean temperature, acidification, oceanic mixing) affecting nutrient availability and growing conditions, species composition, resilience/recovery and leading to ecosystem shifts/changes.

<table>
<tr><th colspan="3">Consequence</th><th colspan="2">Confidence</th><th>Adaptation shortfall</th><th>Adaptation urgency</th></tr>
<tr><td colspan="3">Current: Moderate</td><td colspan="2" rowspan="2">Overall: Very High</td><td rowspan="3">Partial</td><td rowspan="3">Tier 1: Ready to Act</td></tr>
<tr><td rowspan="2">2030
Moderate</td><td rowspan="2">2050
Major</td><td rowspan="2">2090
Extreme</td></tr>
<tr><td>Agreement</td><td>Evidence</td></tr>
<tr><td colspan="2"></td><td>High</td><td>High</td></tr>
</table>

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Sea surface temperature:** Current (East and North-east), Future (East, North-east and Islands)
- **Marine heatwaves:** Current (East, North-east and Islands), Future (East, North-east and Islands)
- **Ocean acidity:** Future (all regions)

Key vulnerabilities: Sensitivity to changes in ocean temperature and acidity, fragmentation and loss of habitats, increased exposure to predication, shifts in species preferred niche/ranges, encroachment of non-endemic species, threatened species more susceptible to changes and damage.

Climate risk summary:
Tasmania's marine ecosystems and species are exposed to climate risks related to hazards such as marine heatwaves, ocean temperature increase, acidification and ocean mixing. There is a **higher level of vulnerability** for marine environments which are also exposed to human activities including ocean-based aquaculture, fishing, land-based discharge of nutrients and pollutants, in addition to those where invasive pests have been introduced. **Current climate risks are expected to have moderate consequences** for marine ecosystems. Climate change is likely to continue having **moderate consequences through to 2030, before consequences increase to major by 2050 and extreme by 2090**. The **confidence** supporting this assessment is **very high,** as there is a **high level of evidence** and a **high level of agreement**. Evidence indicates that climate drivers are already causing substantial impacts, with numerous Tasmanian-specific studies indicating that rising ocean temperature and marine heatwaves are impacting marine ecosystems and species. Current adaptation measures are mainly provided through national and state legislation and some localised/species specific plans. However, there is no coordinated statewide plan for managing marine

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ecosystems and species that considers future climate impacts. Therefore, **adaption shortfall has been rated partial**. The adaptation urgency has been rated as **Tier 1: Ready to Act,** highlighting the need to develop new and stronger actions to protect Tasmania's marine ecosystems and species.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), coastal ecosystems (N3), native species (N5), mining (NT1)
- **Social:** Mental health and wellbeing (S2), cultural heritage (S4)
- **Economic:** Land-based primary sector (E4), fisheries and aquaculture (E5)
- **Built:** Stormwater and sewage systems (B4)

Justification and evidence

Current context

- Tasmania's marine environment is already under pressure from human activities including ocean-based aquaculture, fishing, land-based discharge of nutrients and pollutants, and the introduction of invasive species. Increasing water temperatures can support environments for invasive species. For example, the long spined sea urchin is an invasive species from NSW that is taking over kelp beds and damaging Tasmania rock lobster habitat. Warming waters favour population expansion of sea urchin populations, creating an increasing threat to existing biodiversity (Climate Commision, 2013).
- There has been a strong long-term warming trend in Tasmanian waters, which is currently 2 to 3 times greater than the global average (Holbrook & Bindoff, 1997). Warming off the east coast and in the North-East region has been exacerbated by the observed extension of the East Australian current (Ridgway, 2007) and attributed to an increase in severe marine heatwaves in recent years (Oliver, et al., 2017).
- Recent marine heatwaves saw an increase in the mortality of shellfish and molluscs. The marine heatwave is believed to be a leading cause of the outbreaks of Pacific Mortality Oyster Syndrome, which substantially increased oyster mortality (Earth Systems and Climate Change Hub, 2021). Unfamiliar marine species that are from northern states were also found in Tasmanian waters with warming creating unnatural species migration. Tasmanian waters have more recorded observations of species range shifting than any other state, including 48 species with major distributional shifts and at least 7 newly established species (Robinson, et al., 2015).
- This includes the incursion of sea urchins that subsequently overgraze on sea plants creating barren reefs. Barren reefs in eastern Tasmanian waters increased by ~10.5 per cent between 2002 and 2017 (Ling & Keane, 2018).
- Further, there have been shifts in species associated with rocky reefs which has resulted in increased grazing pressure and associated loss of endemic seaweed species.
- Marine heatwaves, such as the 2015/16 Tasmania event can alter the microbial makeup of microorganisms in affected waters. Changes to microorganisms can have a compounding impact across the food chain (Brown, et al., 2024), however this area needs further investigation.
- Since the 1980s, giant kelp forests have declined by 95 per cent around Freycinet and Maria Island, and 98 per cent around Bruny Island (Johnson, et al., 2011).

Future context

- Projected chronic increases to ocean temperatures and sea water acidity will gradually alter physical and biogeochemical processes that underpin current growing conditions and species composition.
- An increase in acute marine heatwaves will put pressure on vulnerable species (e.g., kelp forests).
- Greater increases to sea surface temperatures off the east coast and in the north-east region of Tasmania caused by the southward extension of the East Australian Current will bring warmer water south (Grose, et al., 2010a).
- Both acute and chronic impacts increase towards the end of the century and are likely to lead to regional shifts in ecosystem composition and the abundance/distribution of species.
- There is pressure on current species that may become maladapted to changing conditions and face increasing competition from species moving south to find refuge. This impact may be compounded by existing pressures of human activities, including ocean-based aquaculture, fishing, land-based discharge of nutrients and pollutants, and the introduction of invasive species. An example of this is the long spined sea urchin, which is

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highlighted above. Warming waters favour population expansion of sea urchin populations, creating an increasing threat to existing biodiversity (Climate Commision, 2013)

Existing adaptation response:

- **National and state level legislation and actions:** Natural Heritage Strategy for Tasmania (2013-2030), Living Marine Resources Management Act 1995, Climate Change – Marine Resources Impacts and Adaptation, Sustainable Marine Research Collaboration Agreement (SMRCA) Strategic Plan for 2022-26, SMRCA Fisheries and Aquaculture Assessments, South-east Commonwealth Marine Reserves Network – Management Plan 2023-2033.
- **Regional/local scale responses:** Regional Natural Resource Management (NRM) Projects (e.g., NRM South project to tackle long spined sea urchins), Recovery Plan for Three Handfish Species.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** Climate impacts are projected to be of a moderate consequence to Tasmania's marine ecosystems and species by 2030. This is particularly supported by existing evidence of the impact that recent marine heatwaves have had on the ecosystem. Climate impacts are projected to become **major** in **2050** and **extreme** by **2090**, as rising ocean temperatures, increasing acidification and more frequent and extreme marine heatwaves negatively harm the marine ecosystem and important Tasmanian species.
- **Confidence – Very High:** The confidence in the assessment of this risk is very high, as there is both a high level of agreement and high level of evidence, with numerous studies relating to the impacts of marine heatwaves being completed in Tasmania.
- **Adaptation shortfall – Partial:** While there is national and state legislation, as well as regional and local scale actions regarding the management and protection of these ecosystems and the species that reside in them, there is no coordinated approach to mitigating future climate risks to marine ecosystems and species. As a result, this creates a partial shortfall.
- A**daptation urgency - Tier 1: Ready to Act.** Further state level action is required to provide a coordinated approach to manage future risks to marine ecosystems and species, given rising ocean temperatures, increasing acidification and more frequent and extreme marine heatwaves.

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5.5.1.5 N5 Risks to native ecosystems and species

N5: Risks to native ecosystems and species due to chronic climate changes

- **PHYSICAL - CHRONIC:** Risks to native ecosystems and species due to chronic temperature/precipitation changes enhancing biosecurity risks through the spread, survival and establishment of invasive species, pests, pathogens, and diseases.

Consequence			Confidence		Adaptation shortfall	Adaptation urgency
Current: Moderate			Overall: Very High		Partial	Tier 1: Ready to Act
2030 Moderate	2050 Major	2090 Major	Agreement	Evidence		
			High	High		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Chronic temperature:** Current (North-east, North-west, Islands), Future (Coast and Islands)
- **Chronic rainfall and drought:** Current (East), Future (North-west and Islands).

Key vulnerabilities: Sensitivity to changes in temperature and rainfall, shifts in species preferred niche/range, encroachment of non-endemic species, shifts in behaviour and physiology, fragmentation, and loss of habitats, threatened species more susceptible to changes and damage.

Climate risk summary:
Current chronic climate risks are expected to have moderate consequences on native species. This is because of **existing vulnerabilities to climate related biosecurity risks** such as habitat loss from invasive species, harmful pathogens, and diseases. Climate change is likely to continue having **moderate consequences through to 2030,** before increasing to **major consequences by 2050 and 2090.** Projected increases to chronic temperatures and changes to precipitation patterns are likely to create conditions that native species are poorly adapted to and potentially enhance the reproduction, survival and spread of non-endemic species and pathogens further increasing the **vulnerability** of native species. The **confidence** supporting this assessment is **very high,** as there is a **high level of evidence** and a **high level of agreement**. Current adaptation measures are largely provided through national and state legislation and regional/local scale management plans. However, there is no coordinated statewide plan for managing the threat of invasive species, pests, pathogens, and diseases to Tasmania's native species that considers future climate impacts. Therefore, **adaptation shortfall has been rated partial.** The adaptation urgency has been rated as **Tier 1: Ready to Act** highlighting that the current level of response is insufficient to address this risk.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), risks to coastal ecosystems (N3), alpine ecosystems (N6), mining (NT1), renewable energy development (NT2)
- **Social:** Mental health and wellbeing (S2), physical safety and wellbeing (S3), cultural heritage (S4)
- **Economic:** Businesses and public organisations (E1), land-based primary sector (E4)
- **Built:** Stormwater and sewage systems (B4)

Justification and evidence

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Tasmania's native species are vulnerable to chronic climate change, including long-term decreases in rainfall and chronic temperature rise. Native species are already under pressure from human activities including agriculture, urbanisation, and deforestation. Chronic risks from reduced water availability and higher temperatures may increase the degradation of the natural habitat for native species. Temperature rise may also move species past their temperature optimums which may threaten their livelihood or force them to migrate. Increased stress in native species because of these climate risks and their impacts will increase vulnerability of native species to pests and diseases. At the same time, temperature rise directly affects pest's reproduction, survival and spread, increasing the risk of outbreaks and exposure of native species to pests.

Current context

- Climate risks are likely already impacting the emergence of diseases in Tasmania. In the past 12 years, Tasmania has experienced an increase in wildlife diseases, such as the Devil Facial Tumour Disease and Chytridiomycosis that threaten the Tasmanian devil and native frogs. There has also been an increase in plant pathogens, such as the emergence of the root-rot soil pathogen (*Phytophthora cinnamomic*). Currently, this pathogen is limited to localities suitable for its reproduction and growth, typically areas below 700m elevation or with over 600mm of rainfall per year. However, raising temperatures and shifts to rainfall patterns, along with changes to other factors such as soil microflora, could exacerbate incidences including the ability to survive at higher altitudes than present (Department of Primary Industries, Parks, Water and Environment, 2010a).
- Plant species in Australia have been moving southward with rising temperatures. Migration of species may lead to increased competition between species and potentially lead to the dominance of the invading species, particularly with changing climate conditions. The survival of species at cooler regions depends largely on their tolerance to minimum temperatures. Chronic temperature rise increases the minimum temperature and therefore allows new species to thrive.
- Rising temperature and increased water stress can also cause stress in flora and fauna, making them more vulnerable to pests and diseases. High temperature stress in plants has been shown to limit plant growth, metabolism, and productivity worldwide.
- Annual mean temperatures in Tasmania have increased by 1.1°C since 1910, or approximately 0.1°C per decade since the 1950s, this rise is lower than the average for Australia of 0.16°C per decade.
- Total annual rainfall in Tasmania ranges from more than 3,000 mm on the west coast, to less than 500mm on the east coast. Since 1975 Tasmania has experienced a reduction in total annual rainfall and a change in seasonal variability, with the greatest reductions occurring in autumn.

Future context

- Increased temperatures will likely cause the increased incidence of pests, disease, and pathogens. As an island state, Tasmania does benefit from being less affected by mainland terrestrial species migration. This means there is a far lower risk of interstate species, pests and pathogens migrating to Tasmania. However, temperature changes will see species migration within Tasmania, threatening existing ecosystem composition in affected areas (Department of Primary Industries, Parks, Water and Environment, 2010a).
- Climate change is expected to increase existing invasive species issues in Tasmania, with weeds and invasive pests often favoured by events such as floods and fires. Increased CO_2 levels may also lead to increased root development in invasive weed species, which in turn can result in greater resistance to herbicides, favouring the survival of invasive species over native species.
- The average annual temperature is projected to rise by up to 2.5°C by 2030, 3.1°C by 2050, and 4.6°C by 2090 with the largest increases in the high emission scenario. The regions with the greatest increases by 2050 are King Island, Flinders Island, East (Tasman, Glamorgan-Spring Bay), and North-west (Circular Head).
- Under the high emission scenario, total annual rainfall is projected to change by -15 to +14 mm by 2030, -27 to +36 mm by 2050, and -97 to +58 mm by 2090. Total annual rainfall increases in the south but decreases across the remainder of the State.
- Increased temperatures and changes to rainfall patterns are likely to impact the water temperatures and quality of freshwater ecosystems that may create opportunities for invasive aquatic plant species and invasive aquatic animals. A key attribute altered by invasive plant species is the availability of light or underwater penetration of sunlight. The emergence of invasive species may subsequently supress native

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species or have cascading impacts on ecosystem functionality. Monitoring river health is a key method for combating invasive aquatic species.

Existing adaptation response

- **National and state level legislation and actions:** Natural Heritage Strategy for Tasmania (2013-2030), Threatened Species Strategy 2000.
- **Regional/local scale responses:** TWWHA Biosecurity Strategy 2021-2031.
- **National and state methodologies for assessing river health and ecological conditions:** such as "Tasmanian River Condition Index (TRCI)" and the "Australian River Assessment System (AUSRIVAS)".

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** Climate impacts are projected to have a moderate impact to native ecosystems and species by 2030. This will likely be driven by changes in climate conditions that increase climate-related biosecurity risks. In 2050 and 2090 climate impacts are projected to have a major consequence to native ecosystems and species. Climate models project major increases in temperature rise and, in places, a major reduction in total annual rainfall. This increases the potential impacts to native species from climate-related biosecurity risks. As these climate risks evolve, native species are expected to face conditions that they are poorly adapted to, increasing inter species competition. Changing climatic conditions may increase the reproduction rate and survivability of non-native pests.
- **Confidence – Very High:** The confidence in the assessment of this risk is very high, with both a high level of agreement, as well as a high level of evidence, with sources of high-quality evidence at a global, national, and state scale.
- **Adaptation shortfall – Partial:** There is some level of policy and strategy implemented currently, however further investment is needed to accurately account for future climate trends and identify required adaptation approach that brings the biosecurity risk to native ecosystems and species down to a low magnitude.
- **Adaptation urgency - Tier 1: Ready to Act.** Further state level action is required to understand future climate trends and identify an adaptation approach that will manage biosecurity risks to native ecosystem and species given projected increases in temperature, changing rainfall patterns and drought coupled with constraints to native species adaptation and the establishment of invasive species, pests, and diseases

5.5.1.6 N6 Risks to alpine ecosystems and species

N6: Risks to alpine ecosystems and species due to chronic climate changes

- **PHYSICAL - CHRONIC:** Risks to alpine ecosystems and species composition due to changes in chronic rainfall, temperature, snow cover, and drought conditions.

Consequence			Confidence		Adaptation shortfall	Adaptation urgency
Current: Moderate			Overall: High		Partial	Tier 1: Ready to Act
2030 Moderate	2050 Major	2090 Extreme	Agreement	Evidence		
			High	Medium		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Chronic temperature:** Current and Future (All alpine regions)
- **Chronic rainfall and drought:** Current and Future (All alpine regions).

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Key vulnerabilities: Sensitivity to changes in temperature and rainfall, shifts in species preferred niche/range, encroachment of non-endemic species, shifts in behaviour and physiology, fragmentation, and loss of habitats, threatened species more susceptible to changes and damage.

Climate risk summary:
Tasmania's **alpine ecosystems and species are exposed to chronic risks** including changes in rainfall, temperature, snow cover, and drought conditions. Many endangered and endemic species native to Tasmania's alpine regions are considered at **a higher level of vulnerability** due to small population sizes, geographical isolation, and limited ability to adapt to projected climatic changes. The **current level of consequence is considered moderate through to 2030**, however is likely to increase to **major** by **2050** and **extreme** by **2090** due to the predicted stress alpine and sub-alpine regions are likely to experience. The **confidence** supporting this assessment is considered **high,** as there is **medium evidence** and a **high level of agreement** within the available evidence. Evidence indicates that climate drivers will create conditions that endemic species are poorly adapted to, while additional pressures will likely arise from the encroachment of non-endemic species seeking refuge. Current adaptation measures are largely provided through national and state legislation and regional/local management plans for terrestrial ecosystems. However, there is no coordinated statewide plan for managing future climate impacts to alpine ecosystems and species. Therefore, **adaptation shortfall has been rated partial**. The adaptation urgency has been rated as **Tier 1: Ready to Act** highlighting that the current level of response is insufficient to address this risk.

Related impact statements:

- **Natural:** inland water ecosystems (N1), terrestrial ecosystems (N2), mining (NT1), renewable energy development (NT2)
- **Social:** mental health and wellbeing (S2), cultural heritage (S4),
- **Economic:** businesses and public organisations (E1), land-based primary sector (E4)
- **Built:** stormwater and sewage systems (B4), transportation networks (B6)

Justification and evidence

Alpine ecosystems are typically found in mountainous areas between the altitudinal limit for tree growth and the nival zone, the highest vegetation zone. However, in Tasmania, the tree line is not typically well defined, there is no permanent snow line and vegetation typically continues to the summit. Consequently, the Risk Assessment also includes areas of subalpine ecosystems where conifers such as Huon pines grow. In total there are approximately 11,700 ha of alpine and subalpine habitats across Tasmania, with vegetation growing from 750m in the southwest to 1400m in the northwest alpine region.
Tasmania's alpine ecosystems are typically dominated by plant species including dwarf forest, conifer shrubbery, sclerophyll shrubbery, heath, grasses, and herb fields. Many of the species are distributed within relatively isolated populations that are geographically isolated from similar habitats, making them particularly vulnerable to climate hazards. Rising temperatures are increasing pressures on alpine ecosystems such as the increased occurrence of bushfires, which endemic species are poorly adapted to, and the encroachment of non-alpine flora and fauna that are moving upward in elevation to remain within suitable climatic conditions. (Auld, et al., 2022)

Current context

- Over the last few decades, Tasmanian alpine areas have observed a trend of steadily rising temperatures and declining rainfall leading to increasingly dry soil and vegetation. These are creating better conditions for bushfires to start and spread.
- Bushfires in high altitude alpine ecosystems have caused irreversible damage to species of flora and fauna that are not resilient to fire. King Billy Pines and Pencil Pines burnt by fire also have their seeds killed and the peat soil in which they are grown becomes extremely damaged. Increasing bushfire frequency makes regeneration impossible in these circumstances (Marris, 2016).
- Tasmanian alpine vegetation is typically slow growing and not well adapted to fires making the areas particularly vulnerable. Many recent bushfires have caused substantial damage to alpine ecosystems causing a decline in fire sensitive species including conifers (such as King Billy Pines and Pencil Pines).
- Dry conditions and logging in the rainforest that surround these alpine ecosystems have also reduced the ability of more fire resilient ecosystems to act as a firebreak (Marris, 2016).

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- Other human impacts occur from the leisure activities (such as hiking) and livestock grazing that result in the eating and trampling of vegetation, leading to an increase in areas of bare ground cover.

Future context

- Climate projections indicate that the observed trend of increasing temperatures, declining rainfall and general drying of alpine landscapes will continue to alter the composition and distribution of vegetation communities (Slatyer, 2010).
- Climatic changes also increase the potential for dry lightning and bushfires, with impacts increasing towards the end of the century, particularly under a higher emission scenario.
- For alpine ecosystems, where the flora species are not adapted to fire regimes, this is likely to increase the mortality of plants and their seeds, destroy the peaty soil in which they grow, and subsequently impact the fauna that reside in this area.
- Additionally, rising temperatures mean that terrestrial species need to either adapt to warmer climates or become endangered/extinct locally (Corlett & Westcott, 2013). Species are likely to migrate where possible (Parmesan & Yohe, 2003) resulting in many alpine species facing increasing competition due to the expansion of non-endemic species to higher altitudes.

Existing adaptation response

- **National and state level legislation and actions:** Bushfires and Climate Change Research Project, Natural Heritage Strategy for Tasmania (2013-2030).
- **Regional/local scale responses:** TWWHA Management Plan 2016, TWWHA Natural Values Climate Change Adaptation Strategy 2021-2031, TWWHA Fire Management Plan.

Justification of adaptation urgency rating:

- **Consequence – Moderate in 2030:** Climate impacts are projected to have a moderate consequence to alpine ecosystems and species by 2030. While this is not a change to the current level of impact experienced in alpine regions in Tasmania, this impact will quickly evolve as chronic climate changes such as rising temperatures, a loss of snow cover, changing rainfall patterns and drought place stress on alpine and sub-alpine regions. Climate impacts will have an increasing effect on alpine ecosystems and species over future time horizons, becoming a major consequence by 2050 and extreme by 2090.
- **Confidence – High:** The confidence in the assessment of this risk is high. This is driven by the high level of agreement on the vulnerability of alpine ecosystems and species to climate changes. Factors such as limited room for species adaptation, and encroachment from species outside of the alpine region increase vulnerability. There is also a medium level of evidence.
- **Adaptation shortfall – Partial:** While there are state and regional actions and initiatives regarding the management and protection of these ecosystems and the species that reside in them, there is no coordinated approach to mitigating future climate risks to alpine ecosystems and species. As a result, this creates a partial shortfall.
- **Adaptation urgency - Tier 1: Ready to Act.** Further state level action is required to provide a coordinated approach to manage future risks to alpine ecosystems and species given rising temperatures, a loss of snow cover, changing rainfall patterns and drought coupled with constraints to species adaptation in the alpine region.

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5.5.2 Natural domain - Transition risks

5.5.2.1 NT1 Risks to the natural domain from mining of critical minerals

NT1: Risks to natural domain

Risks due to the mining of critical minerals impacting biodiversity, inland water, terrestrial ecosystems, marine ecosystem, and natural heritage.

Consequence		Confidence		Adaptation shortfall	Adaptation urgency
Current: Minor		Overall: Medium		Partial	Tier 4: Monitor
2030 Minor	**2050** Moderate	Agreement	Evidence		
		Medium	Medium		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Demand for critical minerals:** Currently (North-west and North), Future (North-west and North),

Key vulnerabilities: Existing impact from historic mine operations, and unique and sensitive ecosystems, threatened species more susceptible to changes and damage.

Climate risk summary:
Rapid growth in the demand for critical minerals (lithium, graphite, cobalt, nickel, manganese, rare earth metals and copper) provides new opportunities for the mining sector. Tasmania has unique and sensitive ecosystems making them **vulnerable** to disturbances**.** Under a low emissions scenario, mineral demand for use in EVs and battery storage is high, growing 350 per cent by 2040 compared to current demand (IEA, 2024a). Current exposure to potential impacts has resulted in **minor consequences**. Increased demand for minerals is likely to result in **minor consequences** by 2030, and **moderate consequences** by 2050. The **confidence** supporting this is **medium** as there is **medium evidence** and a **medium level of agreement** on the impact of mining within the available evidence. Current response measures in place are largely provided by environmental regulation. Adaptation shortfall has been rated as a **partial shortfall** due to the potential for competing priorities to overrule environmental concerns in the development of mining operations. The adaptation urgency rating is **Tier 4: Monitor,** due to the relatively low consequences in 2030. Uncertainty in Tasmania's participation in global mineral trade may change the potential magnitude of impacts to Tasmania.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), terrestrial ecosystems (N2), marine ecosystems (N4), native ecosystems (N5), renewable energy development (NT2), water quality and biodiversity (NT4)
- **Social:** Mental health and wellbeing (S2), physical safety and wellbeing (S3), cultural heritage (S4),
- **Economic:** Businesses and public organisations (E1), land-based primary sector (E4), ocean-based aquaculture and fisheries (E5), economic growth (ET4)
- **Built:** Contaminated sites (B3)

Justification and evidence

Current context

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- Environmental issues associated with mining operations can include the long-term management of tailings dams, waste rock management including acidic and metalliferous mine drainage, dust and noise emissions, surface and groundwater quality, protection of habitat during the development of mining activities and site rehabilitation (EPA Tasmania, 2024).
- Rapid growth in demand for critical minerals (lithium, graphite, cobalt, nickel, manganese, rare earth metals and copper) provides new opportunities for the mining industry. This has been driven by rapid growth in solar PV, energy storage and electric car sales. Demand for lithium tripled between 2017 and 2022, while demand for cobalt and nickel increased 70 per cent and 40 per cent respectively (IEA, 2023a).
- Major commodities extracted in Tasmania include copper, gold, lead, iron, silver, tin, zinc, magnetite, and ultra-high purity silica flour (Office of the Coordinator General, 2024). The Australian Government and the Tasmanian Government have strategies and programs to support economic opportunities through mining of critical minerals (Office of the Coordinator General, 2024; Export Finance Australia, 2024). Mining activities are largely restricted to the West Coast, the North-west and North-east of Tasmania (EPA Tasmania, 2024).
- In Tasmania there are examples of historic mining operations that have caused long-term localised impacts to ecosystems. Examples in Tasmania are associated mining activities that historically had no or limited environmental regulation (activities pre-dating environmental protection acts legislated in the 1970s, 1980s and 1990s) (Nascimento, et al., 2023; Ashurst, 2018).

Future context

- Under a low emissions scenario, mineral demand for use in EVs and battery storage is a major force, growing 350 per cent by 2040 compared to current demand. For minerals, lithium sees the fastest growth, with demand growing by over 8.7 times by 2040 compared to current demand, followed by graphite, cobalt, and nickel (around 2 to 4 times current demand). The expansion of electricity networks means that copper demand for grid lines more than doubles over the same period (IEA, 2024a). Tasmania currently extracts 4 minerals that are subject to increasing demand: copper, tin, zinc, and silica. It also has deposits of bauxite and nickel which form part of the Government Critical Minerals Strategy.
- The Federal Government has listed six minerals on the Strategic Materials List, of these Tasmania has a supply of four, including copper, nickel, tin, and zinc.
- Tasmania's participation in future markets is dependent on several factors such as total market supply demand balance, commodity prices, and the relative cost of extraction, transport, and processing of minerals from Tasmania.

Existing adaptation responses

- **National and state level legislation and actions:** Mineral Resources Development Act 1999, Mineral Resources Regulations 2016, Mining (Strategic Prospectivity Zones) Act 1993, Environment Protection and Biodiversity Conservation Act 1999, DRP Guideline for the Mining Industry, EPA Remediation Programs, Bunding and Spill Management Guideline, Good Practice Guide - Management of Acid and Metalliferous Drainage in Tasmania, Washdown Guidelines for Weed and Disease Control, Environmental Law Handbook, Nature Conservation Act 2002, National Parks and Reserves Management Act 2002.

Justification of adaptation urgency rating

- **Consequence – Minor in 2030**: The impact of mining for critical minerals on biodiversity, inland water, terrestrial ecosystems, marine ecosystem, and natural heritage is expected to be minor by 2030. Current management frameworks such as mining and environmental regulation provide some response to the risk. The extent of increased in mining in Tasmania due to mineral demand is unclear due to factors such as geographic location and relative cost of extraction compared to other jurisdictions. In 2050 there may be moderate impacts, as demand for critical minerals increases.
- **Confidence - Medium**: There is overall a medium level of confidence given levels of agreement surrounding the impacts of this risk on the natural domain.
- **Adaptation shortfall - Partial**: Currently, there may be partial shortfall in response to the risk. Response to the risk is currently provided by national and state legislation. There may be uncertainties or unknown factors that mean current response provisions are insufficient to fully manage the risk. There are vulnerabilities within the natural domain in Tasmania increasing the susceptibility of ecosystems to change. In addition, there are legacy impacts from historic mining operations that may worsen potential impacts from future mining operations.

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- **Adaptation urgency – Tier 4: Monitor.** Given the gaps in knowledge on Tasmania's role in critical mineral markets and partial shortfall in managing the risk, this risk should be monitored to understand if there are any increases in risk levels. This risk should be reevaluated if the risk level as commodity markets evolve overtime.

5.5.2.2 NT2 Risks and opportunities related to renewable energy development

NT2: Risks and opportunities related to renewable energy development

Risks and opportunities related to renewable energy development impacting biodiversity, inland water quality, marine ecosystems, and natural heritage.

Consequence		Confidence		Adaptation shortfall	Adaptation urgency
Current: Minor		**Overall: Low**		**Partial**	**Tier 2: Investigate then Act**
2030 Moderate	**2050** Moderate	Agreement	Evidence		
		Medium	**Low**		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Renewable energy development**: Currently (Central, North-west, North-east), Future (Central, North-west, North-east),

Key vulnerabilities: Unique and sensitive ecosystems, threatened species more susceptible to changes and damage.

Climate risk summary:
There are risks and opportunities to the natural domain from the development of renewable energy in Tasmania. Renewable energy development may impact biodiversity, inland water, marine ecosystems, and natural heritage through the introduction of invasive species, habitat loss, and reduced water quality. Potential opportunities include ecosystem restoration opportunities where local biodiversity can co-locate with renewable energy generation. Some endemic and endangered species in Tasmania may be **vulnerable** to impacts from renewable energy development**.** There are numerous proposed wind farms across Tasmania, including proposed developments in the north-east, north, north-west coast, and central regions. The Tasmanian Renewable Energy Target legislates a target of 200 per cent by 2040. Current exposure to impacts has resulted in **minor consequences**. Increased development of renewable energy in Tasmania may result in **moderate consequences** by 2030, and **moderate consequences** by 2050. The confidence supporting rating is **low** as there is a medium level of **agreement** on the impacts of renewable energy development, and **low evidence.** Scientific evidence regarding risk to vulnerable species in Tasmania is low, as is evidence to support consequences across all areas of potential impact. Adaptation shortfall has been rated as a **partial shortfall** and the adaptation urgency is **Tier 2: Investigate then Act**.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), terrestrial ecosystems (N2)
- **Social:** Cultural heritage (S4), mental health and wellbeing (S2), physical safety and wellbeing (S3), skills (ST3, ST5)
- **Economic:** businesses and public organisations (E1), land-based primary sector (E4), ocean-based aquaculture and fisheries (E5), economic growth (E4)
- **Built:** health care and emergency services (B1)

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Justification and evidence

Current context

- The natural domain may be impacted by the development of renewable energy including wind (onshore and offshore), hydro and solar technologies. Impacts may vary between technology types, with some impacts common across technology types. Impacts common across technologies may include the introduction of invasive species, loss of habitat, and reduced water quality (Abidur Rahman, 2022).
- Impacts from wind farms may include bird mortality. Impacts of hydro power stations may include changes to nutrient cycles of river ecosystems (Maavara, 2020), loss of wetland habitats, altered hydrology introduction and movement of invasive species, and soil loss into river ecosystems from infrastructure maintenance (Normyle, 2019).
- Species that may be impacted in Tasmania include endangered endemic species, such as the Tasmanian Wedge-tailed Eagle, and critically endangered migratory species, such as the Swift Parrot and Orange Bellied Parrot. The Tasmania Wedge-tailed Eagle has been documented as particularly vulnerable to the impact of wind farms. The population of Tasmanian Wedge-tailed Eagle is currently estimated at 1000, with 200 to 250 breeding pairs (Threatened Species Section, 2024). It is currently uncertain whether population numbers are decreasing, increasing or stable. The adaptive capacity of endangered and critically endangered species is considered low (Nature Trackers, 2024).
- Potential opportunities include ecosystem restoration opportunities where local biodiversity can co-locate with renewable energy generation. This includes the planting of native vegetation and creating habitats for wildlife; dual use agriculture enhancing efficiencies of land use and total impact; solar canopies and co-location of solar and urban greening to increase biodiversity in urban centres.
- Tasmania has a long history of hydropower development, with numerous hydroelectric power stations established over the years. It is widely recognised that Tasmania has abundant renewable energy resources such as hydropower and wind resources.
- Wind energy has become an increasingly important component of Tasmania's renewable energy mix. There are now has 5 wind farms, totalling 568 MW in capacity.
- Bass strait has been identified by the Department of Climate Change, Energy, the Environment and Water as one of six priority areas for the development of offshore wind. The area identifies over 10,000km^2 on the north coast of Tasmania between Burnie and Bridport. This may impact marine ecosystems with research currently underway to identify the type and magnitude of impact (DCCEEW, 2024).

Future context

- Future changes to renewable energy predominately project an increase in wind farm development. Impact is greatest under a low emissions scenario with total capacity of wind farms increasing 150 per cent by 2030. Wind capacity in Tasmania increases at a lower rate under a moderate emissions scenario. Wind farm development continues to increase to 2050 under both a low and moderate emissions scenario.
- Tasmania also proposes to develop a hydrogen industry. The site location will be at Bell Bay which is already an industrial site. Development of a hydrogen industry may further increase demand for renewable energy such as wind. Small-scale hydrogen proposals may be located elsewhere in Tasmania, requiring access to water, land, and other resources (Department of State Growth, 2020).
- The disruption of ecosystems by renewable energy can vary in its impact and reversibility. Factors such as location, scale, ecosystem sensitivity, and response measures influence the extent of disruption.

Existing adaptation responses

- **National and state level legislation and actions:** Environment Protection and Biodiversity Conservation Act 1999, Tasmanian Threatened Species Protection Act 1995, Renewable Energy Approval Pathway, Renewable Energy Zone Mapping Important Places, Tasmanian Renewable Energy Target, Tasmanian Renewable Energy Action Plan, Tasmanian Renewable Energy Coordination Framework, Hydrogen Action Plan.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** The impacts of renewable energy development to biodiversity, inland water, terrestrial ecosystems, marine ecosystems, and natural heritage is expected to be moderate by 2030 due to the

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substantial change under a low emissions scenario and current management frameworks such environmental regulation. In **2050 these may be moderate** as renewable energy development is projected to slow after 2030.

- **Confidence - Low**: There is overall a low level of confidence due to medium level of agreement and low level of evidence in some areas of potential impact (such as species population and location, and the impact of some technologies such as offshore wind).
- **Adaptation shortfall - Partial**: There is existing legislation and regulation in place to manage risks associated with infrastructure development on the natural domain, and further work underway to manage Tasmanian-specific vulnerability for some aspects of renewable energy development (such as Renewable Energy Zones Mapping Important Places).
- **Adaptation urgency – Tier 2: Investigate then Act.** Given the gaps in knowledge on the species at risk, implementation options and impact of some technologies on these species, further investigation is needed to understand the risks and opportunities for action.

5.5.2.3 NT3 Opportunities to optimise waste systems

NT3: Opportunities to optimise waste systems

Opportunities to optimise waste systems to reduce impacts on the environment, including reducing waste to landfill, improved collection and increased recyclability for products.

Confidence		Adaptation shortfall	Adaptation urgency
Overall: High		Partial	Tier 3: Continue to Monitor Current Actions
Agreement	Evidence		
High	Medium		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Waste system improvements**: Currently (Metropolitan areas), Future (Metropolitan areas),

Key vulnerabilities: Endemic and threatened species, sensitivity to changes in water quality.

Climate risk summary:
Waste management can have negative impacts on the natural domain from leachate, stormwater runoff, landfill gas, offensive odour, dust, noise, and litter. There are potential opportunities to reduce these impacts by reducing waste to landfill, this can be implemented through improved collection and processing systems, and through the increased recyclability of products. The **confidence** supporting assessing this rating is **high,** as there is a **high-level agreement** and **medium scientific evidence** supporting the benefit of improving systems and increasing circularity. Current adaptation shortfall has been rated as **partial shortfall** in the realisation of this opportunity, and the adaptation urgency rating is **Tier 3: Continue to monitor current actions**. Tasmania has several initiatives underway that will realise aspects of this opportunity (e.g. the diversion of FOGO from landfill), however, some actions require implementation (e.g. container deposit schemes).

Related impact statements:

- **Natural:** Inland water ecosystems (N1), terrestrial ecosystems (N2), native ecosystems (N5), water quality and biodiversity (NT4)
- **Social:** Physical safety and wellbeing (S3)
- **Economic:** Businesses and public organisations (E1), land-based primary sector (E4)
- **Built:** Stormwater and sewage systems (B4)

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Justification and evidence

Current context

- Waste management through landfill may impact groundwater, soil, or air through pollution (Mineral Resources Tasmania, 2002).
- Resource recovery and recycling promotes efficient use of materials, efficient energy use and reduces emissions (World Economic Forum, 2022). In 2022-23 around 500,000 tonnes of waste were disposed of in landfill in Tasmania. Just over 50 per cent of waste disposed in Tasmania was recycled through resource recovery facilities (Department of Natural Resources and Environment, 2023). In October 2023, the Tasmanian Government released the Waste and Resource Recovery Strategy 2023-26. It sets out the vision and strategy that will be implemented to support a circular economy and to reduce waste and greenhouse gas emissions associated with waste management.
- The National Waste Report 2022 found that Tasmania has a below average rate of recycling, with a recycling rate of 50 per cent compared to an average across Australia of 60 per cent (Planet Ark, 2023).
- The 2019 National Waste Action Plan aims to support programs to meet seven targets to improve the sustainability of waste systems. There is opportunity within Tasmania to improve and expand the National Waste Targets. The targets in the National Waste Action Planincluded significantly increasing the use of recycled content by governments and industry and halving the amount of organic waste sent to landfill by 2030.
- Actions under the Tasmanian Waste and Resource Recovery Strategy 2023-26 include coordinating circular economy activities, creating infrastructure to improve reuse, repair, and refurbishment, implementing a container deposit scheme, and developing sustainable procurement. It is intended that this will improve waste systems in Tasmania to be more sustainable and reduce their impact on the environment.

Future context

- Improvement in the sustainability of product development and a drive to reduce emissions may create opportunities to minimise impacts of waste on the environment, through reductions in volume of waste to landfill and improved waste management practices. Opportunities occur under both a low and moderate emission scenario, with greatest opportunity under a low emission scenario.
- Ambitious emissions reduction associated with a low emissions scenario also relies on efficient resource use with a higher degree of recycling, particularly for high emission products such as steel and aluminium.

Existing adaptation responses

- **National and state level legislation and actions:** Australian Government's 2019 National Waste Action Plan, Tasmanian Waste and Resource Recovery Strategy 2023-26, Draft Waste Action Plan.
- **Regional/local scale responses:** Local government programs in include FOGO processing and recycling initiatives.

Justification of adaptation urgency rating

- **Confidence - High**: Overall, there is a high level of confidence due to high level of agreement and medium level of evidence on the benefits to the natural domain of improved waste management systems.
- **Adaptation shortfall - Partial**: Existing strategies in place that respond to the opportunity include the Tasmanian Waste and Resource Recovery Strategy and Draft Waste Action Plan. There may be adaptation shortfall if action plans (e.g. container deposit scheme) are not implemented.
- **Adaptation urgency - Tier 3: Continue to Monitor Current Actions**. Tasmania has several initiatives underway that will realise aspects of this opportunity. Monitoring and continued implementation of these initiatives should continue to realise this opportunity.

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5.5.2.4 NT4 Opportunities to support water quality and biodiversity

NT4: Opportunities for water quality and biodiversity

Opportunities to support water quality and biodiversity through land-based carbon market participation and projects with co-benefits.

Confidence		Adaptation shortfall	Adaptation urgency
Overall: High		Partial	Tier 1: Ready to Act
Agreement	Evidence		
High	Medium		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Land-based carbon markets**: Currently (Rural statewide), Future (rural statewide)

Key vulnerabilities: Poorly designed and ineffective projects, risks to integrity and reputational damage.

The **confidence** supporting this assessment is **high,** as there is **medium evidence** and a **high level of agreement** within the available evidence.

Climate risk summary:
Well-designed and well-implemented land-based carbon sequestration can have positive impacts on the natural domain through improved water quality and biodiversity, benefiting terrestrial and inland water ecosystems. Tasmania's current participation in carbon markets through land-based carbon sequestration is moderate. Under a low emissions scenario the shadow emissions price increases, increasing the incentives and opportunities to participate in land-based carbon sequestration. Policies such as the Nature Repair Market may increase opportunities for carbon sequestration projects with co-benefits for the natural domain. The **confidence** supporting this assessment is **high,** as there is **medium evidence** and a **high level of agreement** on co-benefits of well-designed carbon sequestration projects. Evidence available at a national and international level, with limited evidence available on the potential impacts for Tasmania. Current **adaptation shortfall** has been rated **partial shortfall** in the realisation of this opportunity and the adaptation urgency rating is **Tier 1: Ready to Act.** There are programs incentivising activities at the national level, with gaps in support within Tasmania to fully realise this opportunity.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), terrestrial ecosystems (N2) native ecosystems (N5), renewable energy development (NT2), waste systems (NT3)
- **Social:** Mental health and wellbeing (S2), cultural heritage (S4)
- **Economic:** Carbon market (ET5), land-based primary sector (E4)
- **Built:** Stormwater and sewage systems (B4)

Justification and evidence

Current context

- Carbon market participation through land-based sequestration involves vegetation, soil and fire management practices aimed at sequestering or avoiding the release of carbon. Carbon sequestration through revegetation also offers the potential to provide a range of additional ecosystem services in

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addition to climate regulation. In Australia, the main 'co-benefits' that could result from carbon farming are conservation of biodiversity, increases in soil and water quality, productivity increases, and economic and cultural services for Indigenous communities (Alex, et al., 2019).

- Poorly designed or ineffective projects may risk reputational damage for the project and project proponent, but also the wider integrity of offsets as part of a carbon market.
- Land-based carbon market participation can include land holders and corporate entities, with potential opportunities across rural Tasmania, particularly on agricultural or forestry land.
- The Australian Carbon Credit Unit (ACCU) Scheme encourages individuals and businesses to run projects that reduce emissions or store carbon. The ACCU Scheme aims to incentivise carbon abatement activities through projects ranging from reforestation to energy efficiency. ACCUs are a tradeable financial product that can be used by businesses to offset their emissions under schemes such as the Safeguard Mechanism, Climate Active, and in reporting schemes that may allow participants to publish offset information such as Corporate Emissions Reduction Transparency (Clean Energy Regulator, 2024b).
- There are ninety-eight projects registered under the ACCU Scheme in Tasmania, which represents 5.5 per cent of total projects across Australia. Eight projects registered in Tasmania have created ACCUs.
- The Tasmanian Government is implementing programs to assist Tasmanian landowners and primary producers to access opportunities through participation in carbon markets. This includes assistance with the cost of accessing eligible advice about how to develop carbon initiatives on their land.
- Other programs available in Tasmania include the Tasmanian Landcare Action Grants.
- Valuing co-benefits (production, environmental and social) from carbon farming is currently being realised at the state level in Australia under the Queensland Government's Land Restoration Fund (LRF) and third-party schemes such the Reef Credits are currently under development (Baumber, et al., 2020). In 2023, the Australian Government legislated the *Nature Repair Act 2023* which established a national, voluntary biodiversity market. This represents an untapped area for Tasmania to become involved in (Clean Energy Regulator, 2024f).

Future context

- Sequestration through land-based carbon sequestration is an opportunity that will increase in the future as carbon markets grow to support emissions reduction. This will increase the opportunities for co-benefits that can impact biodiversity and water quality in a positive way.
- Shadow carbon price in Australia in 2030 may reach AU$135/t$CO_2$e and AU$616/tCO_2e under a moderate emission scenario and low emission scenario respectively. By 2050, shadow emissions price in Australia may reach AU$174/t$CO_2$e and AU$2,004/tCO_2e a moderate emission and a low emission scenario respectively.

Existing adaptation responses

- **National and state level legislation and actions:** Australian Government's ACCU Scheme, *Carbon Credits (Carbon Farming Initiative) Act 2011, Nature Repair Act 2023* .

Justification of adaptation urgency rating

- **Confidence - High**: Overall, there is a high level of confidence due to a high level of agreement and medium level evidence on the benefits to the natural domain of well-designed land-based carbon sequestration.
- **Adaptation shortfall - Partial**: There is currently enabling legislation to support land-based carbon sequestration at the Australia Government level with limited state programs to enable participation in the Tasmanian context, which may lead to partial shortfall of this opportunity.
- **Adaptation urgency - Tier 1: Ready to Act.** Further state level action is required to assist participation in Tasmanian to realise this opportunity,

5.6 Detailed climate impact statements for the social domain

5.6.1 Social domain - Physical risks

In the social domain, climate change poses risks to social cohesion, physical and mental health and wellbeing, and cultural heritage. However, there are opportunities associated with new and emerging industries and resilience improvements. There are a total of 10 priority risk and opportunity statements: 4 for physical and 6 for transition themes.

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5.6.1.1 S1 Risks to social cohesion and community wellbeing

S1: Risks to social cohesion and community wellbeing due to extreme weather events

- **PHYSICAL - ACUTE:** Risks to social cohesion and community wellbeing due to extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) that displace or isolate individuals, families, and communities.

Consequence			Confidence		Adaptation shortfall	Adaptation urgency
Current: Moderate			Overall: High		Partial	Tier 1: Ready to Act
2030 Moderate	2050 Major	2090 Extreme	Agreement: High	Evidence: Medium		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Extreme rain and floods:** Current (West and North-west), Future (North and East)
- **Bushfires:** Current (East and South), Future (North and Central)

Key vulnerabilities: Displacement of individuals, loss of essential services and labour, elevated levels of vulnerable population groups, vulnerable groups, and marginalised communities more susceptible.

Climate risk summary:
Current climate risks are expected to have a **moderate consequence** on social cohesion and community wellbeing, due to the existing **vulnerabilities** exposed within communities from past natural disasters and the extended recovery time that is required to mend broken connectedness and social cohesion. Climate change consequences are likely to remain consistent in the short term, at a **moderate consequence** by **2030**. This consequence level will increase progressively in the future, becoming a **major consequence** in **2050**, and an **extreme consequence** in **2090**, as extreme weather events become more frequent and more intense. The **confidence** supporting this assessment is **high,** as there is **medium evidence** and a **high level of agreement** within the available evidence. Evidence indicates that climate drivers are likely to impact community wellbeing and cohesion through factors such as displacement, interruption of essential service delivery, labour, and education, as well as impacts both on those who remain in communities and those who choose to leave. There are a few Tasmanian-specific studies to support this. Current adaptation measures are provided through state level legislation and actions to help mitigate the impact of extreme weather events and natural disasters. However, there is limited focus on narratives around community wellbeing and cohesion. Therefore, **adaptation shortfall has been rated partial.** The adaptation urgency has been rated as **Tier 1: Ready to Act,** highlighting that additional action is required to specifically target this risk.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), coastal ecosystems (N3), marine ecosystems (N4)
- **Social:** Mental health and wellbeing (S2), physical safety and wellbeing (S3), cultural heritage (S4), social cohesion (ST1), skills (ST4)
- **Economic:** Businesses and public organisations (E1), economic growth (ET1)
- **Built:** Health care and emergency services (B1), infrastructure (B2), Stormwater/sewage systems (B4)

Justification and evidence

Current context

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- Social cohesion is where members of a community feel interconnected and supported. It incorporates trust in institutions, the existence of strong interpersonal relationships, having robust and wide coverage of formal and informal social networks and support systems, and the extent to which all community members feel included, treated fairly, and engaged in community activities and governance. Social cohesion is made up of numerous tangible and intangible factors, with a holistic approach to improving community wellbeing as an essential component.
- Extreme weather events and natural disasters can disrupt community wellbeing by threatening food sources, damaging housing infrastructure, disrupting employment, and causing financial instability. To provide effective recovery and support community wellbeing it is recommended that responding to issues relating to food, housing, jobs, and financial security are a primary focus (Australian Institute for Disaster Resilience, 2018). Doing so supports the recovery of previously damaged social and physical infrastructure while also reinstating a sense of financial security.
- Where inequity exists within communities, the impacts of extreme events are likely to be more substantial on those with pre-existing vulnerabilities (World Bank, 2023). In the context of social cohesion, this can result in greater disconnection between community members, which becomes exacerbated as the scale of disaster increases.
- Individuals and communities often experience short to medium term displacement from climate related disasters, as sections of communities and homes become unliveable due to damage. For individuals and families that are required to move, this can lead to feelings of helplessness and despair, disruption to livelihoods and isolation from friends, family and loved ones. Communities that experience multiple disasters within a period shortly after recovery can experience a compounded effect from disaster impacts. (Gergis, et al., 2023)
- Individuals and communities that experience disaster events may also be temporarily cut off from the rest of the state, wider support systems or components of the community. Communities can experience feeling both physically and socially isolated from the rest of the state, particularly when disaster events cause damage to physical infrastructure and communication channels. This isolation becomes distressing when the disruption to communication networks results in an inability to deliver key messages regarding wellbeing, safety and security to the community, and causes members to feel increasingly vulnerable and distressed the longer this disruption is sustained (Australian Institute for Disaster Resilience, 2018).
- Where people choose to relocate in response to natural disasters, the impact of relocation is complex. Factors that can influence the capacity to relocate successfully include the quality of housing, the existing connection to the community, and the financial capacity of the household to maintain living standards post disaster. For those who are forced to move, there may be inadequate recovery services in new areas, leading to a lack of post disaster support compared with those who remain in affected regions. Disconnection from the community and the need to make new social connections can lead to a diminished sense of identity, mental health problems and feelings of a loss of self-efficacy (Gibbs, et al., 2016).
- In the immediate aftermath of extreme weather events, it is common to see communities' bond over shared experience and their resilience. However, communities can be challenged once faced with the difficulties involved in recovery efforts, leading to feelings of anger, despair, and frustration (National Rural Health Alliance, 2004). Recovery from disaster events like bushfires and floods often extends over multiple years and feelings of anger, frustration, isolation, and poor mental health can become embedded. The gradual loss of community members choosing to relocate following a disaster can also negatively impact community members who remain. Individuals may feel abandoned, guilty and a reduced sense of social connection as existing day to day relationships and social networks are reduced (Gibbs, et al., 2016).
- The 2018-19 Tasmanian summer bushfires impacted communities in multiple ways. The extended bushfire threat in regional locations caused a reduction in hours worked across tourism, hospitality, mining, and forestry industries, generating financial stress and in some cases food stress for sections of the community (TasRecovery, 2019).

Future context

- The severity and frequency of these hazards is projected to increase in the future.
- Bushfire events in particular pose the greatest threat to social cohesion due to the level of instantaneous devastation that can be experienced by communities. Across the state, bushfire days are expected to increase, with a longer fire season and a 40 per cent or greater increase in very high fire days by 2050.

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Additionally, rising temperatures and decreasing precipitation levels across the state create more favourable fire conditions.

- Communities in northern Tasmania, particularly King Island and Flinders Island, will experience the greatest increase in mean wind speed and extreme wind speed, increasing the exposure of buildings and community assets to storm damage.
- Extreme rainfall intensity is expected to increase by the greatest proportion in areas of Tasmania that already experience the most intense rainfall. The northeast and southwest of Tasmania will be the most exposed to this increase. As an example, St Helens has been projected to have a substantial increase in flood risk, with what is now a 1-in-200-year rainfall event become a 1-in-20 year event (Climate Commision, 2013).

Existing adaptation response

- **National and state level legislation and actions:** Community Recovery Handbook (AIDR), Tasmanian Bushfire Mitigation Grants Program (concluded), Tasmanian Strategic Flood Mapping, Tasmanian Disaster Resilience Strategy.
- **Regional/local scale responses:** Regional Drought Resilience Planning Program.

Summary of adaptation urgency rating

- **Consequence – Moderate in 2030:** The impacts of climate change on social cohesion and community wellbeing are projected to be moderate by 2030, with extreme events causing moderate disruptions to education, employment, housing, community services, as well as impacting upon patterns of daily activity and behaviour. There is also existing vulnerability where communities have previously experienced natural disasters. When repeated events occur within a short period of time, connectedness can fracture, requiring significant resources to support the recovery process. In 2050 there is projected to be a major consequence from climate impacts, which will increase to extreme by 2090. This is driven both by evolving climate hazards, and a stronger influence from cascading climate impacts to other risks that will disrupt and break social cohesion in across the State.
- **Confidence – High:** There is high confidence in impacts of climate change on social cohesion and community wellbeing and the detrimental effect that repeated exposure to extreme weather events can have on social cohesion. The confidence is driven by a high level of agreement, and medium level of evidence.
- **Adaptation shortfall – Partial:** While there are some adaptation strategies targeted towards recovery (Community Recovery Handbook, 2018), many of the identified adaptation actions focus on reducing the exposure of communities to extreme events. As such, adaptation efforts only partially cover the components of this risk, with limited identified actions targeted towards factors that may influence social cohesion.
- Adaptation urgency - Tier 1: Ready to Act. Further state level action is required to manage risks to social cohesion and community wellbeing, given projected increases to severity and frequency of climate driven events such as bushfire and extreme rainfall coupled with existing vulnerabilities in communities.

5.6.1.2 S2 Risks to mental health and wellbeing

S2: Risks to mental health and wellbeing

- **PHYSICAL - ACUTE:** Risks to mental health and wellbeing due to changes in extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) causing trauma and impacting identity, autonomy, wellbeing/belonging.
- **PHYSICAL – CHRONIC:** Risks to mental health and wellbeing due to ongoing sea level rise, changes in chronic rainfall/temperature causing trauma and impacting identity, autonomy, wellbeing/belonging.

Consequence	Confidence	Adaptation shortfall	Adaptation urgency
Current: Moderate	**Overall: High**	**High**	

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2030 Moderate	2050 Major	2090 Major	Agreement	Evidence		Tier 2: Investigate then Act
			High	Medium		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Extreme rain and floods:** Current (West and North-west), Future (North and East)
- **Bushfires:** Current (East and South), Future (North and Central)
- **Storm surge:** Current (North-west), Future (North-east, East)

Key vulnerabilities: Multiple vulnerable population groups, access to mental health support, loss of income and property damage, increased exposure to the impacts of extreme weather events, loss of transport routes and isolation of communities.

Climate risk summary:

Tasmania is **exposed** to mental health and wellbeing impacts related to climate change including extreme weather events and chronic changes such as temperature increases. Current climate risks are expected to have moderate consequences to mental health and wellbeing due, there are also multiple **vulnerable population groups** within the state (including women, Aboriginal and Torres Strait Islander peoples, emergency service workers, people with a disability, and young children). Climate change is likely to continue having a **moderate consequence through to 2030, increasing to major consequences by 2050 and 2090** due to the projected increases in chronic temperatures and the frequency/intensity of extreme weather events, further impacting vulnerable population groups. The **confidence** supporting this assessment is **high**, as there is **medium evidence** and a **high level of agreement** on the impacts of climate change on mental health, and sources have a high quality of information. There is **limited Tasmanian-specific evidence** regarding the impacts to climate change on mental health at a state scale. Current adaptation measures are mainly provided through state level policies and strategies designed to address mental health issues. However, there are no identified actions that address the interactions between climate change and mental health and wellbeing in Tasmania, and these require further investigation. Therefore, **adaptation shortfall has been rated as high**. The adaptation urgency has been rated as **Tier 2: Investigate then Act**, highlighting the need for additional research to fill evidence gaps and reduce uncertainty.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), coastal ecosystems (N3), marine ecosystems (N4)
- **Social:** Social cohesion (S1), physical safety and wellbeing (S3), cultural heritage (S4), skills (ST3)
- **Economic:** Businesses and public organisations (E1), economic growth (ET1)
- **Built:** Health care and emergency services (S1)

Justification and evidence

Current context

- Common mental health impacts following extreme events such as storms, floods, and bushfires include anxiety, depression, post-traumatic stress disorder (PTSD), stress, poor sleep, substance abuse and increased suicide risk (National Mental Health Commission, 2021).
- According to studies, exposure to bushfires can have effects on trauma and mental health. Impacts can occur both immediately after fire events and in months and years afterwards. Firefighters and emergency responders are some of the most at risk to extreme events, with PTSD, depression, anxiety, and suicide manifesting in the months following an event (Hughes, 2014). Additionally, the Australian National University identified women, Aboriginal and Torres Strait Islander peoples, parents, and children as those with heightened vulnerability to a bushfire event (Heffernan, et al., 2022).
- Surveys by the Climate Council of Australia identified that rural communities are more likely to experience extreme weather disasters and may bear the compound impact of experiencing multiple disasters in their lifetime. This impact is magnified by greater difficulty in accessing mental health support. Additionally, the loss and

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disruptions to community services, which are often integral aspects of rural communities, can enhance physiological distress, feeling of identity and belonging, and mental health responses post disasters. (Gergis, et al., 2023)

- The impact of acute climate events and disasters are often contained to a specific stress and crisis period, with some sustained challenges in the long term that have an extended recovery period. Prolonged climatic events such as droughts can have an ongoing negative impact on affected individuals' homes, social lives, income, lifestyle and employment, which can influence social and mental health (National Mental Health Commission, 2021).
- Increasing frequency of extreme weather events, natural disasters and sea level rise may lead to property damage and in extreme cases make buildings uninhabitable. These events can lead to unplanned social disruption and can trigger negative mental health consequences, through a loss of social function, feelings of displacement, and increased pressures from the required financial response in disaster recovery (Bambrick, 2016a).
- Lower socio-economic status often correlates with decreased health outcomes due to limited access to healthcare, nutritious food, and safe living conditions, all of which impact mental health. Relative to the rest of Australia, Tasmania has a greater incidence of socio-economic disadvantage, with 21per cent of the population living on inadequate income (TasCOSS, 2024). As a result, compared with other states, the Tasmanian population is more vulnerable to climate change impacts due to the additional strain the impacts can place on mental health wellbeing.
- Increasing temperatures may also lead to an increase in mental health related hospital admissions, potentially due to adverse reactions to medications. Outdoor workers or those working in areas with inadequate ventilation may also experience increased aggression, distress, and mental exhaustion under extreme heat conditions (Hughes, et al., 2016).
- Impacts to land and sea ecology can also have flow on effects to the mental wellbeing of primary producers. For example, rising water temperatures and marine heatwaves experienced in Tasmania can lower the productivity of fishing and aquaculture. This places pressure on individuals, families and communities that are reliant on the income derived from these activities (Bambrick, 2016a).

Future context

- Across Tasmania, climate extremes associated with extreme rain, heat, flooding, bushfires, and coastal extremes (storm surge) are projected to increase in frequency and/or intensity under all scenarios, meaning that current impacts experienced across the state are likely to be exacerbated in the future.
- Across rural Australia, studies have shown that where drought events impact agricultural productivity, there is a substantial decline in the mental health of farm workers (Edwards, et al., 2014). As rainfall levels decline and temperatures increase, Tasmanian agricultural land will be exposed to conditions more favourable to drought, increasing the strain on the mental health of farm workers.

Existing adaptation response

- **National and state level legislation and actions:** Tasmanian Climate Change Office Climate Change and Health Round Table, Healthy Tasmania Five Year Strategic Plan.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** The impacts of climate change on mental health and wellbeing are projected to be moderate by 2030. This is due to the expected lasting impacts that extreme weather events and chronic changes in the climate will have on the mental health of Tasmanians, with particular vulnerability for population groups such as the elderly, children, Aboriginal and Torres Strait Islander peoples, and women. In **2050** and **2090** there is projected to be a **major consequence** for this risk, driven both by evolving climate hazards, and a strong influence from cascading risks.
- **Confidence – High:** There is a high level of confidence regarding the understanding of this risk due to a high level of agreement and medium level of evidence. However, it should be noted there is limited evidence that examines Tasmanian specific vulnerabilities that may exacerbate mental health impacts.
- **Adaptation shortfall – High:** While two adaptation actions do provide a reference to mental health, or wellbeing overall, there is no explicit plan in place for the management of mental health with respect to climate change, leading to a high adaptation shortfall.
- Adaptation urgency - Tier 2: Investigate then Act. Further investigation is needed to understand Tasmanian specific vulnerabilities that may exacerbate mental health impacts and where adaptation efforts should be targeted.

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5.6.1.3 S3 Risks to physical safety, health, and wellbeing

S3: Risks to physical safety, health, and wellbeing

- **PHYSICAL - ACUTE:** Risks to physical safety, health, and wellbeing due to changes in extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) impacting heatwaves, water availability, natural resource (food, drinking water and materials) quality/accessibility and the spread of diseases.
- **PHYSICAL – CHRONIC:** Risks to physical safety, health, and wellbeing due to changes in chronic rainfall/temperature impacting heatwaves, water availability, natural resource (food, drinking water and materials) quality/accessibility and the spread of diseases.

Consequence			Confidence		Adaptation shortfall	Adaptation urgency
Current: Moderate			Overall: High		Partial	Tier 1: Ready to Act
2030 Moderate	2050 Major	2090 Major	Agreement	Evidence		
			High	Medium		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Extreme rain and floods:** Current (West and North-west), Future (North and East)
- **Bushfires:** Current (East and South), Future (North and Central)
- **Extreme heat:** Current (North), Future (North and Islands)

Key vulnerabilities: Elevated levels of vulnerable population groups, high proportion of older and sub-standard housing, exacerbation of chronic health issues, loss of essential services and shelter, vulnerable groups, and marginalised communities more susceptible.

Climate risk summary:

Tasmanians are exposed to a range of threats to their physical safety, health, and wellbeing from climate change events. **Current climate risks are expected to have moderate consequences** on Tasmania at the state scale, due to acute hazards having isolated short-term disruptions to physical safety and wellbeing. Certain population demographics are considered more vulnerable to climate impacts, specifically low-socioeconomic individuals and those that live in sub-standard and older housing. Climate change is likely to result in **moderate consequences by 2030, and major consequences by 2050 and 2090**, as the intensity and severity of climate impacts increase, and interactions of cascading risks influence physical safety and wellbeing. The **confidence** supporting this assessment is **high**, as there is **medium level of evidence** and a **high level of agreement** on the impact climate change will have on human health, physical safety, and wellbeing. **Tasmanian specific evidence is limited** for this risk. Current adaptation measures are mainly provided through national and state strategies and plans therefore, **adaptation shortfall has been rated partial**. While further investigation is required to specifically understand the interactions of climate change on Tasmanians' health, wellbeing and physical safety, national and international evidence is applicable to guide the response to this risk. Consequently, the adaptation urgency has been rated as **Tier 1: Ready to Act**.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), coastal ecosystems (N3), marine ecosystems (N4)
- **Social:** Cultural heritage (S4), mental health and wellbeing (S2), social cohesion (ST1), skills (ST3)
- **Economic:** Businesses and public organisations (E1), land-based primary sector (E4), ocean-based aquaculture and fisheries (E5)
- **Built:** Health care and emergency services (B1)

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Justification and evidence

Current context

- Climate change acts as a threat multiplier for existing health issues across the state (Department of Health, 2021). While this increases the level of physical health risk to all individuals across the state, there is an added level of risk to those who are already vulnerable to negative health outcomes.
- Extreme heatwaves and heat have caused more deaths in Australia than the combined effect of bushfires, cyclones, earthquakes, floods, and severe storms. These events exacerbate chronic health conditions, and place additional stress on all individuals, including the healthy. Those most at risk of heat related illnesses are existing vulnerable members of society, including the elderly, young children, those with physical disability or illness, pregnant women and individuals who are taking medication. The Tasmanian population is particularly vulnerable to extreme heat due to the greater proportion of elderly people, those living with chronic health conditions, and higher levels of socially disadvantaged population when compared with the rest of the country. (Campbell, et al., 2024)
- Climate change impacts including ongoing harmful changes to ambient air quality, increases in pollutants, and increasing intensity and frequency of bushfires have also increased the number of smoke induced asthma attacks, exacerbated respiratory issues, and increased the severity of heart and lung conditions for individuals (Hughes & McMichael, 2011).
- Globally, individuals and communities are exposed to a range of threats to their physical safety and wellbeing from climate change events. Primarily acute hazard such bushfire, flooding, storms, and storm surges can cause physical harm, but climate events can also cause several indirect impacts such as the spread of pathogens and diseases, reduce access to shelter, create unsafe working conditions and worsen food security (Bambrick, 2016a).
- Floods can cause drowning, injuries from debris, and contaminant risks from floodwater. Bushfires can lead to burns, dehydration, and widespread respiratory issues from smoke inhalation.
- Changes to climate variables such as rising temperatures, increased rainfall and increased humidity may facilitate more favourable conditions for mosquito borne diseases, such as Ross River virus and Barmah Forest Virus. While the effects are localised to coastal regions in the State's north, and the southeast corner of Tasmania respectively (Department of Health, 2024), changes to climatic conditions can lead to longer disease transmission seasons, an increase in recorded incidents and potential for increased geographic spread of diseases (Lyth, et al., 2013).
- Water security and water quality can be impacted by a multitude of factors. Heavy rainfalls can cause sewage overflow in urban areas, and surface runoff into dams, leading to bacteria in water sources and increased risk of gastrointestinal sickness. In periods of drought and high temperatures, water quality can be affected by algal blooms, which can be harmful through direct contact or consumption of food that has been exposed to toxins (BetterHealth, 2021).

Future context

- In the future, extreme events that directly impact physical safety and wellbeing, particularly heatwaves, bushfires, flooding, and droughts, are projected to increase in both their frequency and intensity.
- Increases in the intensity and frequency of hot weather is likely to exacerbate heat mortality and health risks from heat related illness, particularly in urban environments. The replacement of natural vegetation in the urban environment with human made building materials (such as concrete and pavements) means that surfaces absorb and store more heat during the day before releasing it at night, contributing to physical health issues in urban areas.
- Increases to drought conditions and declines in water availability may lead to potential increases in diseases from water-borne pathogens.
- Increases to the intensity and severity of bushfires is likely to increase direct risks to physical health and safety (through radiation exposure, burns, and tree strikes) and indirect risks through declines in air quality and the inhalation of bushfire smoke.
- The increased frequency of extreme rainfall events is likely to increase health risks and mortality related to flooding, declines in water quality, elevated waterborne diseases, and impacts to food and crop availability. Where water intrudes into buildings it may increase the risk of mould contamination which can cause health problems.

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Existing adaptation response

- **National and state level legislation and actions:** Flood and Bushfire Management Strategies, Tasmanian Coastal Adaptation Pathways Project, Healthy Tasmania Five-Year Strategic Plan.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030**: The impact of climate change on physical safety, health and wellbeing is projected to be moderate by 2030, with chronic changes such as rising temperatures expected to exacerbate health issues in the state and cause moderate lasting impacts on health, safety, and wellbeing. Additionally, acute extreme events will have a moderate impact on physical health and safety, evolving into more prolonged disruptions as they increase in frequency and intensity over time. In **2050 and 2090,** models project a **major consequence** due to a substantial increase to climate impacts, including the influence of cascading risks having major impacts and prolonged disruptions to physical health, safety, and wellbeing.
- **Confidence - High**: The confidence supporting the assessment of this risk is high, due to a high level of agreement and a medium level of evidence.
- **Adaptation shortfall - Partial**: While there are multiple adaptation strategies that help to lower the risk of extreme events and thus improve safety, it has been noted by stakeholders that there is limited adaptation action specifically linking climate change with physical health and wellbeing. It is clear however where additional investment into adaptation efforts is required to support the management of physical safety, health, and wellbeing.
- **Adaptation urgency - Tier 1: Ready to Act.** Further state level action is required to ensure a coordinated approach to manage both acute and chronic risks to physical safety, health, and wellbeing, given projected increases in frequency, intensity and cascading impacts from climate driven events coupled with existing vulnerabilities in communities.

5.6.1.4 S4 Risks to cultural heritage

S4: Risks to cultural heritage due to extreme events and chronic climate changes

- **PHYSICAL - ACUTE:** Risks to cultural heritage, including Aboriginal cultural heritage, due to changes in extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) impacting sites.
- **PHYSICAL – CHRONIC:** Risks to cultural heritage, including Aboriginal cultural heritage, due to ongoing sea level rise impacting sites.

<table>
<tr><th colspan="3">Consequence</th><th colspan="2">Confidence</th><th>Adaptation shortfall</th><th>Adaptation urgency</th></tr>
<tr><td colspan="3">Current: Moderate</td><td colspan="2" rowspan="2">Overall: Low</td><td rowspan="3">Partial</td><td rowspan="3">Tier 2: Investigate then Act</td></tr>
<tr><td rowspan="2">2030
Moderate</td><td rowspan="2">2050
Major</td><td rowspan="2">2090
Extreme</td></tr>
<tr><td>Agreement</td><td>Evidence</td></tr>
<tr><td colspan="3"></td><td>Medium</td><td>Low</td></tr>
</table>

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Bushfires:** Current (East and South), Future (North and Central)
- **Sea level rise:** Future (East and North-east)
- **Chronic rainfall and drought:** Current (East), Future (North-west and Islands).

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Key vulnerabilities: Damage and loss of cultural sites due to extreme weather events, loss of key species and important resources, loss of coastal sites due to erosion and flooding, higher susceptibility of regional locations, impaired connection to Country, aged buildings and built forms, deterioration of materials over time.

Climate risk summary:
Cultural heritage refers to places and values of cultural significance to Tasmanians, including both Aboriginal cultural heritage and more recent heritage related to European settlement of Tasmania. It includes environments in which the cultural heritage of Tasmanian Aboriginal people is preserved, such as the Tasmanian Wilderness World Heritage Area, along with places and precincts on the Tasmanian Heritage Register, such as the Port Arthur Historic Site. It also incorporates Aboriginal cultural objects and traditions that have been passed down to Tasmanian Aboriginal people from past generations, and intangible places where there may be no physical evidence of past cultural activities such as places of spiritual or ceremonial significance or trade and travel routes. Current climate risks are projected to have a moderate consequence to cultural heritage. This is partly due to existing vulnerability due to the location of built cultural heritage sites and Aboriginal cultural heritage sites. Additionally, Aboriginal cultural heritage is heavily interlinked with multiple risk statements, particularly in the natural domain, which heavily influence outcomes to this risk. This is projected to result in a **moderate consequence** to cultural heritage in **2030**, a **major consequence** in **2050** and **extreme consequence** in **2090**. The **confidence** supporting this **low**. While there is a **medium level of agreement**, efforts to engage with Aboriginal communities in a targeted fashion through the Risk Assessment did not yield sufficient insights to be considered representative of in-depth cultural knowledge, expertise and understanding. Coupled with the absence of other data in this space, this has led to low evidence rating. The **adaptation shortfall** has been rated as a **partial shortfall**. The TWWHA Natural Values Climate Change Adaptation Strategy is a substantial state initiative that supports the protection of a significant cultural asset and a critical component of Aboriginal connection to Country. However, whilst multiple other state actions that protect cultural heritage have been identified, these do not explicitly call out protection with respect to climate change. The **adaptation urgency** has been rated as **Tier 2: Investigate then Act**, in recognition that additional consultation is required with Tasmanian Aboriginal communities to improve the confidence in the assessment of this risk with respect to Aboriginal cultural values, and to embed Aboriginal community knowledge into future adaptation actions.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), terrestrial ecosystems (coastal ecosystems (N3) marine ecosystems (N4)
- **Social:** Social cohesion (S1, ST1), mental health and wellbeing (S2), physical safety and wellbeing (S3)
- **Economic:** Land-based primary sector (E4), ocean-based aquaculture and fisheries (E5)

Justification and evidence

Current context

- Climate change impacts such as extreme weather and natural disasters have caused and will continue to cause lasting damage to cultural values, including Aboriginal cultural values, from impacts on native species, built cultural sites, indigenous sites, stories, totems, and traditional resources. These impacts will disrupt and require changes to cultural practices (State of the Environment Australia, 2021).
- Aboriginal cultural heritage is deeply embedded in a connection to Country, resulting in many physical climate hazards having the capacity to impact Aboriginal cultural heritage. Connection to Country is integral to the lives and culture of Aboriginal people, with this relationship influencing social, emotional, physical, and spiritual wellbeing. It represents a worldview held by the people, in which everything is living and there is no division between the animate and inanimate. Additionally, connection to Country is a driving force behind key aspects of Aboriginal culture, such as art, song and dance, and has been passed through generations, providing a strong connection with traditional land (Upward, et al., 2023).
- Natural disasters, such as bushfires can lead to disproportionate damage to wildlife, damage culturally significant artistic sites and damage culturally significant landscape features (State of the Environment Australia, 2021). This environmental damage and destruction of culturally significant sites impacts the ability of Aboriginal people to be connected to and remain connected to their Country (Williamson, 2022).
- The Tasmanian Wilderness World Heritage Area (TWWHA) is a significant cultural asset for the state and represents an area of Outstanding Universal Value. The TWWHA's value makes up a substantial component of the States cultural identity and particularly has numerous tangible and intangible connections with Tasmanian Aboriginal cultural heritage. The TWWHA is exposed to numerous climate change impacts, both acute and chronic, which threaten the ongoing health and performance of this ecosystem. A significant risk

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facing the TWWHA is growing bushfire risk, which threatens to have widespread irreversible damage, particularly to Aboriginal cultural heritage that is interlinked with the TWWHA. As part of the States management and protection of this cultural asset, Tasmania has implemented the TWWHA Natural Values Climate Change Adaptation Strategy 2021-2031 (Department of Primary Industries, Parks, Water and Environment, 2021).

- Bushfires threaten cultural heritage, damaging structures, sites, and landscapes. Built heritage and landscapes are especially vulnerable. The increased scale and intensity of bushfire events limit the resources available for protecting cultural heritage sites requiring the most significant sites to be prioritised. Storm events and flooding will have a similar effect, with cultural heritage sites in poorer conditions being most at risk (State of the Environment Australia, 2021).
- Built cultural heritage sites, such as historical buildings or memorial sites, are less likely to have design considerations for changing climate extremes, making them vulnerable to more frequent and intense extreme events, as well as coastal cultural sites being exposed to sea level rise and storm surge risks.
- An inherent vulnerability of built cultural heritage sites is that they are often singular buildings of significance, that are unable to be moved. As such, much like legacy infrastructure, there is a much more limited scope to reduce the level of exposure to climate hazards, and often limitations on what adaptative measures can be implemented that don't interfere with the way society will perceive or interact with sites of significance.
- Built cultural heritage areas are also particularly vulnerable to increased biodeterioration and corrosion, which can lead to structural decay and damage due to changed foundation conditions (State of the Environment Australia, 2021).
- For further detailed information on additional impacts that can impact built structures, which incorporates built cultural heritage sites, is explored in risk profile B2.
- While cultural heritage sites may be more prevalent in urban areas, regional locations are most at risk considering their increased exposure and vulnerability to climate impacts. The Australian State of the Environment Report 2021 recognises that very little research on existing impacts to cultural heritage from climate change has occurred (State of the Environment Australia, 2021).

Future context

- Climate change is likely to have increasing impacts to all elements of cultural heritage, including Aboriginal cultural heritage, as extreme events such as flooding and bushfires damage and destroy cultural sites, while chronic changes such as rising temperatures, changes to rainfall, sea level rise, erosion and storm surge have a compounding influence in the future.
- Flooding can cause water damage, decay, and loss of plant life within cultural sites. These impacts can occur even without direct flooding, like from higher water tables and salinity. Rising sea levels and associated storm surges also increase erosion which may reduce the accessibility and stability of coastal cultural sites.
- Rising temperatures, changes to rainfall, and increased drought conditions are likely to increase the frequency and intensity of bushfires and fire related risks to all forms of cultural heritage in many areas of the state.
- In 2002, the World Heritage committee identified that sea level rises on the edge of the Tasmanian Wilderness World Heritage Area may lead to erosion and coastal inundation, placing Aboriginal cultural sites in the region at risk (Pearson, 2007).

Existing adaptation response

- **National and state level legislation and actions:** TWWHA Natural Values Climate Change Adaptation Strategy 2021-2031
    - The following identified actions mention protection of cultural heritage but do not explicitly cover climate change.
    - Aboriginal Heritage Act 1975 (Tas), New legislation in preparation: Aboriginal Cultural Heritage Protection Act.
    - Historic Cultural Heritage Act 1995.
- **Regional/local scale responses:** Such as "Port Arthur Historic Sites Statutory Management Plan 2008".

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Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** The impacts to cultural heritage are expected to be moderate in 2030, as extreme weather events are expected to cause damage to cultural assets, and to impact Aboriginal communities' connection to Country. This rating is projected to increase to major in **2050,** before increasing to extreme in **2090** as extreme events have the capacity to destroy large components of cultural heritage, particularly significant built cultural sites and elements of Aboriginal cultural heritage in Tasmania.
- **Confidence – Low:** There is a medium level of agreement regarding the ways in which cultural heritage is impacted by climate change. However, efforts to engage with Aboriginal communities in a targeted fashion through the Risk Assessment did not yield sufficient insights to be considered representative of in-depth cultural knowledge, expertise and understanding regarding this risk. Coupled with the absence of other data in this space, outside of some evidence related to built cultural heritage, evidence for this risk has been rated as **low,** leading to a low confidence rating overall. The evidence in relation to built cultural heritage is further reflected in the consideration of legacy infrastructure in related risk profile B2. The Australian State of the Environment Report 2021 recognises that very little research on existing impacts to cultural heritage from climate change has occurred (State of the Environment Australia, 2021).
- **Adaptation shortfall – Partial:** There is a partial coverage of this risk. A substantial amount of the identified adaptation actions mention the protection of cultural heritage, but do not specifically link it to climate change.
- **Adaptation urgency - Tier 2: Investigate then Act.** Further investigation, particularly in collaboration with Tasmanian Aboriginal communities, is needed to better understand this risk and the specific actions and implementation required to manage it. While built cultural heritage may have an increased readiness for action, this profile has been rated as Tier 2, to reflect the low confidence rating and low level of evidence when considering all aspects of the risk, particularly the impacts on Aboriginal cultural values.

5.6.2 Social Domain - Transition risks

5.6.2.1 ST1 Risks to social cohesion due to the inability of institutions and governance systems to effectively manage climate risks.

ST1: Risks to social cohesion due to inability to effectively manage climate risks

Risks to social cohesion due to the inability of institutions and governance systems to effectively manage climate risks.

Consequence		Confidence		Adaptation shortfall	Adaptation urgency
Current: Minor		Overall: High		Partial	Tier 1: Ready to Act
2030 Moderate	2050 Major	Agreement	Evidence		
		High	Medium		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Governance systems managing climate risk**: Currently (all levels of government), Future (all levels of government)

Key vulnerabilities: Elevated levels of vulnerable population groups, isolated nature of the state, socioeconomic factors, high proportion rural population, less developed nature of rural infrastructure.

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Climate risk summary:
As climate change leads to increasing extreme weather events, the capacity for institutions and governance systems to manage climate risks will have an impact on social cohesion. Governance systems and institutions play a key role in climate resilience and the response to climate impacts, where these systems are ineffective there are increased impacts on community wellbeing and social cohesion as inequalities are further entrenched. Current risks are expected to have a **minor consequence.** Consequences are likely to be **moderate consequence** by **2030**. The consequence level will increase in the future, becoming a **major consequence** in **2050.** The **confidence** supporting this assessment is **high** as there is **a high level of agreement** on the impact of governance on social cohesion and **medium level of evidence** to support this. The **adaptation shortfall** is **partial**, as there are some state actions and institutions in place to ensure climate governance is further integrated across the government institutions. However, there may be gaps in governance approach across all levels of government and there is the potential for mismatch between high-level policies and implementation. As a result, the **adaptation urgency rating** is **Tier 1: Ready to Act**

Related impact statements:

- **Social:** Social cohesion (S1, ST2, ST4), mental health and wellbeing (S2), physical safety and wellbeing (S3), cultural heritage (S4), skills (ST3, ST5, ST6)
- **Economic:** Businesses and public organisations (E1, ET2, ET3), land-based primary sector (E4), ocean-based aquaculture and fisheries (E5), economic growth (ET1)

Justification and evidence

Current context

- Social cohesion is integral to the wellbeing of Tasmanians and can increase resilience to disasters (Tonwshend, et al., 2014).
- Effective management of the range of potential impacts of climate change requires policy alignment and coordination across levels of government and with sectors, and ongoing program management (Múnera-Roldán, et al., 2024).
- Tasmania is exposed to reduced social cohesion if governance systems and institutions are unable sufficiently manage impacts of climate change. Climate change disproportionately burdens those more vulnerable by increasing inequity and reducing social cohesion (IMF, 2021).
- Insufficient management of climate change may limit the choices for future generations, increase the vulnerability of other systems (natural, built, and economic) to climate change, and increase the costs of climate change in the future (IPCC, 2022).
- Tasmania is vulnerable due to combination of geographical, economic, and demographic factors. Tasmania is more isolated compared to other states and territories in Australia and the economy's heavy reliance on agriculture, forestry, and fisheries makes it sensitive to climate variability and extreme weather events such as droughts and bushfires. The population is also older on average and has higher rates of socioeconomic disadvantage, which increases vulnerability as older adults and lower-income groups are less able to prepare for and recover from climate events. Infrastructure in rural and remote areas is often less developed, making these areas more susceptible to damage from extreme weather, while changes in rainfall patterns can affect water supply and hydropower reliability (Tasmanian Policy Exchange at the University of Tasmania, 2021).
- Tasmania's Climate Change Action Plan 2023-25 includes A$10 million of investment in climate change mitigation and adaptation. The Risk Assessment is a key strategic project under the plan (ReCFIT, 2023e).
- In addition to policies and programs supporting adaptation and mitigation, the Tasmanian government supports research and monitoring programs to better understand climate change impacts and trends in the region. These programs could provide valuable data for informing policy decisions and adaptation strategies.

Future context

- In the future, the severity and frequency of climate hazards are projected to increase over time.
- Vulnerable populations in Tasmania may be most impacted by climate risk and require more support for resilience and recovery.
- If governance systems and institutions and unable to effectively manage climate risks with increasing severity and frequency of climate hazards in the future, social cohesion may reduce within Tasmania.

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Existing adaptation responses

- **National and state level legislation and actions:** Implementation of Tasmania's adaptation and resilience priorities as outlined in Tasmania's Climate Change Action Plan 2023-25. (ReCFIT, 2023e)

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** The potential impacts of governance systems and institutions inability to manage climate risk on social cohesion is expected to be moderate by 2030. This is due to climate change impacts increasing, increasing the need for governance and the potential for social cohesion to fragment as climate change increases inequity and disproportionately impacts vulnerable populations. In 2050 there is projected to be a major consequence and potential climate hazards are projected to increase.
- **Confidence – High:** There is a high level of confidence regarding the understanding of this risk due a high level of agreement and medium level of evidence, however, limitations in evidence include the assessment Tasmanian specific vulnerability.
- **Adaptation shortfall – Partial:** Adaptation response is provided by Tasmania's Climate Change Action Plan 2023-25 with some priorities that may support governance (embedding climate change in government decision and collaborating with stakeholders) implementation of some aspect of the Action Plan is still required, this will determine the adequacy of the adaptation response. Further action may be required across different levels of government.
- **Adaptation urgency - Tier 1: Ready to Act.** Further state level action is required to ensure a coordinated approach to implementation of existing plans, such as Tasmania's Climate Change Action Plan 2023-25, and to consider future impacts, given the projected increase in climate driven extreme weather events.

5.6.2.2 ST2 Risks to social cohesion, and health and wellbeing due to existing services being insufficient to meet the needs of a growing population (driven by renewable energy development and new industries that support emissions reduction in Tasmania).

ST2: Risks due to insufficient services for growing population

Risks to social cohesion, and health and wellbeing due to existing services being insufficient to meet the needs of a growing population (driven by renewable energy development and new industries that support emissions reduction in Tasmania).

<table>
<tr><th colspan="2">Consequence</th><th colspan="2">Confidence</th><th>Adaptation shortfall</th><th>Adaptation urgency</th></tr>
<tr><td colspan="2">Current: Insignificant</td><td colspan="2" rowspan="2">Overall: Medium</td><td rowspan="3">Partial</td><td rowspan="3">Tier 2: Investigate then Act</td></tr>
<tr><td rowspan="2">2030
Moderate</td><td rowspan="2">2050
Moderate</td></tr>
<tr><td>Agreement</td><td>Evidence</td></tr>
<tr><td colspan="2"></td><td>Medium</td><td>Medium</td><td></td><td></td></tr>
</table>

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Renewable energy development**: Currently (Hobart and North), Future (Hobart, North and North-west)

Key vulnerabilities: Insufficient services (education, childcare, housing, health, and community), vulnerable population, higher risk in rural and regional areas.

Climate risk summary:
Population growth, driven by industries that support emissions reduction such as renewable energy, may impact social cohesion and health and wellbeing if services are insufficient to meet demand. Vulnerability exists where there are

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insufficient services to meet the needs of Tasmania's current population. This can vary across regions depending on demographics, funding, and supporting infrastructure. Current risks are expected to have an **insignificant consequence** on social cohesion and health and wellbeing. Consequences are likely to increase in the short term to a **moderate consequence level** by **2030**. This **moderate consequence level** is consistent to **2050**. The **confidence** supporting this is **medium** as there is a **medium level of evidence** and a **medium level of agreement** regarding services provision. There is limited evidence available for some service types. The **adaptation shortfall** has been rated **partial,** and the **adaptation urgency** rating is **Tier 2: Investigate then Act**. Further information is needed to determine the capacity of services to meet the needs of a potential increase in population, including service type (health, education, childcare, financial and community services) and location.

Related impact statements:

- **Social:** Mental health and wellbeing (S2), physical safety and wellbeing (S3), social cohesion (ST1, ST3), skills (ST5)
- **Economic:** Businesses and public organisations (E1), economic growth (ET1, ET4), businesses and public organisations (ET2, ET3), businesses (ET5)
- **Built:** Health care and emergency services (B1), sanitation and sewage (B4), transport (B6, BT1)

Justification and evidence

Current context

- Renewable energy development within Tasmania may increase migration to the state as an increase in skilled workers is required. Increased migration may impact health and wellbeing by decreasing access and availability of services to meet the needs of communities and may impact social cohesion through increased inequity. This has potential implications to services in metro and regional areas. The jobs associated with renewable energy include both development and construction activities and operation and maintenance activities. Where services are unable to expand to meet demand, access to services may be reduced (OECD, 2018; University of Sydney, 2023) (OECD /EC-JRC, 2021; Day, 2023).
- Tasmania has experienced steady employment in the renewable energy sector. In the period from FY14 to FY19, jobs within the renewable energy sector were around 1200-1700 full-time equivalent positions (ABS, 2020). Currently, Tasmania has around 2.3 GW of hydro capacity and 0.6 GW of wind capacity (AEMO, 2023a)
- Vulnerability exists where there are insufficient services (education, childcare, housing, health, and community) to meet the need of Tasmania's current population. This can vary across regions depending on demographics, funding, and supporting infrastructure.
- Tasmanians experience poorer health outcomes than those living in most other regions of Australia. A recent inquiry into health services in Tasmania found significant evidence of barriers to access of timely care throughout rural and regional Tasmania (Parliament of Tasmania, 2021).
- Average class size in Tasmanian primary and secondary schools is in line with national averages (Department of Education, Children and Young People, 2022). However, student to teacher ratios is below the national average (ACARA, 2023). This suggests that overall, there is sufficient capacity within the current school system to meet demand. It has been noted that there is regional variation within the education system, with some rural areas having insufficient capacity to meet demand. Recent studies by a local council in Tasmania cite access to education as key reason for families moving away from the area (ACARA, 2023).
- Access and demand for childcare services varies across the State. Regions such as the North, North-west and West identified as areas where demand is higher than capacity. Remote communities may lack access to childcare services within a commutable distance (Department for Education, Children and Young People, 2023).
- Insufficient rental housing in a region may also deter prospective residents and limit opportunities for sustainable economic diversification.

Future context

- Tasmania may experience population increases through renewable energy development as skilled workers are required to service the delivery of projects. A substantial increase in the level of renewable energy generation is projected under a Low Emission scenario. In addition, this is supported by large infrastructure projects (Marinus Link, North West Transmission Development and potential REZ infrastructure) and potential load growth. This may contribute to above average population increases, particularly in the north of the state.

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- Tasmania's Renewable Energy Target sets an aspiration to achieve 200 per cent net renewables by 2040. Development of a hydrogen industry may further increase demand for renewable energy such as wind (Department of State Growth, 2020). Job creation from increased development of renewable energy generation and storage in Tasmania may overburden services and may impact social cohesion, and health and wellbeing.
- Construction and installation of new wind farms generate around 2.8 jobs per MW. Operations and maintenance of wind farms generate around 0.22 jobs per MW installed (Rutovitz, et al., 2020).
- Under a low emissions scenario, wind capacity installed in Tasmania is modelled to increase substantially 2030, with further increases to 2050. Between 2030 and 2050, utility scale storage, hydro and utility scale solar PV also increase in installed capacity.

Existing adaptation responses

- **National and state level legislation and actions:** Community Services Industry Plan 2021-2031, Tasmania's Population Strategy, Tasmanian Renewable Energy Target, Tasmanian Renewable Energy Action Plan, Tasmanian Renewable Energy Coordination Framework, Hydrogen Action Plan.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** The impacts of renewable energy development on social cohesion and health and wellbeing due to insufficient services expected to be moderate by 2030. This is due to the projected substantial increase in renewable energy development under a low emissions scenario and associated migration to meet jobs and skills required. In **2050, the consequence are moderate** as renewable energy development growth increases at a lower rate.
- **Confidence – Medium:** There is a medium level of confidence due to a medium level of agreement and medium level of evidence. The need for jobs and skills for renewable energy development is well researched. Understanding of the migration impacts and potential demand for services is not well understood, as is an understanding of the services most as risk of being unable to respond.
- **Adaptation shortfall – Partial:** There are some strategies targeted towards community service provision (Community Services Industry Plan 2021-2031 and Tasmania's Population Strategy) and the identification of jobs and skills required for renewable energy development (Tasmanian Renewable Energy Action Plan, Tasmanian Renewable Energy Coordination Framework, Hydrogen Action Plan). However, these adaptation efforts only provide partial response to the risk as there is no coordinated between strategies.
- **Adaptation urgency - Tier 2: Investigate then Act.** Further investigation is needed to determine the capacity of services to meet the needs of increasing populations, including service type (health, education, childcare, financial and community services) and location.

5.6.2.3 ST3 Opportunities for increased skills and employment with business development for new and emerging industries that provide adaptation and resilience solutions.

ST3: Opportunities for adaptation related skills and employment

Opportunities for increased skills and employment with business development for new and emerging industries that provide adaptation and resilience solutions.

Confidence		Adaptation shortfall	Adaptation urgency
Overall: Medium		Partial	Tier 2: Investigate then Act
Agreement	Evidence		
Medium	Medium		
Risk/Opportunity summary and associated impact statements			

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Key drivers (region exposed):

- **New and emerging industries - adaptation and resilience:** Currently (Statewide), Future (Statewide),

Key vulnerabilities: Lack of or insufficient investment, insufficient planning, or skill development to maximise opportunity.

Climate opportunity summary:
As the climate changes, adaptation actions will be required to reduce impacts on individuals, communities, and organisations. Adaptation actions are linked to positive economic growth. Tasmania has adaptation actions underway that support preparedness for a changing climate. These include programs like the Climate Resilient Councils project and the community climate change action grants program. Planning changes, disaster preparedness, and ongoing research could help to enhance climate resilience. Evidence to support growth in opportunities for job creation in adaptation-related sectors is **medium** with a **medium level of agreement**, supported by international research rather than Australian or Tasmanian specific examples. The **adaptation shortfall** is **partial** as some policies exist to work to harness this opportunity**,** and **adaptation urgency** carries a rating of **Tier 2 - Investigate then Act.**

Related impact statements:

- **Natural:** Inland water ecosystems (N1), terrestrial ecosystems (N2), risks to coastal ecosystems (N3), native ecosystems (N5), mining (NT1), renewable energy development (NT2)
- **Social:** Mental health and wellbeing (S2), physical safety and wellbeing (S3), social cohesion (ST1, ST3), skills (ST5)
- **Economic:** Businesses and public organisations (E1), economic growth (ET1, ET4), businesses and public organisations (ET2), businesses (ET3, ET5), land-based primary sector (E4), ocean-based aquaculture and fisheries (E5)
- **Built:** Health care and emergency services (B1), sanitation and sewage (B4), transport (B6, BT1)

Justification and evidence

Current context

- Adaptation and resilience solutions involve actions that change systems (such as built, environmental, social, or economic) in response to climate hazards, now and in the future. They aim to moderate and reduce the impact of climate change on individuals, communities, and organisations (UNFCC, 2024a). To date, most government spending and private investment has focused on mitigation activity such as emissions reduction and renewable energy. However, adaptation and resilience are a growing priority globally (OECD, 2024).
- Adaptation measures can create new market opportunities and jobs, as the demand for action increases (Kofi Adom & Amoani, 2021). Adaptation and resilience skills and employment cover multiple industries and sectors, and the skills required to increase adaptation and resilience to climate impacts can be incorporated into many different types of jobs. (EESI, 2021)
- Skills identification exercises from the USA indicate that skills in the STEM (science, technology, engineering, and mathematics) fields are the ones most relevant to climate change adaptation (International Labour Organization, 2018)
- Specific programs within Tasmania aimed at providing adaptation solutions include the Climate Resilient Councils project (Department of Premier and Cabinet, 2024) and Climate Change and Health Roundtable (Health, 2020a).
- Existing programs to manage climate risk may incorporate adaptation and resilience jobs and skills such as planning and resource management programs and disaster preparedness and response plans.
- The private sector is increasingly investing in adaptation and resilience which supports employment and skills (Deloitte Access Economic, 2022).
- Tasmanian entities support ongoing research and monitoring to better understand climate change impacts and develop effective adaptation strategies. Institutions like the University of Tasmania and the Antarctic Climate and Ecosystems Cooperative Research Centre are some of the institutions undertaking research in Tasmania (University of Tasmania, 2024).

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Future context

- In the future, the severity and frequency of potential climate hazards are projected to increase over time. Investment in adaptation and resilience will be required to manage the risks, increasing the opportunity for associated jobs and skills. Adaptation and resilience investment is highest under a High Emissions scenario, although effectiveness is likely to decrease (IPCC, 2022a).
- Research by the International Labour Organisation found that 0.2 per cent of the working population could be directly and indirectly employed in the EU by 2050 in adaptation-related areas. This is related to jobs created by the EU Adaptation Strategy (International Labour Organization, 2018).
- Research from the USA also notes the relationship between adaptation and resilience and the need for increased skills. Employment is across many sectors, including natural resource management, transportation, infrastructure, public health, tourism, and disaster risk management. The American Society of Adaptation Professionals reports that at least 1,500 professional-level adaptation jobs were hired for in 2022 (EESI, 2024).

Existing adaptation responses

- **National and state level legislation and actions:** Implementation of Tasmania's adaptation priorities as outlined in *Tasmania's Climate Change Action Plan 2023-25*.

Justification of adaptation urgency rating

- **Confidence – Medium:** There is a medium level of confidence due to a medium level of agreement and medium level of evidence. Globally there is evidence that adaptation and resilience actions lead to jobs and skills growth. Currently there is a gap in understanding the adaptation and resilience actions required in Tasmania and the types of skills and employment that will be required for implementation. The support required in terms of training and education in Tasmania also requires further investigation.
- **Adaptation shortfall – Partial:** Currently there is a partial shortfall. While there are adaptation priorities for Tasmania (Tasmania's Climate Change Action Plan 2023-25) these do not include strategies to support jobs and skills in adaptation.
- **Adaptation urgency - Tier 2: Investigate then Act.** Further investigation is needed to understand the adaptation and resilience actions required in Tasmania and the types of skills and employment that would support implementation of these actions.

5.6.2.4 ST4 Opportunities for social cohesion, health and wellbeing through adaptation and resilience actions, including across domain co-benefits.

ST4: Opportunities for social cohesion, health, and wellbeing through adaptation actions

Opportunities for social cohesion, health and wellbeing through adaptation and resilience actions, including across domain co-benefits.

Confidence		Adaptation shortfall	Adaptation urgency
Overall: Medium		Partial	Tier 2: Investigate then Act
Agreement	Evidence		
Medium	Medium		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Social cohesion, health, and wellbeing - adaptation and resilience:** Currently (Statewide), Future (Statewide),

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Key vulnerabilities: Lack of or insufficient investment, lack of collective action or cooperation, poorly designed plans, and actions.

Climate opportunity summary:
Overall, adaptation and resilience actions have the potential to improve social cohesion, and health and wellbeing in two ways. First through the avoidance of the potential impacts of climate hazards. Secondly, by fostering shared purpose and identity, empowering communities, promoting equity and inclusivity, creating economic opportunities, improving public health and well-being, raising awareness and education, and facilitating cross-sectoral collaboration. By addressing the interconnected challenges of climate change and social inequality, adaptation efforts can contribute to building more resilient, cohesive, and sustainable societies. The **confidence** supporting this assessment is **medium**, as there is **medium level of evidence** and a **medium level of agreement** on the potential impact of adaptation and resilience on social cohesion and health and wellbeing. The **adaptation shortfall** has been rated as **partial** as some policies exist to realise this opportunity gaps remain regarding detailed actions with a focus on social cohesion, health, and wellbeing. Coordination, consistency and implementation across all levels of government is a current gap for this opportunity. The **adaptation urgency rating** is **Tier 2 - Investigate then Act** as the specific actions and implementation of adaptation and resilience that best supports social cohesion and health and wellbeing in the Tasmanian context is unclear.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), terrestrial ecosystems (N2), risks to coastal ecosystems (N3), native ecosystems (N5), mining (NT1), renewable energy development (NT2)
- **Social:** Mental health and wellbeing (S2), physical safety and wellbeing (S3), social cohesion (ST1, ST3), skills (ST5)
- **Economic:** Businesses and public organisations (E1), economic growth (ET1, ET4), businesses and public organisations (ET2), businesses (ET3, ET5), land-based primary sector (E4), ocean-based aquaculture and fisheries (E5)
- **Built:** Health care and emergency services (B1), sanitation and sewage (B4), transport (B6, BT1)

Justification and evidence

Current context

- Adaptation and resilience actions have a positive impact on health and wellbeing through avoiding potential impacts of climate hazards (Queensland Governement, 2018).
- Adaptation and resilience actions can create shared purpose and identity within a community. These initiatives often require collective action and cooperation among individuals, communities, and institutions. Action can bring people together across cultural, political, and socioeconomic differences (Tasmanian Policy Exchange at the University of Tasmania, 2021).
- Adaptation and resilience actions can have a positive impact on health and wellbeing. For example, improving air quality, promoting active transportation, and enhancing green spaces can have co-benefits for public health and well-being. Polling on climate change consistently indicates high levels of support for pro-climate policies, providing a clear mandate for action (Tasmanian Policy Exchange at the University of Tasmania, 2021).
- Specific programs within Tasmania aimed at providing adaptation solutions include the Climate Resilient Councils project (Department of Premier and Cabinet, 2024) and Climate Change and Health Roundtable (Department of Health, 2020).
- Tasmania's Climate Change Action Plan 2023–25 supports action to increase adaptation and resilience in Tasmania and includes community building priorities, support, resources, and programs to promote the involvement of children and young people, and community resilience.
- Existing programs to manage climate risk such as planning and resource management programs, and disaster preparedness and response plans may include community involvement and volunteering which can support social cohesion.

Future context

- The severity and frequency of potential climate hazards is projected to increase over time. Investment in adaptation and resilience is likely to increase in response, increasing the opportunities for social cohesion, and health and wellbeing benefits (IPCC, 2022a).

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- Adaptation and resilience actions such as improved health systems, resilient communities and infrastructure resilience measures will be most effective under a low emissions scenario where the impact of climate change is less extreme (Adger, 2007).
- Adaptation and resilience actions will need to be more extensive and require a higher investment requirement. Adaptation measures may reach limitations of effectiveness under a high emission scenario as climate extremes will be greater (Adger, 2007).

Existing adaptation responses

- **National and state level legislation and actions:** Climate Change Action Plan 2023-25, Climate Change and Health Roundtable, Climate Resilient Councils.

Justification of adaptation urgency rating

- **Confidence – Medium:** There is a medium level of confidence due to a medium level of evidence and medium level of agreement. Globally there is evidence that adaptation and resilience actions can promote social cohesion, health, and wellbeing. However, the impact of this and its application in Tasmania is not well understood.
- **Adaptation shortfall – Partial:** Currently there is a partial adaptation shortfall. While there are adaptation priorities for Tasmania (Tasmania's Climate Change Action Plan 2023-25) and existing programs that support adaptation and resilience with some consideration of social cohesion, health and wellbeing, there is no coordinated framework or approach enhance social cohesion and health and wellbeing benefits from adaptation actions.
- **Adaptation urgency - Tier 2: Investigate then Act.** Further investigation is needed to understand the specific adaptation and resilience actions that would best support social cohesion and health and wellbeing in the Tasmanian context.

5.6.2.5 ST5 Opportunities for increased skills and employment with renewable energy development

ST5: Opportunities for renewable energy related skills and employment

Opportunities for increased skills and employment with renewable energy development

Confidence		Adaptation shortfall	Adaptation urgency
Overall: Very high		Partial	Tier 3: Continue to Monitor Current Actions
Agreement	Evidence		
High	High		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Renewable energy**: Currently (Hobart and North), Future (Hobart, North and North-west),

Key vulnerabilities: lack of or insufficient investment, insufficient training, and education to maximise opportunity, opposition from local communities relating to developments.

Climate opportunity summary:
Renewable energy development will drive a need for increased skills and employment within the renewable energy industry. Tasmania currently has a skilled workforce in the energy sector, however the size and scope is relatively small

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compared with potential developments associated with the Tasmanian Renewable Energy Target. Delivery of Tasmania's renewable energy policies will create increased demand for workers with these skills. This creates the opportunity to increase training and education in Tasmania to deliver high value employment. The **confidence** supporting assessment this is **very high** as there is **high level of agreement** and **high level of evidence,** with reputable sources outlining the workforce profile for the renewable energy sector. Adaptation shortfall has a rating **partial shortfall** in the realisation of this opportunity. Skills and employment opportunities are considered in current renewable energy related plans and policies, however implementation of actions specific to increasing skills and employment in Tasmania is still required. Continued implementation of Tasmania's renewable energy strategy is required with some key risks still to be resolved. Adaptation urgency is rated as **Tier 3: Continue to Monitor Current Actions.**

Related impact statements:

- **Natural:** Renewable energy development (NT2)
- **Social:** Social cohesion (ST3), skills (ST5)
- **Economic:** Businesses and public organisations (E1), economic growth (ET1, ET4), businesses and public organisations (ET2), businesses (ET3, ET5)
- **Built:** Electricity infrastructure (BT2)

Justification and evidence

Current context

- Renewable energy development will drive a need for increased skills and employment within the renewable energy industry. Additionally, skills and development opportunities may arise in new industries as result of the increased demand and focus on renewable energy. The jobs associated with renewable energy include development and construction activities as well as operation and maintenance activities.
- Tasmania has experienced steady employment in the renewable energy sector. In the period from FY14 to FY19, jobs within the renewable energy sector were around 1200-1700 full-time equivalent positions (ABS, 2020).
- The renewable energy sector relies on technical skills, particularly engineers and electricians, in designing, installing, operating, and maintaining clean energy systems. More than 50 per cent of employment in renewable energy is in engineering-type roles, including electrical and mechanical trades. The Australian clean energy workforce is highly educated and skilled. Compared to the entire Australian workforce, the clean energy sector has a higher percentage of those with graduate, post-graduate, and PhD qualifications. Expanding the renewable energy sector in Tasmania presents the opportunity to deliver a skilled workforce (Clean Energy Council, 2022).

Future context

- Tasmania's Renewable Energy Target sets out an aspiration to achieve 200 per cent net renewables by 2040. Tasmania is also aiming to develop a hydrogen industry, which will require large amount of renewable power as input, contributing to demand for larger renewable electricity generation and storage capacity.
- Under a low emissions scenario, wind capacity installed in Tasmania is expected to increase substantially by 2030, with further increases to 2050. Between 2030 and 2050, hydro, utility scale storage and utility scale solar PV are also modelled to increase in installed capacity.
- Construction and installation of new wind farms generate around 2.8 jobs per MW. Operations and maintenance of wind farms generate around 0.22 jobs per MW installed (Clean Energy Council, 2022)

Existing adaptation responses

- **National and state level legislation and actions:** Implementation of Tasmania's renewable energy priorities as outlined in Tasmanian Renewable Energy Action Plan, Tasmanian Renewable Hydrogen Action Plan, Renewable Energy Coordination Framework (ReCFIT, 2024b).

Justification of adaptation urgency rating

- **Confidence – Very High:** There is a very high level of confidence due a high level of agreement and high level of evidence. Within Australia and globally there is evidence that renewable energy promotes to jobs and skills growth, this has been quantified by some studies.

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- **Adaptation shortfall – Partial:** Currently there is a partial shortfall. Currently jobs and skills requirements for Tasmania is considered as part of renewable energy frameworks and action plans (Tasmanian Renewable Energy Action Plan, Tasmanian Renewable Hydrogen Action Plan, Renewable Energy Coordination Framework). These include strategies to support jobs and skills in renewable energy but rely on implementation to ensure opportunity is fully realised.
- **Adaptation urgency - Tier 3: Continue to Monitor Current Actions**. Tasmania has several strategies that support aspects of this opportunity. Implementation of these initiatives should continue to realise this opportunity.

5.6.2.6 ST6 Opportunity to improve financial wellbeing, and health and wellbeing through improved energy efficiency in housing, particularly for low-income households.

ST6: Opportunities through energy efficient housing

Opportunity to improve financial wellbeing, and health and wellbeing through improving the energy efficiency of housing, particularly for low-income households.

Confidence		Adaptation shortfall	Adaptation urgency
Overall: Very high		Partial	Tier 1: Ready to Act
Agreement	Evidence		
High	High		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Energy efficiency**: Current (Statewide), Future (Statewide)

Key vulnerabilities: Vulnerable population, underlying health conditions, renters, low-income earners.

Climate opportunity summary:
Overall, energy efficiency improvement has the potential to improve financial, physical, and mental health and wellbeing in Tasmania. Electricity can be a major cost to households, particularly low-income households where electricity costs accounts for a high proportion of income. Energy efficient housing has also been shown to improve cardiac and respiratory health. The **confidence** supporting assessment this is **very high** with **high level of agreement** and **high evidence,** with reputable sources outlining the financial and health and wellbeing benefits particularly for low-income households. Current adaptation actions lead to a **partial shortfall** in the realisation of this opportunity as the current response may have limited reach to low-income households in Tasmania. This opportunity has an adaptation urgency rating of **Tier 1: Ready to Act** as current policies may not be sufficient to fully realise this opportunity, particularly for low-income households or those who are renting.

Related impact statements:

- **Social:** Mental health and wellbeing (S2), physical health and wellbeing (S3)
- **Economic:** Businesses and public organisations (ET3)
- **Built:** Health care and emergency services (B1)

Justification and evidence

Current context

- Building more energy efficient new homes and retrofitting existing housing stock can reduce emissions. It also has added health and economic benefits, such as improved mental health and lower household bills for

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residents, and better electricity grid performance (CSIRO, 2022a). Occupants of low-energy houses purchased 45-62 per cent less electricity, had lower utility bills resulting in financial savings of $1,050/year, and had improved thermal comfort, health, and social outcomes (Moore T, 2017v).

- Energy efficient homes have been shown to improve cardiac and respiratory health, particularly for low-income households (University of Technology Sydney, 2023).
- Many of Tasmania's social housing properties were built more than 20 years ago, before minimum building standards were introduced. $16.6 million has been allocated by the Australian and Tasmanian Governments to improve the energy efficiency of 1,600 social housing properties (11 per cent) in Tasmania (Homes Tasmania, 2024).
- The Tasmanian Government has offered interest free loans to assist with energy efficient improvements in residential buildings in Tasmania under the Energy Saver Loan Scheme (ReCFIT, 2023a).

Future context

- Energy efficiency measures in Australia are highest under a low emission scenario.
- Under a high emission future, energy efficiency measures reduce demand for electricity by 143 GWh by 2030 and 600 GWh by 2050.
- Under a low emission scenario, energy efficiency measures would reduce demand for electricity by 249 GWh by 2030 and 1034 GWh by 2050.
- Under a low emissions scenario, increased adoption of energy efficient technologies would reduce energy bills for households, freeing up income for other uses. This can increase equitable outcomes for low socioeconomic groups where a higher proportion of income is spent on energy bills (Australian Council of Social Services, 2021).
- Energy-efficient homes and buildings will provide better indoor air quality and temperature control, improving comfort and reducing health issues related to poor temperature regulation within homes.

Existing adaptation responses

- **National and state level legislation and actions:** Access to interest free loans through the Energy Savers Loan Scheme (ReCFIT, 2023a).

Justification of adaptation urgency rating

- **Confidence – Very high:** The confidence rating of this assessment is very high due to the high level of agreement and high level of evidence. Within Australia and globally there is evidence that energy efficiency supports financial wellbeing and health and wellbeing, research is specific to low-income households.
- **Adaptation shortfall – Partial:** Currently there is a partial shortfall. Energy efficiency improvements in Tasmania are supported through Energy Saver Loan Scheme, which may not be able to be utilised by some households in Tasmania such as low-income households and renters.
- **Adaptation urgency Tier 1: Ready to Act.** Further state level action is necessary to reach low-income households in Tasmania and those who are renting.

5.7 Detailed climate impact statements for the economic domain

5.7.1 Economic domain - Physical risks

In the economic domain, climate change poses risks to the economic growth of the state, the health and performance of key industries and the potential for structural changes to the economy. However, there are opportunities that will be created for key industries, new revenue markets and the potential to implement more efficient low-cost technology in the future. There are a total of 10 priority risk and opportunity statements: 5 for physical and 5 for transition themes.

5.7.1.1 E1 Risks to businesses and public organisations from extreme weather events

E1: Risks to businesses and public organisations from extreme weather events

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- **PHYSICAL - ACUTE:** Risks to businesses and public organisations due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) affecting assets, resources, site access and supply/distribution networks.

Consequence			Confidence		Adaptation shortfall	Adaptation urgency
Current: Minor			**Overall: High**		**Partial**	**Tier 2: Investigate then Act**
2030 Moderate	**2050** Moderate	**2090** Major	**Agreement**	**Evidence**		
			High	Medium		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Extreme rain and floods:** Current (West and North-west), Future (North and East)
- **Bushfires:** Current (East and South), Future (North and Central)
- **Storms:** Current (North), Future (North and Islands)

Key vulnerabilities: Physical damage to assets and property, impacts to key infrastructure, loss of operational capacity, disruptions to supply chains, health related impacts to staff and productivity.

Climate risk summary:

Current climate risks are expected to have minor consequences for businesses and public organisations across the state as they are likely to cause isolated disruptions and profit reductions, and impact for less than a year. One area of key **vulnerability** is that 97 per cent of businesses in the state are small entities. This reduces the likelihood that they have the resources to appropriately invest in adaptation and resilience, thus increasing their exposure to climate impacts. Climate change is likely to result in **moderate consequences by 2030 and 2050, and major consequences by 2090**, as the frequency and intensity of acute climate impacts causes a greater disruption and decline to economic activity. The **confidence** supporting this assessment is **high**, as there is a **medium level of evidence** and a **high level of agreement** on the mechanisms through which climate change is likely to impact businesses and public organisations. **There is some Tasmania specific evidence**, along with multiple sources of high-quality evidence at a national and international scale. Current adaptation measures are largely provided through national and state level legislation, along with regional scale responses. However, further investigation is required to specifically understand the interactions between climate change and businesses and public organisations, along with the subsequent interactions with other related statements across the state. Therefore, **adaptation shortfall has been rated as partial.** The adaptation urgency has been rated as **Tier 2: Investigate then Act,** highlighting that this risk requires further investigation to identify the most appropriate and beneficial actions that will help manage this risk into the future.

Related impact statements:

- **Social:** Mental health and wellbeing (S2), physical safety and wellbeing (S3)
- **Economic:** Supply chains and distribution networks (E2), land-based primary sector (E4), ocean-based aquaculture and fisheries (E5), economic growth (ET4)
- **Built:** Electricity infrastructure (BT2), infrastructure (B5, B6), stormwater and sewage systems (B4), Transport (B6)

Justification and evidence

Current context

- All business types are impacted to different degrees by climate related extreme weather events. The primary impact of extreme weather events is physical damage to business assets and property, resulting in costs for recovery and clean-up. Extreme weather events may also impact the operational capacity of businesses. This may be from loss of access to essential services required for operating, damage to critical infrastructure, and business access being physically cut-off. Beyond the immediate aftermath of extreme weather events,

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businesses may continue to be impacted through a loss of customers who have also been financially impacted, delays to damage recovery and delayed insurance returns (Tonmoy & Rissik, n.d.).

- For businesses that rely heavily on the natural environment, these impacts are examined in detail in risk profiles E3 and E4. Impacts to built structures are detailed further in the built domain risk profile B2.
- As of 2023, roughly 97 per cent of businesses in Tasmania are small businesses (20 employees or less), and 60 per cent of Tasmanian businesses are sole operators. Such businesses may be more exposed to the impact of repeated climate events in a short period of time, as their size may limit capacity to invest in climate resilience and adaptation. Launceston and the Greater Hobart Region are the most exposed areas, as they house 53 per cent of Tasmania's businesses (Department of State Growth, 2023). The 2018 Hobart floods incurred private property damage of nearly A$100 million, of which 33 per cent was commercial sector losses. Public infrastructure damage was A$37 million.
- As an island state that ships 99 per cent of its freight by sea, Tasmania is highly vulnerable to climate related supply chain disruptions (Department of State Growth, 2021). Events, including storms and storm surges, can cause delays to shipping and port activities. In particular, Tasmanian food and beverage businesses export the majority of their products internationally or to other states, so supply chain disruptions will have a material impact to the revenue and costs of affected companies (RDA Tasmania, 2023).
- Due to globalisation, technological improvement, and stronger global competition, organisations are also more frequently operating under longer, more complex, and highly efficient supply chain structures, increasing the overall exposure and vulnerability to acute and chronic climate changes (Ministry for the Environment, 2020). Supply chain networks and transport impacts are examined in greater detail in risk profile E2 and B6.
- Organisations with localised supply chains may be unaffected by events occurring outside Tasmania, but more vulnerable to events within Tasmania as they lack access to an alternative market.
- Incidences of extreme weather will also create risks to human health and safety, leading to an increased frequency of short-term business disruptions. Even if not directly affected, bushfires and floods in affected areas will likely cause temporary business closures, while storms, extreme heat and extreme rainfall can require temporary shutdowns to protect employees. These impacts will vary depending on business location and the nature of business operations.

Future context

- Increases in the frequency and intensity of extreme weather events including heatwaves, bushfires, droughts, floods, and storms are likely to adversely impact access to resources, infrastructure, people, and disrupt supply and distribution networks.
- The impacts of climate change on people also manifest in businesses and public organisations through health-related impacts resulting from exposure to extreme weather events, declining worker productivity during hot weather, and adverse mental health impacts.
- Rising sea levels and the increased occurrence of storm surge events may disrupt supply chains and distribution networks.
- Increases in extreme rain, flooding, bushfires, and storms are likely to increase the physical damage caused to assets including buildings and vehicles, leading to disruptions to business operations and potentially increasing insurance premiums.

Existing adaptation response

- **National and state level legislation and actions:** Tasmania's Climate Change Action Plan 2023-25, Risk Ready, Tasmanian Disaster Resilience Strategy 2026-2030, Tasmanian Disaster Risk Assessment.
- **Regional/local scale responses:** Regional Climate Adaptation Projects.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** The impacts of climate change on businesses and public organisations are expected to be moderate in 2030, as extreme weather events are expected to cause more frequent significant disruptions to the business sector. This rating is projected to remain consistent to **2050,** before increasing to major in **2090** as the scale of disruptions increases substantially in conjunction with substantial increases to the intensity and frequency of extreme climate events.
- **Confidence – High:** Given this complexity, it is important that there is a strong level of understanding, with Tasmanian focused evidence to guide the management of this risk. While the confidence supporting this risk is high, due to a high level of agreement and medium level of evidence, the evidence base of medium reflects that

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there is more research required at a Tasmanian scale to gain greater insight into the interactions of complex risks, and the cascading impact they can have on businesses and public organisations.

- **Adaptation shortfall – Partial:** While there are multiple adaptation efforts that address this risk, due to the scope of required management and number of interrelated risks that can have cascading impacts on business and public organisations, a partial shortfall rating has been applied.
- **Adaptation urgency - Tier 2: Investigate then Act.** Further investigation is required to identify the most appropriate and beneficial actions to manage risks to businesses and public organisations, given the high level of complexity within this risk. Further developments in the management of other interrelated risks that have a strong influence on the outcomes of businesses and public organisations could help reduce this knowledge gap.

5.7.1.2 E2 Risks to national and international supply/distribution networks due to extreme weather events

E2: Risks to supply and distribution networks due to extreme weather events

- **PHYSICAL - ACUTE:** Risks to national and international supply and distribution networks due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, cyclones, storm surge) leading to disruptions and delays.

Consequence			Confidence		Adaptation shortfall	Adaptation urgency
Current: Moderate			Overall: High		Partial	Tier 1: Ready to Act
2030 Moderate	2050 Major	2090 Major	Agreement: High	Evidence: Medium		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Storm surge:** Current (coastal regions), Future (coastal regions)
- **Storms:** Current (North), Future (North and Islands)
- **Extreme weather events:** National and International

Key vulnerabilities: Reliance on ports and shipping in north of the state, disruptions to businesses and service delivery, cascading impacts across complex supply networks and freight hubs outside Tasmania.

Climate risk summary:
Current climate risks are expected to have moderate consequences on national and international supply chains. Recent disruptions to global supply chains were seen during the COVID-19 pandemic, additionally there have been international examples of extreme weather events and their cascading effects on interrelated supply chains. Climate change is likely to result in **moderate consequences** through to **2030, before increasing to major consequences by 2050** and **2090**, as the frequency and intensity of climate impacts in Tasmania, across Australia and internationally increases. The elongated nature of international supply chains and Tasmania's island geography increases **vulnerability**. The **confidence** supporting this assessment is **high,** as there is **medium level of evidence** and a **high level of agreement** on the mechanisms through which supply chains and distribution networks are impacted by climate related hazards. **There is some Tasmanian specific evidence,** along with multiple sources of evidence on the broader international impact to supply chains. Current adaptation measures are largely provided through national and state level legislation that aims to upgrade critical infrastructure, improve infrastructure resilience, and minimise supply chain disruptions. Therefore, **adaptation shortfall has been rated partial.** The adaptation urgency has been rated as **Tier 1: Ready to Act** highlighting that the current level of response is insufficient to address the risk.

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Related impact statements:

- **Natural:** Coastal ecosystems (N3)
- **Social:** Mental health and wellbeing (S2), physical safety and wellbeing (S3)
- **Economic:** Businesses and public organisations (E1, ET2), land-based primary sector (E4), ocean-based aquaculture and fisheries (E5)
- **Built:** Health care and emergency services (B1), infrastructure (B2, BT3)

Justification and evidence

Current context

- More than 99 per cent of Tasmanian freight is moved by sea. The majority of this freight interacts with the Bass Strait, meaning any disruption to services in this region, either in mainland Australia or at sea, pose a significant risk to supply and distribution networks for Tasmania (Department of State Growth, 2021).
- Due to its geographical separation from mainland Australia, Tasmania is particularly prone to supply and distribution disruptions resulting from storms and storm surge events that impact shipping and port activities.
- The COVID-19 pandemic highlighted the risks embedded into the freight component of Tasmania's supply chain network. Freight services were centred around a just-in-time inventory management system, designed to minimise the level of storage required in Tasmania. This exposed dependant businesses to service disruptions and materials shortages. Climate change impacts threaten to have similar impacts, with Tasmania's interactions with both mainland states and international markets (Department of State Growth, 2021).
- One of the most difficult components in adapting to climate change is the scope of its impact on an international scale and the spillover effect this has into supply chains. Where production inputs are sourced internationally, increased frequency and intensity of extreme weather events will cause greater supply disruptions through damages to production and critical infrastructure (Woetzel, et al., 2020). This impact may be felt more heavily in developing nations where defences to withstand impacts such as extreme flooding or storm events are less robust. This can lead to supply shortages, increasing the price on imports, and result in flow on disruptions to local production within Tasmania.
- Where Tasmania relies on other Australian states for goods, for example importing food that cannot be produced locally, it is also exposed to disruptions to supply chain transport infrastructure. Floods, bushfires, and cyclones can cut off key road and rail routes, leading to large delays and potential for supply contracts to be unfulfilled.
- As previously noted in risk profile E1, increased globalisation, international competitiveness and integration of technology has led to longer, highly efficient, and complex supply chains. In turn, this has increased the potential for exposure to climate change impacts on an international scale. It is noted that these impacts can be difficult to anticipate and may be less visible to organisations prior to their realisation. However, increased complexity can also improve resilience of some supply networks (Ministry for the Environment, 2020).
- Organisations with localised supply chains may be unaffected by events occurring outside Tasmania, but more vulnerable to events within Tasmania as they lack access to an alternative market.
- The level of vulnerability of organisations differs due to multiple factors including geographical area, the scale at which they operate (local, regional, national, international), industry characteristics, and competition.

Future context

- Bushfires, extreme rain, flooding, and associated impacts such as landslides are likely to increasingly disrupt supply and distribution networks at local, regional, national, and international scales. This applies to both land- and sea-based transport networks.
- Across the entire state, rising sea levels and increases in extreme weather events including storm surges will affect all sea-related transport infrastructure under a warming climate.
- The increasing impacts of extreme weather events on supply and distribution networks are likely to have a number of negative consequences for business including unfilled orders, breaches of contract, loss of productivity, changes to share price, reputational damage, customer loss, regulatory changes, and increased scrutiny of business activity.
- The scale of future risk generally depends on magnitude of change to systems at risk and implementation of adaptation action across other key risks (i.e., E1 (businesses), E3 (insurability), E4 (land), E5 (ocean), B2 (built), B5 (ports), B6 (transport)).

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Existing adaptation response

- **National and state level legislation and actions:** Risk Ready, Understanding Future Risks to Ports in Australia, Tasmanian Urban Passenger Transport Framework.

Summary of adaptation urgency rating

- **Consequence – Moderate in 2030:** The impacts of climate change on national and international supply/distribution networks are expected to be moderate by 2030. As Tasmania is an island state, there is an extreme volume of freight moved by sea, creating a high level of vulnerability due to heavy reliance on transport networks connecting to ports, and consistent and reliable shipping conditions. As such, projected climate impacts by 2030 can cause significant disruptions to Tasmania's international and national supply/distribution networks. There is a projected increase to **major consequence** in **2050** and **2090**, as increased frequency and intensity of climate impacts causes ongoing disruptions that may require businesses and industries within Tasmania to structurally adjust their supply and distribution networks to remain profitable and mitigate risks.
- **Confidence – High:** There is a high level of confidence, which is largely driven by the high level of agreement on the impacts that climate change will have on this risk. There is also a medium level of evidence.
- **Adaptation shortfall – Partial:** Currently there are some strategies in place at a state and national scale to manage this risk. However, as supply chains and distribution networks are heavily influenced by impacts to jurisdictions outside of Tasmania, current adaptation efforts can only partially manage this risk. It is clear where adaptation efforts should be targeted to help manage this risk, particularly towards lowering the vulnerability of intrastate and interstate supply networks to climate impacts.
- **Adaptation urgency - Tier 1: Ready to Act**. Further action is necessary to lower the future exposure of national and international supply and distribution networks to climate change.

5.7.1.3 E3 Risks to the insurability of businesses, public sector, and private assets

E3: Risks to the insurability of businesses, public sector, and private assets

- **PHYSICAL - ACUTE:** Risks to the insurability of businesses, public sector, and private assets due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge).
- **PHYSICAL - CHRONIC:** Risks to the insurability of businesses, public sector, and private assets due to chronic changes in temperature, precipitation, and ongoing sea level rise.

Consequence			Confidence		Adaptation shortfall	Adaptation urgency
Current: Moderate			**Overall: Very High**		**Partial**	**Tier 2: Investigate then Act**
2030 Moderate	**2050** Major	**2090** Major	**Agreement**	**Evidence**		
			High	**High**		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Extreme rain and floods:** Current (West and North-west), Future (North and East)
- **Bushfires:** Current (East and South), Future (North and Central)
- **Storm surge:** Current (coastal areas), Future (coastal areas)

Key vulnerabilities: Increased frequency and severity of climate related damage, increasing volume of insurance claims, loss of insurance and insurance affordability, financial risk to state budget for disaster recovery.

Climate risk summary:
Current climate risks are projected to have moderate consequences on the insurability of businesses, the public sector, and private assets, as evidenced by the significant economic disruption that recent extreme weather events and natural

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disaster have had, and the relative volume of insurance claims from these events. Climate change is likely to continue having **moderate consequences through to 2030, before increasing to major consequences in 2050 and 2090**, as the frequency and intensity of extreme weather events increases, and ongoing sea level rise impacts more communities and affects the viability of insurance. The **confidence** supporting this assessment is **very high,** as there is **high level evidence** and a **high level of agreement** on the mechanisms through which climate related hazards drive insurance claims and impact insurance viability. **There is also Tasmanian specific evidence** regarding the potential impacts of climate change to the insurability of Tasmanian properties. Current adaptation measures are largely provided through national and state level legislation and actions, such as the Disaster Ready Fund. However, further investigation is required to identify potential adaptation measures that will reduce the risks of underinsurance, insurance unaffordability and expected changes in the future to insurance coverage. Therefore, adaptation shortfall has been rated as **partial.** The adaptation urgency has been rated as **Tier 2: Investigate then Act**, highlighting that this risk requires further investigation to identify the most appropriate and beneficial actions that will help manage risks into the future.

Related impact statements:

- **Natural:** Coastal ecosystems (N4)
- **Social:** Mental health and wellbeing (S2)
- **Economic:** Businesses and public organisations (E1), land-based primary sector (E4), ocean-based aquaculture and fisheries (E5), economic growth (ET1), businesses (ET3)
- **Built:** Built environment (B2), stormwater and sewage (B4)

Justification and evidence

Current context

- Extreme weather events can cause a range of damage to an individual's home and contents, business properties and assets, as well as critical public infrastructure. To protect themselves, individuals, businesses, and governments insure buildings and assets.
- The 2022 flooding event in Tasmania, Victoria and NSW saw A$736 million in insurance claims, with personal claims representing A$618 million and commercial claims representing A$118 million. Most claims were related to building and commercial property damage (Insurance Council of Australia, 2023a).
- Since the 2019-20 black summer bushfires, insurance payouts across Australia total more than A$16.8 billion for natural disaster related claims. Extreme weather events are making high risk regions difficult to insure as extreme weather and natural hazards, including flood and bushfire, increase in frequency and intensity (Insurance Council of Australia, 2023).
- In areas where insurance is becoming increasingly unaffordable, those without insurance would likely have little to no ability to recover from frequent natural disasters and climate changes (Parliament of Australia , n.d.).
- An existing challenge for insurance holders is underinsurance, where the value of insurance to be provided on a claim is insufficient to rectify the damage to the property or assets (Insurance Council of Australia, 2021a). In addition, duty taxes increase the cost of insurance premiums, resulting in individuals and businesses choosing an insurance policy that is cheaper, or not insuring, due to the cost of insurance being too high. In Tasmania, with GST and insurance duties, this adds an additional 21 per cent to the final price paid by customers (Insurance Council of Australia, 2019). Individuals and businesses that choose not to insure, or select a less comprehensive insurance policy, take on the risk of making up the difference, and when the cost of doing so is too high, they may have to choose relocating rather than rebuilding, or to close their business.
- In Tasmania, buildings and assets are often underinsured, and many insurance policies within Australia do not cover repairs to improve resilience following an extreme event (Parliament of Australia , n.d.). As of 2016, the median rate of non-insured households for a suburb in Tasmania was 6.09 per cent (Insurance Council of Australia, 2019).
- Compounding factors can further exacerbate insurance affordability issues. For example, increasing construction costs and skilled labour shortages are also contributing to rising insurance costs (Insurance Council of Australia, n.d.).
- In some instances, businesses and asset owners may be unaware they are underinsured. This is often caused by the complexity of insurance policies and a lack of detailed understanding of disaster risk (Parliament of Australia, n.d.).

Future context

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- Increases to extreme weather events including bushfires, floods and storms are projected to make 2 per cent of homes in Tasmania effectively uninsurable by 2030 (Hutley, et al., 2022).
- Ongoing sea level rise, associated coastal erosion and storm surges are causing an increasing number of homes, businesses, and public infrastructure to be potentially uninhabitable or unsafe, rendering insurance less and less viable (Insurance Council of Australia, 2021). As of 2018, no insurance companies within Australia cover gradual sea level rise, and few cover the impacts of storm surge and erosion (CoastAdapt, 2018). This presents significant financial risk to businesses, public sector, and private assets, and is likely to place further burden on state and federal budgets to fund damage recovery.

Existing adaptation response

- **National and state level legislation and actions:** National Disaster Ready Fund, Hazard Insurance Partnership, Land Information System Tasmania, Risk Ready, National Industry Roundtable Land Use Planning and Resilience.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** The impacts of climate change on the insurability of businesses, the public sector and private assets is projected to be moderate by 2030. This is supported by the significant financial damage that extreme events are currently having, and the immense volume of insurance claims in the aftermath of damages. Consequence level is expected to increase to **major in 2050** and **2090** as vulnerability of businesses, public organisations and private assets to climate change impacts and underinsurance increases.
- **Confidence – Very High:** There is a very high level of confidence due to a high level of agreement and high level of evidence.
- **Adaptation shortfall – Partial:** While there are several adaptation actions that work towards reducing the level of risk to businesses, public organisations, and private assets, this only partially addresses this risk. Adaptation actions have limited coverage to areas including climate-induced insurance unaffordability concerns, the growing extent of climate induced insurance catastrophes as well as knowledge gaps relating to how insurance products evolve to account for climate risks. While there is a very high level of confidence, the understanding of required actions is uncertain. It is anticipated that more action will be possible once further investigation is undertaken at an industry level in conjunction with the State.
- **Adaptation urgency - Tier 2: Investigate then Act.** Further Investigation is required to identify potential adaptation measures that will reduce the risks of underinsurance, insurance unaffordability and expected changes to insurance coverage, given projected increases to climate driven extreme weather events.

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5.7.1.4 E4 Risks and opportunities to land-based primary sector

E4: Risks and opportunities to land-based primary sector

- **PHYSICAL - ACUTE:** Risks to land-based primary sector (agriculture, forestry, viticulture) productivity due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms) damaging crops/produce, impacting availability and prices.
- **PHYSICAL - CHRONIC:** Risks and opportunities to land-based primary sector (agriculture, forestry, viticulture) productivity due to changes in chronic rainfall, temperature and drought conditions impacting water availability, growing season length, and growing conditions.

<table>
<tr><th colspan="3">Consequence</th><th colspan="2">Confidence</th><th>Adaptation shortfall</th><th>Adaptation urgency</th></tr>
<tr><td colspan="3">Current: Minor</td><td colspan="2" rowspan="2">Overall: Very High</td><td rowspan="3">Partial</td><td rowspan="3">Tier 1: Ready to Act</td></tr>
<tr><td rowspan="2">2030
Moderate</td><td rowspan="2">2050
Moderate</td><td rowspan="2">2090
Major</td></tr>
<tr><td>Agreement</td><td>Evidence</td></tr>
<tr><td colspan="2"></td><td>High</td><td>High</td></tr>
</table>

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Bushfires:** Current (East and South), Future (North and Central)
- **Chronic temperature:** Current (North-east, North-west, Islands), Future (Coast and Islands)
- **Chronic rainfall and drought:** Current (East), Future (North-west and Islands).

Key vulnerabilities and barriers: Sensitivity of crops to changes in temperature and rainfall, damage and loss of crops and stock, loss of transport and supply routes, higher insurance premiums and operating costs, health impacts to staff working outdoors.

Climate risk and opportunity summary:
Current climate risks are expected to have minor consequences on the land-based primary sector. This is due to current extreme weather events causing short to medium term disruption and a reduction to profits for a period of 1 year or less. As the current climate continues to evolve, there will also be **opportunities**. This includes improved land use flexibility, higher yields for dryland pasture production and the development of new wine varieties. Climate change is likely to result in **moderate consequences by 2030 and 2050, and major consequences by 2090,** due to chronic changes in rainfall, temperature, and drought conditions, along with increases in the intensity and frequency of extreme weather events. The **confidence** supporting this assessment is **very high,** as there is a **high level of evidence** and a **high level of agreement** on the mechanisms through which climate change will impact the land-based primary sector. **There will also be opportunities** for the cultivation of new species, increases to the spatial viability for production, and reductions to some existing risks. This is supported by multiple high-quality sources of evidence at a national scale, along with **Tasmanian specific evidence**. Current adaptation measures are largely provided through national and state legislation, along with regional and local scale responses. However, further management is required to both mitigate risks and fully realise the opportunities available. Potential structural adjustments to the sector are likely to require long lead times and require substantial investment and support. Therefore, **adaptation shortfall has been rated partial**. The adaptation urgency has been rated as **Tier 1: Ready to Act** highlighting that the current level of response is insufficient to address this risk.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), terrestrial ecosystems (N2), coastal ecosystems (N3), native ecosystems (N5), alpine ecosystems (N6), mining (NT1), renewable energy development (NT2)
- **Social:** Mental health and wellbeing (S2), physical safety and wellbeing (S3), cultural heritage (S4),
- **Economic:** Businesses and public organisations (E1), ocean-based aquaculture and fisheries (E5)
- **Built:** Stormwater and sewage systems (B4), transport networks (B6, BT4)

Justification and evidence

Current context

- Both acute and chronic climate events can cause several risks to the agriculture sector, these include production risks, market risks, and financial risks (BOM, n.d.).
- Extreme weather events can impact production by creating incidences of heat stress, changing growing seasons, and causing the loss and destruction of crops and livestock. Where production is impacted, farm incomes decrease, and higher operational costs lead to higher prices (Bartos, 2022).
- From a market perspective, extreme weather events can cut off transport routes and delay supply chains, which results in spoilage of products, higher storage costs and potentially greater costs for fuel and transport, all of which lower producer profits (Bartos, 2022).
- Increased production risk and uncertainty from greater frequency and intensity of extreme weather events has also caused more expensive insurance premiums for farmers, and in some cases has left farmers unable to insure certain aspects of their operation (Conn, 2023). Nationally, securing bank loans in areas of climate uncertainty and greater exposure to climate impacts has become more difficult, with repayments also becoming more expensive (Bartos, 2022).
- Vineyards in 2013, 2016, and 2019 have been negatively impacted by bushfire events, causing a loss of wine grapes on farm. Smoke taint from fire events also poses a significant risk to producers, as smoke tainted wine has significant damage to quality, making it unpalatable and unsaleable (Wine Tasmania , 2023).

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- Hail damage from extreme storms can create large scale losses to damaged produce. The 2021 severe storm event in Southern Tasmania destroyed large proportions of horticulture produce for both the 2021 and 2022 harvesting seasons (NEMA, 2022).

Future context

The following points reflect some of the future **risks** to the land based primary sector:

- Increased frequency and intensity of extreme weather events such as extreme rain, floods, bushfires, extreme heat, and storms can damage crops and produce. This impacts availability and prices, causing significant disruptions to the land-based primary sector.
- An increase in bushfire risk enhances the potential for smoke taint to wine crops, which significantly damages quality, making it unsaleable (Tasmanian Institute of Agiculture, n.d.; Wine Tasmania , 2023).
- Models indicate an increase in meteorological drought durations in central highlands and northwest regions, impacting water availability (Climate Futures for Tasmania, n.d.).
- Increasing temperatures create more favourable conditions for weeds, pests, and pathogens, posing a threat to crop health (Climate Futures for Tasmania, n.d.).
- Rising sea levels may push saltwater into freshwater aquifers, in a process known as saltwater intrusion, affecting water supplies essential for agriculture.
- Increasing temperatures may shorten growing seasons of wine varieties due to earlier harvesting and bud bursting. As a result, this may lower the maturity of currently grown wines (Tasmanian Institute of Agiculture, n.d.).

The following points reflect some of the available **opportunities** to the land based primary sector.

- Dryland pasture production is projected to increase by 10-100 per cent by 2085, depending on location. Regions with lower annual temperatures will benefit the most, with earlier growing periods and higher growth rates in warmer months (Climate Futures for Tasmania, n.d.).
- Higher elevation locations, previously unsuitable for certain crops, may become viable, allowing farmers to shift production towards areas with greater returns, creating more flexible land use (Climate Futures for Tasmania, n.d.).
- There is a projected reduction in frost by half by 2100, beneficial for the horticulture industry. However, this may also support pest and disease development (Climate Futures for Tasmania, n.d.).
- Warmer temperatures altering ripening periods could lead to new and unique wine flavour profiles (Tasmanian Institute of Agiculture, n.d.).
- Northern Tasmania may develop similar production conditions to the Coonawarra region in South Australia, opening new opportunities for viticulture (Tasmanian Institute of Agiculture, n.d.).
- Increasing annual temperatures can enhance the growing rate of crops, leading to less time for plant maturity. By 2030, some crops may mature an entire month earlier than identical crops in 1960-90 (Climate Futures for Tasmania, n.d.).

Existing adaptation response

- **National and state level legislation and actions:** AgriVision 2050, Tree Alliance, Climate Change and Agriculture, Future Drought Fund, AgriGrowth Loan Scheme, Enterprise Suitability Maps
- **Regional/local scale responses:** Regional Drought Resilience Planning Program, Don Irrigation Scheme.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** The impact of climate change on land-based primary systems is moderate by 2030, as chronic climate changes begin to negatively impact the productive performance of many crops across the state. Additionally, the increased frequency and intensity of acute events is expected to cause significant short-term disruptions to agricultural producers. By **2050,** climate change impacts are projected to remain as a **moderate** consequence. This impact is projected to become **major** by **2090.** This is driven by the projected increase in intensity and frequency of acute events, chronic system changes and cascading risks, which have the potential to cause significant structural adjustment to take place in the land based primary sector.
- **Confidence – Very High:** Both the agreement and level of evidence supporting the analysis of risks and opportunities to the sector are high, creating a clear understanding of what climate impacts need to be addressed and where to direct action towards capitalising on available opportunities.

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- **Adaptation shortfall – Partial:** While there are actions at a state level to manage this risk, they only partially address this risk. Further action is required to fully realise available opportunities that will arise from chronic climate changes at a state level. For example, there is limited adaptation response targeted towards the future structural adjustments to the sector that will be catalysed by climate change and a limited enabling environment to support opportunities to producers.
- **Adaptation urgency - Tier 1: Ready to Act.** Further state level action is necessary to provide a coordinated approach to both manage future chronic risks to the land-based primary sector and capitalise on opportunities, given projected increases in both climate driven extreme weather events and chronic events such as increasing temperature and drought. Action in the next five years will allow for typically longer lead times in the sector to enact structural changes to producers' operations.

5.7.1.5 E5 Risks and opportunities to ocean-based aquaculture and fisheries

E5: Risks and opportunities to ocean-based aquaculture and fisheries

- **PHYSICAL - ACUTE:** Risks to ocean-based aquaculture and fisheries due to acute hazards (marine heat waves) affecting nutrient availability and growing conditions, species composition and the spatial distribution of fish stocks, along with growing conditions/productivity/health of aquaculture sites.
- **PHYSICAL - CHRONIC:** Risks and opportunities to ocean-based aquaculture and fisheries due to changes in chronic temperature, ocean temperature and acidification impacting the spatial distribution of fish stocks, operations, along with growing conditions/productivity/health of aquaculture sites.

<table>
<tr><th colspan="3">Consequence</th><th colspan="2">Confidence</th><th>Adaptation shortfall</th><th>Adaptation urgency</th></tr>
<tr><td colspan="3">Current: Moderate</td><td colspan="2" rowspan="2">Overall: Very High</td><td rowspan="3">Partial</td><td rowspan="3">Tier 1: Ready to Act</td></tr>
<tr><td rowspan="2">2030
Moderate</td><td rowspan="2">2050
Major</td><td rowspan="2">2090
Major</td></tr>
<tr><td>Agreement</td><td>Evidence</td></tr>
<tr><td colspan="3"></td><td>High</td><td>High</td></tr>
</table>

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Sea surface temperature:** Current (East and North-east), Future (East, North-east and Islands)
- **Marine heatwaves:** Current (East, North-east and Islands), Future (East, North-east and Islands)
- **Ocean acidity:** Future (all regions)

Key vulnerabilities and barriers: Sensitivity to changes in ocean temperature and acidity, fragmentation and loss of habitats, declining productivity and viability of current operations, increased exposure to disease and viruses, shifts in species preferred niche/ranges.

Climate risk and opportunity summary:
Current climate risks have **moderate consequences** to ocean-based aquaculture and fisheries, which have already seen a strong warming trend and increased occurrence of marine heatwaves. These events have caused declining industry productivity, increased heat stress on salmon fisheries and increased mortality for oyster and abalone stocks. The **confidence** supporting this is **very high** as there is strong agreement and numerous studies of the Tasmanian-specific impact of these events. Climate change **consequences** in **2030** are to remain **moderate**, with risk increasing to a **major consequence rating** in both **2050** and **2090** due to the projected increase in surface water warming and marine heatwaves, particularly in the north-east of the State. This is likely to impact the viability and spatial distribution of current fishing and aquaculture activities, due to physiological impacts to stock and increased disease incidence. Some **opportunities** will arise through a migration of fish and crustacean species that prefer more temperate waters, and

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greater opportunities for salmon farming in the south of the state as salmon will be more productive in cooler waters during summer months. The current adaptation measures in place will only **partially** manage these risks and realise the opportunities. The **adaptation urgency rating** is **Tier 1: Ready to Act,** as, considering the volume of studies on the impacts that marine heatwaves have in Tasmania, it is clear that adaptive action beyond current levels, is required to address this risk.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), coastal ecosystems (N3), marine ecosystems (N4), mining (NT1)
- **Social:** Cultural heritage (S4), mental health and wellbeing (S2)
- **Economic:** Land-based primary sector (E4)
- **Built:** Stormwater and sewage systems (B4)

Justification and evidence

Current context

- There has been a strong long-term warming trend in Tasmanian waters, which is currently 2 to 3 times greater than the global average rate (Holbrook & Bindoff, 1997). Warming off the east coast and in the north-east region has been exacerbated by the observed extension of the East Australian current (Ridgway, 2007) and attributed to an increase in severe marine heatwaves in recent years (Oliver, et al., 2017). For instance, during the summer months of FY16 and FY18, a marine heatwave caused the Tasman Sea to experience sea surface temperatures of up to 2°C warmer than the seasonal average (Oliver, et al., 2017). The 2016/17 marine heatwave was the longest on record, lasting for 251 days (Oliver, et al., 2017), while the 2017/18 event persisted for 221 days (Perkins-Kirkpatrick, et al., 2019).
- Marine heatwaves are becoming more common in Tasmanian waters, with at least 100 marine heatwave days per year observed every year for the period 2014 to 2020 (Kajtar, et al., 2023). The fishery and aquaculture industries in Tasmania, which had a gross value of production (GVP) in 2020-21 of A$1.18bn (ABARES, 2022), have been severely impacted by marine heatwaves in recent years, especially the oyster, abalone, and salmon industries (Kajtar, et al., 2024). Stocked salmon are particularly vulnerable as they are physically unable to migrate to cooler waters during a heatwave. Marine heatwaves are also driving species migration towards Tasmanian waters, causing changes to the spatial distribution of fish stocks, and increasing instances of more tropical fish species being found in Tasmanian waters.
- Marine heatwaves can cause a number of hazards and impacts including range extensions to marine species that normally reside further north (Johnson, et al., 2011), declining productivity (Watson, et al., 2013; Thompson & McDonald, 2020), and the occurrence of diseases and viruses (such as Pacific Oyster Mortality Syndrome) (Ugalade, et al., 2018). It is believed that marine heatwave was a driving cause of the outbreak of Pacific Oyster Mortality Syndrome on the east coast of Tasmania, that damaged pacific oyster stocks and forced hatcheries to close in both 2015/16 a 2017/18 summers. Poor aquaculture performance was also experienced for abalone and Atlantic salmon during this period (Earth Systems and Climate Change Hub, 2021).
- Marine heatwaves can alter the microbial makeup of micro-organisms. Research on the 2015/16 Tasman Sea marine heatwave showed changes in microbial assemblage structure found in warmer waters in Queensland. This can be exacerbated by repeat marine heatwaves and is expected to have cascading effects on the food chain that could extend across the entire Tasman Sea, including into Tasmanian waters (Brown, et al., 2024).

Future context

- Rising ocean temperatures in winter could make Tasmanian salmon farms more suitable for salmon growth, however rising ocean temperatures in the summer would have the opposite effect. Spatial set up of salmon farming is also projected to be altered, with northern regions to become less suitable, and southern regions presenting as the most optimal location for Salmon aquaculture (Meng, et al., 2022).
- Ocean warming events, similar to the 251-day warming in 2015/16, are expected to become more frequent with global warming scenario predictions (Oliver, et al., 2017). Predictions suggest that by 2050, conditions similar to the 2015/16 marine heatwave may occur every 1-in-5 years under a low emissions scenario (SSP1-2.6) to 1-in-2 years under a high emissions scenario (Kajtar, et al., 2024).
- There are potential opportunities for fishing or farming temperate species, including eastern lobster, southern bluefin tuna and yellow tail kingfish. However, farming of Tasmanian salmon will be threatened by warmer waters, as increasing temperatures are leading to salmon being farmed under physiological stress, increased

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incidence of disease and decreased feeding, which may decrease system productivity (Parliament of Australia, 2017).

- Warming temperatures and declining ecosystem health may see further instances of aquaculture producers choosing to withdraw tenders or reduce the size of tenders for supplying of aquaculture products, like the decision made by Tassal in 2016 (Lynch, 2016).

Existing adaptation response

- **National and state level legislation and actions:** Climate Change – Marine Resources Impacts and Adaptation, Sustainable Marine Research Collaboration Agreement (SMRCA) Strategic Plan for 2022-26, SMRCA Fisheries and Aquaculture Assessments.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030**: The impact of climate change on ocean-based aquaculture and fisheries is projected to be moderate by 2030. This is largely driven by the continued disruption from marine heatwaves that have caused temporary shocks to salmon, oyster, and abalone stocks. There is a projected **major consequence** in **2050** and **2090** due to projections indicating a gradual increase to sea surface temperature and the increased frequency of marine heatwave events, especially under a high emission scenario towards the end of the century. This is likely to impact the viability and spatial distribution of current activities but create a potential opportunity for fishing or farming more temperate species.
- **Confidence – Very High:** There is a very high level of confidence regarding the known impacts to ocean-based aquaculture and fisheries due to a high level of agreement and high level of evidence. This provides a clear pathway for where actions should be directed to mitigate climate impacts and to support ocean-based fisheries and aquaculture producers to take advantage of a changing climate.
- **Adaptation shortfall – Partial:** While there are several current adaptation measures in place, these actions may only partially mitigate the impact that a rising frequency and intensity of marine heatwaves will have. Additionally, while climate change is likely to provide opportunities for new species cultivation and greater salmon farming opportunities in southern waters of Tasmania, current adaptation actions may not fully realise the potential opportunities available for producers.
- **Adaptation urgency - Tier 1: Ready to Act**. Further state level action is needed to provide a coordinated approach to manage the current and future impacts of marine heatwaves, and to capitalise on opportunities, given projected increases in surface water warming and marine heatwaves.

5.7.2 Economic domain - Transition risks

5.7.2.1 ET1 Risks of slow, ineffective or no action to support emissions reduction within Tasmania limiting business' ability to respond to emissions reduction requirements limiting economic growth.

ET1: Risks to economic growth due to slow or ineffective emissions reduction

Risks of slow, ineffective or no action to further reduce emissions within Tasmania limiting economic growth.

Consequence		Confidence		Adaptation shortfall	Adaptation urgency
Current: Minor		Overall: Medium		Partial	Tier 3: Continue to Monitor Current Actions
2030 Major	2050 Extreme	Agreement	Evidence		
		Medium	Medium		
Risk/Opportunity summary and associated impact statements					

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Key drivers (region exposed):

- **Emissions reduction mechanisms**: Currently (Statewide), Future (Statewide)

Key vulnerabilities: Lack of or insufficient investment, slow or ineffective action, poorly designed plans and actions, potential for reputational damage, risk of emission reduction requirements and adjustments.

Climate risk summary:
Tasmania has a relatively low emissions intensity and strong base of renewable energy. However, in the future, slow, ineffective or no action on emissions reduction could limit economic growth. This may be due to a range of reasons including potential future emissions prices, market expectations, reputational damage for businesses, and impacts from the regulatory environment. Emissions price has been used as a proxy to show the potential impact if emissions reductions are not achieved. Tasmania is exposed to potential emissions pricing through sectors with high emissions. **Some businesses are already more vulnerable** particularly where emissions are hard-to-abate. Currently, the impact of emissions reduction mechanisms has **minor consequences** on economic growth**.** Increasing requirements to reduce emissions both from policy and market pressures are **likely to result in major consequences by 2030**, and **extreme consequences by 2050**. The confidence supporting this is **medium** as there is a **medium level of evidence** and a **medium level of agreement** on the potential impact and consequence of this risk. The current supporting measures for emissions reduction in Tasmania are provided through the Tasmania Renewable Energy Target, Tasmania's legislated emissions target, and through the development of sector specific emissions reduction plans. As a result, adaptation shortfall has been rated **Partial,** with an adaptation urgency rating of **Tier 3: Continue to Monitor Current Actions**.

Related impact statements:

- **Natural:** Critical minerals (NT1), renewable energy (NT2), carbon markets (NT4)
- **Social:** Social cohesion (ST1), skills (ST5),
- **Economic:** Land-based primary sector (E4), risks to businesses (E1, ET2, ET3), opportunities for from renewable energy (ET4)
- **Built:** Transport (BT1, BT4, electricity system (BT2), circular economy (BT4)

Justification and evidence

Current context

- While Tasmania as a state currently has below net zero emissions, some Tasmanian businesses are still impacted by emissions reduction mechanisms, such as the Safeguard Mechanism.
- Businesses may be impacted in the transition to a low emissions economy indirectly through competition, market expectation, reputation, and voluntary participation in carbon markets. Further to this, many businesses and government organisations in Australia consider carbon pricing in decision making through the use of 'values of emissions reduction' or shadow carbon pricing, used to value emissions reduction and align decision making to national and global objectives. This means that businesses that are unable to reduce emissions may be subject to penalties (through the Safeguard Mechanism) or be uncompetitive where supply chain emissions are increasingly considered by businesses.
- Tasmania is one of very few jurisdictions in the world that has below net zero emissions. Accounting for sequestration through Land Use, Land Use Change and Forestry (LULUCF), Tasmania sequesters more carbon than is emitted. Excluding LULUCF, in absolute terms, emissions in Tasmania have been increasing slightly in recent years (ReCFIT, 2023e).
- Maintaining Tasmania's net zero status is not guaranteed into the future (ReCFIT, 2023). There are a range of factors that could negatively impact Tasmania's emissions profile, including population growth or changes in consumer demand. In addition, climate change may impact the carbon carrying capacity of Tasmania's forests.
- Agriculture and energy (direct combustion, and industrial processes and product use) are the highest emissions sources for Tasmania (ReCFIT, 2023).
- Tasmania's three largest export sectors are Agriculture, Forestry and Fisheries, and Mining and Manufacturing. These sectors may be exposed to emissions reduction requirements through international carbon border adjustment mechanisms, market competition and reputational expectations.
- A significant share of Tasmania's emissions profile is attributable to six industrial facilities covered by the Safeguard Mechanism, all of which will need to start reducing emissions significantly in order meet the requirements of the scheme.
- Many businesses in Tasmania have received funding from the Tasmanian Government (Department of State Growth, 2023a) and/or Australian Government (Minister for Climate Change and Energy, 2024a) to reduce

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emissions. However, Tasmania may be vulnerable due to limited currently available technology to decarbonise hard-to-abate sectors and may face competition from other jurisdictions that have more connectivity and supply chain pressures.

Future context

- Modelling suggests shadow emissions pricing in Australia in 2030 may reach A$ 135/tCO_2e under a moderate emission scenario and A$ 616/tCO_2e under a low emission scenario. Therefore, the impact of shadow emissions pricing on Tasmania is rated as major under the low emission scenario and moderate under the moderate emission scenario.
- Modelling suggests shadow emissions pricing in Australia in 2050 may reach A$ 174/tCO_2e and A$ 2,004/tCO_2e under a moderate emission and a low emission scenario respectively. The impact is rated as extreme under the low emission scenario and major under the moderate emission scenario.
- Tasmania's export sector contributes significantly to the State's economy. Exports of goods and services in 2021 was estimated at $A 5.0 billion, approximately 15 per cent of Gross State Product (GSP). Key export countries include China, South Korea, Vietnam, Japan, Taiwan, and the United States. Key export commodities include processed metals and metal products, ores and concentrates, meat products, seafood products, and dairy products. Many of these are emission-intensive products.
- Where emissions are not covered by national climate policy or where mandated action is limited, exports may be subject to carbon border adjustment mechanisms, competition, or market expectations. This may impact the competitive advantage of Tasmanian products in a global market. In 2030, emissions pricing to major export countries are modelled to reach A$ 30-80/tCO_2e and A$ 550-625/tCO_2e under a moderate emission and a low emission scenario respectively. In 2050, carbon price to major export countries for Tasmania are projected to reach A$ 40-110/tCO_2e and A$ 1550-1900/tCO_2e under a moderate emission and a low emission scenario respectively. This may have a potential impact on the competitive advantage of Tasmanian products in a global market.

Existing adaptation responses

- **National and state level legislation and actions:** Implementation of Tasmania's emission reduction priorities as outlined in Tasmania's Climate Change Action Plan 2023-25 (ReCFIT, 2023e), Power the Regions Fund (Minister for Climate Change and Energy, 2024a) .

Justification of adaptation urgency rating

- **Consequence – Major in 2030:** The impact on economic growth of slow, ineffective or no action to support emissions reduction is projected to be major by 2030, under a low emissions scenario. This is due to potential national and international drivers that may result in emissions reduction policy, market, and reputational impacts for Tasmania, particularly for high emissions industries. In 2050, the consequence rating is elevated to extreme due to the potential increases to emissions reduction efforts between 2030 and 2050.
- **Confidence – Medium:** There is a medium level of confidence due to a medium level of agreement and a medium level of evidence.
- **Adaptation shortfall – Partial:** Tasmania has in place the Tasmania Renewable Energy Target, Tasmanian Emissions Targets, Climate Change Action Plan 2023-25, and is developing sector specific Emissions Reduction and Resilience Plans. Various funding programs are available at the national level to support emissions reduction. Current action may partially shortfall depending on the implementation of current action plans and funding programs.
- **Adaptation urgency - Tier 3: Continue to Monitor Current Actions.** Tasmania has several strategies that support aspects of this opportunity. Implementation of these initiatives should continue to realise this opportunity.

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5.7.2.2 ET2 Risks to businesses and public organisations due to supply chain impacts as organisations adjust to a low carbon economy

ET2: Risks to businesses and public organisations due to supply chain impacts

Risks to businesses and public organisations due to supply chain costs as organisations adjust to a low carbon economy.

<table>
<tr><th colspan="2">Consequence</th><th colspan="2">Confidence</th><th>Adaptation shortfall</th><th>Adaptation urgency</th></tr>
<tr><td colspan="2">Current: Minor</td><td colspan="2" rowspan="2">Overall: Medium</td><td rowspan="3">Partial</td><td rowspan="3">Tier 2: Investigate then Act</td></tr>
<tr><td rowspan="2">2030
Moderate</td><td rowspan="2">2050
Major</td></tr>
<tr><td>Agreement</td><td>Evidence</td></tr>
<tr><td colspan="2"></td><td>Medium</td><td>Medium</td><td></td><td></td></tr>
</table>

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Emissions reduction requirements on supply chain**: Currently (statewide), Future (statewide)

Key vulnerabilities: Exposure to emission reduction policies, supply and technology constraints, increased supply chain costs, isolated nature of the state and small scale of economy.

Climate risk summary:
Businesses and public sector organisations in Tasmania may be impacted by the transition to a low emissions economy through their supply chains. This may be driven in two ways, either through emissions reduction policies impacting the price of goods in their country of origin, or through constraints on technology and product supply if demand increases faster than supply. Current supply chain impacts have **minor consequences** on businesses and public organisations in Tasmania as economies transition to low emissions. Increasing supply chain pressures are likely to result in **moderate consequences** by **2030**, and **major consequences** by **2050**. The **confidence** supporting this is **medium** as there is a **medium level of agreement** and **medium level of evidence** on the impacts of the transition to a low emissions economy on supply chains. The current adaptation measures in place to address the risks to supply chains from the transition to a low emissions economy are largely provided through legislated emissions reduction targets, and through the development of sector specific emissions reduction pathways. National strategies on supply chains have been developed however still require implementation and consideration of the application and effectiveness for Tasmania. As a result, **adaptation shortfall** has been rated **Partial**. The **adaptation urgency rating** is **Tier 2: Investigate then Act**.

Related impact statements:

- **Social:** Skills (ST3, ST5)
- **Economic:** Risks to businesses (E1, ET2, ET3), opportunities for from renewable energy (ET4)
- **Built:** Electricity system (BT3)

Justification and evidence

Current context

- Businesses and public sector organisations in Tasmania may be impacted by the transition to a low emissions economy through their supply chains. This may be driven in two ways - either through emissions reduction policies impacting the price of goods in their country of origin, or through constraints on technology and product supply if demand increases faster than supply.
- The economic impact of international carbon pricing or other emissions reduction policies differs across sectors, depending on their position within global supply chains and emissions intensity of material and product inputs for the sector. Carbon pricing and emissions reduction policies can indirectly affect businesses and public organisations through materials and products that are imported to Tasmania (Frankovic, 2024)

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- Globally there will be increased demand for low carbon products that are required to transition supply chains to sustainable materials. (Azvedo, et al., 2022) Raw materials, such as low emissions steel, copper and plastics, may rise in price, particularly in the short to medium term, due to demand and supply imbalances (Krishnan, et al., 2022). Commodities and raw materials used to deliver low carbon technologies may experience supply shortages or carry a green premium.
- Tasmania imports around A$ 2.1 billion in goods each year.
- Major import products include refined petroleum, other ores and concentrates, residual petroleum products, animal oils and fats, and coke and semi coke products. Animal feed and fertiliser are also key imports for the agricultural sector in Tasmania.
- Sectors that rely on these products are exposed to supply chain costs associated with a transition to low emissions.
- The current risk is minor as many businesses are not yet impacted by supply chain constraints associated with a low emissions transition. Some businesses in Tasmania are impacted by a transitioning supply chain, such as businesses impacted by the Safeguard Mechanism that are looking to reduce emissions, and those importing products from countries with emissions control mechanisms in place.
- As an island state and relatively small economy, Tasmania may be more vulnerable to increased supply chain costs due to reliance on international trade and smaller market share.

Future context

- The price of emissions-intensive imported products may increase in the future due to emissions reduction actions and policies globally. Key import countries for Tasmania include Republic of Korea, Malaysia, China, Taiwan and Brunei (DFAT, 2023). Key import commodities include petroleum, ores and concentrates, residual petroleum product.
- Imported products may be subject to emissions reduction mechanisms in their country of origin, increasing the future risk to some sectors in Tasmania. In 2030, shadow emissions pricing to major import countries are projected to reach A$ 30-80/tCO_2e and A$ 550-625/tCO_2e under a moderate emission and a low emission scenario respectively. In 2050, shadow emissions pricing to major import countries are projected to reach A$ 40-110/tCO_2e and A$ 1550-1900/tCO_2e under a moderate emission and a low emission scenario respectively.
- In the future, Tasmanian businesses are likely to require more materials that supports the low emissions economy. For example, companies will be required to transition vehicle fleets to low carbon and electric alternatives, retrofit industrial buildings with sustainable alternatives and invest in renewable energy delivery (Krishnan, et al., 2022). Additionally, some organisations may be affected by legacy investment into obsolete technologies and holding fossil fuel-based assets (Deloitte, 2023). This can increase the investment cost in transitioning to a low carbon supply chain, due to the significant scale of change required.
- Demand globally for renewable energy technology, electric vehicles, green steel, minerals, and hydrogen electrolysers will increase. This increased demand will be reflected in Tasmania as these commodities are also critical to the State's transition to a low emissions economy.
- Energy price may increase as there is pressure on supply and demand dynamics in the transition to a low emissions economy.
- Impact will be greatest under a low emissions scenario.

Existing adaptation responses

- **National and state level legislation and actions:** Implementation of Tasmania's emission reduction priorities as outlined in Tasmania's Climate Change Action Plan 2023-25 (ReCFIT, 2023e), National Freight and Supply Chain Strategy, Critical Minerals Strategy 2023–2030, National Renewable Energy Supply Chain Action Plan.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** Risks to businesses and public organisations due to supply chain impacts have the potential to have moderate consequence by 2030 due rate of change in emissions reduction required under a low emission scenario. In **2050, the consequence rating is elevated to major** due to projected further increases to emissions reduction efforts between 2030 and 2050 under a low emissions scenario.
- **Confidence – Medium:** There is a medium level of confidence given the medium level of agreement and medium level of evidence.
- **Adaptation shortfall – Partial:** Tasmania has developed a Climate Change Action Plan 2023-25, and is developing sector specific Emissions Reduction and Resilience Plans. The Australian Government has developed

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strategies and action plans for transport and supply chains, critical minerals, and renewable energy. Current action may partially shortfall as they are focused on the national level and may not consider Tasmania's requirements or consider Tasmanian specific vulnerabilities such as market size and distance.

- **Adaptation urgency - Tier 2: Investigate then Act.** Further investigation is required to understand Tasmania's requirements and specific supply chain vulnerabilities, such as market size and distance, given the potential impacts of emissions reduction policies on the price of goods in their country of origin or constraints on technology and product supply due to demand increasing faster than supply.

5.7.2.3 ET3 Risks and opportunities for business through the implementation of new technology to reduce emissions (including fugitive/agriculture/industrial/fuel switching)

ET3: Risks and opportunities for businesses

Risks and opportunities for business through the implementation of new technology to reduce emissions (including fugitive/agriculture/industrial/fuel switching).

<table>
<tr><th colspan="2">Consequence</th><th colspan="2">Confidence</th><th>Adaptation shortfall</th><th>Adaptation urgency</th></tr>
<tr><td colspan="2">Current: Minor</td><td colspan="2" rowspan="2">Overall: Medium</td><td rowspan="3">Partial</td><td rowspan="3">Tier 2: Investigate then Act</td></tr>
<tr><td rowspan="2">2030
Moderate</td><td rowspan="2">2050
Moderate</td></tr>
<tr><td>Agreement</td><td>Evidence</td></tr>
<tr><td colspan="2"></td><td>Medium</td><td>Medium</td><td></td><td></td></tr>
</table>

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Emissions reduction technology**: Currently (Statewide), Future (Statewide),

Key vulnerabilities and barriers: Requirement for substantial capital investment, slow or ineffective action, poorly designed plans and actions, potential for reputational damage, risk of emission reduction requirements and adjustments.

Climate risk and opportunity summary:
Implementing low emissions technology will require substantial capital investment but may result in decreased operating costs over time. This may be a risk for businesses where investment exceeds returns. However, may also have positive impacts where return on investment is positive and operating costs are reduced. Current risks and opportunities from the implementation of new technologies have a **minor consequence** on businesses in Tasmania. Increasing pressure to reduce emissions is likely to result in **moderate consequences** by 2030, and **moderate consequences** by 2050. The **confidence** supporting this assessment is **medium** as there is a medium level of agreement and medium level of evidence on the impacts on the potential risks and opportunities. As technology options and costs change over time the level of support required to reduce the risk and realise the opportunity is unclear. The current adaptation measures in place to address the need for emissions reduction are largely provided through legislated emissions reduction targets and through the development of sector specific emissions reduction plans. Support is also available through Australian Government programs. As a result, adaptation shortfall has been rated **Partial.** Adaptation urgency rating for this risk and opportunity is **Tier 2: Investigate then Act.**

Related impact statements:

- **Social:** Skills (ST3, ST5)
- **Economic:** Businesses (E1, ET2), land-based primary sector (E4)

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- **Built:** Electricity infrastructure (BT2), transport (BT4)

Justification and evidence

Current context

- Implementing low emissions technology will require substantial front-loaded capital investment but may result in decreased operating costs over time. Businesses will incur costs associated with hiring new staff and training existing staff to support the integration and ongoing management of technology. This presents both risks and opportunities for businesses in Tasmania (Krishnan, et al., 2022).
- Tasmania's four largest economic sectors are Healthcare, Agriculture, Forestry and Fisheries, and Construction. These sectors vary in emissions intensity for Tasmania. The highest sources of emissions in Tasmania include agriculture, energy (including transport) and industrial processes and products use.
- There are currently some proven technology options available to sectors looking to reduce their emissions such as improving energy efficiency, fuel switching, reducing resource use, sequestering carbon, reducing fugitive emissions and reducing emissions associated with waste (Balafoutis, et al., 2017; Electric Vehicle Council, n.d.).
- Many options presently available to businesses involve proven technology. Businesses can implement changes that are the lowest cost with certainty around cost recovery.
- Some technologies are incentivised through government programs such as the Federal Government Renewable Energy Target, Instant Tax Write Off, Accelerated Depreciation for Small Business, and the Tasmanian Government Interest Free Loan Scheme for Businesses.
- The current risk is minor as many businesses can implement technology options and business practice changes that are low risk and high return, utilising proven technology or low-cost options.

Future context

- In the future, emissions reduction requirements are likely to increase compared with current requirements.
- This may impact more small-to-medium enterprises with harder to abate equipment such as heavy vehicles, manufacturing plants and equipment.
- Technologies required to meet more stringent emissions reduction requirements may present a greater risk to businesses due to higher costs and lower technology readiness levels.
- There is likely to be significant investment in technology under a low emissions scenario which should reduce the cost of developing technologies (as demonstrated by past reduction in technology costs such as solar). This will unlock opportunities for businesses, both in terms of options available and reduced capital costs allowing for broader implementation (Keywan Riahi, 2017).
- Impact will be greatest under a low emissions scenario for both the risk and opportunity. Businesses will require more substantial emissions action under a low emissions scenario. However, investment will be greatest potentially increasing the technology options available and reducing the cost.

Existing adaptation responses

- **National and state level legislation and actions:** Implementation of Tasmania's emission reduction priorities as outlined in Tasmania's Climate Change Action Plan 2023-25 (ReCFIT, 2023e), Emissions Reduction and Resilience Plans, Federal Government Renewable Energy Target, Instant Tax Write Off, Accelerated Depreciation for Small Business, Tasmanian Government Interest Free Loan Scheme for Businesses, Emissions Reduction and Resilience Plans, Federal Government Renewable Energy Target, Instant Tax Write Off, Accelerated Depreciation for Small Business, Tasmanian Government Interest Free Loan Scheme for Businesses.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** The risk to businesses through the implementation of new low emissions technology has the potential for minor impacts by 2030. This is due to the mix of technological maturity, with many sectors able to access technologies of relative maturity, but solutions for some sectors remaining in the research and development phase. The consequence rating **remains moderate in 2050.** Further increases in technology development are likely to result in moderate risk consequence between 2030 and 2050 under a low emissions scenario.
- **Confidence – Medium:** There is a medium level of confidence given the medium level of agreement and medium level of evidence. As technology options and costs change over time the level of support required to reduce the risk and realise the opportunity is unclear.

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- **Adaptation shortfall – Partial:** Action plans and funding is available at both the state and national level to support businesses to transition to lower emissions which may not provide full coverage to all business in Tasmania to reduce the risk and realise the opportunity, resulting in a partial shortfall.
- **Adaptation urgency - Tier 2: Investigate then Act.** Further investigation is required to understand how technology options and costs change over time and the level of support needed to both manage risk and realise opportunities through the implementation of new technology to reduce emissions.

5.7.2.4 ET4 Opportunities for economic growth through renewable energy supply

ET4: Opportunities for economic growth through renewable energy supply.

Opportunities for economic growth through renewable energy supply.

Confidence		Adaptation shortfall	Adaptation urgency
Overall: Very High		Partial	Tier 3: Continue to Monitor Current Actions
Agreement	Evidence		
High	High		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Renewable energy**: Currently (Hobart and North), Future (North and North-west),

Key barriers: Lack of or insufficient investment, slow or ineffective action, poorly designed plans, and actions.

Climate opportunity summary:

There are opportunities for economic growth through the development of renewable energy in Tasmania. The **confidence** supporting this is **very high** as there is a **high level of evidence** and a **high level of agreement** on the potential impacts of the opportunities. Benefits from renewable energy development are likely to increase over time as there is increasing need for emissions reduction. Benefits are likely to be highest under a low emissions scenario. The current adaptation measures in place to address the need for emissions reduction are largely provided through legislated renewable energy targets and associated frameworks and action plans. Overall implementation of Tasmania's renewable energy strategy is still required with some key risks yet to be resolved. **Adaptation shortfall** has been rated **Partial**. The **adaption urgency rating** is **Tier 3: Continue to Monitor Current Actions**.

Related impact statements:

- **Natural:** Marine ecosystems (N4), coastal ecosystems (N3), inland water ecosystems (N1)
- **Social:** Mental health and wellbeing (S2), cultural heritage (S4)
- **Economic:** Land-based primary sector (E4), ineffective action on climate change
- **Built:** Health care and emergency services (B1)

Justification and evidence

Current context

- Globally, renewable energy is transforming industry sectors and diversifying career opportunities. Increasing renewable energy generation in Australia will lead to increased jobs and growth in the Tasmanian economy.
- GSP for Tasmania sits at around A$ 38.5 billion, after strong growth of 4.3 per cent in 2022. Economic growth in 2023 was lower at 1.5 per cent (DFAT, 2023). Utilities, including electricity generation distribution and retail, accounts for around 2.5 per cent of GSP (DFAT, 2023).

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- Tasmania's labour market remains strong. In March 2023, employment was at its highest level, while the unemployment rate remained at a low level at 3.8 per cent. Employment in the utilities sector is around 2,100 jobs, around 1 per cent of total employment in the state (Rutovitz, et al., 2022).
- Tasmania has high levels of renewable energy generation, with historic development of hydro power as the State's primary source of generation. There has been some recent growth in renewable energy, with the development of 5 wind farms totalling 573MW of wind energy (Renewables Tasmania, 2021). As a result, Tasmania is considered to have 100 per cent net renewables generation (ReCFIT, 2024b).
- In addition, Tasmania has achieved net zero emissions, with the aspiration to maintain net zero emissions into the future. Frameworks for maintaining this position include development of further renewable energy, decarbonisation of emissions intensive industries, development of green industries and nature-based carbon sequestration (ReCFIT, 2023).

Future context

- Under a low emissions scenario wind capacity installed in Tasmania is expected to increase substantially by 2030, with further increases to 2050. Between 2030 and 2050, hydro, utility scale storage and utility scale solar PV are also modelled to increase in installed capacity.
- Estimates developed for Tasmania's 100 per cent Renewable Energy Target suggest an economic contribution of over 4,600 jobs between 2021 and 2027. Studies into jobs and skills required for the energy transition suggest that development of renewable energy delivers 2,000 jobs per year, increasing from 1,000 in 2023 (Rutovitz, et al., 2022).
- Up to $7.1 billion will be contributed to Tasmania's economy through the delivery of projects to meet the Renewable Energy Target (ReCFIT, 2022).

Existing adaptation responses

- **National and state level legislation and actions:** Tasmanian Renewable Energy Target, Tasmanian Renewable Energy Action Plan, Tasmanian Renewable Energy Coordination Framework, Hydrogen Action Plan.

Justification of adaptation urgency rating

- **Confidence – Very High:** There is a very high level of confidence given the high level of agreement and high level of evidence on the economic benefits of renewable energy. It is noted there is some debate around the magnitude of impact.
- **Adaptation shortfall – Partial:** Comprehensive policies and action plans is available at both the state and national level to support renewable energy development in Tasmania, with a breadth of coverage across the energy system. To be effective in realising this opportunity current policies and action plans require implementation with some risks to implementation still to be resolved.
- **Adaptation urgency - Tier 3: Continue to Monitor Current Actions**. Tasmania has several policies and action plans that support aspects of this opportunity. Implementation of these initiatives should continue to realise this opportunity with some risks to implementation still to be resolved.

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5.7.2.5 ET5 Opportunities for business through new revenue streams available from carbon markets

ET5: Opportunities for businesses from carbon markets

Opportunities for business through new revenue streams available from carbon markets.

Confidence		Adaptation shortfall	Adaptation urgency
Overall: Very High		Partial	Tier 1: Ready to Act
Agreement	Evidence		
High	High		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Carbon markets**: Currently (Rural statewide), Future (rural statewide)

Key barriers: Policies and actions may not be sufficient to realise opportunity, problems with supply and demand of carbon credits, integrity of carbon credits and future reputational damage.

Climate opportunity summary:
There are opportunities for economic growth for Tasmania through participation in carbon markets. Benefits from carbon market participation are likely to increase over time as there is increasing need for emissions reduction, and businesses will look to offsets and market-based solutions to meet emissions reduction targets and requirements. The **confidence** supporting this is **very high** as there is a high level of agreement and high level of evidence on the impacts of the opportunities. The current response in place to address the need for emissions reduction is largely provided through legislated carbon offset mechanism and renewable energy targets. While there are some policies and actions in place, the **adaptation shortfall** is rated **partial** as it is currently unclear if this will be sufficient to fully realise available opportunities from carbon markets for Tasmania. This adaptation urgency rating is **Tier 1: Ready to Act**.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), coastal ecosystems (N3), marine ecosystems (N4)
- **Social:** Cultural heritage (S4), mental health and wellbeing (S2), skills (ST3, ST5)
- **Economic:** land-based primary sector (E4)
- **Built:** Stormwater and sewage systems (B4)

Justification and evidence

Current context

- In Australia, carbon market participation utilises the Australian Carbon Credit Unit (ACCU) scheme. Businesses can undertake carbon removal projects, or carbon avoidance projects, with the value of the carbon credit received reflecting the level of CO_2 removed or avoided. Any additional co-benefits of the project may be valued in the market, currently seen through higher prices for some method types or projects with specific co-benefit. Project developers can sell this credit to buyers, who have committed to offsetting their own emissions, and may be unable to directly or affordably do so. Additional revenue streams can arise from this marketplace in the form of retail traders and brokers who can help facilitate the sale and purchase of credits (Favasuli & Sebastian, 2021).
- The Federal Government Renewable Energy Target also creates a carbon market, with renewable energy certificates (Large-scale Generation Certificates (LGCs) and Small-scale Technology Certificates (STCs) being traded to allow electricity users to meet emissions reduction targets for Scope 2 emissions. This includes regulated targets (the Renewable Energy Target) and voluntary targets.

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- Currently in Australia there is a total of 1,767 projects registered under the ACCU Scheme. The majority of these are land-based sequestration projects, often considered 'carbon farming'. Carbon farming involves farm management to mitigate emissions and capture carbon in the landscape. This can open income streams and market opportunities for enterprises but can also have flow-on benefits for productivity, biodiversity, and climate resilience (Eisner & Bhattarai, n.d.)
- Across projects in Australia, 17.2 million ACCUs were issued in 2023. Australian National Register of Emissions Units holdings grew to 36.2 million at the end of 2023. There was an overall demand of 3.7 million ACCUs in 2023 (Clean Energy Regulator, 2024).
- The ACCU spot price fluctuated between approximately A$24 and A$40 over the 2023 calendar year.
- 98 projects registered under the ACCU Scheme are in Tasmania, equating to 5.5 per cent of total projects across Australia. Eight projects registered in Tasmania have generated ACCUs (Clean Energy Regulator , 2024).
- Power stations in Tasmania accredited under the Large-scale Renewable Energy Target have a cumulative capacity of almost 3, 000 MW. Many of these are hydro power stations built prior to 1997, meaning generation below their baseline is ineligible for LGCs. Tasmanian power stations created over 2 million LGCs in 2022.
- The LGC spot price fluctuated between around A$40 and A$58 over 2023, though contract prices for LGCs were often lower than the spot price.

Future context

- Future carbon markets may include Safeguard Mechanism Certificate and Renewable Energy Guarantee of Origin certificates. The first represents tradable emissions for facilities under the Safeguard Mechanism. Where facilities can reduce their emissions below their required baseline for a year, they are able to create and trade certificates with other Safeguard facilities. Renewable Energy Guarantee of Origin certificates are proposed certificates under the Guarantee of Origin scheme that will allow hydrogen producers to purchase and certify electricity used for the production of hydrogen as renewable energy, therefore, being able to claim 'green' status for the hydrogen produced.
- Opportunities in carbon market participation are likely to increase in the future as emissions intensive industries look to balance emissions reduction with required targets, utilising offsets where decarbonisation technology is not yet available or commercially viable.
- Tasmania has favourable geography for carbon market participation through carbon farming, with agriculture and forestry forming key sectors in the Tasmanian economy., Renewable energy resources and the Tasmanian Renewable Energy Target also create opportunities to participate in the LGC market or future and Renewable Energy Guarantee of Origin market.
- Shadow emissions price in Australia in 2030 may reach A$135/$tCO_2e$ under a moderate emission scenario and A$616/$tCO_2e$ under a low emission scenario.
- Shadow emissions price in Australia in 2050 may reach A$174/$tCO_2e$ under a moderate emission and A$2,004/$tCO_2e$ under a low emission scenario. As emissions reduction requirements increase, businesses may look to offset larger proportions of their emissions. This will increase the financial opportunities available through carbon market participation.

Existing adaptation responses

- **National and state level legislation and actions:** Carbon Farming Initiative, Renewable Energy Target, Safeguard Mechanism. Policies supporting this include, Carbon Farming Advice Rebate Pilot Program, Landcare Action Grants, Guarantee of Origin.

Justification of adaptation urgency rating

- **Confidence – Very High:** There is overall a very high level of confidence due to the high level of agreement and high level of evidence available on the economic benefits of carbon market participation.
- **Adaptation shortfall – Partial:** Action plans and funding is available at both the national level to support carbon farming markets. There are limited state programs available to support carbon market participation in the Tasmanian context.
- **Adaptation urgency - Tier 1: Ready to Act**. Further state level action would support increased carbon market participation in the Tasmanian context.

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5.8 Detailed climate impact statements for the built domain

5.8.1 Built domain - Physical risks

In the built domain, climate change poses risks to the quality and reliability of critical infrastructure across the state, as well as threatening homes and businesses from acute and chronic events. However, there are transition opportunities available in the form of lower emissions transport, improved electricity infrastructure flexibility and the potential to implement more resilient and well adapted infrastructure in the future. There are a total of 10 priority risk and opportunity statements: 6 for physical and 4 for transition themes.

5.8.1.1 B1 Risks to health care and emergency services

B1: Risks to health care and emergency services due to extreme weather events

- **PHYSICAL - ACUTE:** Risks to health care and emergency services availability due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms) causing a rise in event-related emergency and health issues

Consequence			Confidence		Adaptation shortfall	Adaptation urgency
Current: Major			Overall: Medium		Partial	Tier 2: Investigate then Act
2030 Major	2050 Major	2090 Extreme	Agreement: Medium	Evidence: Medium		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Extreme rain and floods:** Current (West and North-west), Future (North and East)
- **Bushfires:** Current (East and South), Future (North and Central)
- **Extreme heat:** Current (North), Future (North and Islands)
- **Storms:** Current (North), Future (North and Islands)

Key vulnerabilities: Increased incidence of physical and mental health impacts, remoteness of decentralised communities, pressure on resourcing and response, elevated levels of vulnerable population groups.

Climate risk summary:

Current climate risks are expected to have major consequences on health care and emergency management services, due to the potential for widespread disruption to operational capacity and service delivery that is caused by extreme weather events. There is also increased **vulnerability** created by the remoteness of Tasmania's highly decentralised communities, resulting in challenges for emergency responses in the event of disasters. Climate change is likely to continue having **major consequences** through to **2030 and 2050**, increasing to **extreme consequences** by **2090** due to the increased frequency and intensity of extreme weather. The **confidence** supporting this assessment is **medium,** as there is **medium evidence** and a **medium level of agreement.** Although the different ways that climate change can impact the emergency and health care sector are generally well understood, there has been limited research on climatic impacts with regards to Tasmania's highly decentralised population. There is also uncertainty regarding the future operational capacity and service delivery of health care and emergency services in Tasmania as this area is highly vulnerable to cascading impacts from interrelated risks (e.g., transport, supply chains, critical

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infrastructure), and how these risks are managed. Current adaptation measures are largely provided through national and state level legislation. However, further investigation is required to specifically align climate change interactions with improving resilience and functional capacity of health care and emergency management services. Therefore, **adaptation shortfall has been rated partial**. The adaptation urgency has been rated as **Tier 2: Investigate then Act,** highlighting that further investigation is required (such as new studies or research) to fill significant knowledge gaps and identify a clear path for where additional adaptation actions can be implemented to support and enhance current initiatives.

Related impact statements:

- **Social:** Mental health and wellbeing (S2), social cohesion (ST4), skills (ST5)
- **Economic:** Land-based primary sector (E4)
- **Built:** Health care and emergency services (B1), stormwater and sewage systems (B4), transportation networks (B6)

Justification and evidence

Current context

- Climate change will impact health outcomes in numerous ways, including, but are not limited to, increased injury and fatalities from natural disasters, rising incidence of mental health challenges from climate related incidents, rising rate of infections, and changing environmental conditions that exacerbate existing health conditions within society (Department of Health, 2020).
- Tasmania is particularly vulnerable to the impacts of climate change due to the spatial and demographic characteristics of its population. Tasmania faces challenges due to its rapidly ageing population, and social and health indicators for the state, which are more closely linked to outcomes seen with remote and rural communities across Australia. An additional challenge for the emergency and healthcare response to natural disasters and other climate hazards is Tasmania's highly decentralised population (Astill, et al., 2018).
- There is also indirect risks arising from the interconnection between critical infrastructure assets and services and the operations of health care and emergency services. Telecommunications for example are relied upon to alert and activate people during emergency events, while they are also critical for the effective coordination of emergency services staff and resources (State Emergency Service, 2023). While not the only dominant risk driver for such an event, the increasing frequency and intensity of climate events increases the potential for disruption to these essential networks and the also elevated the exposure to the cascading impacts that may occur as a result of such an event (State Emergency Service, 2022).
- Similar to the impact on health care services, climate change has and will continue to have varied impacts on emergency services. These include but are not limited to (AFAC, 2018);
    - Increased frequency and intensity of extreme weather events and natural disasters.
    - Increased pressure on resourcing and responding capability from more frequent and more intense events.
    - Increased health and safety risks for staff and volunteers.
    - Increasing exposure and vulnerability of communities, creating greater resourcing requirements for emergency services.
    - Ecosystem changes that can impact the effectiveness of existing risk mitigation and exacerbate impacts.

Future context

- As climate events increase in frequency and intensity, so will the level of fatigue and resourcing strain on emergency and health care responders. As events extend in the duration and impact, staff engaged in the response are exposed to operational risks, as the demanding physical and emotional toll of emergency and health care response is magnified (AFAC, 2018a).
- Volunteers make up a material proportion of emergency response workforces and are essential in supporting the surge in demand for emergency services in natural disasters and extreme weather events (Royal Commission, 2020). In Tasmania, and across Australia, volunteering rates for emergency services have declined, however the increased frequency of natural disasters and extreme weather events requires an ongoing demand of skilled volunteers (Volunteering Tasmania, 2021).

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- There are several identified barriers to volunteering, such as time constraints of individuals and the mental health challenges arising from exposure to disaster response and recovery (Dwyer, et al., 2020). The combination of these barriers and the increasing frequency of natural disasters is likely to compound the volunteer shortage. As a result, emergency services and health care services that are reliant on volunteering may become further operationally constrained as the evolution of climate change exacerbates existing industry issues.

Existing adaptation response

- **National and state level legislation and actions:** Tasmania's Climate Change Action Plan 2023-25, Healthy Tasmania Five-Year Strategic Plan, The Long-Term Plan for Healthcare 2040, The Tasmanian Disaster Resilience Strategy, The Tasmanian Disaster Risk Assessment.

Justification of adaptation urgency rating

- **Consequence – Major in 2030:** The impacts of climate change on health care and emergency services are expected to be major by 2030 due to the potential for widespread disruption to operational capacity and service delivery as the result of extreme weather events. Climate impacts are projected to have a **major consequence in 2050**. By **2090** this increases to **extreme**, as the consequence of climate change is projected to have widespread long term service disruption, both from acute and chronic hazards as well as cascading risks.
- **Confidence – Medium:** There is a medium level of confidence in the assessment of this risk due to a medium level of agreement and medium level of evidence. While there is understanding of multiple different ways in which climate change will impact the emergency and health care sector, important contextual factors such as the highly decentralised nature of Tasmania's population and the impact this will have on emergency service response in a changing climate, have received limited research. Additionally, this risk has many interrelated risks that will impact on the operational capacity of health care and emergency services. The management of impacts to transport, supply chains for medical supplies, and the management of critical infrastructure will also influence health care and emergency services. As the management of these risks is uncertain, this supports a medium confidence in the assessment of future exposure and the consequence that future climate changes will have.
- **Adaptation shortfall – Partial:** Currently, there is only a partial level of coverage from government strategies in place in the form of national and state legislation, but no clear objective that aligns climate change with improving resilience and functional capacity of health care and emergency management services.
- **Adaptation urgency - Tier 2: Investigate then Act.** Further investigation is required to understand specific impacts in the Tasmanian context and how cascading impacts from interrelated risks will impact the future operational capacity and service delivery of health care and emergency services across the state, given projected increases in climate related extreme weather events coupled with existing vulnerabilities in communities.

5.8.1.2 B2 Risks to the built environment due to climate extremes

B2: Risks to the built environment due to extreme events and chronic climate impacts

- **PHYSICAL - ACUTE:** Risks to the built environment (buildings/building related structures) due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms).
- **PHYSICAL – CHRONIC:** Risks to the built environment (buildings/building related structures) due to changes in chronic temperature, precipitation, and ongoing sea level rise.

Consequence	Confidence	Adaptation shortfall	Adaptation urgency

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Current: Moderate			Overall: High		Partial	Tier 1: Ready to Act
2030 Major	2050 Major	2090 Extreme	Agreement	Evidence		
			High	Medium		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Extreme rain and floods:** Current (West and North-west), Future (North and East)
- **Bushfires:** Current (East and South), Future (North and Central)
- **Sea level rise:** Future (coastal areas)

Key vulnerabilities: Sensitivity of legacy critical infrastructure, increased frequency and severity of climate related damage, loss of insurance and insurance affordability, high proportion of older buildings, buildings located in high-risk areas.

Climate risk summary:

Current climate risks are expected to have moderate consequences on buildings and structures. This is due to the existing evidence of damage that extreme weather impacts have on residential, commercial, industrial, and public infrastructure. There is an existing **vulnerability** for legacy critical infrastructure that is ill-equipped for forecasted changes to the climate or has already been constructed within a hazardous location. Climate change is likely to result in **major consequences** by **2030 and 2050**, and an **extreme consequence** by **2090**. This is due to increasing frequency of extreme weather events, particularly bushfire and flood, that will threaten infrastructure across the state, as well as sea level rise that threatens coastal developments. Additionally, consequences are impacted by the growing number of uninsurable buildings and structures across Tasmania, increasing the **vulnerability** of building owners to damages from acute and chronic events. The **confidence** supporting this is **high**, as there is **medium evidence** and a **high level of agreement** with multiple sources of Tasmanian-specific information. Current adaptation measures are largely provided through national and state legislation and regional/local scale responses aiming to minimise the threats and impacts to buildings and structures. Although there are some knowledge gaps on the scope and number of buildings impacted by climate change, the overall impact of extreme events and chronic climate changes on the built environment are well understood. As such this creates a clear path for action. Focus areas may include flooding and sea level rise, as well as the rising number of effectively uninsurable buildings and structures. Therefore, **adaptation shortfall has been rated as partial.** The adaptation urgency has been rated as **Tier 1: Ready to Act.**

Related impact statements:

- **Natural:** Inland water ecosystems (N1), coastal ecosystems (N3)
- **Social:** Mental health and wellbeing (S2), cultural heritage (S4)
- **Economic:** Land-based primary sector (E4), fisheries and aquaculture (E5)
- **Built:** Stormwater and sewage systems (B4)

Justification and evidence

Current context

- Buildings and structures are threatened by both acute and chronic climate events. Events that pose the greatest current threat include bushfire, prolonged periods of drought, extreme rainfall, storms, and lightning. Extreme weather events and natural disasters can cause a range of damages to private and commercial property, industrial property, research facilities and structures as well as cultural assets. Damage can create significant recovery costs for affected individuals, businesses, and government, and negatively impact insurance premiums. Buildings made from flammable materials that are located within high-risk bushfire areas are at the greatest risk of being damaged by fire. Older buildings with low permeability and those in low lying flood plain areas are at the greatest risk of damage from flood and extreme rainfall. Coastal buildings and structures in low

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lying areas or on the shoreline are exposed to inundation from sea level rise and storm surge, and potential damage from shoreline erosion.

- Tasmania has, on average, 29,000 ha of land damaged by fire each year, with upper limits of 100,000 ha. Damage to buildings in fire affected areas can be irrecoverable and can be geographically widespread due to the nature of fire events. The 2013 fires in southern Tasmania near Dunalley destroyed 203 homes and incurred an insurance claim cost of A$89 million (AIDR, 2013). Areas with the current greatest risk of high intensity fire events include the Huon Valley, large areas from Sorrel north-east to Little Swan Port, large areas of grassland below Launceston, forest near Fingal Valley, Derwent Valley and largely uninhabited areas of grassland in the south-west (State Fire Management Council, 2014). While all areas of Tasmania are exposed to bushfire risk, some regions such as the Tasmanian World Wildlife Heritage Area pose less risk to the built environment in the event of a major fire, such as the one that occurred in 2019, due to significantly fewer buildings structures being located within these regions.
- All regions of Tasmania are exposed to storm risk, with the north-east and north-west regions of Tasmania most exposed. Destructive wind and airborne/falling debris in storms can cause property damage to buildings, and in some cases lead to water ingress, creating issues of mould and water damage within properties. In 2009, Tasmania reported the effects of a tornado in the north-east of the state that caused serious structural damage to homes. (Fox-Hughes, et al., 2018). Coastal infrastructure is covered in further detail in impact statement B5.
- Tasmania is exposed to statewide flooding risk, with 91.5per cent of properties insured for flood damage as of 2016. The 2016 flooding event in Tasmania incurred A$80 million damages to infrastructure (Blake, 2017). While all regions of Tasmania are exposed to the possibility of extreme rainfall, residential areas in the State's north, particularly the northwest, are the most at risk of damage from extreme rainfall events. Launceston's development of a flood mitigation levee, and ongoing investment into this system, successfully protected low lying homes and businesses during the 2016 flooding event. Estimated loss avoidance was roughly A$216 million (Blake, 2017).
- Buildings and related structures are strongly interconnected and dependent on critical infrastructure such as the electricity and telecommunications. Such critical infrastructure and the essential services they support, are already, and will continue to be impacted by both acute and chronic climate hazards (Leal Filho, 2024). The impact of extreme weather events, particularly storms and bushfires, has been long understood (Prakas, 2024). Events that threaten critical infrastructure are increasingly interconnected and can lead to compound effects on buildings and the functionality of the built environment. These impacts can also have complex impacts across domains (CSIRO, n.d.).
- Currently, the urban heat island effect within cities does not appear to be an issue for Tasmania. This is due to the high levels of tree canopy cover in places like Launceston (44.5%), resulting in less strain on buildings that may be unequipped to handle rising temperatures. It should be noted that there is no information on urban heat island effects within Hobart (due to cloud cover obscuring satellite overpass). However, Hobart has seen a 2.7% increase in shrubs and 3.2% increase in grass that may lead to higher levels of tree canopy cover helping to mitigate future urban heat island effects (Greener Spaces Better Places, 2017).
- Legacy infrastructure was built under different circumstances, and often does not suit the climate conditions of the 21st century, including placement in locations that may be deemed unsuitable if construction was to occur now. This includes coastal infrastructure that has been built without consideration for sea level rise or erosion risk, buildings, critical infrastructure, and others structures of importance in high bushfire risk areas, or low-lying floodplains. To respond to these issues, the *Building Act 2016* (Tasmanian Government, 2021) no longer permits these types of construction in areas deemed to be hazardous. There is a low level of information on decisions regarding adaptation and relocation that is required with respect to previously built legacy infrastructure.
- Cultural built heritage infrastructure also contains many features of other legacy infrastructure within the state and is exposed to the same climate hazards. As these buildings and structures are often one of a kind, immovable and irreplaceable, protective management strategies need to be considered to mitigate against the impacts of a changing climate, particularly where changing thresholds have not been considered within the original construction.

Future context

- As climate change impacts continue to evolve, rising sea levels and associated storm surges will continue to threaten the built environment of Tasmania.

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- Climate projections indicate storms and wind speed will increase in Tasmania, particularly during the winter and spring. There is also likely to be a small increase in the frequency of extreme wind gusts during the 21st century. The biggest increases in both mean wind speed and extreme wind gusts occur in northern Tasmania, particularly across both Flinders and King Islands (Checet, et al., 2012).
- Under a high emissions scenario (RCP8.5), by 2100, the most vulnerable electorates to bushfire, flooding and/or coastal inundation will be Franklin, Lyons and Clark, with at least 14 per cent of proprieties in these regions at a medium to high risk of impact (Climate Council, 2022).
- Extreme weather events will have increasing impacts across the built environment, including impacts to critical infrastructure and the essential services they support, such as electricity and telecommunications. Risks to critical infrastructure are managed through robust legislative and regulatory mechanisms and have not been identified as a priority risk in their own right. However, the loss or delayed return of this infrastructure and related services is a complex risk likely to have significant impacts across other domains and affect the state's capacity to respond to other impacts.
- Under a 1.1m sea level rise scenario, between 12,000 – 15,000 residential buildings will be impacted from inundation and shoreline recession (DCCEE, 2011). Key suburban areas at risk of flooding inundation include Hobart (Sandy Bay region and Rosny Park), Glenorchy, Kingston, Ulverstone, Burnie, and Somerset (LISTmap, n.d.).
- As climate hazards continue to occur and grow in both frequency and intensity, reduced availability of insurance for buildings and structures across the state becomes a significant issue. By 2030, 2 per cent of Tasmanian properties (6,905) will have an annual replacement cost for damages greater than 1 per cent. This makes the properties effectively uninsurable for many Tasmanians and businesses, as the cost of premiums will become too high to afford (Hutley, et al., 2022). The north-east and eastern coast of Tasmania is most at risk. The south of Hobart, the City of Clarence, and Huon Valley will also see risks to buildings significantly increase by 2100, as the threat of coastal inundation and bushfire in Tasmania's southwestern national parks becomes more significant (Climate Council, 2022).

Existing adaptation response

- **National and state level legislation and actions:** Building Act 2016, SLR and Allowances for Tasmania, Bushfire Fuel Reduction Program, Tasmanian Disaster Resilience Strategy 2026-2030, Land Information System Tasmania, Tasmanian State Coastal Policy, Tasmanian Planning Scheme, Tasmania's Climate Change Action Plan 2023-25, *Land Use Planning and Approvals Act 1993*.
- **Regional/local scale responses:** Tasmanian Local Council Sea Level Rise Planning Allowances, Launceston Flood Levy.

Justification of adaptation urgency rating

- **Consequence – Major in 2030:** The impact of climate change on the built environment due to climate extremes is projected to be major by 2030. This is supported by existing evidence of impacts to the built environment from extreme climate events, including causing extensive damage and making a significant number of buildings uninhabitable. The consequence is projected to remaining consistent to **2050** and further increase to **extreme in 2090.** This is due to increasing intensity and frequency of extreme weather events and sea level rise creating compounding damages that can cause widespread disruption, a complete loss of utility, and many buildings to become uninhabitable.
- **Confidence – High:** The confidence supporting this risk assessment is high, with a strong level of agreement on the mechanisms by which the built environment is impacted by climate extremes. However, while there is a large quantity of high-quality sources, it has been noted that there is limited quantitative information on the number of homes exposed to specific hazards, particularly at more local and regional scales, resulting in a medium level of evidence.
- **Adaptation shortfall – Partial:** There are several adaptation actions currently in place that support the management of this risk. However, due to the scope of the built environment and potential scale of disruption across the state from climate extremes, adaptation efforts are rated as a partial shortfall.
- **Adaptation urgency - Tier 1: Ready to Act.** Further state level action is required to ensure a coordinated approach to manage risks to the built environment, given projected increase in both climate related extreme weather events and chronic climate impacts. Focus areas may include flooding, bushfire, and sea level rise.

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5.8.1.3 B3 Risks to contaminated sites due to extreme events and chronic climate impacts

B3: Risks to contaminated sites due to extreme events and chronic climate impacts

- **PHYSICAL - ACUTE:** Risks to contaminated sites (landfills, mining areas, polluted land) due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) and causing damage and increased capital expenditure.
- **PHYSICAL – CHRONIC:** Risks to contaminated sites (landfills, mining areas, polluted land) due to changes in chronic temperature, precipitation and ongoing sea level rise.

Consequence			Confidence		Adaptation shortfall	Adaptation urgency
Current: Moderate			Overall: High		Partial	Tier 2: Investigate then Act
2030 Moderate	2050 Major	2090 Major	Agreement: High	Evidence: Medium		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Extreme rain and floods:** Current (West and North-west), Future (North and East)
- **Sea level rise:** Future (East and North-east)

Key vulnerabilities: Sensitivity of dated and legacy sites, coastal sites at risk from erosion and flooding, mobilisation of pollutants and contaminants from sites, sites and related infrastructure not designed for scale of future climate risks.

Climate risk summary:

Current climate risks are expected to have moderate consequences on contaminated sites, with areas in Tasmania exposed to acute hazards capable of causing many short-term disruptions to site operations. Sites with dated infrastructure are particularly **vulnerable**. The **consequences are likely to remain moderate through to 2030**, increasing to **major in 2050 and 2090** due to projected increases in the intensity and frequency of extreme weather events and the long-term impact of projected changes to climate such as sea level rise and precipitation. The **confidence** supporting this assessment is **high,** as there is a **medium level of evidence** and a **high level of agreement** regarding the mechanisms by which acute and chronic hazards will impact contaminated sites. **Tasmanian-specific evidence** on the exposure of contaminated sites **is limited**. Current adaptation measures are largely provided through national and state level legislation and actions. However, further investigation is required to understand the interaction of climate change and Tasmanian contaminated sites, specifically due to aging infrastructure and the long lead time for future infrastructure development. Therefore, **adaptation shortfall has been rated partial**. The adaptation urgency has been rated as **Tier 2: Investigate then Act** highlighting that the current level of response is insufficient to address this risk.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), coastal ecosystems (N3)
- **Social:** Cultural heritage (S4), physical safety and wellbeing (S3)
- **Economic:** Businesses and public organisations (E1), land-based primary sector (E4), fisheries and aquaculture (E5)
- **Built:** Stormwater and sewage systems (B4)

Justification and evidence

Current context

- Contaminated sites (shown on LISTmap) across Tasmania including active and closed landfills, mining areas and polluted land are currently at risk from extreme weather events including extreme rain, flooding, sea level rise and storm surges. These events are projected to increase in both frequency and intensity due to climate change.

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- Contaminated sites are impacted by both acute and chronic climate impacts. While climate change is an issue for both inland and coastal sites, contaminated sites near the coast and those at risk of nearby erosion are most affected. Extreme rainfall in acute events can mobilise contaminants in flood water and displaced sediment, redistributing them into nearby marine and freshwater environments. This can be exacerbated if extreme rain follows periods of drought or a heatwave. Drought can create more permeable soil, leading to higher levels of leaching into landfill, and increasing the concentration of contaminants in sites. There is also a risk of harmful air pollution and airborne contaminants, caused by burning of waste or bushfire events (Kumar & Reddy, 2020). Rising sea levels and associated storm surges threaten contaminated sites with proximity to the coast, due to the impacts of flooding (Morton, 2016).
- Additionally, contaminated sites that have been exposed to toxic materials have previously demonstrated the potential for acid leaching when exposed to large amounts of rainfall. For example, this has occurred at the Mt Lyell copper mine (EPA Tasmania, n.d.).
- Contaminated sites that have dated infrastructure or legacy infrastructure are unlikely to be effectively designed to be resilient to the impact of climate hazards and the evolution of a changing climate. To reduce the risk posed by climate change to contaminated sites, capital investment may be required to fix existing design flaws and improve the adaptive capacity of the operating site (Kumar & Reddy, 2020).
- While modern landfills in Tasmania are subject to strict rules regarding their siting, design, operation, and rehabilitation (EPA Tasmania, 1994), legacy landfills are more likely to be situated in vulnerable areas or subject to erosion and design failures leading to the washout of pollutants.

Future context

- The ability to determine the specific sensitivity and exposure of contaminated sites around Tasmania to climate change is hindered by a lack of information on the location of many closed landfills and mines. As such, detailed investigations have not yet been undertaken to determine the vulnerability of contaminated sites to climate change.
- In general, contaminated sites around Tasmania will face increasing exposure to climate risk, particularly under a higher emission scenario (SSP3-7.0) towards the end of the 21st century.
- Extreme rain is projected to increase in both intensity and frequency, leading to an increase in associated flooding. This may increase the mobilisation of toxic chemicals from contaminated sites or remobilise toxic chemicals already in the environment.
- Similarly, many legacy landfills and contaminated sites are in low-lying coastal areas, making them susceptible to future sea level rise and the increased frequency of storm surge events.
- The failure of contaminated sites and landfills to contain pollution can potentially lead to cascading consequences for the environment, public health, and the economy.

Existing adaptation response

- **National and state level legislation and actions:** Landfill Sustainability Guide 2004, Environmental Management and Pollution Control Act 1994 (EMPCA), Risk ready, Tasmanian Disaster Resilience Strategy 2026-2030, Land Information System Tasmania.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** Climate change impacts to contaminated sites are projected to be moderate by 2030. Acute events and chronic climate changes may cause many short-term disruptions to contaminated sites. Where contaminated sites are older and have more dated infrastructure, there is a higher level of **vulnerability**, which may require increased maintenance and repair to offset damages. Consequence is projected to increase to **major** in **2050** and **2090**, as climate impacts exceed disaster resilience thresholds for existing infrastructure, causing extensive damage to contaminated sites.
- **Confidence – High:** While there is a high level of confidence due to the strong level of agreement, there is limited information available on the exposure of Tasmanian sites to contamination risks, resulting in a medium level of evidence. Based on this lack of Tasmanian-specific evidence, there is ambiguity as to the required focus for adaptation action.
- **Adaptation shortfall – Partial:** While there are several actions identified that incorporate the management of contaminated sites, the degree to which these management actions consider adaptation is not clear. This results in a partial shortfall.

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- **Adaptation urgency - Tier 2: Investigate then Act.** Further investigation is required to understand specific impacts of climate change to contaminated sites in Tasmania.

5.8.1.4 B4 Risks to stormwater and sewerage systems due to extreme events and chronic climate impacts

B4: Risks to stormwater and sewerage systems due to extreme events and chronic climate impacts

- **PHYSICAL - ACUTE:** Risks to stormwater and sewerage systems due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, storm surge) causing damage and increased flow.
- **PHYSICAL – CHRONIC:** Risks to stormwater and sewerage systems (stormwater and wastewater systems) due to changes in chronic precipitation and ongoing sea level rise causing damage and increased flow.

Consequence			Confidence		Adaptation shortfall	Adaptation urgency
Current: Moderate			Overall: High		Partial	Tier 2: Investigate then Act
2030	2050	2090	Agreement	Evidence		
Moderate	Major	Major	High	Medium		

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Extreme rain and floods:** Current (West and North-west), Future (North and East)
- **Sea level rise:** Future (coastal areas)

Key vulnerabilities: Existence of illegal inflows and groundwater infiltration, stormwater infrastructure not designed for scale of future climate risks, overwhelmed infrastructure leading to stormwater overflows and pollution issues, reduced infiltration capacity of urban areas.

Climate risk summary:
Current climate risks are expected to have a moderate consequence on stormwater and sewage systems. In Hobart, limited geographical coverage, and relatively new stormwater infrastructure create greater vulnerability to stormwater flooding. Additionally, sewerage systems have a **vulnerability** to extreme rainfall and flooding events due to the existence of illegal inflows and groundwater infiltration into the pipe network. Climate change is likely to result in **moderate consequences by 2030, and major consequence by 2050 and 2090** due to increased intensity and frequency of extreme rainfall, and existing vulnerabilities being exacerbated by ongoing sea level rise. The **confidence** supporting this assessment is **high,** due to **medium scientific evidence** and a **high level of agreement**. However, further investigation is required to specifically address knowledge gaps across each of the two separate systems. Current adaptation measures are largely provided through national and state level legislation and actions. However, current adaptation measures only provide partial coverage for this risk and further investigation is required to specifically understand the interactions of climate change. Additionally, as the sewerage and storm water systems are managed separately, actions identified within one system cannot be applied as a management approach for the other. Therefore, **adaptation shortfall has been rated as partial.** The adaptation urgency has been rated as **Tier 2: Investigate then Act** highlighting that the current level of response is insufficient, and that further investigation is needed to guide adaptation actions for both major urban centres and regional locations.

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Related impact statements:

- **Natural:** Coastal ecosystems (N3), inland water ecosystems (N1),
- **Social:** Mental health and wellbeing (S*), maladaptation and insufficient adaptation policies (S)
- **Economic:** Land-based primary sector (E4), fisheries and aquaculture (E5)

Justification and evidence

Current context

- In Tasmania, stormwater and sewage pipes are separate systems that are managed independently. As such, there can be differing impacts and considerations for the two networks.
- Extreme rainfall and intense rainfall events can lead to stormwater flooding, and result in damage and recovery costs to repair underground stormwater infrastructure. Similar events may incur instances of sewage overflows, when stormwater inadvertently enters and compromises the sewage system, threatening the physical health of citizens (National Water Comission, 2012).
- Excessive stormwater overflows can reduce the capacity of soil to absorb stormwater and therefore increase surface runoff. In such instances, urban environments can experience increased pollution if storm water systems are unable to accommodate the precipitation event (Department of Primary Industries, Parks, Water and Environment, 2010).
- Hobart is situated between Kunyani/Mount Wellington and the Derwent Estuary, making it prone to flash flooding from extreme rainfall events (City of Hobart, 2021), as seen recently in 2018. While Launceston has similarly exposed areas that are prone to flash flooding and inundation of stormwater systems, the city receives additional protection from the Launceston Flood Levees (City of Launcestion, n.d.).
- Hobart's implementation of stormwater infrastructure is relatively new, with areas of the city and surrounding area containing limited to no stormwater infrastructure (City of Hobart, n.d.). Many properties discharge stormwater from roofs onto the ground, and in some cases where there are illegal connections into the sewer system, stormwater is redirected into sewer pipes. In extreme rainfall events, this can lead to sewer overflows, and increased risk for houses in low-lying areas (City of Hobart, n.d.).
- Issues associated with stormwater management are more prevalent in urban areas compared to rural areas due to a higher number of impervious surfaces reducing the capacity of urban settings to absorb extreme rainfall events.
- While major towns and urban centres within Tasmania are part of a connected sewage system, there are many rural areas in Tasmania which require independent on-site septic systems, as it is not feasible to be connected to the sewage network (ReCFIT, 2023d). In such locations, particularly those in coastal locations, instances of flooding from extreme rainfall, sea level rise and storm surges can cause the failure of septic systems.
- High intensity rainfall events and flooding place pressure on sewerage pipes from increased inflows. Where illegal connections to the sewerage network exist, the stormwater generated in an intense rainfall event can damage pipe infrastructure. Additional pressure can be generated from higher levels of groundwater in extreme rain and flooding events which causes higher rates of groundwater to seep into sewerage networks through drainage cracks, manhole covers, and joints in the pipe network.

Future context

- In coastal areas where existing ground water levels are naturally high, repeated extreme rainfall and flooding will further exacerbate these issues from stormwater systems, as natural environments have a lesser ability to absorb stormwater and increase the amount of surface runoff as a result (NOAA, 2024).
- Sea level rise in low lying areas can lead to repeated inundation of drainage and sewage infrastructure, causing blockages (National Water Comission, 2012). In cases where sea level rise impacts the viability of gravity sewer systems, increased expenditure is expected for repair of sewerage infrastructure (Ware, 2016).

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- Increases in the frequency of storm surge events will put pressure on adaptation and clean-up efforts.

Existing adaptation response

- **National and state level legislation and actions:** Risk ready, Tasmania Disaster Resilience Strategy 2026-2030, Land Information System Tasmania.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** Climate impacts on stormwater and sewerage systems are projected to be moderate by 2030. This will be driven by the short-term disruptions from extreme rain and flooding events. Additionally, increased damages to pipe infrastructure that is caused from infiltration and illegal inflows in extreme rain events will see an increase in repair costs. By 2050 and 2090, climate change is projected to cause a major consequence to stormwater and sewerage systems. This is due to several reasons, including increased frequency of flash flooding, greater inundation of rural communities, and flooding damage from ongoing sea level rise. These impacts are likely to place increased pressure on stormwater systems. Projected increases in the intensity of rainfall events and altered rainfall patterns may create larger inflows into sewerage pipes, placing greater pressure on the system and increasing the risk of damage to assets.
- **Confidence – High:** There is a high confidence in the assessment of this risk, with a high level of agreement and a medium level of evidence. It is important to note that there are some knowledge gaps in the vulnerability of the Tasmanian stormwater system with respect to a changing climate.
- **Adaptation shortfall – Partial:** Currently there is a partial adaptation shortfall. While there are some adaptation actions that have been implemented to address this risk including management of sewerage by TasWater, there is limited coverage at a statewide level of the management of stormwater.
- **Adaptation urgency - Tier 2: Investigate then Act. Further investigation is required to understand specific impacts and to ensure that actions relevant to sewage and storm** water systems are managed in a coordinated way.

5.8.1.5 B5 Risks to ports and coastal infrastructure

B5: Risks to ports and coastal infrastructure due to extreme events and sea level rise

- **PHYSICAL - ACUTE:** Risks to ports and coastal infrastructure due to extreme weather events (storm surge, winds, storms).
- **PHYSICAL – CHRONIC:** Risks to ports and coastal infrastructure due to ongoing sea level rise.

Consequence			Confidence		Adaptation shortfall	Adaptation urgency
Current: Minor			Overall: Medium		Partial	Tier 1: Ready to Act
2030 Moderate	2050 Moderate	2090 Major	Agreement	Evidence		
			High	Low		
Risk/Opportunity summary and associated impact statements						

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Key hazards (regions exposed):

- **Storm surge:** Current (coastal regions), Future (coastal regions)
- **Storms:** Current (North), Future (North and Islands)
- **Sea level rise:** Future (coastal regions)

Key vulnerabilities: long lead time to implement adaptive action, increased disruptions and closures, reliance on ports for functioning of state, increased asset damage and maintenance costs, assets and infrastructure not designed for future sea levels and more intense storm surges.

Climate risk summary:
Current climate risks are expected to have moderate consequences on ports and coastal infrastructure. This is predominately from existing impacts to port infrastructure causing isolated short-term disruptions, with no permanent damage to assets. Climate change is likely to result in moderate **consequences by 2030 and 2050, and major consequences by 2090** due to projected increases in sea level rise and the associated intensification of storm surge events. The **confidence** supporting this assessment is **medium**, as there is **a low level of evidence** and a **high level of agreement** at the international scale regarding climate change related impacts to ports and coastal infrastructure. **Tasmanian-specific evidence** regarding the exposure and vulnerability of ports and coastal infrastructure **is limited**. Current adaptation measures are largely provided through national and state level legislation and regional/local scale measures to port infrastructure that are managed by TasPorts. However, given the importance of ports to Tasmania, and the long lead times to implement adaptative actions for large scale port and coastal infrastructure, further investigation is required to specifically understand the interactions of climate change at the state level. Therefore, adaptation shortfall has been rated as **partial.** The adaptation urgency has been rated as **Tier 1: Ready to Act** highlighting that the current level of response is insufficient to address this risk.

Related impact statements:

- **Natural:** Coastal ecosystems (N3),
- **Social:** Mental health and wellbeing (S2)
- **Economic:** Land-based primary sector (E5), fisheries and aquaculture (E5)
- **Built:** Health care and emergency services (B1), transport (B6), low emissions transport (BT4)

Justification and evidence

Current context

- TasPorts is a state-owned company responsible for the operation of ten ports across Tasmania. These ports are essential for the movement of 99per cent of Tasmania's freight. As an island state, the operation of these ports acts as an integral component to the functioning of Tasmania. Other than the Port of Hobart, all ports are located in the State's North, with additional cargo and community ports on King Island and Flinders Island (TasPorts, n.d.).
- Port infrastructure contains multiple elements that can be vulnerable to climate risks (Fisk, 2017; PIANC, 2014):
    - Storm surge and flooding events pose risks including erosion, wave damage to port facilities, and disruptions to operations. They increase maintenance costs, necessitate emergency dredging, and raise the likelihood of power outages and drainage system impacts. Inundation of cargos and hazardous materials can also lead to negative environmental outcomes.
    - Strong winds, intense rainfall and lightning can damage loading infrastructure like cranes and halt work operations.
    - Heatwaves and higher temperatures raise air conditioning costs, increase the strain on refrigerated storage, and increase heat-related health risks for workers, potentially disrupting operations and requiring adjusted work hours.
    - Sea level rise exposes Tasmanian port structures to heightened wave action, changes in coastal morphology, and increased saltwater corrosion. It reduces clearance for ships, and could affect loading, unloading and vessel passage under overhead obstacles like bridges. Additionally, impacts to rail and road transport networks and supply chains can have a flow on disruption to port operations. This will be discussed more in in Risk Profile B6.
- Coastal infrastructure includes a variety of assets such as piers, marinas, coastal roads and bridges, coastal tourism assets, car parks and key community buildings such as surf lifesaving clubs.
- Coastal infrastructure is impacted from multiple climate hazards. Rising sea levels create more intense storm surges, which can damage existing structures, create saltwater intrusion damage, and alter sediment flows that

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may change the efficacy of existing infrastructure. Sea level rise, extreme rainfall and storm events also expose coastal infrastructure to wave damage, shoreline erosion and flooding inundation in low lying areas (Ministry for the Environment, 2024).

Future context

- Due to the nature of port infrastructure, there is limited flexibility to modify existing port locations, as this requires long development times, substantial upfront costs, and extensive changes to existing connecting infrastructure. This is reflected in the outcomes of TasPorts 2043 plan, which recommended that the state should maintain and continue to support the existing multi-port system (TasPorts, 2015). This highlights that improvements to the adaptive capacity and resilience of existing infrastructure will be the approach to managing port infrastructure in the future.
- A 2008 Climate Change and Coastal Asset Vulnerability report published by the Department of Primary Industries and Water identified key areas of concern to infrastructure from a projected high sea level rise scenario in 2100. It listed key coastal assets such as community buildings, hundreds of kilometres of coastal access roads, state highways, and coastal service stations as some of the areas of high concern due to impacts of storm surge and inundation from sea level rise (DPIW, 2008).
- Sea level rise and more intense storm surges might require capital investment into preventative coastal infrastructure. This could include the development of new projects as well as projects to upgrade existing sea walls that are vulnerable to spill over and damage (Department of Climate Change, 2009).
- Future designs and location selections for piers, jetties, marinas and boating facilities will need to consider sea level rise and future climate change impacts such as storm surges, to ensure that they will remain operational in the context of future weather and tidal conditions (Page & Thorp, 2010).

Existing adaptation response

- **National and state level legislation and actions:** Understanding Future Risks to Ports in Australia.
- **Regional/local scale responses:** TasPorts Sustainability Strategy Regional Port Management Plans, Regional Strategy – Adapting a Changing Coastline.

Justification of adaptation urgency rating

- **Consequence – Moderate in 2030:** Climate impacts are projected to have a moderate consequence to ports and coastal infrastructure by 2030. This is predominately expected to be driven by short term disruptions to ports across Tasmania from an increasing frequency of extreme rain, storms, and extreme wind. Damaged coastal infrastructure in the next five years is expected to be repairable, as sea level rise and associated storm surges will have more noticeable damages in future time horizons. This will remain consistent to **2050** and increase to **major consequence** by **2090** as ongoing sea level rise, storm surges and extreme weather have a more significant impact on Tasmanian ports.
- **Confidence – Medium:** The confidence for the assessment of this risk is medium. Despite high levels of agreement on an international scale as to how climate change impacts ports and coastal infrastructure, there is a low level of evidence at a national and state scale.
- **Adaptation shortfall – Partial:** There are multiple identified adaptation measures currently in place for ports and coastal infrastructure. However, considering Tasmania is an island state, the effective long-term management of its ports is of critical importance. As such, there is a partial shortfall since the interactions of multiple related risks with ports across the state has created some gaps in the coverage of this risk. Additionally, large-scale adaptation actions have long lead times as changes to ports and coastal infrastructure are complex, involving high levels of effort both from a funding and construction perspective.
- **Adaptation urgency – Tier 1: Ready to Act.** Further state level action is required to understand specific impacts of climate change on ports in the Tasmanian context and ensure a coordinated approach to managing risks to ports and coastal infrastructure, given projected sea level rise, storms and storm surge, coupled with the limited flexibility in modifying existing port locations.

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5.8.1.6 B6 Risks to transportation networks due to extreme events and chronic climate impacts

B6: Risks to transportation networks due to extreme events and chronic climate impacts

- **PHYSICAL - ACUTE:** Risks to transportation networks (roads/railways/airports) due to increased frequency and intensity of extreme weather events (extreme rain and floods, bushfires, extreme heat, storms, winds).
- **PHYSICAL – CHRONIC:** Risks to transportation networks (roads/railways/airports) due to changes in chronic temperature, precipitation, and ongoing sea level rise.

<table>
<tr><th colspan="3">Consequence</th><th colspan="2">Confidence</th><th>Adaptation shortfall</th><th>Adaptation urgency</th></tr>
<tr><td colspan="3">Current: Moderate</td><td colspan="2" rowspan="2">Overall: High</td><td rowspan="3">Partial</td><td rowspan="3">Tier 1: Ready to Act</td></tr>
<tr><td rowspan="2">2030
Major</td><td rowspan="2">2050
Major</td><td rowspan="2">2090
Extreme</td></tr>
<tr><td>Agreement</td><td>Evidence</td></tr>
<tr><td colspan="3"></td><td>High</td><td>Medium</td><td></td><td></td></tr>
</table>

Risk/Opportunity summary and associated impact statements

Key hazards (regions exposed):

- **Extreme rain and floods:** Current (West and North-west), Future (North and East)
- **Extreme heat:** Current (North), Future (North and Islands)
- **Sea level rise:** Future (coastal regions)

Key vulnerabilities: Loss of connectivity impacting businesses and communities, coastal infrastructure at risk from erosion and flooding, increased damage and repair costs, increased delays, and loss of operational capacity, impacts to safety of staff and public.

Climate risk summary:
Current climate risks are expected to have a moderate consequence on transport networks within Tasmania. This may cause many short-term disruptions to utility; however, damages are in most cases currently recoverable by maintenance and repair. Climate change is likely to result in **major consequences by 2030 and 2050, and extreme consequences by 2090**, as the frequency and intensity of extreme weather events increases, as along with worsening chronic climate changes. The **confidence** supporting this is **high**, as there is **medium level of evidence** and a **high level of agreement** on the mechanisms through which transport networks are affected by both acute and chronic climate hazards. Current adaptation measures are largely provided through state level legislation and regional/local scale responses. However, further investigation is required to specifically understand the interactions of climate change on Tasmanian transport networks and a high level of coordination across many areas is required to improve statewide transport resilience. Therefore, the adaptation shortfall has been rated as **partial**. The adaptation urgency has been rated as **Tier 1: Ready to Act** highlighting that the current level of response is insufficient to address this risk given the potential for widespread service disruption and loss of critical transportation infrastructure.

Related impact statements:

- **Social:** Social cohesion and community wellbeing (S1), Mental health and wellbeing (S2), Physical safety, health, and wellbeing (S3)
- **Economic:** Risks to businesses and public organisations (E1), Risks to supply chains (E2), Land-based primary sector (E4), fisheries and aquaculture (E5)
- **Built:** Low emissions transport (BT4), health care and emergency services (B1), ports and costal infrastructure (B5), Transport (BT1, BT4)

Justification and evidence

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Current context

- Tasmania's transportation network has a strong reliance on road networks, with the predominant transport choice being motor vehicles owned by individuals rather than public transport. This is due in part to its mountainous terrain and dispersed population with low urban density (ReCFIT, 2023c). TasRail does not provide a passenger train system, however it is essential for connecting businesses and industry to major ports and freight terminals. The state road network is made up of over 3,700km of roads and over 1,300 bridges and major structures, facilitating the movement of people and freight.
- Tasmania's transport infrastructure is exposed to a multitude of threats from climate change, which will create significant recovery costs and incurred costs to the economy from disruptions and delays. A summary of expected impacts is listed below (Fisk, 2017):
- Roads
    - Storms and extreme rainfall: Flash flooding events, extreme rain, lightning, and extreme wind created by flooding events can cause damage to roads and surrounding road infrastructure such as bridges, tunnels, and signage. Additionally, these events may induce a landslip, creating substantial damage to sections of road. These impacts can lead to significant repair costs, road closures, delays, and safety risks to road users. Changes to rainfall patterns may also impact road maintenance activities via changes to the incidence of weeds and vegetation growth.
    - Increasing temperature: Heatwaves and rising temperatures pose risks such as road fatigue, surface degradation, UV-induced tarmac oxidation, stressed infrastructure, heat-related health issues, and altered work schedules, necessitating increased maintenance, safety measures, and adaptive work practices.
    - Bushfires near roads can destroy assets, create unsafe driving conditions, limit escape routes for residents, and hinder emergency vehicle access, posing significant safety and infrastructure challenges.
    - Sea level rise leads to inundated low-lying roads, saltwater intrusion damaging infrastructure, and increased costs for protecting and restoring coastal roads against erosion. Impacted roads may be closed or experience substantial delays.
- Rail
    - Storms and extreme weather heighten risks like erosion, flood damage, and infrastructure failures along coastal train routes, as seen in Burnie. This can lead to delays, cancellations, and increased maintenance. It also increases the likelihood of safety risks from landslides, reduced traction during extreme weather, and debris hazards, affecting reliability and safety of rail operations.
    - Heatwaves and increasing temperatures in Tasmania raise risks of track failures, heat-related illnesses among workers, and necessitate adjusted work hours. These impacts affect rail operations and safety, demanding adaptive measures and enhanced worker safety protocols. Bushfires will have a similar impact as felt on road networks for disruption and destruction of assets.
    - Sea level rise and associated storm surges can flood low lying coastal rail tracks, while saltwater intrusion and erosion can threaten the operational capacity of lines.
- Airports and airfields
    - Extreme rainfall and storms could suspend operations at major airports, including Launceston, Hobart, and Devonport. This will have flow on complications and impacts on passengers and supply chains. Storms can increase likelihood of power outages due to flooding of electrical facilities and increase the impacts on airport drainage systems. Extreme storms may cause damage to runways and surrounding critical infrastructure.
    - Extreme heat can lead to higher energy costs associated with air conditioning in passenger terminals and cargo areas. Workers are also exposed to increased health and safety risks from heat related stressors, and potentially reductions in working hours. Bushfires within the vicinity of airports may lead to delays from smoke disruption.

Future context

- Increases in extreme weather events including storms, extreme rainfall, floods, and bushfires are likely to increase the physical damage caused to land based transport networks (such as roads, rail) and associated infrastructure (such as bridges and tunnels).
- Higher temperatures, and the increased occurrence of heatwaves and drought conditions may increase impacts to road and rail networks through land subsidence, degradation of asphalt, and the buckling of rails. Road and

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rail networks in the north of Tasmania are likely to be at greater risk, as maximum temperatures and hot days are projected to be higher in these locations.

- Increases to extreme rain and floods are likely to increase impacts on road and rail networks through direct damage to asphalt and rails, and damage to supporting infrastructure such as signage, lights and embankments that may be washed away.
- In coastal locations, ongoing sea level rise and the increased occurrence of storm surge events are likely to increase physical damage and repair costs to low lying infrastructure.
- Climate related damage to transport infrastructure is likely to increasingly impact the movement of people and freight, leading to significant disruptions and costs to businesses, households, and government. The provision of emergency services (police, fire, ambulance) may also be impacted as they rely on the road network to remain operational.

Existing adaptation response

- **National and state level legislation and actions:** Tasmanian Urban Passenger Transport Framework.
- **Regional/local scale responses:** Regional Integrated Transport Plans, Hobart Airport Climate Change Adaptation Plan 2020, Hobart Airport Climate Risk Register.

Justification of adaptation urgency rating

- **Consequence – Major in 2030:** Climate impacts are projected to have a major consequence to transportation networks by 2030. This will be particularly driven by an increasing frequency and intensity of extreme weather events causing widespread short-to-medium term disruptions to transport infrastructure. Extreme events such as floods and bushfires may cause extensive infrastructure damage requiring major repairs at a state scale. Consequence is projected to remain major in 2050 and increase to extreme in 2090. This is driven by increasing frequency and intensity of extreme events and ongoing chronic climate changes. These impacts will also heavily influence cascading risks that interact with transport networks, leading to widespread service disruptions to road, rail, and air transport networks. Transport networks in some regions may incur a complete loss of utility.
- **Confidence – High:** The confidence supporting the assessment of this risk is high, as there is a high level of agreement on the impact of climate change to transportation networks. While there is a medium level of evidence, this high level of agreement helps provide a clear direction on where adaptation should be targeted.
- **Adaptation shortfall – Partial:** Currently, adaptation measures are considered to have a partial coverage of this risk. This is largely due to the scale of adaptation that is required to ensure that the entire State's risk to transport is well managed.
- **Adaptation urgency - Tier 1: Ready to Act.** Further state level action is required to respond to specific impacts of climate change on Tasmanian transport networks and ensure a coordinated approach to improving transport resilience, given projected increases in frequency and intensity of extreme weather events, coupled with the potential for widespread service disruption and loss of critical transportation infrastructure.

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5.8.2 Built domain - Transition risks

5.8.2.1 BT1 Opportunities for public and active transport

BT1: Opportunities for public and active transport			
Opportunities for public and active transport reducing transport emissions for individuals and some businesses, with associated co-benefits.			
Confidence		**Adaptation shortfall**	**Adaptation urgency**
Overall: Very high		**Partial**	**Tier 3: Continue to Monitor Current Actions**
Agreement	**Evidence**		
High	**High**		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Public and active transport:** Currently (Hobart and Launceston), Future (Hobart, Launceston, other regional centres),

Key barriers: Aging infrastructure.

Climate opportunity summary:
Promoting public and active transport offers numerous benefits, including reduced emissions, lower congestion, and pollution, improved public health, enhanced public spaces, economic growth, efficient land use, energy conservation, improved safety, stronger community cohesion, and greater urban resilience. These impacts foster sustainable and liveable urban areas. Future opportunities in public and active transport are expected to increase, particularly under a low emissions scenario. The **confidence** supporting this is **very high** as there is **a high level of agreement** and **high level of evidence** on the impacts of the opportunities. Current adaptation actions exist, with state strategies and frameworks with some regional strategies in place. Alignment across levels of government, and implementation is required to fully realise this opportunity. **Adaptation shortfall** has been rated **Partial**. The adaptation urgency rating is **Tier 3: Continue to Monitor Current Actions**.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), terrestrial ecosystems (N2)
- **Social:** Social cohesion (S1, ST2), mental health and wellbeing (S2), physical health and wellbeing (S3), financial wellbeing (ST6)
- **Economic:** Businesses and public organisations (E1)
- **Built:** Built environment (B2), circular economy (BT3)

Justification and evidence

Current context

- Promoting public and active transport can lead to numerous benefits for the built environment, including reduced congestion and pollution, improved public health, enhanced public spaces, economic growth, efficient land use, energy conservation, improved safety, stronger community cohesion, and greater urban resilience. These positive impacts contribute to creating more sustainable and liveable urban areas.
- Transport emissions currently make up 21 per cent of the State's emissions, excluding land use, land use change and forestry emissions. Cars account for 46 per cent of total transport emissions, with heavy duty trucks and buses at 31 per cent and light commercial vehicles at 23 per cent (ReCFIT, 2024c).

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- Together, the Tasmanian Transport Access Strategy and Tasmanian Urban Passenger Transport Framework provide for integrated and coordinated passenger transport in Tasmania (Department of State Growth, n.d.; Department of State Growth, 2010).
- Better Active Transport Grant programs include a statewide initiative and a specific one for Greater Hobart. They support local governments in developing and constructing active transport infrastructure such as bike paths, shared pathways, and pedestrian crossings (Infrastructure Tasmania, 2024).
- The Tasmanian Active infrastructure program allocates A$10 million over two years, supports the development and upgrade of sport and active recreation infrastructure which may include parks, walking paths and cycle ways (Department of State Growth, 2024a).
- Greater Hobart Cycling Plan has specific funding allocated to support the delivery of the Plan. These projects aim to create safer and more accessible cycling routes in the Hobart area (Infrastructure Tasmania, 2024).

Future context

- Opportunities in pubic and active transport are likely to increase in the future, with particular emphasis on an improved transport system under a low emissions scenario.

Existing adaptation responses

- **National and state level legislation and actions:** Tasmanian Transport Access Strategy, Tasmanian Urban Passenger Transport Framework Better Active Transport Grant, Tasmanian Active Infrastructure program.
- **Regional/local scale responses:** Greater Hobart Cycling Plan.

Justification of adaptation urgency rating

- **Confidence – Very High:** There is overall a very high level of confidence given the high level of agreement and high level of evidence on the impact of public and active transport on emissions, with co-benefits and health and wellbeing.
- **Adaptation shortfall – Partial:** There is a statewide strategy in place, supported by regionally aligned strategies, however continued implementation may be needed to ensure all objectives under frameworks are realised.
- **Adaptation urgency - Tier 3: Continue to Monitor Current Actions.** Tasmania has a statewide policy in place, supported by regionally aligned strategies to support public and active transport. Implementation of these initiatives should continue to realise this opportunity.

5.8.2.2 BT2 Opportunities for improved flexibility within electricity infrastructure

BT2: Opportunities for improved flexibility within electricity infrastructure

Opportunities for improved flexibility within electricity infrastructure system from increased renewable energy generation.

Confidence		Adaptation shortfall	Adaptation urgency
Overall: Very High		Partial	Tier 3: Continue to Monitor Current Actions
Agreement	Evidence		
High	High		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Renewable energy**: Currently (statewide), Future (statewide)

Key barriers: Supply chain and technology constraints.

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Climate opportunity summary:
Tasmania has a strong history of renewable energy development and aspires to achieve 150 per cent renewables generation by 2030 and 200 per cent renewable energy generation by 2040. Successful realisation of these aspirations may create opportunities for increased flexibility in the electricity system, such as utilising Consumer Energy Resources, microgrids, demand response and remote energy supply. Tasmania's major energy projects (Marinus Link and associated transmission, Renewable Energy Zones, Battery of the Nation, and Hydrogen Hub) will also allow for further development and flexibility at a larger scale, such as increased load. The **confidence** supporting this is **very high,** as there is a high level of agreement and high level of evidence including examples and literature from Tasmania, and Australia. Flexibility within electricity infrastructure is considered in current responses to this opportunity, however implementation of actions specific to increasing is still required, further consideration of Consumer Energy Resources and remote electricity systems may require further consideration in action plans. In addition, overall implementation of Tasmania's renewable energy strategy is still required with some key risks still to be resolved. Adaptation shortfall is rated **Partial** in the realisation of this opportunity. The adaptation urgency rating is **Tier 3: Continue to Monitor Current Actions**.

Related impact statements:

- **Natural:** Energy development (NT2)
- **Social:** Cultural heritage (S4)
- **Economic:** Businesses and public organisations (E1), land-based primary sector (E4),
- **Built:** Transport networks (B6, BT4)

Justification and evidence

Current context

- Increased renewable energy generation presents opportunities for electricity infrastructure flexibility. Strategies include demand response programs, energy storage technologies, grid modernisation, and distributed generation. Hybrid renewable systems combine sources for increased reliability which can improve sustainability and energy delivery outcomes for remote locations. Increased generation, storage and interconnection delivered through Tasmania's major energy projects (Marinus Link and associated transmission, Renewable Energy Zones, Battery of the Nation, and Hydrogen Hub) will also allow for further development and flexibility at a larger scale. This may include increased capacity for load in Tasmania, allowing businesses within Tasmania to expand their operation or switch to low emissions electricity to reduce emissions. Supportive policies drive investment in flexible infrastructure and renewable integration, including renewable energy targets, grants, and incentives.
- Currently, Tasmania has around 2.3 GW of hydro capacity, 0.6 GW of wind capacity, and 0.3 GW of rooftop solar which provides a base of flexible generation for the Tasmanian electricity grid. However, Tasmania is currently constrained in the level of additional load that can be added, and the load capacity of some areas in the transmission and distribution network.
- Tasmania's Renewable Energy Target (TRET) sets out an aspiration to achieve 200per cent net renewables by 2040. Renewable energy includes hydrogen produced with electrolysers, which require large amount of renewable power as input, contributing to demand for larger renewable electricity generation and storage capacity.
- Major projects and programs to support the TRET include Marinus Link and supporting transmission infrastructure, Battery of the Nation, and Renewable Energy Zones.
- Tasmanian's Hydrogen Action Plan will also increase flexibility of Tasmania's energy supply.
- The Tasmanian Government Energy Saver Loan Scheme provides support for households looking to install rooftop solar and Consumer Energy Resources.
- The Australian Government's National Consumer Energy Resources Roadmap may provide support and frameworks to support consumer energy generation and demand response (Department of Climate Change, 2024a).
- Energy market bodies such as the Australian Energy Market Commission and Australian Energy Market Operator also have work programs aimed at improving frameworks and regulation to support consumer energy resources (AEMC, 2023)

Future context

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- Under a low emissions scenario, wind capacity installed in Tasmania is expected to increase substantially 2030, with an additional 0.6 GW installed between 2030 and 2050. Between 2030 and 2050, 0.4 GW of battery storage is expected to be installed in Tasmania.

Existing adaptation responses

- **National and state level legislation and actions:** Implementation of Tasmania's renewable energy priorities as outlined in Tasmanian Renewable Energy Action Plan, Tasmanian Renewable Hydrogen Action Plan, Renewable Energy Coordination Framework (ReCFIT, 2024b).

Justification of adaptation urgency rating

- **Confidence – Very High:** There is overall a very high level of confidence given the high level of agreement and high scientific evidence on the benefits of renewable energy for flexibility within the electricity system. This is supported by case studies and Australia and Tasmania-specific research.
- **Adaptation shortfall – Partial:** Current actions partially shortfall the realisation of opportunities with frameworks and action plans in place. Further consideration and implementation action may be required for remote areas and Consumer Energy Resources. Action plans require implementation.
- **Adaptation urgency - Tier 3: Continue to Monitor Current Actions**. Tasmania has a range of initiatives in place to support this opportunity. Further consideration and implementation action may be required for remote areas and Consumer Energy Resources.

5.8.2.3 BT3 Opportunities for infrastructure development to increase circular economy

BT3: Opportunities for infrastructure development to increase circular economy

Opportunities for infrastructure development to increase circular economy.

Confidence		Adaptation shortfall	Adaptation urgency
Overall: High		Partial	Tier 1: Ready to Act
Agreement	Evidence		
Medium	High		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Circular**: Currently (statewide), Future (statewide)

Key barriers: Lack of or insufficient investment, slow or ineffective action, poorly designed or lack of plans and actions, lack of state and/or national commitment.

Climate opportunity summary:

Infrastructure development for a circular economy in Tasmania includes efficient Resource management systems. Future opportunities under low emissions scenarios emphasise resource efficiency and robust climate policies, leading to increased recycling and reduced environmental impact. The **confidence** supporting this is **high,** as there is a medium level of agreement and **high level of evidence** containing some Tasmanian specific information. **Adaptation shortfall** is rated **Partial.** Tasmania's overarching strategy waste and resource recovery strategy has been recently updated, with pillars focusing on promoting circularity within the Tasmanian economy. Action plans for implementation are yet to be developed which will clarify the coverage and provide insight into whether action is sufficient to fully realise this opportunity. The **adaptation urgency rating** for this profile is **Tier 1: Ready to Act**.

Related impact statements:

- **Natural:** Inland water ecosystems (N1), terrestrial ecosystems (N2), native ecosystems (N5), renewable energy development (NT2), waste material (NT3)

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- **Economic:** Businesses and public organisations (E1), land-based primary sector (E4), fisheries and aquaculture (E5), businesses (ET3)
- **Built:** Stormwater and sewage systems (B4)

Justification and evidence

Infrastructure development is required to advance circular economy opportunities by enhancing resource management systems. Investment in advanced circular economy infrastructure can reduce waste and improve resource efficiency. Circular economy design includes water recycling systems, refurbished products, and sustainable urban planning.

Current context

- Investing in efficient waste management and recycling infrastructure is an essential component of a circular economy, helping to minimise wastage and pollution, while allowing for disposed materials to be recycled and repurposed. Tasmania has invested in the establishment of a rubber crumbling plant, to convert end of life tyres across the state into reusable material for road infrastructure. The Tasmanian Waste and Resource Recovery Strategy outlines goals to upgrade local government waste collection and sorting infrastructure (Tasmanian Waste and Resource Recovery Board, 2023) and is also providing infrastructure grants for the projects that embed circularity principles into the re-use, collection and repurposing of priority materials (Tasmanian Waste and Resource Recovery Board, 2024).
- Investing in improvements to water and sewage infrastructure can have a larger benefit. TasWater recognises inefficiency in its water network, with unaccounted water losses being larger than mainland states (Tasmanian Economic Regulator, 2021). Investment and development that upgrades the capacity of Tasmania's water management and sanitation systems by enabling them to embed circularity principles can improve water use efficiency, optimise operations, lower energy consumption, and minimise negative environmental water outcomes (The World Bank, 2021).
- TasWater has circular economy targets including 100 per cent use of treated effluent from sewage treatment plants and organics management (TasWater, 2023).
- Green building infrastructure in urban areas that prioritises energy efficiency can reduce the electricity, gas and water consumption of households and businesses, while lowering wastage. This helps to lower the strain on resources in urban areas, while delivering cost savings to occupants. Additionally, optimising new housing for efficient use of resources and material choice that focuses on reusability can increase the circularity of the construction sector (Rynne & Verikios, 2020).
- Investing in digital infrastructure is also essential to adopting circularity. This can include but is not limited to investment into artificial intelligence, block chain technology and the Internet of Things (IOT). For example, leveraging the IOT can enable greater data collection and oversight of supply chains, leading to more informed decisions that optimise resources and minimise wastage. Similarly, artificial intelligence tools can help design circular products, optimise existing infrastructure to support circularity and support the operations of circular business models (Ellen MacArthur Foundation, 2019).

Future context

- Low emissions scenarios have a strong emphasis on resource efficiency and reuse to reduce emissions.
- Under a low emissions scenario, circular economy opportunities see growth due to enhanced resource efficiency and robust climate policies. Such scenarios emphasise sustainable practices, including recycling, waste reduction, and the use of renewable materials, leading to reduced environmental impact and increased economic resilience.
- In a moderate emissions future, progress would be slower but still notable, driven by moderate policy efforts and technological advancements.
- Both scenarios would benefit from state and international commitments to sustainability, fostering circular economy initiatives.

Existing adaptation responses

- **National and state level legislation and actions:** Tasmanian Waste and Resource Recovery Strategy 2023-26, Draft Waste Action Plan.
- **Regional/local scale responses:** FOGO processing and recycling initiatives.

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Justification of adaptation urgency rating

- **Confidence – High:** There is overall a high level of confidence given the medium level of agreement and high scientific evidence on circular economy opportunities.
- **Adaptation shortfall – Partial:** There are identified adaptation measures currently in the recently updated Tasmanian Waste and Resource Recovery Strategy 2023-26. Some incentives are in place to increase recycling and processing of some waste streams. Current work is underway to develop actions under the waste and resource recovery strategy for Tasmania that will include circular economy pathways which will determine whether this opportunity is fully realised.
- **Adaptation urgency - Tier 1: Ready to Act**. Further state level action is required to implement action plans focussed on circular economy.

5.8.2.4 BT4 Opportunities for lower emissions transport systems

BT4: Opportunities for lower emissions transport systems			
Opportunities for lower emissions transport systems due to low emissions vehicles.			
Confidence		**Adaptation shortfall**	**Adaptation urgency**
Overall: Very high		**Partial**	**Tier 1: Ready to Act**
Agreement	**Evidence**		
High	**High**		

Risk/Opportunity summary and associated impact statements

Key drivers (region exposed):

- **Low emissions vehicles**: Currently (metropolitan), Future (statewide),

Key barriers: Lack of investment, poorly designed or lack of policies and actions, supply chain and technology constraints.

Climate opportunity summary:
Electrifying transport in Tasmania would present several opportunities to reduce emissions and lower the environmental impact of existing transport systems. A low emissions transport system is a key part of meeting emissions reduction goals. By 2030, over 100, 000 EVs (20% of total registrations) are expected, rising to almost all vehicles by 2050 under a low emissions scenario. The **confidence** supporting this assessment is **very high** as there is a high level of agreement and high scientific evidence on the opportunities of low emissions transport. Current actions may not fully capture or realise the available opportunities for a low emissions transport system. While there are transport strategies in place and a Draft Emissions Reduction and Resilience Plan underway for the transport sector, these may not capture the complexity required for transitioning to low emissions vehicles such as changing infrastructure, electricity supply and new fuels. Adaptation shortfall has been rated **Partial**. The **adaptation urgency rating** is **Tier 1: Ready to Act.**

Related impact statements:

- **Natural:** Inland water ecosystems (N1), terrestrial ecosystems (N3)
- **Social:** Mental health and wellbeing (S2), physical health and wellbeing (S3)
- **Economic:** Businesses and public organisations (E1, ET2)
- **Built:** Transport (B6, BT1), built environment (B2, BT3)

Justification and evidence

Current context

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- Transport emissions currently make up 21 per cent of the State's emissions, excluding land use, land use change and forestry emissions. Cars account for 46 per cent of total transport emissions, with heavy duty trucks and buses at 31 per cent and light commercial vehicles at 23 per cent (ReCFIT, 2024c).
- Heavy vehicles disproportionately contribute to transport emissions relative to the number of heavy vehicles on the road. On average, these vehicles are aged between 10-15 years, leading to more inefficient, higher polluting vehicles on the road (Electric Vehicle Council, 2022).
- The Tasmanian Government has released the Draft Emissions Reduction and Resilience Plan – Transport which has a focus on increasing EVs in Tasmania, and outlines opportunities and barriers to implementation.
- As Tasmania's electricity generation is dominated by renewable energy sources, adopting an electric transport system and network is achievable and would provide an opportunity for Tasmania to further promote its achievements compared to other Australian states (Minshull, 2017).
- The establishment of the Electric Vehicle Working Group, managed by ReCFIT, has supported the implementation of several initiatives to support the transition to a low emissions transport network and the achievement of net zero emissions by 2030. This includes providing a rebate program for purchases of battery electric vehicles and e-mobility vehicles (ReCFIT, 2023b), performing low emissions bus trials in Launceston and Hobart (Metro Tasmania, n.d.), and helping the development of an Emissions Reduction and Resilience Plan for Transport (Electric Vehichle Council, 2023).

Future context

- To meet emissions reduction objectives, a low emissions transport system is required. This will increase the opportunities for low emissions vehicles across the State.
- Under a low emissions scenario, there will be over 100,000 electric vehicles registered in Tasmania by 2030, approximately 20 per cent (ABS, 2021) of total vehicle registrations. By 2050, almost all vehicles (over 500,000) will be electric.
- Under a moderate emissions scenario, there will be over 6,000 electric vehicles registered in Tasmania by 2030. By 2050, over 230,000 electric vehicles will be registered in Tasmania, around half of all vehicles registered.

Existing adaptation responses

- **National and state level legislation and actions:** Tasmanian Transport Access Strategy, Tasmanian Urban Passenger Transport Framework, Draft Emissions Reduction and Resilience Plan – Transport Sector.

Justification of adaptation urgency rating

- **Confidence – Very high:** There is a very high level of confidence due to the high level of agreement and high scientific evidence regarding opportunities from low emissions transport, with multiple sources of Australia specific information and some studies on the opportunities for Tasmania.
- **Adaptation shortfall – Partial:** Some incentives are in place to increase the number of electric vehicles in the state. However, very high electric vehicle uptake is required to meet transport emission reduction objectives, and further development of supporting infrastructure for electric vehicles and alternative fuel sources may be required. Implementation is required to ensure all objectives under frameworks are realised.
- **Adaptation urgency – Tier 1: Ready to Act.** Further state level action to implement frameworks focussed on supporting electric vehicles, including infrastructure and alternative fuel sources would further enable this opportunity.

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6 Conclusions

Climate change impacts all facets of Tasmanian life, across all value domains, and adaptation to be coordinated at a state level to ensure efficient and successful action in a timely manner. The Risk Assessment is the first full climate assessment conducted for the state, in that it captures physical and transition climate hazards, state geographical and socio-economic exposure and vulnerabilities, and identification of existing response actions. To be a resilient state, Tasmania must ensure it undertakes adequate preparedness and adaptation activities, along with building capacity to respond flexibly to a changing climate and to adjust as climate-related opportunities arise.

The Risk Assessment delivers on the matters the Minister needs to take into account under Section 5(b) of the *Climate Change (State Action) Act 2008*, including using the latest and best available science and projected impacts, consideration of risks associated with the energy transition, consideration of economic, social and environmental implications of climate change, and assessment of the associated risks to Tasmanian communities, natural environments and ecosystems and economic activity. All these have direct and indirect climate-related impacts on the health and wellbeing of Tasmanians and future generations.

The findings and results of the Risk Assessment have highlighted a need for urgent action for individual risks, however, as is shown throughout the Risk Assessment, no risk impact statement can or should be treated in isolation and those risks with greater adaptation urgency typically link to many other risks across other domains.

The conclusion to this report is presented as a set of key findings below and hopes to pave the way forward for the state in further assessing climate impacts.

6.1 Looking forward for future statewide climate risk assessments

Four key areas of consideration have been highlighted as part of the Risk Assessment. These may be utilised in developing a successful adaptation response.

Consistent messaging from stakeholders throughout the engagement process for the Risk Assessment highlighted the need for state-level coordination for local efforts. Across Tasmania many groups have prepared, and are preparing, adaptation proposals, efforts and actions. Coordinated efforts may reduce may enable more efficient and effective applications for resources and funding. Given that climate adaptation responses are often place-based, flexible co-ordination might help to share learnings and resources.

The effects of climate change on future generations are not well understood due to the complexity and variability of climate systems, future global response, and unknown tipping points. However, it is clear that climate change is already, and will increasingly, threaten the health and wellbeing of Tasmania. Existing vulnerabilities are likely to worsen issues around food and water security. Climate change will also place additional stress on infrastructure, transport systems. Emergency services may increasingly come under pressure as the climate crisis further affects public health and wellbeing. Coordinating strategies that address both current health concerns and the evolving climate is crucial for ensuring a healthy and resilient Tasmanian population. A thorough examination of health, safety, and emergency services in relation to climate change is needed.

Increased climate education is key to successfully implementing climate adaptation and building resilience in future generations. Enhancing climate literacy at all levels—ranging from individual knowledge to organisational awareness—is crucial for fostering a collective understanding of climate risks. A more informed public and workforce will not only increase awareness of the impacts of climate change but also enable better decision-making across sectors. This education must extend to schools, communities, businesses, and government institutions, ensuring that climate considerations are embedded into everyday practices and long-term planning. The Risk Assessment engagement revealed that awareness of the impacts of climate change was generally low across diverse stakeholder groups. This gap in understanding presents a significant barrier, limiting the ability to integrate climate risk into strategic planning and decision-making processes. By

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prioritising education, Tasmania can strengthen its capacity to proactively address climate risks, fostering a more resilient society capable of adapting to future climate challenges.

Comprehensive, high-quality data is essential for refining climate risk assessments. This includes monitoring ongoing environmental changes, and accurately evaluating the cost-effectiveness of adaptation strategies. Without robust data, decision-makers lack the insights to understand the full scope of climate-related risks and make informed choices about resource allocation and adaptation strategies. Enhanced data collection should include a wide range of metrics, from environmental indicators such as temperature, precipitation, and sea levels, to socioeconomic factors that affect community vulnerability. Investing in data, including data collection, monitoring technologies, and data-sharing platforms, will allow for more effective response action to the challenges posed by climate change. This will not only support more accurate, timely decision-making but also support long-term resilience and adaptation. Prioritising these investments will strengthen Tasmania's capacity to address climate risks.

With these considerations in mind Tasmania can move forward in developing an adaptation response.

Future work in the space involves undertaking more assessments at different levels of granularity, in order to improve understand of climate risks and opportunities. Additional assessment can also incorporate evolution in the understanding of climate risk. These key principles for future work are outlined below.

1. **Tasmania is in a position to execute adaptation successfully**

In contrast to the characteristics of both population and landmass, Tasmania is smaller than many other Australian jurisdictions, which may offer flexibility and agility in executing the implementation of climate adaptation and mitigation measures. Knowledge sharing, data monitoring, and cost benefits related to climate should be communicated more widely to grow the economy, whilst accessing adaptation technologies and methods beyond the state's borders. Strong governance is required to ensure the adaptation needs of the state are met, and to help inform updates and expansions in the next statewide climate assessment.

2. **Develop detailed and more localised assessments to run alongside the state-level assessment**

While the Risk Assessment provides a broad overview of potential climate hazards and their impacts, it may not capture the detailed, localised variations in hazards, exposure, and vulnerability. For example, a deep dive into climate impacts on health, wellbeing, safety, emergency services access and networks, and the links to climate hazards is critical. Granular assessments at a sub-state level will help to identify specific areas, populations, and infrastructure that are most at risk, allowing for targeted interventions. Further, it was made clear across the assessment that multiple local adaptation efforts are underway, but not well coordinated at a state level. There is an opportunity for the state to improve monitoring and knowledge sharing gained from local and/or sector-specific climate assessments and successful adaptation implementation. This will allow for better oversight of complex risks into the future, as well as enhanced data quality for the state's next risk assessment in 5 years' time.

3. **Continue to conduct and build upon the framework for Tasmania's Risk Assessment for Climate Change**

The 2024 iteration of the Risk Assessment is a critical step in Tasmania's climate change journey, particularly as the first Australian state to commit to a legislated regular climate risk assessment. The Risk Assessment will inform multiple adaptation and resilience strategies and programs in coming years. As the assessment is conducted every five years, it is important that the methodology and data sets used are continually documented, upgraded, and aligned to current best practice.

In future iterations of the statewide climate change risk assessments, additional elements could be added to create a more robust, comprehensive, and usable assessment. These elements may include:

- earlier and more embedded integration of Aboriginal engagement and perspectives in progressing the Risk Assessment
- continuing to retest and refresh the methodology with stakeholders, including any physical and transition climate data and research updates to ensure relevance to the Tasmanian context
- additional efforts to integrate complex risk as research continues to evolve in the future
- additional consultation with regional areas within Tasmania
- more detailed mapping and analysis of key state assets.

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4. Continuous monitoring and alignment of climate risk considerations/methodologies with Australian jurisdictions and international examples

There is building momentum, both at a national level and internationally, for the assessment of climate risks. All states and territories in Australia have committed to and implemented policies, action plans, and strategies to address elements of climate change. It is critical that states and territories continue to implement initiatives that balance the need for regional nuance with coordinated alignment to methodologies. Tasmania should continue to monitor and engage in the activities and efforts underway elsewhere in the country and in other jurisdictions, and where possible leverage learnings and other information.

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7 Technical Appendix

This appendix section provides expanded methodology and climate model projection data and information, specifically:

- **Climate scenario analysis:** Climate scenario analysis extended methodology details and future climate projections summarized over the state
- **Exposure regions:** Categorisation of on-land and marine regions across Tasmania and surrounding waters used to describe the exposure of the state regions to a changing climate
- **Adaptation sources:** Categorised list of adaptation strategies, Acts, plans and other sources for Tasmania's adaptation to a changing climate.

7.1 Climate scenario analysis detailed methodology and projections

7.1.1 Climate scenario sources

The most widely adopted and credible reference climate scenarios (across all sectors globally) were adopted for the Risk Assessment as follows.

Physical:

- The Intergovernmental Panel on Climate Change Sixth Assessment Report (IPCC AR6) use five Shared Socio-economic Pathways (SSPs) that examine how global society, demographics and economics might change over the next century. The SSPs have been simulated in over 50 global climate models. The SSPs build upon Representative Concentration Pathways (RCPs) from the IPCC AR5. Scenario type (SSP or RCP) choice is often dependent on available climate metrics (e.g., acute extremes).

Transition:

- The Network for Greening the Financial System (NGFS) developed scenarios that are derived from the Intergovernmental Panel on Climate Change (IPCC) pathways and scenarios from the Potsdam Institute for Climate Impact Research and the International Institute for Applied System Analysis (IIASA). The NGFS climate scenarios deliver a set of harmonised transition pathways, chronic climate impacts and indicative economic impacts for each of the NGFS climate pathways.
- The Australian Energy Market Operator (AEMO) developed the Integrated System Plan (ISP) to provides a comprehensive roadmap for the National Electricity Market (NEM). The roadmap is optimised for consumer benefits through a transition period of great complexity and uncertainty. The ISP models four scenarios span a range of plausible futures with varying rates of emission reduction, electricity demand, and decentralisation.

7.1.2 Climate data sources for the scenario analysis

The climate scenarios are assessed using climate data sources (primarily climate models), selection of data based upon robust and leading practice approaches, and selection of climate metrics that can assess the impacts of climate change on Tasmania. The Risk Assessment included use of data from credible publicly available sources with high quality climate projections and scenario data that had a geospatial coverage across Tasmania.

There are multiple types of climate models that simulate the climate scenarios assessed here. These can be summarised as:

- **Global climate models (GCMs)** are four-dimensional (latitude, longitude, time, and height) representations of the climate system at every point in time and location globally for the past, present, and future. These models are complex 4-dimensional simulations of the past from about 1860 to at least 2100. Each global climate model is a combination of an atmospheric, land, ocean, and ice models. Typically, outputted data is available at 100km scales.

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- **Regional climate models (RCMs)** are a scaled version of global climate models over a particular region. Typical regional climate model grid resolution is 5 to 50km. Regional climate models can be downscaled in two ways, and both types of regional climate models are used in the Risk Assessment:
    - **Dynamically** running a fully interactive finer granularity model with different parameterizations using global climate models as the boundary inputs.
    - **Statistically** using empirical relationships applied to the global climate models at finer granularity. These simulations are faster than dynamically simulated simulations but do not always capture climate extremes as well.

- **Integrated Assessment Models (IAMs)** use and inform global climate models from a socio-economic point of view and are used to assess transition risks and opportunities. IAMs combine socio-economic models and physical climate models. They simulate different mitigation and adaptation pathways linked to specific the SSP greenhouse gas emissions used in the GCMs to explore physical climate risk.

It is important to note that climate model data for transition scenarios is generated using integrated assessment models modelling socio-economic futures with a focus on a world that decarbonises. Conversely, data for physical scenarios is generated by global and regional climate models that focus primarily on futures of planetary warming. Models and other data types differ in their estimate of the Earth's system and climate changes in each location for different metrics. Considerations on climate measurements, metrics, models, and scenarios are based on leading scientific practice. Where possible, a multi-model average **was used for the climate projections (particularly for the physical hazards) which includes selecting models that are distinct (i.e., not based on the same ocean, atmospheric, land and ice components).**

Physical climate model data sources for the assessed climate scenarios:

- IPCC AR6 11 global climate model average (100km)
- ESCI 7 regional climate model average (5km)
- AWO 4 global climate model average and 2 regional climate model average (downscaled and bias corrected) (5km)
- NEX-GDDP-CMIP6 20 climate model average downscaled from CMIP6 IPCC models (25km)

Transition climate model data sources for the assessed climate scenarios:

- NGFS Phase 4.1 3 global socioeconomic models (modelled at regional levels, downscaled to country level)
- AEMO 2024 Integrated System Plan (draft), energy market model, input and assumptions outlining efficient pathways for energy system transformation under 3 scenarios.

7.1.3 Climate model metrics

7.1.3.1 Physical

The data for the physical scenario analysis was primarily extracted from the NASA NEX downscaled 25km CMIP6 dataset and manipulated into metrics by Deloitte. The acute and chronic physical climate model metrics are aligned to the World Meteorological Organisation (WMO) standard metrics that are calculated values describing the state and the changes in the chronic and acute climate system. The metrics and data sources are described in Table 25.

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Table 25: The physical hazards assessed, available climate scenarios, horizons including data sources and granularity.

Hazard Type	Hazard	Metric[1]	Units	Granularity	Data Source
Acute	Extreme rain and floods	Wettest Day Rainfall	mm	25km	NEX-GDDP-CMIP6
		Extreme Rain Days	days		
	Extreme heat	Hottest Annual Temperature	°C	25km	NEX-GDDP-CMIP6
		Days over 30°C	days		
	Dry spell	Longest Dry Spell	days	25km	NEX-GDDP-CMIP6
	Frost	Frost Days	days	25km	NEX-GDDP-CMIP6
	Bushfire	Extreme Fire Weather Days	days	25km	NEX-GDDP-CMIP6
		Fire Weather Intensity	index		
	Storm surge	1-in-100year Storm Surge Event	m / years	100km	IPCC AR6, Vousdoukas et al. (2018)
Chronic	Rainfall	Total Annual Rainfall	mm	25km	NEX-GDDP-CMIP6
		Total Seasonal Rainfall	mm		
		Rain Days	days		
	Temperature	Annual Mean Temperature	°C	25km	NEX-GDDP-CMIP6
		Seasonal Average Temperature	°C		
	Soil Moisture	Soil Moisture Content	%	5km	AWO
	Sea level	Relative Sea Level Rise	cm	100km	IPCC AR6, Vousdoukas et al. (2018)
	Marine	Sea Surface Temperature	°C	100km	IPCC AR6, Iturbide et al., 2021
		Sea Surface Acidity	pH		

[1] All metrics except soil moisture content correspond to IPCC AR6.

[2] The NASA NEX-GDDP-CMIP6 dataset was retrieved from NASA CCS (https://www.nccs.nasa.gov/services/data-collections/land-based-products/nex-gddp-cmip6), prepared by the Climate Analytics Group and NASA Ames Research Center using the NASA Earth Exchange and distributed by the NASA Center for Climate Simulation (NCCS). Metrics were derived by Deloitte climate scientists with the following climate models: ACCESS-CM2, ACCESS-ESM1-5, BCC-CSM2-MR, CanESM5, CMCC-ESM2, CNRM-CM6-1, CNRM-ESM2-1, EC-Earth3, FGOALS-g3, GFDL-ESM4, GISS-E2-1-G, INM-CM5-0, IPSL-CM6A-LR, KACE-1-0-G, MIROC6, MPI-ESM1-2-HR, MRI-ESM2-0, NorESM2-MM, UKESM1-0-LL. Primary Dataset Reference: Thrasher, B., Maurer, E. P., McKellar, C., & Duffy, P. B., 2012: Technical Note: Bias correcting climate model simulated daily temperature extremes with quantile mapping. Hydrology and Earth System Sciences, 16(9), 3309-3314, doi: 10.5194/hess-16-3309-2012.

[3] Soil moisture content was retrieved from the Australian Water Outlook (AWO) dataset (https://awo.bom.gov.au/about/overview). This dataset used the following global climate models: ACCESS1-0, CNRM-CM5, GFDL-ESM2M, MIROC5 and regional climate models CCAM, WRF to produce climate inputs to the Australian Water Resources Assessment Landscape model (AWRA-L). Dataset Reference: Wilson et al (2022). A national hydrological projections service for Australia. Climate Services, 28(100331), doi: 10.1016/j.cliser.2022.100331.

[4] Relative sea level rise and 1-in-100year storm surge event were retrieved from IPCC AR6 dataset and the metrics derived by Michael Vousdoukous using atmospheric forcing from a CMIP6 ensemble as input to the following models: FES2014 (tidal elevation), DFLOW FM (storm surge) and WW3 (waves). Dataset Reference: Vousdoukas et al. (2018). Global probabilistic projections of extreme sea levels show intensification of coastal flood hazard, Nature Communications, 9(2360, doi: 10.1038/s41467-018-04692-w.

[5] Sea surface temperature and sea surface acidity were retrieved from the IPCC WGI Interactive Atlas. This dataset used a 26-model ensemble for sea surface temperature and 9-model ensemble for sea surface acidity Dataset Reference: IPCC AR6.

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7.1.3.2 Transition

A broad range of models was used to investigate risks and opportunities in Tasmania, including international socioeconomic scenarios: SSP, IEA or NGFS, and national and sector transition plans.

Table 26: The transition drivers assessed, available climate scenarios, horizons including data sources and granularity.

Driver Type	Driver	Metrics
Policy	Increased price of emissions	• Emissions (t CO_2); Carbon Price (A$)
	Other climate policy and regulation	• Emissions (t CO_2); Energy quantity (MWh or MJ) and mix (%); Energy Price (A$)
Legal	Geopolitical risk	• GDP (A$); GSP (A$); Sectoral activity (%)
Technology	Low emissions energy supply	• Energy quantity (MWh) and mix (%)
	Capital cost of new technology	• Price (A$); Sectoral activity (A$)
	Resilience through technology	• GDP (A$); GSP (A$); Sectoral activity (%)
Market	Investment opportunities in enabling technologies	• Price (A$); Sectoral activity (%)
	Stranded assets with high emissions	• Price (A$); Sectoral activity (%)
	Supply chain risks	• Price (A$); Sectoral activity (%)
	Changing consumer preferences and behaviour	• Price (A$; Sectoral activity (%)
	Trade exposure risks	• International emissions price (A$); Commodity price (A$)
	Work force requirements	• Employment by sector; Sectoral activity (%)
Resource efficiency	Circular economy opportunities	• *Qualitative literature*
	Energy efficiency improvements	• Emissions (t CO_2); Energy quantity (MWh or MJ) and mix (%)
Reputation	Poor public perception of industries	• *Qualitative literature*

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7.1.4 Climate scenario analysis detailed model projections

7.1.4.1 Physical hazards

This section contains the climate model projections values of the metrics which are used as proxies for physical hazards trends, specifically for temperature, rainfall, bushfire and coastal and marine related climate metrics.

Table 27: Current and future change in exposure to temperature.

Metric	Current exposure (1995-2014)	Future change (increase) in exposure					
		Moderate (SSP2-4.5) 2-3 °C			High (SSP3-7.0) 3-4 °C		
		2030	2050	2090	2030	2050	2090
Annual average temperature **	**11.3°C (9.0 to 13.3)**	+0.5°C (0.4 to 0.6)	+1.0°C (0.8 to 1.1)	+1.7°C (1.5 to 1.9)	+1.4°C (1.0 to 2.5)	+2.0°C (1.6 to 3.1)	+3.7°C (3.2 to 4.6)
Seasonal average temperature	**(Spring) 10.6°C (8.3 to 12.5)**	+0.4°C (0.3 to 0.5)	+1.0°C (0.8 to 1.1)	+1.5°C (1.3 to 1.6)	+1.4°C (0.9 to 2.6)	+1.9°C (1.4 to 3.1)	+3.4°C (2.9 to 4.4)
	(Summer) 15.3°C (13.3 to 17.5)	+0.6°C (0.4 to 0.7)	+1.1°C (0.8 to 1.2)	+1.8°C (1.5 to 2.0)	+1.5°C (1.0 to 2.9)	+2.2°C (1.8 to 3.5)	+3.9°C (3.3 to 5.1)
	(Autumn) 12.1°C (9.6 to 14. 2)	+0.6°C (0.5 to 0.7)	+1.1°C (0.8 to 1.2)	+1.8°C (1.5 to 1.9)	+1.4°C (1.0 to 2.5)	+2.1°C (1.7 to 3.1)	+3.9°C (3.4 to 4.8)
	(Winter) 7.5°C (4.9 to 9.3)	+0.5°C (0.4 to 0.5)	+1.0°C (0.8 to 1.0)	+1.6°C (1.4 to 1.7)	+1.2°C (0.8 to 2.0)	+1.8°C (1.4 to 2.6)	+3.3°C (2.9 to 4.0)
Highest annual temperature **	**27.0°C (23.7 to 29.4)**	+0.5°C (0.3 to 0.7)	+1.1°C (0.9 to 1.2)	+1.9°C (1.7 to 2.1)	+2.7°C (1.5 to 6.9)	+3.7°C (2.5 to 7.7)	+5.4°C (4.2 to 9.3)
Lowest annual temperature	**-2.4°C (-6.2 to 2.1)**	+0.6°C (0.4 to 0.6)	+1.0°C (0.8 to 1.1)	+1.7°C (1.6 to 1.8)	+1.9°C (1.3 to 3.3)	+2.5°C (1.9 to 3.8)	+3.9°C (3.3 to 5.1)
Days over 25°C	**4 days per year (0 to 10)**	+2 days (0 to 4)	+4 days (1 to 9)	+8 days (1 to 17)	+5 days (1 to 15)	+9 days (2 to 20)	+23 days (7 to 39)
Days over 30°C **	**0.3 days per year (0 to 1)**	+0.1 days (0 to 0.2)	+0.2 days (0 to 0.6)	+0.6 days (0.5 to 1.4)	+0.9 days (0.1 to 4.9)	+1.4 days (0.1 to 6.2)	+3.7 days (0.6 to 10.5)
Frost days **	**8 days per year (0 to 33)**	-2 days (0 to -6)	-3 days (0 to -11)	-5 days (0 to -16)	-4 days (0 to -12)	-5 days (0 to -16)	-7 days (0 to -23)

** These values represent the projected change in global mean surface air temperature by the CMIP6 GCMs over the 2081-2100 period compared to a reference period to the 1850 to 1900 pre-industrial period. Changes relative instead to the more recent 1995–2014 period may be calculated approximately by subtracting 0.85°C, the best estimate of the observed warming from 1850–1900 to 1995–2014. Source: IPCC AR6 SPM.*

*** Metrics illustrated with a figure across all time horizons and scenarios.*

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Table 28: Current and future change in exposure to rainfall.

Metric	Current exposure (1995-2014)	Future change in exposure					
		Moderate (SSP2-4.5) 2-3 °C			High (SSP5-8.5) 3-4 °C		
		2030	2050	2090	2030	2050	2090
Total annual rainfall **	**917 mm (491 to 1480)**	-2 mm (-15 to +13)	-11 mm (-43 to +30)	-12 mm (-53 to +43)	-7 mm (-15 to +14)	-8 mm (-27 to +36)	-43 mm (-97 to +58)
Total seasonal rainfall	**(Spring) 246 mm (135 to 389)**	-9 mm (-19 to +4)	-18 mm (-35 to -2)	-14 mm (-30 to +8)	-14 mm (-23 to -2)	-15 mm (-26 to -3)	-31 mm (-58 to -5)
	(Summer) 162 mm (109 to 242)	+8 mm (+2 to +15)	+1 mm (-4 to +4)	-3 mm (-13 to +3)	-3 mm (-8 to +4)	-7 mm (-14 to -1)	-12 mm (-31 to +3)
	(Autumn) 210 mm (115 to 354)	+6 mm (-4 to +14)	-2 mm (-7 to +3)	+5 mm (-5 to +20)	+2 mm (-1 to +8)	+2 mm (-4 to +8)	-8 mm (-21 to +8)
	(Winter) 300 mm (133 to 495)	+5 mm (-1 to +21)	+8 mm (-4 to +33)	+8 mm (-9 to +53)	+9 mm (+3 to +21)	+13 mm (+3 to +38)	+9 mm (-10 to +70)
Rain days per year **	**152 days (100 to 180)**	-1 day (-4 to 0)	-4 days (-6 to -1)	-7 days (-9 to -2)	-3 days (-4 to -1)	-5 days (-7 to -1)	-13 days (-18 to -4)
Extreme rain days over 20mm **	**4 days per year (1 to 13)**	+15% (+3 to +31)	+17% (+4 to +33)	+26% (+11 to +40)	+10% (+4 to +21)	+19% (+10 to +28)	+34% (+11 to +51)
Wettest day rainfall **	**30 mm (23 to 40)**	+8% (+5 to +11)	+8% (+6 to +11)	+13% (+10 to +16)	+7% (+4 to +9)	+10% (+7 to +12)	+16% (+13 to +20)
Soil moisture content **, ***	**54% (33 to 81%)**	-1% (-3 to +3)	-1% (-5 to +6)	-2% (-5 to +3)	-1% (-3 to +2)	-2% (-5 to +2)	-8% (-13 to -2)

** These values represent the projected change in global mean surface air temperature by the CMIP6 GCMs over the 2081-2100 period compared to a reference period to the 1850 to 1900 pre-industrial period. Changes relative instead to the more recent 1995–2014 period may be calculated approximately by subtracting 0.85°C, the best estimate of the observed warming from 1850–1900 to 1995–2014. Source: IPCC AR6 SPM.*

*** Metrics illustrated with a figure across all time horizons and scenarios.*

**** Soil moisture content was calculated using Australian Water Outlook (AWO) data covering the RCP4.5 (moderate) and RCP8.5 (high) scenarios from CMIP5 as CMIP6 data isn't currently available for this metric. This dataset uses 30-years averages covering the following time periods: current exposure (1976-2005), 2030 (2016-2045), 2050 (2036-2065), and 2085 (2070-2099). Source: AWO.*

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Table 29: Current and future change in exposure to bushfires.

Metric	Current exposure (1995-2014)	Future change in exposure					
		Moderate (SSP2-4.5) 2-3 °C			High (SSP3-7.0) 3-4 °C		
		2030	2050	2090	2030	2050	2090
Fire weather days **	**18 days per year (13 to 20)**	+3 days (+1 to +4)	+7 days (+2 to +9)	+13 days (+5 to +15)	+4 days (+2 to +5)	+9 days (+4 to +11)	+26 days (+11 to +30)
Fire weather intensity **	**10 (6 to 13)**	+6% (+2 to +7)	+12% (+6 to +15)	+21% (+12 to +26)	+8% (+4 to +10)	+16% (+10 to +20)	+39% (+23 to +47)

** These values represent the projected change in global mean surface air temperature by the CMIP6 GCMs over the 2081-2100 period compared to a reference period to the 1850 to 1900 pre-industrial period. Changes relative instead to the more recent 1995–2014 period may be calculated approximately by subtracting 0.85°C, the best estimate of the observed warming from 1850–1900 to 1995–2014. Source: IPCC AR6 SPM.*

*** Metrics illustrated with a figure across all time horizons and scenarios.*

Table 30: Current and future change in exposure to coastal and marine.

Metric	Current exposure (1995-2014)	Future change in exposure					
		Moderate (SSP2-4.5) 2-3°C			High (SSP3-7.0) 3-4°C		
		2030	2050	2090	2030	2050	2090
Relative sea level rise	-	+9 cm (+8 to +10)	+19 cm (+18 to +21)	+44 cm (+42 to +46)	+9 cm (+8 to +10)	+20 cm (+19 to +22)	+53 cm (+49 to +57)
Storm surge events	**2.7 m (2.1 to 3.2)**	79 year event (75 to 83)	32 year event (23 to 41)	6 year event (3 to 7)	78 year event (74 to 83)	28 year event (19 to 37)	3 year event (2 to 4)
Sea surface temperature **	**15.1°C (14.1 to 15.8)**	+0.6°C (+0.4 to +0.8)	+1.1°C (+0.8 to +1.5)	+1.7°C (+1.4 to +2.1)	+0.7°C (+0.4 to +0.9)	+1.4°C (+1.0 to +1.8)	+3.0°C (+2.3 to +3.6)
Ocean acidity	**8.10 pH units**	-0.06 units (+0.7%)	-0.11 units (+1.3%)	-0.18 units (+2.2%)	-0.07 units (+0.8%)	-0.14 units (+1.7%)	-0.28 units (+3.5%)

** These values represent the projected change in global mean surface air temperature by the CMIP6 GCMs over the 2081-2100 period compared to a reference period to the 1850 to 1900 pre-industrial period. Changes relative instead to the more recent 1995–2014 period may be calculated approximately by subtracting 0.85°C, the best estimate of the observed warming from 1850–1900 to 1995–2014. Source: IPCC AR6 SPM.*

*** Metrics illustrated with a figure across all time horizons and scenarios.*

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7.1.4.2 Transition drivers

This section contains projections for key metrics related to Transition drivers for Tasmania. This listed metrics can be found in the table below:

Table 31: Projected future changes in exposure for Tasmania Transition drivers

Metric	Current exposure (1995-2014)	Future change in exposure			
		Low (NGFS Net Zero 2050) 1.5-2°C		Moderate (NGFS NDC) 2-3°C	
		2030	2050	2030	2050
Emissions (Tasmania)	**-4.80 Mt CO2e**	0 Mt CO2e	0 Mt CO2e	0 Mt CO2e	0 Mt CO2e
Emissions (Australia)	**404 Mt CO2e**	207 Mt CO2e	0 Mt CO2e	339 Mt CO2e	299 Mt CO2e
(Shadow) emission price	**A$ 32 per tonne CO2e**	A$ 221	A$ 2727	A$ 31	A$ 91
Carbon price major export countries	**N/A**	A$ 228	A$ 2686	A$ 91	A$ 82
Carbon price major impact countries	**N/A**	A$ 261	A$ 2584	A$ 98	A$130
Renewable Energy (Wind, Tasmania)	**0.6 GW of wind**	5.5 GW	16.6 GW	6.4 GW	16.9 GW
Renewable Energy (Hydro, Tasmania)	**2.3 GW of hydro**	2.6 GW	2.6 GW	2.6 GW	2.6 GW
Renewable Energy (Utility Solar PV, Tasmania)	**0 GW**	0.3 GW	0.3 GW	0.3 GW	0.3GW
Renewable Energy (Storage, Tasmania)	**0 GW**	0.3 GW	1.1 GW	0.2 GW	1.1 GW
Capital cost - solar PV	**100**	58	38	58	38
Capital cost - wind	**100**	70	48	70	48
Rooftop solar	**270 MW**	595 MW	1378 MW	456 MW	655 MW
Hydrogen	**0 Mt of H2**	0.002	0.021	0.001	0.004
Electricity price index	**100%**	122%	74%	120%	83%
Electric vehicles	**2,045**	110,756	511,354	6707	237,701
Residential energy efficiency	**Avoided energy use (GWh)**	249	1034	143	600

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Sequestration (land based)	**100**	159	317	154	286

7.2 Defining Tasmanian regions for the Risk Assessment

7.2.1 Tasmanian regions and LGAs

The twenty-nine LGAs of Tasmania are typically grouped together into six different regions: Central, Hobart, Launceston, North-east, North-west, and west, and South-east. For the Risk Assessment, this aggregation of LGAs was expanded to ten different regions to better capture the geographical differences in climate values between LGAs. For example, North-west and west was split into North-west, West and King Island. The ten regions and the LGAs which they encompass can be found in Table 32 and Figure 28: Map of Tasmanian regions and LGAs listed below:

Table 32: Summary of LGAs within each Tasmanian region

LGA_CODE21	LGA_NAME21	REG_NAME	LGA_AREASQKM21
61010	Central Highlands (Tas.)	Central	7982.4155
64610	Northern Midlands	Central	5135.2505
65010	Southern Midlands	Central	2615.4935
62410	Glamorgan-Spring Bay	East	2591.591
64810	Sorell	East	583.7723
65210	Tasman	East	660.3947
62010	Flinders (Tas.)	Flinders Island	1996.6244
60410	Brighton	Hobart	171.1508
61410	Clarence	Hobart	377.9614
62610	Glenorchy	Hobart	121.1632
62810	Hobart	Hobart	77.8965
63610	Kingborough	Hobart	720.1093
63410	King Island	King Island	1095.7407
62210	George Town	Launceston	653.4308
64010	Launceston	Launceston	1413.6306
64210	Meander Valley	Launceston	3330.8146
65810	West Tamar	Launceston	691.1537
60210	Break O'Day	North-east	3523.8858
61810	Dorset	North-east	3230.5456
60610	Burnie	North-west	610.9528
60810	Central Coast (Tas.)	North-west	933.0891
61210	Circular Head	North-west	4897.6511
61610	Devonport	North-west	111.259
63210	Kentish	North-west	1156.1888
63810	Latrobe (Tas.)	North-west	600.4619
65410	Waratah-Wynyard	North-west	3535.9075
61510	Derwent Valley	South	4108.1113
63010	Huon Valley	South	5507.3541
65610	West Coast	West	9583.5388

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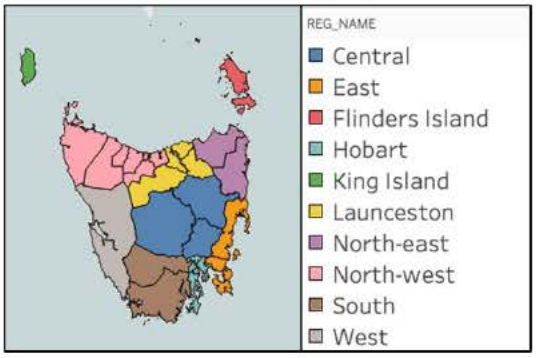

Figure 28: Map of Tasmanian regions and LGAs

7.2.2 Tasmanian marine bioregions

The assessment of aquatic ecosystems for marine and coastal waters for the Risk Assessment are based on the mesoscale bioregionalisation (meso-regions) detailed in the Integrated Marine and Coastal Regionalisation of Australia (IMCRA v4.0) framework. IMCRA provides a spatial framework for classifying Australia's coasts and near shore environments based on common patterns of natural characteristics and environmental processes that make sense ecologically and are a tool for understanding complex ecosystems. Bioregion boundaries are derived from biological and physical data, including the distribution of demersal fishes, marine plants and invertebrates, sea floor geomorphology and sediments, and oceanographic data. IMCRA meso-regions are restricted to within Tasmanian waters and at a depth not exceeding the 200 m isobath. These regions for Tasmania can be found in Table 33 and listed below:

Table 33: Summary of IMCRA v4.0 Mesoscale bioregions within Tasmanian waters

Meso Num	Meso Name	Water Type	Area KM2
44	Otway	Transitional Waters	37272.46
45	Boags	Cold Temperate Waters	8076.56
46	Davey	Cold Temperate Waters	6783.88
47	Bruny	Cold Temperate Waters	7278.44
48	Freycinet	Cold Temperate Waters	7947.92
49	Flinders	Transitional Waters	20780.44
51	Central Bass Strait	Cold Temperate Waters	49310.76
52	Twofold Shelf	Transitional Waters	31336.31
57	Franklin	Cold Temperate Waters	10361.95

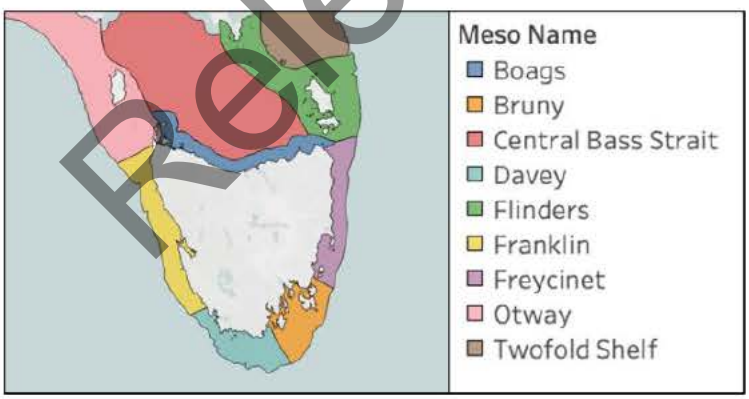

Figure 29: Map of Tasmanian mesoscale bioregions

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7.3 Detailed adaptation action sources

The tables below summarise the legislation, strategies and roadmaps, tools and programs that were sourced to estimate the adaptation shortfall ratings and understand the state's progress towards climate adaptation for the 40 prioritised climate impact statements.

Table 34: Legislation that provided adaptation and resilience response for Tasmania

Author/ Organisation	Document title	Selected relevant Impact statements
Department of Primary Industries, Parks, Water and Environment	Tasmanian State Coastal Policy 1996	N3, B2
Tasmanian Government	Living Marine Resources Management Act 1995	N4, E5
Tasmanian Government	Mineral Resources Development Act 1995 and the Environmental Management and Pollution Control Act	NT1
Tasmanian Government	Climate Change (State Action) Act 2008	ALL
Federal Government	National Greenhouse and Energy Reporting Act 2007	ET1, ET4
Federal Government	Renewable Energy (Electricity) Act 2000	ST2, ST5, ET1, ET4, BT2
Federal Government	Carbon Credits (Carbon Farming Initiative) Act 2011	NT4, ET4

Table 35: Strategies and roadmaps that provided adaptation and resilience response for Tasmania

Author/ Organisation	Document title	Relevant Impact statements
Renewables, Climate and Future Industries Tasmania	Tasmania's Climate Change Action Plan 2023-25	E1, ET1, ET3, B1, B2
Department of Natural Resources and Environment	National Guidelines for Water Quality	N1
Department of Natural Resources and Environment	Natural Heritage Strategy for Tasmania (2013-2030)	N1, N2, N3, N4, N5, N6,
Department of Primary Industries, Parks, Water and Environment	TWWHA Management Plan 2016	N1, N2, N3, N5, N6
Department of Primary Industries, Parks, Water and Environment	TWWHA Natural Values Climate Change Adaptation Strategy 2021-2031	N1, N2, N3, N5, N6
Department of Natural Resources and Environment	TWWHA Fire Management Plan	N1, N2, N3, N5, N6
Department of Natural Resources and Environment	Threatened Species Strategy 2000	N5, N6

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Department of Primary Industries, Parks, Water and Environment	TWWHA Biosecurity Strategy 2021-2031	N5
Department of Primary Industries, Parks, Water and Environment	TWWHA Natural Values Climate Change Adaptation Strategy 2021-2031	N6
Department of Primary Industries, Parks, Water and Environment	Tasmanian Government's Waste and Resource Recovery Strategy 2023-26	NT3, B5
Tasmania State Emergency Service (and specific councils)	Flood and Bushfire Management Strategies (Council based),	S1, S3, B2
Department of Agriculture, Fisheries and Forestry (Australian Government), managed by Department of Premier and Cabinet Tasmania	Future Drought Fund	S1, E4
Department of Health	Healthy Tasmania Five Year Strategic Plan	S2, S3, B1
Renewables, Climate and Future Industries Tasmania	Tasmania's Risk Assessment for Climate Change	ST1
Department of Health	Long-Term Plan for Healthcare in Tasmania 2040	ST2
Department for Education, Children and Young People	Department for Education, Children and Young People Strategic Plan 2024 – 2030	ST2
Department of State Growth	Tasmanian Renewable Energy Action Plan	ST2, ST5, ET1, ET4, BT2
Renewables, Climate and Future Industries Tasmania	Renewable Energy Coordination Framework	ST2, ST5, ET1, ET4, BT2
Department of State Growth	Tasmanian Renewable Hydrogen Action Plan	ST5, ET1, ET4, BT2
Department of State Growth	Tasmanian Urban Passenger Transport Framework	E2, B6, BT1,
Department of Natural Resources and Environment	AgriVision 2050	E4
Renewables, Climate and Future Industries Tasmania	Emissions Reduction and Resilience Plans	ET3, BT4
Office of Security and Emergency Management	Tasmania Disaster Resilience Strategy 2026-2030	B2, B3, B4, E1, S1
Department of Police, Fire, and Emergency management	Tasmanian Disaster Risk Assessment	B2, E1
Federal Government	National Housing Accord 2022	ST6
Department of Premier and Cabinet	Disaster Ready Fund	E3
Department of Natural Resources and Environment	Managing Coastal Hazards	S1, S3, E1, E2, E5

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Department of State Growth	AgriGrowth Loan Scheme	E4
Institute for Marine and Antarctic Studies	Sustainable Marine Research Collaboration Agreement (SMRCA) Strategic Plan 2022-26	N4, E5
Renewables, Climate and Future Industries Tasmania	Sea Level Rise Planning Allowances	B2
Department of Natural Resources and Environment	Rural Water Use Strategy	N1

Table 36: Tools that provided adaptation and resilience response for Tasmania

Author/ Organisation	Document title	Relevant Impact statements
Environmental Protection Authority	Environmental Impact Assessments	NT2
Tasmanian Government	Renewable Energy Zone Mapping Important Places	NT2
TAS ALERT	Risk Ready	E1, E2, E3, B3, B4
Renewables, Climate and Future Industries Tasmania	Land Information System Tasmania	E3, B2, B3, B4
University of Tasmania	Australia's Wine Future: A Climate Atlas	E4
National Emergency Management Agency	Hazard Insurance Partnership	E3

Table 37: Programs that provided adaptation and resilience response for Tasmania

Author/ Organisation	Document title	Relevant Impact statements
Department of Primary Industries, Parks, Water and Environment	Implementing Adaptation to Climate Change in Terrestrial and Freshwater Natural Environments in Tasmania	N1, N2, N3,
Renewables, Climate and Future Industries Tasmania	Bushfires and Climate Change Research Project	N2, N6
Southern Tasmanian Councils Authority	Regional Strategy – Adapting to a changing coastline in Tasmania	N3, B5
Renewables, Climate and future Industries Tasmania	Tasmanian Coastal Adaptation Pathways Project	N3, S3
University of Tasmania	Climate Change – Marine Resources Impacts and Adaptation	N4, E5
Renewables, Climate and Future Industries Tasmania	Renewable Energy Approval Pathway	NT2
Department of Natural Resources and Environment	Carbon Farming Advice Rebate Pilot Program	NT3, ET5

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Department of Natural Resources and Environment	Carbon Farming Advice Rebate Pilot Program	NT4,
Department of Natural Resources and Environment	Tasmanian Landcare Action Grants	NT4, ET5,
Drought Ready Tasmania	Regional Drought Resilience Planning Program	S1, E4
Department of Health	Climate Change and Health Round Table	S2, ST1, ST3
Department of Premier and Cabinet	Climate Resilient Councils	ST1, ST3, ST4
Renewables, Climate and Future Industries Tasmania	Energy Saver Loan Scheme	ST6
Department of Climate Change, Energy, the Environment and Water	Homes Tasmania Energy Efficiency Program	ST6
Regional Councils Adaptation Project	Regional Climate Adaptation Projects	E1,
National Climate Change Adaptation Research Facility	Understanding Future Risks to Ports in Australia	E2, B5
Tree Alliance	Tree Alliance	E4
Department of Natural Resources and Environment	Climate Change and Agriculture	E4
CSIRO	SLR and Allowances for Tasmania	B2
Tasmanian Fire Service	Bushfire Fuel Reduction Program	B2
Renewables, Climate and Future Industries Tasmania	e-Transport support	BT4
Department of Climate Change, Energy, the Environment and Water	Capacity Investment Scheme	ST2, ST5, ET1, ET4, BT2
Department of Climate Change, Energy, the Environment and Water	Large-scale Renewable Energy Target	ST2, ST5, ET1, ET4, BT2
Department of Climate Change, Energy, the Environment and Water	Small-scale Renewable Energy Scheme	ST2, ST5, ST6, ET1, ET4, BT2
Department of Climate Change, Energy, the Environment and Water	Rewiring the Nation	ST2, ST5, ET1, ET4, BT2
Department of Climate Change, Energy, the Environment and Water	Community Batteries for Household Solar program	ST6
Department of Climate Change, Energy, the Environment and Water	Hydrogen Headstart program	ST2, ST5, ET1, ET4, BT2
Australian Institute for Disaster Resilience	Community Recovery Handbook	S1
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8 References

AASB, 2023. *Exposure Draft ED SR1 Australian Sustainability Reporting Standards – Disclosure of Climate-related Financial Information.* [Online]
Available at: https://aasb.gov.au/news/exposure-draft-ed-sr1-australian-sustainability-reporting-standards-disclosure-of-climate-related-financial-information/

ABARES, 2022. *Australian Fisheries and Aquaculture Statistics 2021.* [Online]
Available at: https://daff.ent.sirsidynix.net.au/client/en_AU/ABARES/search/detailnonmodal/ent:$002f$002fSD_ASSET$002f0$002fSD_ASSET:1034361/one

Abidur Rahman, O. F. M. M. H., 2022. Environmental impact of renewable energy source based electrical power plants: Solar, wind, hydroelectric, biomass, geothermal, tidal, ocean, and osmotic. *Renewable and Sustainable Energy Reviews,* Volume 161.

ABS, 2020a. *Employment in Renewable Energy Activities, Australia.* [Online]
Available at: https://www.abs.gov.au/statistics/labour/employment-and-unemployment/employment-renewable-energy-activities-australia/latest-release

ABS, 2020. *Employment in Renewable Energy Activities, Australia.* [Online]
Available at: https://www.abs.gov.au/statistics/labour/employment-and-unemployment/employment-renewable-energy-activities-australia/latest-release

ABS, 2021. *Motor Vehicle Census, Australia.* [Online]
Available at: https://www.abs.gov.au/statistics/industry/tourism-and-transport/motor-vehicle-census-australia/latest-release

ABS, 2022. *Snapshot of Tasmania.* [Online]
Available at: 2021 Census data show that private rentals

ACARA, 2023. *Student-teacher ratios.* [Online]
Available at: https://www.acara.edu.au/reporting/national-report-on-schooling-in-australia/student-teacher-ratios

ACE CRC, 2010. *Climate Futures for Tasmania general climate impacts: the summary,* Hobart: Antarctic Climate and Ecosystems Cooperative Research Centre.

Adger, W. S. A. M. M. C. C. K. O. J. P. R. P. B. S. a. K. T., 2007. Assessment of adaptation practices, options, constraints and capacity. In: O. C. J. P. P. v. d. L. a. C. H. M.L. Parry, ed. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge: Cambridge University Press, pp. 717-743.

Adom, P. K. & Amoani, S., 2021. The role of climate adaptation readiness in economic growth and climate change relationship: An analysis of the output/income and productivity/institution channels. *Journal of environmental Management,* Volume 293.

AEMC, 2023. *Unlocking the Full Potential of Consumer Energy Resources.* [Online]
Available at: https://www.aemc.gov.au/news-centre/media-releases/unlocking-full-potential-consumer-energy-resources

AEMO, 2023. *2022 Integrated System Plan (ISP).* [Online]
Available at: https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp

AEMO, 2023a. *Draft 2024 ISP Consultation.* [Online]
Available at: https://aemo.com.au/consultations/current-and-closed-consultations/draft-2024-isp-consultation

AEMO, 2023b. *Energy Efficiency Forecasts 2023 – Final Report,* s.l.: s.n.

Released under RTI

AER, 2023. *Monitoring performance and analysing trends.* [Online]
Available at: https://www.aer.gov.au/industry/wholesale/charts

AFAC, 2018. *Fire and Emergency Services and Climate Change,* East Melbourne : Australasian Fire and Emergency Service Authorities Council Limited.

AFAC, 2018a. *Discussion paper on Climate Change and the Emergency Management Sector,* East Melbourne: Australasian Fire and Emergency Service Authorities Council Limited.

AIDR, 2013. *Dunalley and Tasmanian bushfires 2013.* [Online]
Available at: https://knowledge.aidr.org.au/resources/bushfire-dunalley-tasmania-2013/#:~:text=At%20least%2080%20properties%20were,were%20lost%20at%20Connelly's%20Marsh

AIDR, 2016. *Flood - Tasmania, 2016.* [Online]
Available at: https://knowledge.aidr.org.au/resources/flood-tasmania-june-july-2016/

Alex, B. et al., 2019. Promoting co-benefits of carbon farming in Oceania: Applying and adapting approaches and metrics from existing market-based schemes. *Ecosystem Services,* Volume 39.

ARENA, 2024. *Driving the Nation Program.* [Online]
Available at: https://arena.gov.au/funding/driving-the-nation-program/

Armstrong Mckay, D. et al., 2022. Exceeding 1.5°C global warming could trigger multiple climate tipping points. *Science,* 377(6611).

Ashurst, 2018. *Key regulatory issues for mining operations in Australia.* [Online]
Available at: https://www.lexology.com/library/detail.aspx?g=1e8a5c78-a1c3-4260-b03a-95fde6d68e8f

Astill, S. et al., 2018. Reconceptualising 'community' to identify place-based disaster management needs in Tasmania. *Australian Journal of Emergency Management ,* pp. 48-51.

Auld, J., Everingham, S. E., Hemmings, F. A. & Moles, A. T., 2022. Alpine plants are on the move: Quantifying distribution shifts of Australian alpine plants through time. *Diversity and Distributions,* 955(5), p. 943.

Australian Council of Social Services, 2021. *The economic impacts of the National Low-Income Energy Productivity Program,* s.l.: ACOSS.

Australian Institute for Disaster Resilience, 2018. *Community Recovery Handbook 2.* [Online]
Available at: https://knowledge.aidr.org.au/media/5634/community-recovery-handbook.pdf

Australian PV Institute, 2024. *Australian PV market since April 2001.* [Online]
Available at: https://pv-map.apvi.org.au/analyses

Australia's Chief Scientist, 2024. *Australia's circular economy opportunity.* [Online]
Available at: https://www.chiefscientist.gov.au/news-and-media/australias-circular-economy-opportunity

AWO, 2021. *About the Australian Water Outlook.* [Online]
Available at: https://awo.bom.gov.au/about/overview

Azvedo, M., Moore, A., Van den Huelvel, C. & Van Hoey, M., 2022. *Capturing the green-premium value from,* s.l.: McKinsey & Company.

Bailey, T. G., 2012. *Eucalypt regeneration and ecological restoration of remnant woodlands in Tasmania, Australia,* s.l.: University of Tamania.

Balafoutis, A. et al., 2017. Precision Agriculture Technologies Positively Contributing to GHG Emissions Mitigation, Farm Productivity and Economics. *Sustainability,* 9(8), p. 1339.

Bambrick, H., 2016a. *Climate change impacts on human health in the coastal zone. CoastAdapt Impact Sheet 5,* Gold Coast: National Climate Change Adaptation Research Facility.

Released under RTI

Bambrick, H., 2016. *Climate change impacts on human health in the coastal zone,* Gold Coasta: National Climate Change Adaptation Research Facility.

Bao, J., Sherwood, S. C., Alexander, L. V. & Evans, J. P., 2017. Future increases in extreme precipitation exceed observed scaling rates. *Nature Climate Change,* Volume 7, pp. 128-132.

Bartos, S., 2022. *Fork in the Road: Impacts of climate change on our food supply,* s.l.: Bartos Consulting Group.

Baumber, A. et al., 2020. Carbon farming for resilient rangelands: people, paddocks and policy. *The Rangeland Journal,* Issue 42, pp. 293-307.

Beck, K. et al., 2019. The long-term impacts of climate and fire on catchment processes and aquatic ecosystem response in Tasmania, Australia. *Quaternary Science Reviews,* 221(1), p. 105892.

Beck, K., Fletcher, M.-S., Wolfe, B. & Saunders, K., 2023. Aquatic ecosystem response to climate, fire, and the demise of montane rainforest, Tasmania, Australia. *Global and Planetary Change,* Volume 223, p. 104077.

BetterHealth, 2021. *Climate change and health.* [Online]
Available at: https://www.betterhealth.vic.gov.au/health/healthyliving/climate-change-and-health

Blake, M., 2017. *Report of the Independent Review into the Tasmanian Floods of June and July 2016,* s.l.: Australian Institute for Disaster Resilience.

BloombergNEF, 2023. *2023 Hydrogen Levelized Cost Update: Green Beats Gray.* [Online]
Available at: https://about.bnef.com/blog/2023-hydrogen-levelized-cost-update-green-beats-gray/

BOM, 2024. *Bushfire weather.* [Online]
Available at: http://www.bom.gov.au/weather-services/fire-weather-centre/bushfire-weather/index.shtml

BOM, 2024a. *Drought.* [Online]
Available at: http://www.bom.gov.au/climate/drought/#tabs=Soil-moisture

BOM, 2024b. *Rainfall and temperature records.* [Online]
Available at: http://www.bom.gov.au/climate/extreme/records.shtml?bookmark=brochures

BOM, 2024c. *Tasmania in autumn 2024.* [Online]
Available at:
http://www.bom.gov.au/climate/current/season/tas/summary.shtml#:~:text=Rainfall,based%20on%201961%2D1990).

BOM, n.d. *Weather and Climate Risk in Agriculture.* [Online]
Available at: http://www.bom.gov.au/watl/about-weather-and-climate/risk/index.shtml

Bowman, D. M., Kolden, C. & Williamson, G. J., 2022. Bushfires in Tasmania, Australia: An Introduction. *Fire,* 5(2), p. 33.

Brown, M. v. et al., 2024. A marine heatwave drives significant shifts in pelagic microbiology. *Communications Biology,* 7(125).

Brown, M. V. et al., 2024. A marine heatwave drives significant shifts in pelagic microbiology. *Communications Biology,* Volume 7.

Campbell, S. L., Borchers-Arriagada, N., Williamson, G. J. & Johnston, F. H., 2024. Assessing mortality associated with heatwaves in the cool climate region of Tasmania, Australia. *The Journal of Climate Change and Health,* Volume 17.

Campbell, S. L. et al., 2021. Ambulance dispatches and heatwaves in Tasmania, Australia: A case-crossover analysis. *Environmental Research ,* Volume 202.

Carroll, R., Wright, I. A. & Reynolds, J. K., 2023. Loss of soil carbon in a world heritage peatland following a bushfire. *International Journal of Wildland Fire,* 32(7), pp. 1059-1070.

CEFC, 2024. *Electric vehicles.* [Online]
Available at: https://www.cefc.com.au/where-we-invest/decarbonisation/electric-vehicles/

Released under RTI

Checet, L. A. et al., 2012. *Climate Futures for Tasmania: Severe Wind Hazard and Risk Technical Report,* s.l.: Univerisity of Tasmania.

City of Hobart, 2021. *Understanding flood risk.* [Online]
Available at: https://www.hobartcity.com.au/City-services/Stormwater-and-urban-waterways/Understanding-flood-risk

City of Hobart, 2022. *City of Hobart Bushfire Management Strategy 2022.* [Online]
Available at: https://www.hobartcity.com.au/files/assets/public/v/2/council/strategies-and-plans/bushfire-management-strategy-2022.pdf

City of Hobart, n.d. *Issues and inestigations.* [Online]
Available at: https://www.hobartcity.com.au/City-services/Stormwater-and-urban-waterways/Issues-and-investigations

City of Launcestion, n.d. *Flood.* [Online]
Available at: https://www.launceston.tas.gov.au/Emergency-Management-Hub/1.-Understand-your-risk/Flood

Clarence City Council, 2008. *Climate change impacts on Clarence coastal areas,* Clarence: Clarence City Council.

Clean Energy Council, 2022. *Skilling the Energy Transition,* Melbourne: Clean Energy Council.

Clean Energy Regulator , 2024. *Quarterly Carbon Market Report December Quarter 2023.* [Online]
Available at: https://cer.gov.au/markets/reports-and-data/quarterly-carbon-market-reports/quarterly-carbon-market-report-december-quarter-2023

Clean Energy Regulator, 2024a. *ACCU project and contract register.* [Online]
Available at: https://cer.gov.au/markets/reports-and-data/accu-project-and-contract-register?view=Projects

Clean Energy Regulator, 2024b. *Australian Carbon Credit Unit Scheme.* [Online]
Available at: https://cer.gov.au/schemes/australian-carbon-credit-unit-scheme#:~:text=Under%20the%20ACCU%20Scheme%2C%20participants,their%20project%20stores%20or%20avoids

Clean Energy Regulator, 2024c. *Renewable Energy Target.* [Online]
Available at: https://cer.gov.au/schemes/renewable-energy-target#:~:text=The%20RET%20sets%20a%20target,less%20carbon%2Dintensive%20energy%20system

Clean Energy Regulator, 2024d. *Small-scale installation postcode data.* [Online]
Available at: https://cer.gov.au/markets/reports-and-data/small-scale-installation-postcode-data

Clean Energy Regulator, 2024e. *Small-scale Renewable Energy Scheme.* [Online]
Available at: https://cer.gov.au/schemes/renewable-energy-target/small-scale-renewable-energy-scheme

Clean Energy Regulator, 2024f. *CER commences work on the Nature Repair Market.* [Online]
Available at: https://cer.gov.au/schemes/cer-commences-work-nature-repair-market

Climate Change in Australia, 2021. *Tasmania's Changing Climate,* s.l.: CSIRO.

Climate Commision, 2013. *The critical decade: Tasmanian impacts and opportunities,* Canberra: Climate Council Australia.

Climate Council, 2022. *Climate Risk Map of Australia.* [Online]
Available at: https://www.climatecouncil.org.au/resources/climate-risk-map/

Climate Futures for Tasmania, n.d. *Impacts on Agriculture Technical Report Summary,* s.l.: Climate Futures for Tasmania.

CoastAdapt, 2018. *Role of insurance in adaptation.* [Online]
Available at: https://coastadapt.com.au/role-of-insurance

Commonwealth of Australia, 2006. *A Guide to to the Integrated Marine and Coastal Regionalisation of Australia Version 4.0,* Australia: Department of the Environment and Heritage.

Conn, A., 2023. *Rural insurance premiums soar after climate disasters with contractors, farmers paying the price.* [Online]
Available at: https://www.abc.net.au/news/rural/2023-05-02/rural-insurance-costs-soar-consumers-feel-pinch/102268750

Released under RTI

Corlett, R. T. & Westcott, D. A., 2013. Will plant movements keep up with climate change?. *Trends in Ecology & Evolution,* 28(8), pp. 482-488.

CSIRO, 2015. *Potential for land-sector carbon sequestration and implications for land use, food, water and biodivserity,* s.l.: s.n.

CSIRO, 2021. *A circular economy roadmap for plastics, tyres, glass and paper in Australia.* [Online]
Available at: A circular economy roadmap for plastics, tyres, glass and paper in Australia

CSIRO, 2022. *Taking stock of Australia's carbon sequestration potential.* [Online]
Available at: https://www.csiro.au/en/news/All/Articles/2022/December/taking-stock-of-australias-carbon-sequestration-potential

CSIRO, 2022a. *Residential energy efficiency: building for health and economic benefits.* [Online]
Available at: https://www.csiro.au/en/research/technology-space/energy/energy-efficient-living/residential-energy-efficiency-builders

CSIRO, n.d. Critical Infrastructure Protection and Resilience. [Online] Available at:
https://www.csiro.au/en/about/challenges-missions/Critical-Infrastructure

Curnin, S., Brooks, B. & Brigerson, E., 2022. *2018/19 Tasmanian Bushfires Community Recovery Fund Evaluation Project,* s.l.: University of Tasmania .

Day, C., 2023. *Population growth and the economy: A mixed blessing?.* [Online]
Available at: https://www.sydney.edu.au/business/news-and-events/news/2023/08/07/population-growth-and-the-economy-a-mixed-blessing.html

DCCEE, 2011. *Climate Change Risks to Coastal Buildings and Infrastructure* , Canberra: Department of Climate Change and Energy Efficiency.

DCCEEW, 2023. *Appliances, lighting and equipment.* [Online]
Available at: https://www.dcceew.gov.au/energy/energy-efficiency/appliances-lighting-and-equipment

DCCEEW, 2023a. *The National Electric Vehicle Strategy,* Canberra: Department of Climate Change, Energy, the Environment and Water.

DCCEEW, 2023b. *Australian Energy Statistics, Table O Electricity generation by fuel type 2021-22 and 2022.* [Online]
Available at: https://www.energy.gov.au/publications/australian-energy-statistics-table-o-electricity-generation-fuel-type-2021-22-and-2022#:~:text=The%20largest%20source%20of%20renewable,three%20percentage%20points%20on%202021

DCCEEW, 2023c. *Delivering cheaper, cleaner and smarter energy to households,* s.l.: s.n.

DCCEEW, 2024. *Bass Strait, Northern Tasmania proposed offshore wind area.* [Online]
Available at: https://www.dcceew.gov.au/energy/renewable/offshore-wind/areas/bass-strait#:~:text=The%20Bass%20Strait%20region%20is,support%20an%20offshore%20wind%20industry.

DCCEEW, 2024a. *Australian Carbon Credit Unit (ACCU) Scheme.* [Online]
Available at: https://www.dcceew.gov.au/climate-change/emissions-reduction/accu-scheme

DCCEEW, 2024b. *Capacity Investment Scheme.* [Online]
Available at: https://www.dcceew.gov.au/energy/renewable/capacity-investment-scheme

DCCEEW, 2024. *Clean energy and the electricity market.* [Online]
Available at: https://www.dcceew.gov.au/energy/renewable/clean-energy-electricity-market

DCCEEW, 2024d. *Growing Australia's hydrogen industry.* [Online]
Available at: https://www.dcceew.gov.au/energy/hydrogen

Deloitte Access Economic, 2022. *Economic reality check Adapting Australia for climate-resilient growth,* s.l.: s.n.

Released under RTI

Deloitte, 2021. *Economic reality check: Adapting Australia for climate-resilient growth.* [Online]
Available at: https://www.deloitte.com/au/en/services/economics/perspectives/economic-reality-check.html

Deloitte, 2023. *Sustainable Supply Chain Trnsformation: How to master the green transition of industrial supply chains,* s.l.: Deloitte.

Department for Education, Children and Young People, 2023. *What we heard: Community engagement on Early Learning for Three Year Olds,* Hobart: Department for Education, Children and Young People.

Department of Climate Change, 2009. *Climate Change Risks to Australia's Coast,* Canberra: Department of Climate Change.

Department of Climate Change, E. t. E. a. W., 2024a. *National Consumer Energy Resources Roadmap,* Canberra: Commonwealth Government of Australia.

Department of Education, Children and Young People, 2022. *Key Data.* [Online]
Available at: https://publicdocumentcentre.education.tas.gov.au/library/Shared%20Documents/Key-Data-2022.pdf

Department of Health, 2020. *Tasmanian Climate Change and Health Roundtable,* s.l.: Public Health Services and the Tasmanian Climate Change Office.

Department of Health, 2021. *Climate change and health.* [Online]
Available at: https://www.health.tas.gov.au/health-topics/environmental-health/climate-change-and-health

Department of Health, 2024. *Mosquito-borne diseases.* [Online]
Available at: https://www.health.tas.gov.au/health-topics/infectious-diseases/infectious-diseases-guides-and-fact-sheets/mosquito-borne-diseases#mosquitoborne-diseases-that-occur-in-tasmania

Department of Natural Resources and Environment Tasmania , 2024. *National Guidelines for Water Quality.* [Online]
Available at: https://nre.tas.gov.au/water/water-monitoring-and-assessment/water-monitoring/surface-water-quality/water-quality-guidelines

Department of Natural Resources and Environment, 2022. *Assessing River Health.* [Online]
Available at: https://nre.tas.gov.au/water/water-monitoring-and-assessment/surface-water-assessment/assessing-river-health-and-condition

Department of Natural Resources and Environment, 2023. *Tasmanian Waste and Resource Recovery Data.* [Online]
Available at: https://nre.tas.gov.au/environment/waste-and-resource-recovery/tasmanian-waste-and-resource-recovery-data#2022-23WasteData%E2%80%8B%3Cbr%3E

Department of Natural Resources and Environment, 2023a. *Water Management Plans.* [Online]
Available at: https://nre.tas.gov.au/water/water-management-plans

Department of Police, F. &. E. M., 2024a. *Emergency Management Committees.* [Online]
Available at: https://www.ses.tas.gov.au/emergency-management-2/emergency-management-committees/

Department of Premier and Cabinet, 2016. *Mitigating Natural Hazards through Land Use Planning and Building Control,* s.l.: Department of Premier and Cabinet.

Department of Premier and Cabinet, 2017. *Tasmania's Climate Change Action Plan 2017–2021.* [Online]
Available at: https://www.dpac.tas.gov.au/divisions/archived-climatechange/tasmanias_climate_change_action_plan_20172021

Department of Premier and Cabinet, 2024. *Local government climate change adaptation.* [Online]
Available at: https://www.dpac.tas.gov.au/divisions/archived-climatechange/what_you_can_do/local_government/local_government_adaptation#:~:text=Climate%20Resilient%20Councils&text=The%20Project%20aims%20to%20improve,making%20strategic%20and%20financial%20decisions.

Department of Primary Industries, Parks, Water and Environment, 2010a. *Vulnerability of Tasmania's Natural Environment to Climate Change: An Overview,* Hobart: Department of Primary Industries, Parks, Water and Environment.

Released under RTI

Department of Primary Industries, Water and Environment, 2002. *Tasmanian Natural Resource Management Framework,* Hobart: Department of Primary Industries, Water and Environment.

Department of Primary Industries, Water and Environment, 2003. *Environmental Management Goals for Tasmanian Surface Waters - King island,* s.l.: s.n.

Department of Primary Industries, Water and Environment, 2021. *Tasmanian Wilderness World Heritage Area Natural Values Climate Change Adaptation Strategy 2021-2031,* Hobart: Department of Primary Industries, Parks, Water and Environment.

Department of State Growth, 2010. *Tasmanian Urban Passenger Transport Framework.* [Online]
Available at: https://www.stategrowth.tas.gov.au/policies_and_strategies/framework

Department of State Growth, 2020. *Tasmanian Renewable Hydrogen Action Plan ,* Tasmania : s.n.

Department of State Growth, 2021. *Productivity Commission Inquiry into Vaulnerable Supply Chains.* [Online]
Available at: https://www.pc.gov.au/__data/assets/pdf_file/0008/275498/sub011-supply-chains.pdf

Department of State Growth, 2023. *Business statistics snapshot June 2023.* [Online]
Available at:
https://www.business.tas.gov.au/__data/assets/pdf_file/0004/430573/Small_Business_Statistics_Update_June_2023_V2.pdf

Department of State Growth, 2023a. *Tasmanian small business grant recipients.* [Online]
Available at: https://www.business.tas.gov.au/tasmanian_small_business_grant_recipients

Department of State Growth, 2024. *Registration & Licensing Statistics.* [Online]
Available at: https://www.transport.tas.gov.au/licensing/general_information/statistics

Department of State Growth, 2024a. *Tasmanian Active Infrastructure Grants Program.* [Online]
Available at:
https://www.stategrowth.tas.gov.au/sportrec/grants_and_funding_programs/accordion/tasmanian_active_infrastructure_grants_program

Department of State Growth, n.d. *Transport Access Strategy.* [Online]
Available at: https://www.stategrowth.tas.gov.au/policies_and_strategies/transport_access_strategy

DFAT, 2023. *Tasmania.* [Online]
Available at: https://www.dfat.gov.au/sites/default/files/tas-cef.pdf

Dowdy, A., Mills, G. A., Finkele, K. & de Groot, W., 2009. *Australian fire weather as represented by the McArthur Forest Fire Danger Index and the Canadian Forest Fire Weather Index,* s.l.: Centre for Australian Weather and Climate Research, Bushfire Cooperative Research Centre, Canadian Forest Service.

DPIW, 2008. *Climate Change and Coastal Asset Vulnerability: An audit of Tasmania's coastal assets potentially vulnerable to flooding and sea-level rise,* Tasmania: Department of Primary Industries and Water.

Dwyer, A., Campell, D., Julian, R. & Barnes, A., 2020. *Documenting the key recruitment and sustainability issues related to emergency response volunteers in Tasmania,* s.l.: University of Tasmania .

Earth Systems and Climate Change Hub, 2021. *Marine heatwaves in the Tasman Sea: future projections,* s.l.: s.n.

Edwards, B., Gray, M. & Hunter, B., 2014. The Impact of Drought on Mental Health in Rural and Regional Australia. *Social Indicators Research,* Volume 121, pp. 177-194.

Edwards, B., Gray, M. & Hunter, B., 2014. The Impact of Drought on Mental Health in Rural and Regional Australia. *Social Indicators Research,* Volume 121, pp. 117-194.

EESI, 2021. *Adaptation Jobs Explainer: Understanding this Critical and Growing Workforce.* [Online]
Available at: https://www.eesi.org/articles/view/adaptation-jobs-explainer-understanding-this-critical-and-growing-workforce

Released under RTI

EESI, 2024. *How Do You Count Climate Adaptation Jobs.* [Online]
Available at: https://www.eesi.org/articles/view/how-do-you-count-climate-adaptation-jobs

Eisner, R. & Bhattarai, G., n.d. *Land use in carbon farming.* [Online]
Available at: https://www.utas.edu.au/tia/research/research-projects/project/agricultural-systems/land-use-in-carbon-farming

Electric Vehichle Council, 2023. *Australian Electric Vehicle Industry Recap2023,* s.l.: Electric Vehicle Council.

Electric Vehicle Council, 2022. *Electric trucks: Keeping shelves stocked in a net zero world,* s.l.: The Electric Vehicle Council and the Australian Trucking Association.

Electric Vehicle Council, n.d. *Recharging the economy: The economic impact of accelerating electric vehicle adoption,* s.l.: Electric Vehicle Council.

Ellen MacArthur Foundation, 2019. *Artificial intelligence and the circular economy: AI as a tool to accelerate the transition ,* s.l.: s.n.

Energy Markets & Policy, 2023. *https://emp.lbl.gov/wind-technologies-market-report.* [Online]
Available at: https://emp.lbl.gov/wind-technologies-market-report

EPA Tasmania, 1994. *Landfills.* [Online]
Available at: https://epa.tas.gov.au/business-industry/regulation/waste-management/landfills

EPA Tasmania, 2024. *Mining and Extractive.* [Online]
Available at: https://epa.tas.gov.au/business-industry/regulation/industrial-activities/mining-and-extractive

EPA Tasmania, n.d. *Mt Lyell Acid Drainage Remediation.* [Online]
Available at: https://epa.tas.gov.au/business-industry/regulation/remediation/mt-lyell-acid-drainage-remediation#:~:text=The%20last%20century%20of%20mining,%2C%20iron%2C%20manganese%20and%20zinc.

Export Finance Australia, 2024. *We're growing Australia's critical minerals sector.* [Online]
Available at: https://www.exportfinance.gov.au/criticalminerals

Fairman, T. A., Nitschke, C. R. & Bennett, L. T., 2019. Carbon stocks and stability are diminished by short-interval wildfires in fire-tolerant eucalypt forests. *Forest Ecology and Management,* Volume 505.

Favasuli, S. & Sebastian, V., 2021. *Voluntary carbon markets: how they work, how they're priced and who's involved.* [Online]
Available at: https://www.spglobal.com/commodityinsights/en/market-insights/blogs/energy-transition/061021-voluntary-carbon-markets-pricing-participants-trading-corsia-credits

Fisk, G. W., 2017. *Climate risks and adaptation pathways for coastal transport infrastructure. Guidelines for planning and adaptive responses,* Goald Coast: National Climate Change Adaptation Research Facility.

FloodList, 2023. *Australia – PERILS Estimates AUD 840m Loss for New South Wales and Victoria Floods.* [Online]
Available at: https://floodlist.com/australia/insurance-loss-new-south-wales-victoria-floods-october-2022

Fox-Hughes, P., Barnes-Keoghan, I. & Porter, A., 2018. Observations of a tornado at an Automatic. *Journal of Southern Hemisphere Earth Systems Science Weather Station in northern Tasmania,* Volume 68.

Fox-Hughes, P. et al., 2014. Future fire danger climatology for Tasmania, Australia, using a dynamically downscaled regional climate model. *International jounal of Wildland Fire ,* 23(3), pp. 309-321.

Frankovic, I., 2024. How do carbon prices spill over along global supply chains? The impact on Europe and Germany. *Journal of Policy Modeling.*

Gergis, J., Blashki, G., Gardner, J. & Bradshaw, S., 2023. *Climate Trauma: The growing toll of climate change on the mental health of Australians,* s.l.: Climate Council of Australia Limited.

Gibbs, L. et al., 2016. *Post-bushfre relocation decision-making and personal wellbeing,* Melbourne : University of Melbourne.

Released under RTI

Greener Spaces Better Places, 2017. *Where Should All the Trees Go? Tasmania.* [Online]
Available at: https://www.greenerspacesbetterplaces.com.au/guides/where-should-all-the-trees-go/

Grose, M. et al., 2010. *Climate futures for Tasmania,* Hobart, Tasmania: Antarctic Climate & Ecosystems Cooperative Research Centre.

Grose, M. R. et al., 2019. The role of topography on projected rainfall change in mid-latitude mountain regions. *Climate Dynamics,* Volume 53, pp. 3675-3690.

Grose, M. et al., 2010a. *Climate Futures for Tasmania: general climate impacts technical report,* Hobart: Antarctic Climate & Ecosystems Cooperative Research Centre.

Hausfather, Z., 2018. *Explainer: How 'Shared Socioeconomic Pathways' explore future climate change.* [Online]
Available at: https://www.carbonbrief.org/explainer-how-shared-socioeconomic-pathways-explore-future-climate-change/

Heffernan, T. et al., 2022. *Mental health, wellbeing and resilience after the 2019-20 bushfires: The Australian national bushfire health and wellbeing survey - A preliminary report,* Canberra: Australian NAtional University.

Holbrook, N. J. & Bindoff, N. L., 1997. Interannual and Decadal Temperature Variability in the Southwest Pacific Ocean between 1955 and 1988. *Journal of Climate Change,* 10(5), pp. 1035-1049.

Homes Tasmania, 2024. *Improving Tasmania's social housing with energy efficiency upgrades.* [Online]
Available at: https://www.homestasmania.com.au/newsroom/2024/improving-tasmanias-social-housing-with-energy-efficiency-upgrades#:~:text=Homes%20Tasmania%20%2D%20Improving%20Tasmania's%20social%20housing%20with%20energy%20efficiency%20upgrades&text=More%20than%201%20600

Hughes, L., 2014. *Be prepared: Climate change and the South Australian bushfire threat,* s.l.: Climate Council of AUstralia Limited.

Hughes, L., Hannah, E. & Fenwick, J., 2016. *The Silent Killer: Climate Change and the Health Impacts of Extreme Heat,* s.l.: Climate Council of Australia.

Hughes, L. & McMichael, T., 2011. *The critical decade: Climate change and health,* s.l.: Climate Commission Secretariat (Department of Climate Change and Energy Efficiency).

Hutley, N., Dean, A., Hart, N. & Jordie, D., 2022. *Uninsurable nation: Australia's most climate-vaulnerable places,* s.l.: Climate Council of Australia.

IEA, 2023. *Global EV Outlook 2023,* s.l.: International Energy Agency.

IEA, 2023a. *Critical Minerals Market Review 2023,* s.l.: s.n.

IEA, 2023b. *Energy transition towards net zero.* [Online]
Available at: https://www.iea.org/reports/australia-2023/executive-summary

IEA, 2023c. *Renewables 2023.* [Online]
Available at: https://www.iea.org/reports/renewables-2023/executive-summary

IEA, 2023d. *Will solar PV and wind costs finally begin to fall again in 2023 and 2024?.* [Online]
Available at: https://www.iea.org/reports/renewable-energy-market-update-june-2023/will-solar-pv-and-wind-costs-finally-begin-to-fall-again-in-2023-and-2024

IEA, 2024. *Electricity 2024.* [Online]
Available at: https://www.iea.org/reports/electricity-2024/executive-summary

IEA, 2024a. *Global Critical Minerals Outlook 2024.* [Online]
Available at: https://iea.blob.core.windows.net/assets/ee01701d-1d5c-4ba8-9df6-abeeac9de99a/GlobalCriticalMineralsOutlook2024.pdf

Released under RTI

IEA-PVPS, 2023. *Trends in PV Applications 2023.* [Online]
Available at: https://iea-pvps.org/trends_reports/trends-2023/

IEEE, 2023. *Vehicle to Grid (V2G) Technology.* [Online]
Available at: https://innovationatwork.ieee.org/vehicle-to-grid-v2g-technology/

IMF, 2021. *Policies aimed at slowing warming could be better designed to reduce inequality.* [Online]
Available at: https://www.imf.org/en/Publications/fandd/issues/2021/09/climate-change-and-inequality-guivarch-mejean-taconet

Infrastructure Tasmania, 2024. *Active Transport.* [Online]
Available at: https://www.infrastructure.tas.gov.au/policy_and_advice/active_transport

Insurance Council of Australia, 2019. *The Impact of Government Duties on Household Insurance,* s.l.: Insurance Council of Australia.

Insurance Council of Australia, 2021. *Climate Change Impact Series: Actions of the Sea and Future Risks ,* s.l.: Climate Council of Australia.

Insurance Council of Australia, 2021a. *Insurance Catastrophe Resilience Report 2020-21,* s.l.: Insurance Council of Australia.

Insurance Council of Australia, 2023. *Climate change action.* [Online]
Available at: https://insurancecouncil.com.au/issues-in-focus/climate-change-action/#:~:text=Impacts%20on%20the%20availability%20and,catastrophes%20and%205%20significant%20even

Insurance Council of Australia, 2023a. *Insurance Catastrophe Resilience Report 2022-23,* s.l.: Insurance Council of Australia.

Insurance Council of Australia, n.d. [Online]
Available at: https://insurancecouncil.com.au/issues-in-focus/affordability/

International Labour Organization, 2018. *The employment impact of climate change adaptation. Input Document for the G20 Climate Sustainability Working Group,* Geneva: ILO.

IPCC, 2014. *Climate Change 2014 Synthesis Report,* Geneva, Switzerland: Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

IPCC, 2021. *Climate Change 2021: The Physical Science Basis.* [Online]
Available at: https://www.ipcc.ch/report/ar6/wg1/

IPCC, 2021. *IPCC WGI Interactive Atlas: Regional information (Advanced).* [Online]
Available at: https://interactive-atlas.ipcc.ch/regional-information#eyJ0eXBlIjoiQVRMQVMiLCJjb21tb25zIjp7ImxhdCI6LTM3NzY1NTMsImxuZyI6LTExNDU2MzEsInpvb20iOjMsInByb2oiOiJFUFNHOjU0MDMwIiwibW9kZSI6ImNvbXBsZXRlX2F0bGFzIn0sInByaW1hcnkiOnsic2NlbmFyaW8iOiJoaXN0b3JpY2FsIiwicGVy

IPCC, 2021. *Sixth Assessment Report.* [Online]
Available at: https://www.ipcc.ch/

IPCC, 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change,* . Cambridge University Press, Cambridge, UK and New York, NY, USA: Cambridge University Press.

IPCC, 2022a. Summary for Policymakers: : Climate Change 2022: Impacts, Adaptation and Vulnerability. In: D. R. M. T. E. P. K. M. A. A. M. C. L. S. L. V. M. A. O. B. R. [H.-O. Pörtner, ed. *Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge: Cambridge University Press, pp. 3-33.

IRENA, 2020. *Grenn hydrogen cost reduction.* [Online]
Available at: https://www.irena.org/publications/2020/Dec/Green-hydrogen-cost-reduction

IRENA, 2023. *Renewable Power Generation Costs in 2022.* [Online]
Available at: https://www.irena.org/Publications/2023/Aug/Renewable-power-generation-costs-in-2022

Released under RTI

Johnson, C. R. et al., 2011. Climate change cascades: Shifts in oceanography, species' ranges and subtidal marine community dynamics in eastern Tasmania. *Journal of Experimental Marine Biology and Ecology,* 400(1-2), pp. 17-32.

Johnston, L., 2022. *Heatwaves in Tasmania? Stop laughing, here's what you need to know.* [Online]
Available at: https://www.abc.net.au/news/2022-11-29/heatwaves-in-tasmania-here-is-what-you-need-to-know/101568360

Kajtar, J. B. et al., 2024. A stakeholder-guided marine heatwave hazard index for fisheries and aquaculture. *Climatic Change,* 177(26).

Kajtar, J., Holbrook, N. & Lyth, A., 2023. *Assessment and communication of risks to Tasmanian aquaculture and fisheries from marine heatwaves: stakeholder engagement synthesis.* [Online]
Available at:
https://figshare.utas.edu.au/articles/report/Assessment_and_communication_of_risks_to_Tasmanian_aquaculture_and_fisheries_from_marine_heatwaves_stakeholder_engagement_synthesis/23200016

Keating, A. & Handmer, J., 2021. *The Southwest Tasmania Fires of Summer 2018-2019: A post event review capability study,* North Sydney: Zurich Australian Insurance Limited.

Keywan Riahi, D. P. v. V. E. K. J. E. B. C. O. S. F. N. B. K. C. R. D. O. F. W. L. A. P. J. C. C. S. K. M. L. L. J., 2017. The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview. *Global Environmental Change,* Volume 42, pp. 153-168.

Kloser, E. & Miller, D., 2024. *How drought conditions are impacting Tasmania and why climatologists no longer use the D word.* [Online]
Available at: https://www.abc.net.au/news/2024-03-07/tas-drought-conditions-as-dry-tasmania-looking-very-brown/103546058

Kofi Adom, P. & Amoani, S., 2021. The role of climate adaptation readiness in economic growth and climate change relationship: An analysis of the output/income and productivity/institution channels. *Journal of Environmental Management,* Volume 293.

Krishnan, M. et al., 2022. *The net-zero tansition,* s.l.: McKinsey Global Institute .

Kumar, G. & Reddy, K. R., 2020. Addressing Climate Change Impacts and Resiliency in Contaminated Site Remediation. 24(4).

Leal Filho, W. A. Z. R. S. J. e. a., 2024. An assessment of priorities in handling climate change impacts on infrastructures. Sci Rep, 14(14147).

Lesley, H., 2014. *Climate Change and the South Australia Bushfire Threat ,* s.l.: Climate Council of Australia Limited.

Lida, Y., Takatani, Y., Kojima, A. & Ishii, M., 2020. Global trends of ocean CO2 sink and ocean acidification: an observation-based reconstruction of surface ocean inorganic carbon variables. *Jounranl of Oceanography,* Volume 77, pp. 323-358.

Ling, S. D. & Keane, J. P., 2018. *Resurvey of the Longspined Sea Urchin (Centrostephanus rodgersii) and associated barren reef in Tasmania,* Hobart: University of Tasmania.

LISTmap, n.d. *Land Information System Tasmania.* [Online]
Available at: https://maps.thelist.tas.gov.au/listmap/app/list/map

Liu, T. et al., 2023. Teleconnections among tipping elements in the Earth system. *Nature Climate Change,* Volume 13, pp. 67-74.

Local Goverment Association of Tasmania, 2024. *Climate Change.* [Online]
Available at: https://www.lgat.tas.gov.au/lgat-advocacy/climate-change

Love, P. T. et al., 2016. *Impact of climate change on weather-related fire risk factors in the TWWHA: Interim Report,* s.l.: ReCFIT.

Released under RTI

Lynch, J., 2016. *Tassal withdraws tenders to supply fresh salmon to Coles.* [Online]
Available at: https://www.smh.com.au/business/tassal-withdraws-tenders-to-supply-fresh-salmon-to-coles-20160407-go0neu.html

Lyth, A., Allchin, R., Holbrook, N. & Bell , E., 2013. *Ross River Virus in Tasmania in a changing climate: a vulnerability assessment,* Hobart: Univeristy of Tasmania.

Maavara, T. &. C. Q. &. V. M. K. &. B. L. &. Z. J. &. N. J. &. Z. C., 2020. River dam impacts on biogeochemical cycling. *Nature Reviews Earth & Environment,* 1(2), pp. 103-116.

Marris, E., 2016. Tasmanian bushfires threaten iconic ancient forests. *Nature,* Volume 530, pp. 137-138.

Mastrandrea, M. D. et al., 2010. *Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties,* s.l.: Intergovernmental Panel on Climate Change (IPCC).

May B, B. J. G. A. a. M. S., 2012. *Tasmanian Forest Carbon Study,* Hobart: Tasmanian Climate Change Office.

McInnes, K. L. et al., 2016. *Sea-Level Rise and Allowances for Tasmania based on the IPCC AR5,* s.l.: CSIRO.

Meng, H., Hayashida, H., Norazami-Lokman, N. H. & Strutton, P. G., 2022. Benefits and detrimental effects of ocean warming for Tasmanian salmon aquaculture. *Continental Shelf Research ,* Volume 246.

Metro Tasmania, n.d. *Zero emission buses.* [Online]
Available at:
https://www.metrotas.com.au/zeroemission/#:~:text=Three%20Hydrogen%20Electric%20Buses%20(HEBs,board%20through%20a%20fuel%20cell

Meyer, A., Holbrook, N., Strutton, P. & Eccleston, R., 2021. *The IPCC Sixth Assessment Report: What does it mean for Tasmania?,* s.l.: Australian Research Council Centre of Excellence for Climate Extremes and the University of Tasmania.

Mineral Resources Tasmania, 2002. *The effects of waste disposal on groundwater quality in Tasmania.* [Online]
Available at: https://www.mrt.tas.gov.au/__data/assets/pdf_file/0009/230787/Overview_Report.pdf

Minister for Climate Change and Energy, 2024a. *$330m investment in Australian heavy industry future.* [Online]
Available at: https://minister.dcceew.gov.au/bowen/media-releases/330m-investment-australian-heavy-industry-future

Ministry for the Environment, 2019. *Arotakenga Huringa Ahuarangi: A framework for the National Climate Change Risk Assessment for Aotearoa New Zealand,* Wellington: Ministry for the Environment.

Ministry for the Environment, 2020. *National Climate Change Risk Assessment for New Zealand – Arotakenga Tūraru mō te Huringa Āhuarangi o Āotearoa: Technical report – Pūrongo whaihanga,* Wellington: Ministry for the Environment .

Ministry for the Environment, 2024. *Coastal hazards and climate change guidance,* Wellington: Ministry for the Environment.

Minshull, L., 2017. *Tasmania in pole position for electric car industry: The potential of electric vehicles in Tasmania,* s.l.: The Australia Institute.

Moore T, N. L. S. Y. M. C. a. H. R., 2017v. Benefits and challenges of energy efficient social housing. *Energy Procedia,* Issue 121, pp. 300-307.

Morton, D., 2016. *Climate change and contaminated land,* Gold Coast: National Climate Change Adaptation Research Facility.

Múnera-Roldán, C., Colloff, M. J., Pittock, J. & van Kerkhoff , L., 2024. Aligning adaptation and sustainability agendas: lessons from protected areas. *Mitigation and Adaptation Strategies for Global Change ,* Volume 29.

NASA Earth Observatory, 2022. *World of Change: Global Temperatures.* [Online]
Available at: https://earthobservatory.nasa.gov/world-of-change/global-temperatures

Nascimento, S. C. et al., 2023. Long-Term Impact of Historical Mining on Water Quality at Mount Lyell, Western Tasmania, Australia. *Mine Water and the Environment,* Volume 42, pp. 399-417.

Released under RTI

National Mental Health Commission, 2020. *Monitoring mental health and suicide prevention reform: National Report 2020,* Sydney: National Mental Health Commission.

National Mental Health Commission, 2021. *Monitoring mental health and suicide prevention reform: National Report 2020,* Sydney: NMHC.

National Rural Health Alliance, 2004. *Rural Communities and Disaster Recovery.* [Online]
Available at: https://ruralhealth.org.au/sites/default/files/position-papers/position-paper-04-09-30.pdf

National Water Comission, 2012. *Water policy and climate change in Australia,* Canberra: NWC.

Nature Trackers, 2024. *Our ProjectsWhere? Where? Wedgie.* [Online]
Available at: https://naturetrackers.au/projects/where-where-wedgie/

NEMA, 2022. *Crunch Time for Tassie Farmers after Hailstorm Bruising.* [Online]
Available at: https://nema.gov.au/stories/crunch-time-for-tassie-apples

NGFS, 2024. *Central Banks and Supervisors Network for Greening the Financial System.* [Online]
Available at: https://www.ngfs.net/en

Nied, M. et al., 2014. On the relationship between hydro-meteorological patterns and flood types. *Journal of Hyrdrology,* 519(Part D), pp. 3249-3262.

NOAA, 2024. *Understanding Sotrmwater Inundation.* [Online]
Available at: https://coast.noaa.gov/stormwater-floods/understand/#:~:text=Flooding%20may%20introduce%20debris%20that,absorb%20stormwater%2C%20thus%20increasing%20runoff.

Normyle, A. &. P. J., 2019. A review of the impacts of pumped hydro energy storage construction on subalpine and alpine biodiversity: lessons for the Snowy Mountains pumped hydro expansion project. *Australian Geographer,* 51(1), p. 53–68.

OECD /EC-JRC, 2021. *Access and Cost of Education and Health Services: Preparing Regions for Demographic Change.* Paris: OECD Publishing.

OECD, 2024. *Climate Finance and the USD 100 billion goal.* [Online]
Available at: https://www.oecd.org/en/topics/sub-issues/climate-finance-and-the-usd-100-billion-goal.html

Office of the Coordinator General, 2024. *Mining and mineral processing.* [Online]
Available at:
https://www.stategrowth.tas.gov.au/ocg/investment_opportunities/sector_opportunities/Mining_and_mineral_processing

Office of the Tasmanian Economic Regulator, 2023. *ENERGY IN TASMANIA REPORT 2021-22,* Hobart: Office of the Tasmanian Economic Regulator.

Oliver, E. C. et al., 2017. The unprecedented 2015/16 Tasman Sea marine heatwave. *Nature Communication,* Volume 8.

Oliver, E. C. & Holbrook, N. J., 2014. Extending our understanding of South Pacific gyre “spin-up”: Modeling the East Australian Current in a future climate. *JGR Oceans,* 119(5), pp. 2788-2805.

Oliver, E. C., O'Kane, T. J. & Holbrook, N. J., 2015. Projected changes to Tasman Sea eddies in a future climate. *JGR Oceans,* 120(11), pp. 7150-7165.

Page, L. & Thorp, V., 2010. *Tasmanian Coastal Works Manual Chapter 14: Structures and Facilities,* Tasmania: Department of Primary Industries, Parks, Water and Environment -.

Paquette, A. & Hargreaves, A. L., 2021. Biotic interactions are more often important at species’ warm versus cool range edges. *Ecology Letters,* 24(11), pp. 2427-2438.

Parliament of Australia , n.d. *Chapter 5 Insurance and property finance,* s.l.: s.n.

Parliament of Australia, 2017. *In hot water: the impacts of climate change on marine fisheries and biodiversity. Chapter 4: Consequences of climate change for fishing, aquaculture and other ocean-based activities.* [Online]

Released under RTI

Available at:
https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/ClimateChangeOceans/Report

Parliament of Australia, n.d. *Chapter 4: Lack of consumer awareness.* [Online]
Available at:
https://www.aph.gov.au/parliamentary_business/committees/house_of_representatives_committees?url=spla/insurance/report/chapter%204.pdf

Parliament of Tasmania, 2021. *Report on Rural Health Sevices in Tasmania,* Hobart: Legislative Council Government Administration Committee.

Parmesan, C. & Yohe, G., 2003. A globally coherent fingerprint of climate change impacts across natural systems. *Nature,* Volume 421, pp. 37-42.

Parry, I. W., de Mooij, R. A. & Keen, M., 2012. *What Is the Best Policy Instrument for Reducing CO2 Emissions?,* s.l.: International Monetary Fund.

Pearson, M., 2007. *Climate change and its impacts on Australia's cultural heritage,* Canberra: Heritage Management Consultants.

Perkins-Kirkpatrick, S. E. et al., 2019. The Role of Natural Variability and Anthropogenic Climate Change in the 2017/18 Tasman Sea Marine Heatwave. *Bulletin of the American Meterological Society,* 100(1), pp. S105-S110.

PIANC, 2014. *'Sustainable Ports' A Guide for Port Authorities,* Brussles: Environmental Navigation Commission.

Pitman, A. et al., 2021. *The Intergovernmental Panel on Climate Change 6th Assessment Report: A special briefing by the ARC Centre of Excellence for Climate Extremes,* s.l.: ARC Centre of Excellence for Climate Extremes.

Point Advisory, 2021. *2021 Update of Tasmania's Emissions Pathway Review – technical report,* Hobart: Tasmanian Climate Change Office.

Pook, M., Risbey, J. & McIntosh, P., 2010. East coast lows, atmospheric blocking and rainfall: A Tasmanian perspective. *IOP Conf. Ser.: Earth Environ. Sci,* Volume 11.

Pörtner, H. O. et al., 2022. *Summary for Policymakers,* Cambridge, UK and New York, NY, USA: Cambridge University Press.

Prakas, S. A. a. A., 2024. Climate change adaptation in the Australian electricity sector and the lure of resilience thinking. Energy Research & Social Science, Volume 118.

Queensland Government., 2018. *Queensland Climate Adaptation Strategy,* Brisbane: State of Queensland .

RDA Tasmania, 2023. *RDA Tasmania National Freight and Supply Chain Strategy Review Submission.* [Online]
Available at: https://www.infrastructure.gov.au/sites/default/files/documents/nfscs--rda-tasmania.pdf

ReCFIT, 2016. *Bushfire and Climate Change Research Project.* [Online]
Available at: https://www.stategrowth.tas.gov.au/recfit/bushfire_and_climate_change_research_project

ReCFIT, 2018. *Electric Vehicles in Tasmania,* Hobart: Tasmanian Climate Change Office.

ReCFIT, 2022. *Renewable Energy Coordination Framework,* s.l.: Renewables, Climate and Future Industries Tasmania.

ReCFIT, 2023. *Climate Change Action Plan.* [Online]
Available at: https://recfit.tas.gov.au/climate/climate_change_action_plan

ReCFIT, 2023a. *Energy Saver Loan Scheme.* [Online]
Available at: https://www.recfit.tas.gov.au/household_energy/energy_saver_loan_scheme

ReCFIT, 2023b. *Fact Sheet - Tasmania's transport sector.* [Online]
Available at:
https://www.stategrowth.tas.gov.au/recfit/climate/climate_change_action_plan/action_plan_fact_sheets/fact_sheet_-

Released under RTI

transport#:~:text=The%20Tasmanian%20Government%20has%20committed,2021%20Tasmanian%20Emissions%20Pathway%20Review

ReCFIT, 2023c. *State of Play Report: Tasmania's transport sector,* Tasmania: Department of State Growth.

ReCFIT, 2023d. *State of Play Report: Tasmania's waste sector,* Hobart: Department of State Growth.

ReCFIT, 2023e. *Tasmania's Climate Change Action Plan 2023-25,* Hobart: Department of State Growth.

ReCFIT, 2024. *Business Energy Efficiency Scheme.* [Online]
Available at: https://recfit.tas.gov.au/grants_program/business_energy_efficiency_scheme

ReCFIT, 2024a. *Green hydrogen.* [Online]
Available at: https://recfit.tas.gov.au/future_industries/green_hydrogen

ReCFIT, 2024b. *Tasmanian Renewable Energy Action Plan.* [Online]
Available at: https://recfit.tas.gov.au/renewables/tasmanian_renewable_energy_action_plan

ReCFIT, 2024c. *Tasmania's Greenhouse Gas Emissions.* [Online]
Available at: https://recfit.tas.gov.au/tasmanias_greenhouse_gas_emissions

Rejeb, A. et al., 2022. The Internet of Things and the circular economy: A systematic literature review and research agenda. *Journal of Cleaner Production,* Volume 350.

Renewables Tasmania, 2021. *Draft Renewable Energy Coordination Framework,* s.l.: Department of State Growth.

Ridgway, K. R., 2007. Long-term trend and decadal variability of the southward penetration of the East Australian Current. *Geophysical Research Letters,* 34(13).

Robinson, L. M. et al., 2015. Rapid assessment of an ocean warming hotspot reveals "high" confidence in potential species' range extensions. *Global Environmental Change,* Volume 31, pp. 28-37.

Romps, D. M., Seeley, J. T., Vollaro, D. & Molinari, J., 2014. Projected increase in lightning strikes in the United States due to global warming. *Science,* 346(6211), pp. 851-854.

Royal Commission, 2020. *Royal Commission into National Natural Disaster Arrangements,* s.l.: Govern-General of the Commonwealth of Australia.

Rutovitz, J., Briggs, C., Dominish, E. & Nagrath, K., 2020. *Renewable Energy Employment in Australia: Methodology,* Sydney: University of Technology Sydney.

Rutovitz, J., Langdon, R., Mey, F. & Briggs, C., 2022. *Electricity Sector Workforce Projections for the 2022 ISP: Focus on Tasmania,* s.l.: Prepared by the Institute for Sustainable Futures for RACE for 2030.

Rutovitz, J., Langdon, R., Mey, F. & Briggs, C., 2022. *The Australian Electricity Workforce for the 2022 Integrated System,* s.l.: Prepared by the Institute for Sustainable Futures for RACE for 2030.

Rynne, B. & Verikios, G., 2020. *Potential economic pay-off of a circular economy,* s.l.: KPMG.

Sellberg, M. et al., 2018. From resilience thinking to Resilience Planning: Lessons from practice. *Journal of Environmental Management,* Volume 217, pp. 906-918.

Simpson, N. P. et al., 2021. A framework for complex climate change risk assessment. *One Earth,* 4(4), pp. 489-501.

Slatyer, R., 2010. Climate change impacts on Australia's alpine ecosystems. *The ANU Undergraduate Research Journal,* Volume 2, pp. 81-97.

State Emergency Service, 2022. *TASDRA 2022: Tasmanian Disaster Risk Assessment,* Hobart: Department of Police, Fire and Emergency Management.

State Emergency Service, 2023. *Tasmanian Emergency Management Arrangements Issue 2,* Hobart: Department of Police, Fire and Emergency Management .

Released under RTI

State Fire Management Council, 2014. *Bushfire in Tasmania: A new approach to reducing our statewide relative risk,* Hobart: State Fire Management Council Unit.

State of the Environment Australia, 2021. *Climate change.* [Online]
Available at: https://soe.dcceew.gov.au/heritage/pressures/climate-change

Styger, J., Marsden-Smedley, J. & Kirkpatrick, J., 2018. Changes in Lightning Fire Incidence in the Tasmanian Wilderness World Heritage Area, 1980–2016. *Fire,* 1(3), p. 38.

TasCOSS, 2022. *Household Energy Efficiency Initiatives: creating jobs, stimulating our economy and lowering power bills,* Tasmania: s.n.

TasCOSS, 2024. *Supporting Tasmanians in a Worsening Cost of Living Crisis.* [Online]
Available at: https://tascoss.org.au/wp-content/uploads/2023/12/TasCOSS-%E2%80%94-Supporting-Tasmanians-in-a-Worsening-Cost-of-Living-Crisis-FINAL-v1-12-12-23.pdf

Tasmania Fire Service, 2024. *Bushfire-Prone Areas.* [Online]
Available at: https://www.fire.tas.gov.au/Show?pageId=colBushfireProneAreas

Tasmanian Economic Regulator, 2021. *Report on the state of the Tasmanian Water and Sewerage Industry 2019-20,* s.l.: Tasmanian Economic Regulator.

Tasmanian Government , 2023. *Taking strong action on climate change.* [Online]
Available at: https://www.premier.tas.gov.au/site_resources_2015/additional_releases/taking-strong-action-on-climate-change

Tasmanian Government , 2024. *Backing our farmers with extended support for dry and drought affected communities.* [Online]
Available at: https://www.premier.tas.gov.au/site_resources_2015/additional_releases/backing-our-farmers-with-extended-support-for-dry-and-drought-affected-communities?utm_source=miragenews&utm_medium=miragenews&utm_campaign=news

Tasmanian Government, 2021. *Building Act 2016.* [Online]
Available at: https://www.legislation.tas.gov.au/view/whole/html/inforce/current/act-2016-025

Tasmanian Institute of Agiculture, n.d. *Projected impact of climate change on wine grape production opportunities for growers,* s.l.: Climate Futures for Tasmania.

Tasmanian Institute of Agriculture, 2012. *Impact of climate change overview: Opportunities for Tasmanian agriculture.* [Online]
Available at: https://nre.tas.gov.au/Documents/Overview-Climate-Impacts.pdf

Tasmanian Parks and Wildlife Service, 2024. *Marine reserves.* [Online]
Available at: https://parks.tas.gov.au/explore-our-parks/marine-reserves

Tasmanian Policy Exchange at the University of Tasmania, 2021. *A blueprint for a climate-positive Tasmania.* [Online]
Available at: https://www.utas.edu.au/__data/assets/pdf_file/0003/1475562/A-blueprint-for-a-climate-positive-Tasmania.pdf

Tasmanian Policy Exchange, 2023. *Driving Net-Zero: Options for reducing Tasmania's transport emissions. Technical Policy Paper.* [Online]
Available at: https://www.utas.edu.au/__data/assets/pdf_file/0012/1667577/Transport-technical-policy-report_final-28072023.pdf

Tasmanian Waste and Resource Recovery Board, 2023. *Tasmanian Waste and Resource Recovery Strategy 2023-2026,* Hobart: Department of Natural Resources and Environment Tasmania.

Tasmanian Waste and Resource Recovery Board, 2024. *Waste and Resource Recovery High Priority Infrastructure Grant Guidelines 2024,* s.l.: Tasmanian Waste and Resource Recovery Board.

Released under RTI

TasPorts, 2015. *TasPorts 2043.* [Online]
Available at: https://tasports2043.com.au/#0

TasPorts, 2022. *TasPorts Stakeholder Update | Weather Event Notice #2.* [Online]
Available at: https://tasports.com.au/news/tasports-stakeholder-update-weather-event-notice-2

TasPorts, n.d. *About TasPorts.* [Online]
Available at: https://www.tasports.com.au/about-tasports

TasRecovery, 2019. *2018-19 Bushfires: Final Recovery Plan.* [Online]
Available at: https://www.ehatas.org.au/documents/item/951

TasWater, 2023. *Environment Policy.* [Online]
Available at:
https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.taswater.com.au%2FArticleDocuments%2F285%2FEnvironment_Policy.pdf.aspx&psig=AOvVaw3QtSRxW9_Gy-P9bb4q2UVt&ust=1723503523900000&source=images&cd=vfe&opi=89978449&ved=0CAYQrpoMahcKEwjI4ongh-6HAxUAAAAAHQAA

TasWater, 2024. *Getting the water to you.* [Online]
Available at: https://www.taswater.com.au/community/education/water-wise/water-treatment#:~:text=TasWater%20makes%20use%20of%2048,of%20the%20tap%20at%20home.

TasWater, 2024a. *Restrictions.* [Online]
Available at: https://www.taswater.com.au/news/restrictions

TCFD, 2023. *Reporting Climate-Related Financial Information.* [Online]
Available at: https://www.fsb-tcfd.org/publications/

The World Bank, 2020. *The Adaptation Principles: 6 Ways to Build Resilience to Climate Change.* [Online]
Available at: https://www.worldbank.org/en/news/feature/2020/11/17/the-adaptation-principles-6-ways-to-build-resilience-to-climate-change

The World Bank, 2021. *Water in Circular Economy and Resilience (WICER).* [Online]
Available at: https://www.worldbank.org/en/topic/water/publication/wicer

Thompson, P. & McDonald, K., 2020. *Spatial and seasonal trends in net primary production,* s.l.: State and Trends of Australia's Ocean Report.

Threatened Species Section, 2024. *Species management profile: Tasmanian Wedge-tailed Eagle (Aquila audax subsp. fleayi).* [Online]
Available at: https://www.threatenedspecieslink.tas.gov.au/Pages/Wedge-tailed-Eagle.aspx

Tonmoy, F. & Rissik, D., n.d. *Climate Change Risk Mnagaement Tool For Small Businesses In Queensland.* [Online]
Available at: https://www.qld.gov.au/__data/assets/pdf_file/0026/132398/ccrmt-businesses-full.pdf

Tonwshend, I., Awosoga, O., Kulig, J. & Fan, H., 2014. Social cohesion and resilience across communities that have experienced a disaster. *Natural Hazards,* Volume 76, pp. 913-938.

Tozer, C. R. et al., 2018. The Relationship between Wave Trains in the Southern Hemisphere Storm Track and Rainfall Extremes over Tasmania. *Monthly Weather Review,* 146(12), pp. 4201-4230.

Ugalade, S. C., Preston, J., Ogier, E. & Crawford, C., 2018. Analysis of farm management strategies following herpesvirus (OsHV-1) disease outbreaks in Pacific oysters in Tasmania, Australia. *Acquaculture,* Volume 495, pp. 179-186.

UNFCC, 2024. *How Climate Technology Is Being Ramped Up.* [Online]
Available at: https://unfccc.int/news/how-climate-technology-is-being-ramped-up

UNFCC, 2024a. *Introduction Climate and Resilience.* [Online]
Available at: https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/introduction

Released under RTI

University of Tasmania, 2024. *Sustainability Education and research partnerships.* [Online]
Available at: https://www.utas.edu.au/about/sustainability/learning-teaching-and-research/education-and-research-partnerships

University of Technology Sydney, 2023. *Energy efficient homes are boosting your health,* Sydney: University of Technology Sydney.

Upward, K., Saunders, V. & Usher, K., 2023. The impact of climate change on country and community and the role of mental health professionals working with Aboriginal communities in recovery and promoting resilience. *International Journal of Mental Health Nursing,* 32(6), pp. 1484-1495.

van Dijk, A. I. et al., 2013. The Millennium Drought in southeast Australia (2001–2009): Natural and human causes and implications for water resources, ecosystems, economy, and society. *Water Resources Research,* 49(2), pp. 1040-1057.

van Wagner, C. E. & Pickett, T. L., 1985. *Equations and FORTRAN Program for the Canadian Forest Fire Weather Index System,* Ottawa: Canadian Forestry Service, Government of Canada.

Volunteering Tasmania, 2021. *Safeguarding Volunteering in Tasmania: Environmental scan report,* Hobart: Volunteering Tasmania.

Wardlaw, T., 2024. *Giants Under Threat,* s.l.: Climate Futures.

Ware, D., 2016. *Climate change impacts on coastal water supply and waste water management. CoastAdapt Impact Sheet 12,* Goald Coast: National Climate Change Adaptation Research Facility.

Watson, R. A. et al., 2013. Ecosystem model of Tasmanian waters explores impacts of climate-change induced changes in primary productivity. *Economic Modelling,* Volume 264, pp. 115-129.

Webstoy, M., Andrew, S. C., Gallagher, R. V. & Schrader, J., 2024. Species gain and loss per degree Celsius. *OKIOS,* 2024(4).

Williams, E. R., 2005. Lightning and climate: A Review. *Atmospheric Research,* 76(1-4), pp. 272-287.

Williamson, B., 2022. *Caring for Country means tackling the climate crisis with Indigenous leadership: 3 things the new government must do.* [Online]
Available at: https://theconversation.com/caring-for-country-means-tackling-the-climate-crisis-with-indigenous-leadership-3-things-the-new-government-must-do-183987

Wine Tasmania , 2023. *Tasmania Fire and Emergency Service Bill 2023.* [Online]
Available at: https://www.fire.tas.gov.au/wp-content/uploads/2023/12/Wine-Tasmania.pdf

Woetzel, J. et al., 2020. *Could Climate become the weak link in your supply chain?,* s.l.: Mckinsey Global Institute.

World Bank, 2023. *Social Dimensions of Climate Change.* [Online]
Available at: https://www.worldbank.org/en/topic/social-dimensions-of-climate-change

World Economic Forum, 2022. *This is how cities can reduce emissions with waste-reduction solutions.* [Online]
Available at: https://www.weforum.org/agenda/2022/11/waste-emissions-methane-cities/

World Economic Forum, 2024. *1.5°C is a physical limit: Here's why this target can't be negotiated.* [Online]
Available at: https://www.weforum.org/agenda/2024/01/earth-systems-tipping-points-1-5-degrees-celsius/#:~:text=1.5%C2%B0C%20is%20a%20physical%20limit%20beyond%20which%20Earth,latest%20climate%20science%20and%20collaborate.

World Economic Forum, 2024a. *The Global RIsks Report 2024,* Geneva: The World Economic Forum.

Yair, Y., 2018. Lightning hazards to human societies in a changing climate. *Environmental Research Letters,* Volume 13.

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Climate Change Office

Managing Tasmania's climate risks and opportunities

The Tasmanian Government response to
Tasmania's Risk Assessment for Climate Change 2024

November 2024

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Renewables, Climate and Future Industries Tasmania
Department of State Growth

Tasmanian Government

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In recognition of the deep history and culture of these islands, we acknowledge all Tasmanian Aboriginal people as the continuing Custodians of this Land and Sea Country and pay our respect to Elders past and present.

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Minister's message

Hon Madeleine Ogilvie MP
Minister for the Environment

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Tasmania's Risk Assessment for Climate Change 2024 (the Risk Assessment) is the first statewide climate change risk assessment for Tasmania and one of the first jurisdiction-wide assessments in Australia. The Risk Assessment will be a vital source of information as we consider climate risks and opportunities for Tasmania.

I am pleased to present the Tasmanian Government response to the Risk Assessment — *Managing Tasmania's climate risks and opportunities*. This response will guide the government's future adaptation priorities and action.

The Risk Assessment was undertaken by Deloitte Risk Advisory Pty Ltd, in partnership with the Climate Change Office in Renewables, Climate and Future Industries Tasmania (ReCFIT). The Risk Assessment is based on extensive research, climate scenario analysis, expert advice and analysis, targeted stakeholder input, and robust climate science. I would like to thank everyone who has contributed to the development of the Risk Assessment.

The Risk Assessment details the impacts climate change is having on the natural, social, built and economic domains of Tasmania, both now and into the future. The information in the Risk Assessment helps us to understand how these events will change over time and interact with one another.

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The government recognises that Tasmania has experienced a number of natural hazard events in recent years and that, under the changing climate, these are projected to increase in intensity and frequency. We are committed to taking action to build resilience across our state. A significant part of this work will be ensuring that our inaugural risk assessment for climate change, and any future risk assessments, are widely communicated, understood, and made available.

We will also work to build on the range of resources already available, to make sure that Tasmanians have the climate science, data and information needed to make informed decisions when it comes to climate change. This includes building the capability of government to consider and respond to risks and opportunities of the changing climate.

Collaboration across Tasmania will be vital to the success of our adaptation action. We will focus on building connections across our economy and society to ensure that adaptation action can be efficiently delivered and can maximise benefits for a range of stakeholders.

Finally, we are committed to ensuring that our adaptation action is iterative and contains appropriate mechanisms to reflect and review the work undertaken, so that we can ensure continuous improvement. Our *Climate Change (State Action) Act 2008* requires a risk assessment to be prepared every five years, ensuring that the latest information can be considered, and we can learn from previous assessments and action.

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Tasmania's changing climate

Tasmania's climate is changing, and these changes will have an impact on our communities, environments and economy.

Impacts of a changing climate in Tasmania

Significant change in rainfall patterns

More hot days and heatwaves

Increased ocean acidification and water temperature

Increase in storms, creating coastal erosion

Longer fire seasons, more days of high fire danger

Rise in sea levels

Rise in annual average temperatures

Fewer frosts

Increased windspeed

In recent years, Tasmania has experienced a range of extreme weather events, including two significant bushfire events, a record marine heatwave off the east coast, prolonged dry periods in 2015-16 and 2019-20, and flooding. These events have had environmental economic and social impacts on governments, business, communities and households.

As our climate continues to change, Tasmania is likely to experience increased hot days and heatwaves, longer and more severe fire seasons, significant changes in seasonal and regional rainfall patterns, increased windspeed, rising sea levels, increases in sea surface temperature and ocean acidification, and increased frequency of storm events and associated flooding, coastal erosion and inundation.

There are also climate-related risks and opportunities associated with the transition to a low emissions economy. These risks and opportunities may be caused by changes in technology, markets, consumer and investor sentiment, policy and regulation.

Technological changes

Policy and regulatory changes

Market changes

Changing consumer and investor sentiment

The Tasmanian Government is committed to building resilience to the changing climate and collaborating to ensure our actions on climate change are connected and complementary.

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Why do we need a climate change risk assessment?

Climate change will have wide-ranging impacts across Tasmania. Climate change is a complex, global problem and yet it needs local adaptation solutions and collective action. Information about Tasmania's future climate risks and opportunities will help us make decisions about how Tasmania can best plan for and adapt to the changing climate, build resilience, and support growth and productivity across our economy.

The *Climate Change (State Action) Act 2008* was amended in 2022 to include a requirement to undertake a statewide climate change risk assessment every five years, and take into account:

- the latest and best available science on the projected impacts of climate change on Tasmania
- consideration of the risks associated with energy transition, including social and economic impacts
- consideration of economic, social and environmental implications of climate change and assessment of the associated risks to Tasmanian communities, natural environments and ecosystems, and economic activity
- the impact of climate change on the health and wellbeing of Tasmanians, and future generations
- any other matter that the Minister considers relevant.

Tasmania's Risk Assessment for Climate Change 2024 (the Risk Assessment) is the first statewide climate change risk assessment undertaken for our state. It provides comprehensive Tasmanian-specific information about the risks and opportunities climate change presents.

The Risk Assessment supports informed decision making by providing a holistic picture and useful data about the impacts of climate change on Tasmania. This information will help the Tasmanian Government to plan and prioritise adaptation action, and improve the resilience of our systems, natural and built environments, economy, and community in a strategic and integrated way. It will also assist Tasmanian communities, local government, and private entities to undertake more detailed assessments of climate risks specific to their region or organisation.

Tasmania is the first Australian jurisdiction to have a legislated requirement for assessment of both the physical and transition risks of climate change, and among the first to release a jurisdiction-wide climate change risk assessment. This and future risk assessments will provide Tasmania with strong, iterative, up-to-date evidence about the challenges and opportunities the changing climate presents, and ensure we are well placed to manage climate risks and take advantage of opportunities.

Many other jurisdictions in Australia are also currently undertaking climate change risk assessments. The National Climate Risk Assessment and National Adaptation Plan are expected to be released in late 2024.

The Risk Assessment will guide the Tasmanian Government's adaptation action on climate change for the next five years. We encourage all Tasmanians to use this information as a basis for more detailed climate risk assessments, and to inform adaptation planning and action.

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About this document

This is the Tasmanian Government's response to *Tasmania's Risk Assessment for Climate Change 2024* (the Risk Assessment). It details the Tasmanian Government response to the risks, opportunities and themes identified in the Risk Assessment, and sets out our strategic direction for climate adaptation in response to the evidence presented in the Risk Assessment.

The Tasmanian Government already has a range of climate adaptation activities underway, some of which have been considered in the Risk Assessment. Sometimes these actions are a direct response to an identified risk (such as a flood levee), and other times they are broader actions to enable effective adaptation action (such as education materials). It is important that we build on existing work and collaborate with others to maximise our efforts.

Our response to the impacts of climate change is multifaceted and will continue to be integrated across all relevant areas of government program delivery.

This document responds to the findings of the Risk Assessment and sets out how we will continue to build our capacity, adapt our systems, increase our resilience to climate risks, and pursue opportunities in coming years.

You can read the Risk Assessment on the ReCFIT website at recfit.tas.gov.au/cc-risk-assessment

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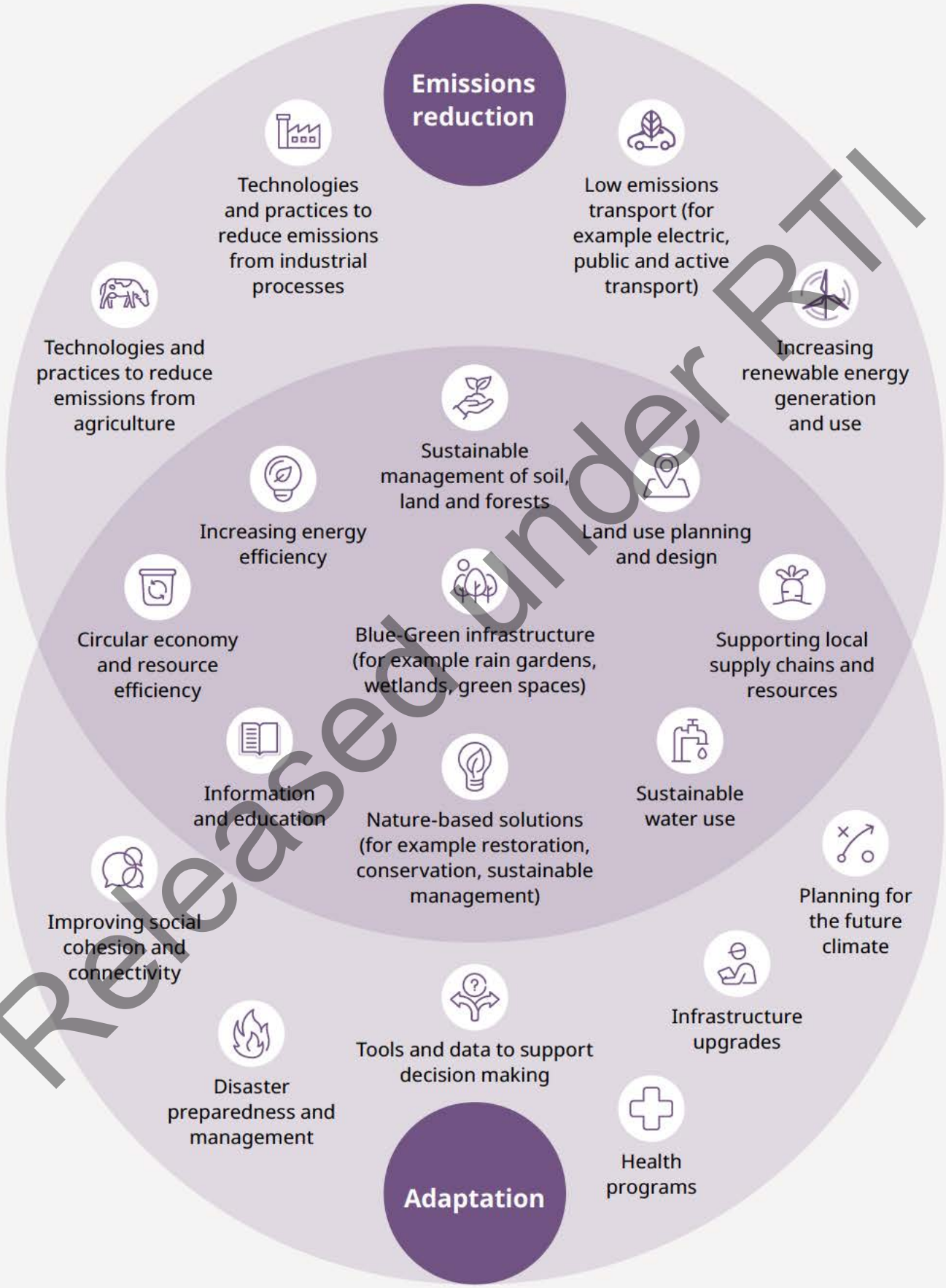
How do we respond to climate change?



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Tasmania's Risk Assessment for Climate Change 2024

Summary of methodology

Deloitte Risk Advisory Pty Ltd was contracted to undertake the first statewide risk assessment, in partnership with the Climate Change Office in Renewables, Climate and Future Industries Tasmania (ReCFIT).

The Risk Assessment draws on internationally recognised climate risk frameworks, and primarily uses *A framework for complex climate change risk assessment*, Simpson, N.P. et al, 2021.[1] This framework considers climate risk as being made up of a hazard or driver combined with exposure to the hazard, vulnerability of the community, element or system to the hazard, and any existing response to the risk that might help to mitigate it. This approach is consistent with that used in the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report.

The Risk Assessment assesses:

- **physical climate-related risks and opportunities**, including:
  - climate-related acute shocks, such as heatwaves, floods, bushfires, drought, coastal erosion, coastal storm surge
  - longer-term climate trends, such as temperature change, sea level rise, seasonal distribution and intensity of rainfall, incidence of frost, distribution of invasive species and diseases
- **climate-related transition risks and opportunities**, from changes in policy, regulation, technology development, reputation, and market shift, as a result of goals to reduce greenhouse gas emissions
- **climate-related complex, compounding, and cascading risks and opportunities**, which involve multi-directional interactions between types of risk.

The Risk Assessment considers these risks and opportunities across four value domains (Natural, Social, Economic and Built), and evaluates them according to the level of the consequence (both now and into the future), confidence in the evidence, and the adaptation shortfall after considering any existing adaptation activity identified as part of the assessment.

These factors combine to give each risk or opportunity an adaptation urgency rating, from Tier 1 to Tier 4. Risks and opportunities with a Tier 1 urgency rating (most urgent) are considered ready for further action in the next five years. Risks with a Tier 2 rating are considered to need further investigation in the next five years to better understand the risk or opportunity or possible adaptation responses, before additional action can be taken.

You can read more about the methodology of the Risk Assessment in Chapter 2 of the Risk Assessment[2] Technical Report

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1 *A framework for complex climate change risk assessment*, Simpson, N.P. et al., 2021 available at www.sciencedirect.com/science/article/pii/S2590332221001792

2 recfit.tas.gov.au/cc-risk-assessment

Engagement and stakeholder input

Targeted stakeholder consultation was undertaken to inform the Risk Assessment, including across government, and with key industry bodies, government businesses, non-government organisations, local government, research institutions, and community groups. This consultation occurred in stages over 2023 and 2024.

Stage 1: First-Pass Risk Assessment workshops

Regional workshops were held in Hobart, Launceston and Burnie in September 2023 to discuss the draft first-pass risk and opportunity scan. The workshops were supported by an online survey and several targeted briefings for those unable to attend the workshops.

Stage 2: Targeted stakeholder engagement

One-on-one interviews were held with key stakeholders and subject matter experts, as well as targeted cross-dependency sector workshops.

Stage 3: Targeted approach for Tasmanian Aboriginal organisations

The Climate Change Office (CCO) contacted a number of Tasmanian Aboriginal organisations during the development of the Risk Assessment. The Climate Change Office continues to work to build its connections with Tasmanian Aboriginal communities and acknowledges that more work can be done to ensure future risk assessments are representative of the in-depth cultural knowledge, expertise and understanding held by Tasmanian Aboriginal people.

Stage 4: Online adaptation/response workshops

Online workshops were held in mid-2024 with key stakeholders who have a role in adaptation responses, to understand existing adaptation action in Tasmania.

Full details of the consultation are provided in Chapter 3.2 of the Risk Assessment[3] Technical Report

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3 recfit.tas.gov.au/cc-risk-assessment

What does the Risk Assessment tell us?

The Risk Assessment details the level of impact the changing climate and the global transition to low emissions is likely to have on Tasmania. It also provides a clearer understanding of the complexity of the issues, and the connections between risks and opportunities, experienced under the changing climate.

The Risk Assessment considers the economic, social and environmental implications of climate change and assesses the associated risks to Tasmanian communities, natural environments, ecosystems, built infrastructure and economic activity.

It also identifies the risks and opportunities associated with the energy transition, including social and economic impacts.

Many of the climate change hazards and resulting risks and opportunities identified through the Risk Assessment are consistent with existing research at a jurisdictional and national level.

The Tasmanian Government, through its comprehensive legislative framework and commitment to a five-yearly statewide climate change risk assessment is proactively considering and identifying climate change adaptation needs and opportunities.

Read the Risk Assessment[4] Summary Report.

Key findings

The Risk Assessment identifies four key areas considered to be critical as part of any adaptation response:

1 State-level coordination of local efforts

The Risk Assessment highlights that adaptation efforts occurring at local levels require coordination and that increased information sharing between governments, business, industry and the community could improve adaptation outcomes.

2 Climate change will increasingly impact the health and wellbeing of Tasmanians

The Risk Assessment highlights that climate change is likely to exacerbate food and water security and put increased pressure on our key systems (for example infrastructure, transport and emergency services), while also impacting human health and wellbeing. It suggests that a coordinated approach across strategies is necessary to address the intersection of climate change and health and wellbeing.

3 Education is vital to successful climate adaptation and increased resilience for future generations

The Risk Assessment indicates that education and awareness of the impacts of climate change can be improved across Tasmania.

4 Development of, and investment in, additional data collection is required to better inform risk-based decision making

The Risk Assessment suggests that Tasmania can strengthen its capacity to effectively address climate change impacts by prioritising development of, and investment in, data systems.

4 recfit.tas.gov.au/cc-risk-assessment

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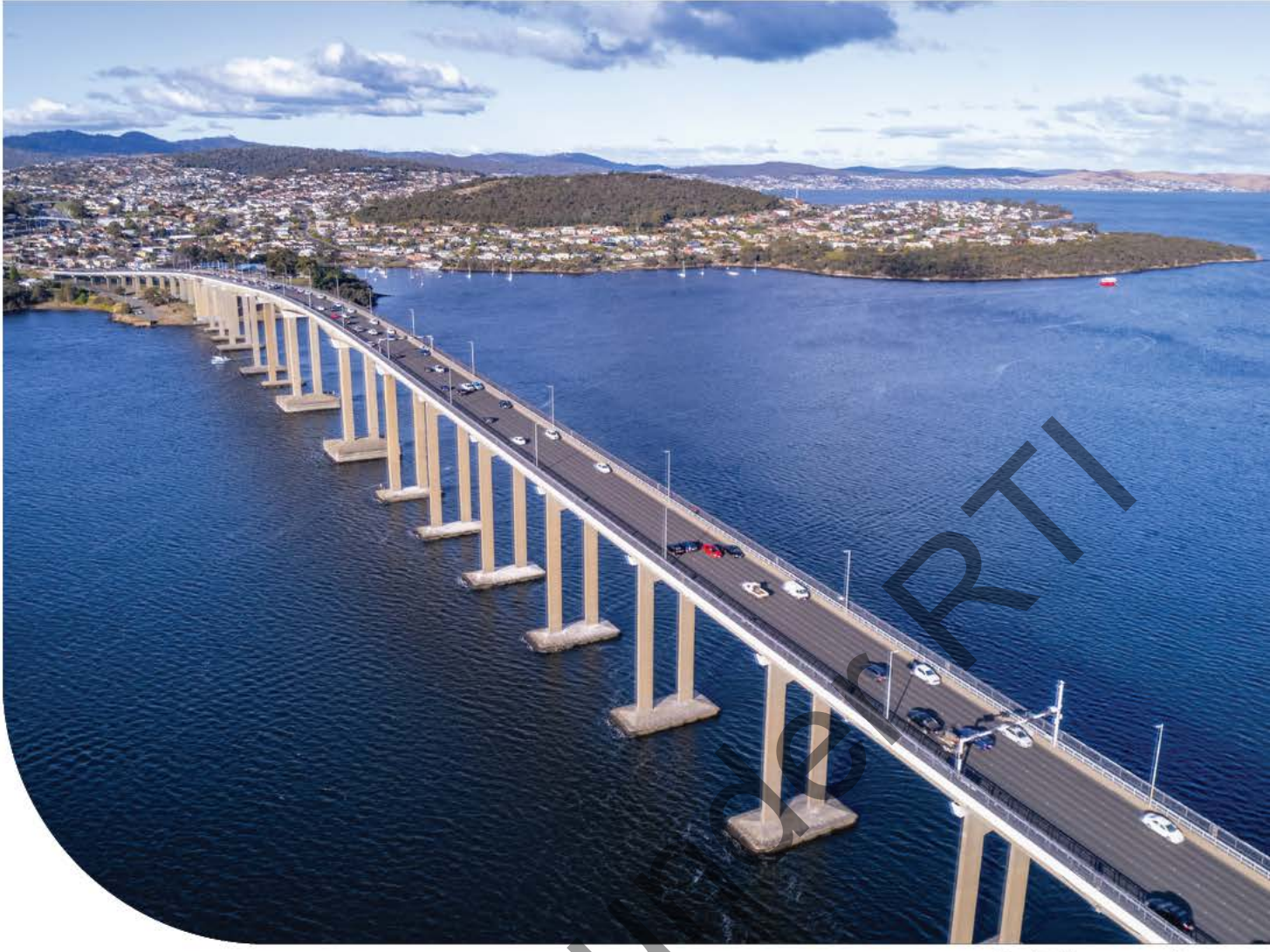

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Priority risks and opportunities

The first stage of the Risk Assessment identified 88 climate risks and opportunities for Tasmania. Of these, 40 were then prioritised for detailed analysis, with a focus on climate impacts that would benefit from action in the next five years. This prioritisation also incorporated impacts that will occur later in the 21st century, where adaptation activity may require a long lead time.

The 40 priority climate risks and opportunities are shown on the following page.

The letter and number attached to each risk or opportunity relates to their identification in *Tasmania's Risk Assessment for Climate Change 2024 Technical Report* and *Summary Report*.

The full list of 88 impacts identified in the first stage of the Risk Assessment is provided in Chapter 2 of the Risk Assessment[5] Technical Report.

5 recfit.tas.gov.au/cc-risk-assessment

Natural Domain

Physical risks and opportunities

- Risks to inland water ecosystems and species due to extreme weather events and chronic changes (N1)
- Risks to terrestrial ecosystems and species due to extreme weather events and chronic changes (N2)
- Risks to coastal ecosystems and species (erosion-related risk) (N3)
- Risks to marine ecosystems and species due to extreme weather events and chronic changes (N4)
- Risks to native ecosystems and species due to chronic changes enhancing biosecurity risks (N5)
- Risks to alpine ecosystems and species due to chronic changes (N6)

Transition risks and opportunities

- Risks to the natural domain from the mining of critical minerals (NT1)
- Risks and opportunities related to renewable energy development impacting biodiversity, inland water quality, marine ecosystems, and natural heritage (NT2)
- Opportunities to optimise waste systems to reduce impacts on the environment (NT3)
- Opportunities to support water quality and biodiversity (NT4)

Social Domain

Physical risks and opportunities

- Risks to social cohesion and community wellbeing due to extreme weather events (S1)
- Risks to mental health and wellbeing due to extreme weather events and chronic changes (S2)
- Risks to physical safety, health and wellbeing due to extreme weather events and chronic changes (S3)
- Risks to cultural heritage, including Aboriginal cultural heritage due to extreme weather events and chronic changes (S4)

Transition risks and opportunities

- Risks to social cohesion due to the inability of institutions and governance systems to effectively manage climate risks (ST1)
- Risks to social cohesion, and health and wellbeing due to insufficient services for a growing population (driven by renewable energy development and new industries) (ST2)
- Opportunities for increased skills and employment with business development for new and emerging industries that provide adaptation and resilience solutions (ST3)
- Opportunities for social cohesion, health and wellbeing through adaptation and resilience actions, including across domain co-benefits (ST4)
- Opportunities for increased skills and employment with renewable energy development and new industries (ST5)
- Opportunity to improve financial wellbeing, and health and wellbeing through improved energy efficiency in housing, particularly for low-income households (ST6)

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Economic Domain

Physical risks and opportunities

- Risk to businesses and public organisations due to extreme weather events (E1)
- Risks to national and international supply/distribution networks due to extreme weather events (E2)
- Risks to the insurability of businesses, public sector and private assets due to extreme weather events and chronic changes (E3)
- Risks and opportunities to land-based primary sector due to extreme weather events and chronic changes (E4)
- Risks and opportunities to ocean-based aquaculture and fisheries due to extreme weather events and chronic changes (E5)

Transition risks and opportunities

- Risks of slow, ineffective or no action on emissions reduction, limiting economic growth (ET1)
- Risks to businesses and public organisations due to supply chain costs as organisations adjust to a low carbon economy (ET2)
- Risks and opportunities for business through the implementation of new technology to reduce emissions (including fugitive/agriculture/industrial/fuel switching) (ET3)
- Opportunities for economic growth through renewable energy supply (ET4)
- Opportunities for business through new revenue streams available from carbon markets (ET5)

Built Domain

Physical risks and opportunities

- Risks to healthcare and emergency services due to extreme weather events (B1)
- Risks to the built environment due to extreme events and chronic changes (B2)
- Risks to contaminated sites due to extreme events and chronic changes (B3)
- Risks to stormwater and sewerage systems due to extreme events and chronic changes (B4)
- Risks to ports and coastal infrastructure due to extreme events and chronic changes (B5)
- Risks to transportation networks due to extreme events and chronic changes (B6)

Transition risks and opportunities

- Opportunities for public and active transport (BT1)
- Opportunities for improved flexibility within electricity infrastructure (BT2)
- Opportunities for infrastructure development to support the circular economy (BT3)
- Opportunities for lower emissions transport systems due to low emissions vehicles (BT4)

Tier 1: Ready to act

Tier 2: Investigate then act

Tier 3: Continue to monitor current actions

Tier 4: Monitor

Risk Opportunity

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Improving Tasmania's resilience to climate risks and taking advantage of opportunities

As our climate changes, we need to continue to adapt and build resilience in our systems and environments.

Adapting to the changing climate requires action and leadership at all levels, including Australian, state and local government, business, industry, community and individuals. We will need to work together to ensure we adapt in the most effective ways.

We also know that localised solutions, and adaptation action that is community-connected and led, is often the most effective.

There is already significant work underway by governments, business, industry and the community to improve Tasmania's capacity to adapt to a changing climate and make the most of the opportunities that it presents. This work includes a range of actions supported by the Climate Change Office through:

- *Tasmania's Climate Change Action Plan 2023-25*
- the six sectoral Emissions Reduction and Resilience Plans, which contain a range of actions to build resilience and respond to climate risks
- *Tasmania's Emission Reduction and Resilience Roadmap 2024-29*, which details the links, and common themes and opportunities, between all sectoral plans and the Risk Assessment.

This document details a range of actions designed to improve Tasmania's resilience to climate risks and take advantage of opportunities in response to the findings of the Risk Assessment.

Action is focused in five key areas:

1. We will help Tasmanians **understand the climate risks and opportunities** in the Risk Assessment and how they might be impacted
2. We will support Tasmanians to access **fit-for-purpose climate science, data and information** to prepare for the changing climate
3. We will build **public sector climate capability** to strengthen how we adapt and make the most of opportunities
4. We will facilitate **collaborative partnerships** to support adaptation action
5. We will monitor and **learn as we go**, recognising that adaptation is an iterative process

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By focusing our action in these areas, we will better understand climate risks and opportunities, and improve consideration of climate impacts across existing work programs and in future activities. We will broaden our capacity to respond to the impacts of climate change and progress more complex climate adaptation activities in future.

Specific actions to be undertaken in the focus areas are detailed below. Some actions are fully funded and ready to implement, and some are already underway but may require strengthening. Other activities require additional funding before they can be progressed.
The status of each action is shown as either:

New

New initiatives that are being funded through the Risk Assessment response or have been recently announced.

In progress

Initiatives that are already being progressed by ReCFIT or the relevant department.

Future funding opportunity

Initiatives that require additional funding before they can be progressed.

Tasmania's next climate change action plan will continue to build on the actions detailed in this document, and further respond to the Risk Assessment.

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1

We will help Tasmanians understand the risks and opportunities in the Risk Assessment and how they might be impacted

We all have a role to play in adapting to the changing climate and making the most of the opportunities it presents.

Tasmanian communities, businesses and individuals need the right information and support to understand how they might be impacted by future climate changes and what actions they can take to reduce risk, and take advantage of opportunities.

The Tasmanian Government will continue to provide support for action on climate change to reduce risks, enable opportunities, and support the health and wellbeing of all Tasmanians.

While some risks and opportunities identified in the Risk Assessment can inform adaptation action by government, other risks and opportunities will require the efforts of businesses, individuals and communities. The complexity of climate change means that traditional risk management approaches aren't always fit-for-purpose and new ways of considering, reducing and acting on risks will be required.

Sharing the outcomes of the Risk Assessment will also help us to make the most of the opportunities presented for Tasmania in the transition to a low emissions economy and as our climate changes.

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Actions

Objective	Status	Delivered by
Share information on climate risks and opportunities for Tasmania		
Offer public webinars presenting the findings of *Tasmania's Risk Assessment for Climate Change 2024* to raise awareness of the climate risks and opportunities relevant to our state.	IN PROGRESS	ReCFIT (CCO)
Offer briefings and produce materials presenting the findings of *Tasmania's Risk Assessment for Climate Change 2024*, tailored to the local government sector.	IN PROGRESS	ReCFIT (CCO)
Produce fact sheets and other communication materials sharing the findings of *Tasmania's Risk Assessment for Climate Change 2024*. These products will be tailored for different user groups, so they can easily interpret and apply climate risk information.	IN PROGRESS	ReCFIT (CCO)
Support the Department of Premier and Cabinet (DPAC) to use the data and evidence in *Tasmania's Risk Assessment for Climate Change 2024* to inform Tasmania's next Disaster Resilience Strategy.	NEW	ReCFIT (CCO) DPAC

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2

We will support Tasmanians to access fit-for-purpose climate science, data and information to prepare for the changing climate

We recognise that all levels of government, businesses, industry and the community need up-to-date, tailored climate information to prepare for and adapt to climate change. This information includes detailed projections of how our climate may change, and information about impacts for specific regions and sectors.

We will support Tasmanians to access and use climate science, data and information to help inform decisions so that we can all work to adapt to the changing climate.

We are already providing information through initiatives such as the program to update Tasmania's fine-scale climate projections, the Local Government Climate Capability Program, and the sectoral Emissions Reduction and Resilience Plans.

We will focus on connecting the science with the needs of users, ensuring that the relevant questions are answered and that information is fit-for-purpose and useful to inform decision making. This work will require connection between the expertise of Tasmania's science and research community, and decision makers at all levels. Actions shown on the next page are designed to support this connection.

By improving the quality and accessibility of information, we can make better decisions and be more prepared for future climate change.

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Actions

Objective	Status	Delivered by
Support new climate science		
Partner with the Institute for Marine and Antarctic Studies (IMAS) and the Australian Research Council Centre for Excellence for Our Future Oceans (currently being considered by the Australian Research Council) to support research into the impacts of climate change on the marine environment.	NEW	ReCFIT (CCO) IMAS
Work with the University of Tasmania (UTAS) on the Natural Hazards Atlas Project, which will produce mapping of natural hazards to build disaster resilience and preparedness.	NEW	UTAS ReCFIT (CCO)
Update Tasmania's fine-scale climate projections to provide the most up-to-date future climate information to Tasmanians. The updated projections will play an important role in the development of the climate change adaptation initiatives and investment.	IN PROGRESS	ReCFIT (CCO)
Improve access to useful climate information		
Establish a baseline assessment of Tasmania's social, economic, and environmental wellbeing, including measures relevant to climate change.	NEW	DPAC
Conduct stakeholder analysis to better understand user needs in relation to climate projections, and how this information might best be delivered.	IN PROGRESS	ReCFIT (CCO) UTAS
Develop a public education program on climate change impacts and opportunities.	IN PROGRESS	ReCFIT (CCO)
Update Tasmania's Enterprise Suitability Maps to show how crops and farm tree species could be grown productively in the future under different climate scenarios.	IN PROGRESS	NRE Tas ReCFIT (CCO)

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Objective	Status	Delivered by
Tailor information for specific audiences and purposes		
Build on existing programs and initiatives, and partner with key stakeholders, and children and young people, to co-design a permanent youth engagement platform for sustainability issues, including climate resilience.	NEW	DPAC
Develop user-friendly interpretive materials about climate projections tailored for specific user groups, including those that need more technical information or specific assistance, informed by the stakeholder needs analysis.	IN PROGRESS	ReCFIT (CCO)

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3

We will build public sector climate capability to strengthen how we respond to climate change and make the most of opportunities

The Risk Assessment identifies that education and understanding are key to enabling successful climate adaptation.

We recognise that many of the risks and opportunities identified are relevant to the work of government departments and agencies. We are committed to building climate capability in the public sector, and ensuring that consideration of climate change, and climate-related risks and opportunities, is embedded in decision making across our operations.

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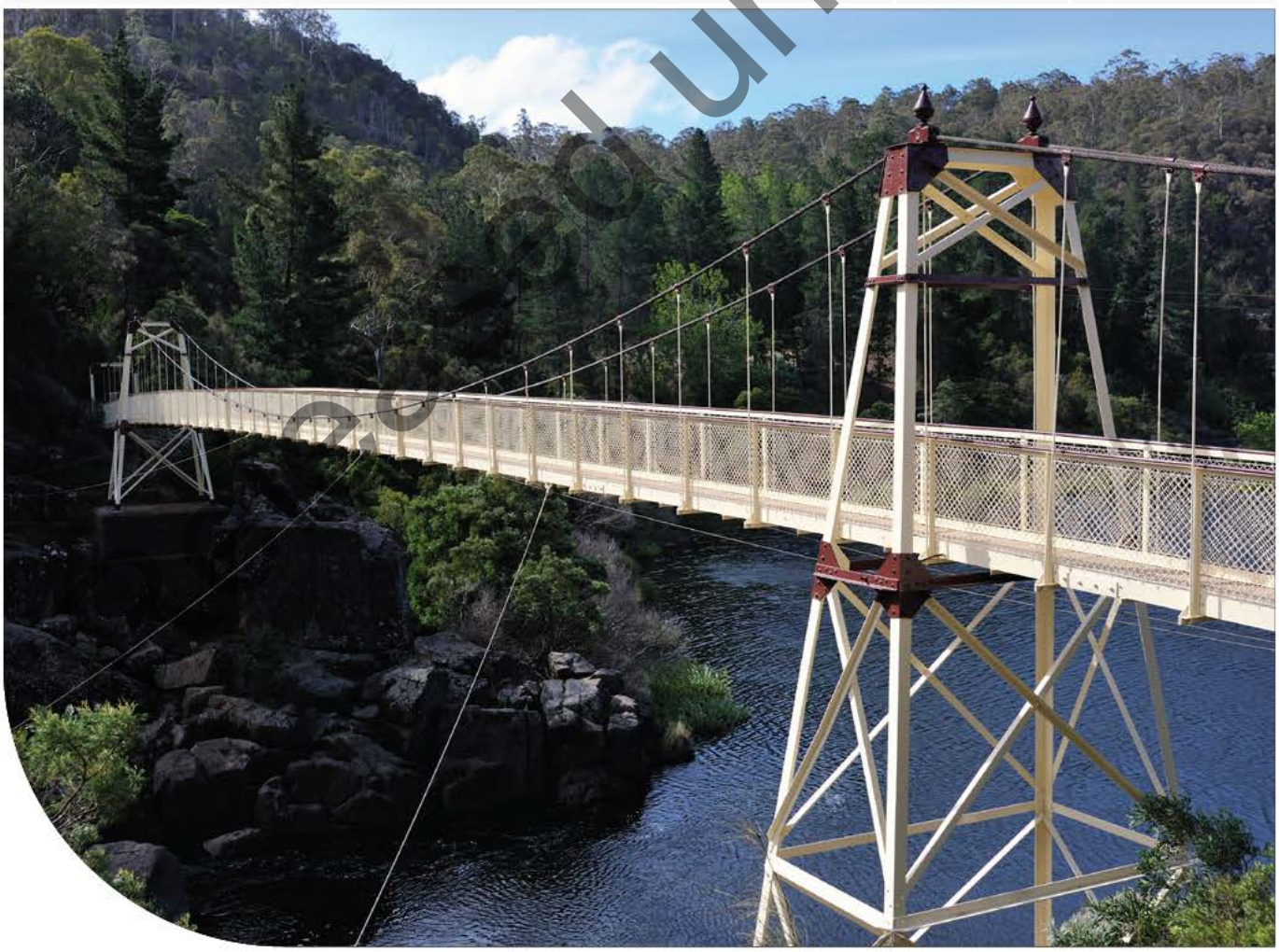
Actions

Objective	Status	Delivered by
Integrate consideration of climate change into government decision making		
Progress and release the whole-of-government policy framework to embed climate change consideration into government decision making.	IN PROGRESS	ReCFIT (CCO)
Strengthen understanding of climate change impacts		
Upskill Tasmanian Government agencies on the findings of *Tasmania's Risk Assessment for Climate Change 2024*, and how the findings relate to their work programs.	NEW	ReCFIT (CCO)
Explore options to partner with National Environmental Science Program (NESP) Climate Systems Hub to provide introductory climate change training to key staff in Tasmanian Government agencies.	NEW	ReCFIT (CCO) NESP Climate Systems Hub



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Objective	Status	Delivered by
Support cross-agency knowledge sharing and adaptation action		
Work with the Department of Natural Resources and Environment Tasmania (NRE Tas) to integrate the findings of *Tasmania's Risk Assessment for Climate Change 2024* in their nature-based work programs, including actions in response to the State of the Environment Report.	NEW	ReCFIT (CCO) NRE Tas
Collaborate with the Department of Health to build awareness of the risks of climate change to the health and wellbeing of Tasmanians, and drive action across government.	NEW	ReCFIT (CCO) Department of Health
Support government agencies to integrate the findings of *Tasmania's Risk Assessment for Climate Change 2024* into relevant existing and new whole-of-government strategies.	NEW	ReCFIT (CCO)
Continue to host the cross-agency coastal hazards information sharing forum.	IN PROGRESS	ReCFIT (CCO)
Apply the climate change considerations embedded in the Tasmanian Planning Policies so that they are given effect through reviews of the Regional Land Use Strategies and the State Planning Provisions of the Tasmanian Planning Scheme.	IN PROGRESS	State Planning Office
Work with relevant government agencies to explore ways to increase social cohesion and adaptive capacity in communities.	FUTURE FUNDING OPPORTUNITY	ReCFIT (CCO)
Establish a Tasmanian Government agency climate change network to facilitate increased cross-agency information sharing.	FUTURE FUNDING OPPORTUNITY	ReCFIT (CCO)

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4

We will facilitate collaborative partnerships to support adaptation action

The Tasmanian Government will collaborate across all levels of government, and with business, industry, research institutions, communities and individuals. Everyone has a role to play in adapting to the changing climate, and we will all need to adjust.

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Building relationships and collaborating across sectors will help us find more cohesive solutions to complex risks and opportunities.

Adaptation is most effective when it involves everyone - governments, communities, households, individuals, business and industry - and recognises and capitalises on the skills and capacity each group holds. *Tasmania's Risk Assessment for Climate Change 2024* provides a firm basis for understanding climate risks and opportunities and helps these groups to better prepare for our future climate. Considering climate risk needs to become embedded in decision making for governments, organisations, communities and individuals across Tasmania.

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Actions

Objective	Status	Delivered by
Partner with others to drive climate adaptation action		
Establish a Climate Change Business Innovation Grant Program to support businesses to take action on climate change, focusing on local innovation, collaboration and partnerships.	NEW	ReCFIT (CCO)
Work with government businesses to share climate knowledge, understand climate risks and opportunities, and enable adaptation action.	NEW	ReCFIT (CCO)
Pursue opportunities to work with the Australian Government to support and resource future adaptation action, such as through the Disaster Ready Fund.	NEW	ReCFIT (CCO)
Implement the Community Climate Change Action Grants program, which supports community-led action on climate change.	IN PROGRESS	ReCFIT (CCO)
Continue working with the Local Government Association of Tasmania (LGAT) and the local government sector to build climate capability, through the co-designed Local Government Climate Capability Program, and coordinate adaptation efforts between local councils and the state government where relevant.	IN PROGRESS	ReCFIT (CCO) LGAT
Continue to participate in local government sector climate change forums.	IN PROGRESS	ReCFIT (CCO)
Pursue opportunities to partner with Tasmanian Aboriginal communities to incorporate Aboriginal knowledge into action on climate change.	IN PROGRESS	ReCFIT (CCO)
Embed consideration of specific risks and opportunities identified in *Tasmania's Risk Assessment for Climate Change 2024* in current and future sectoral Emissions Reduction and Resilience Plans developed with industry.	IN PROGRESS	ReCFIT (CCO)

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Objective	Status	Delivered by
Collaborate with the private sector to build resilience		
Work with Business Tasmania and other key partners to deliver a Climate Reporting Support Program to support small- to medium-sized businesses to better understand climate-related risks to meet changing regulatory and market demands, including measuring and reporting on their emissions.	NEW	ReCFIT (CCO) Business Tasmania
Partner with the insurance sector in Tasmania to better understand the impacts of climate change on the insurability of Tasmanian assets, and possible areas for adaptation action.	NEW	ReCFIT (CCO)
Develop and implement resilience-building actions for industry through the sector-based Emissions Reduction and Resilience Plans and the Whole-of-Economy Roadmap.	IN PROGRESS	ReCFIT (CCO)
Support small- to medium-sized businesses to better anticipate, manage and adapt to the impacts of climate change, through tailored information, tools, resources and support.	FUTURE FUNDING OPPORTUNITY	ReCFIT (CCO)
Share opportunities to participate in adaptation activity with stakeholders, to help connect interested groups with relevant activities.	NEW	ReCFIT (CCO)
Acknowledge good work		
Establish a Business and Industry Climate Change Innovation Forum to showcase the innovative work underway across Tasmania, provide information about emerging opportunities and risks, and encourage networking and information sharing between sectors.	NEW	ReCFIT (CCO)
Introduce a Climate Change Champions Program to recognise innovative, best practice climate action across all sectors.	NEW	ReCFIT (CCO)
Identify case studies of adaptation activity and knowledge, and share information in a way that is tangible and useful to others.	FUTURE FUNDING OPPORTUNITY	ReCFIT (CCO)

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5

We will monitor and learn as we go, recognising that adaptation is an iterative process

Adapting to climate change is an iterative process, and will require continued evaluation and an evolving understanding of the impacts.

The Tasmanian Government, under the *Climate Change (State Action) Act 2008* (the Act), is required to develop a statewide climate change risk assessment every five years. This means that the risks and opportunities identified as part of Tasmania's first climate change risk assessment will be evaluated again in five years. This iterative approach will enable us to improve on the processes used to develop these risk assessments, in line with international best practice. It will also allow for ongoing assessment of climate risks and opportunities, as new information is available.

This process aligns with other work required under the Act, including the sectoral emissions reduction and resilience plans and the development of climate change action plans. The Climate Change Office will continue to report on our progress through our annual climate change activity statements and greenhouse gas reports.

It can be difficult to measure the effectiveness of adaptation actions due to their diversity, complexity, and intended goals or objectives. Work is underway at a national and international level to better understand how we can meaningfully measure and evaluate climate change adaptation.

We will build on this work, support a culture of continuous improvement, and monitor and review our adaptation planning and action in line with our requirements for the independent review of the Act.

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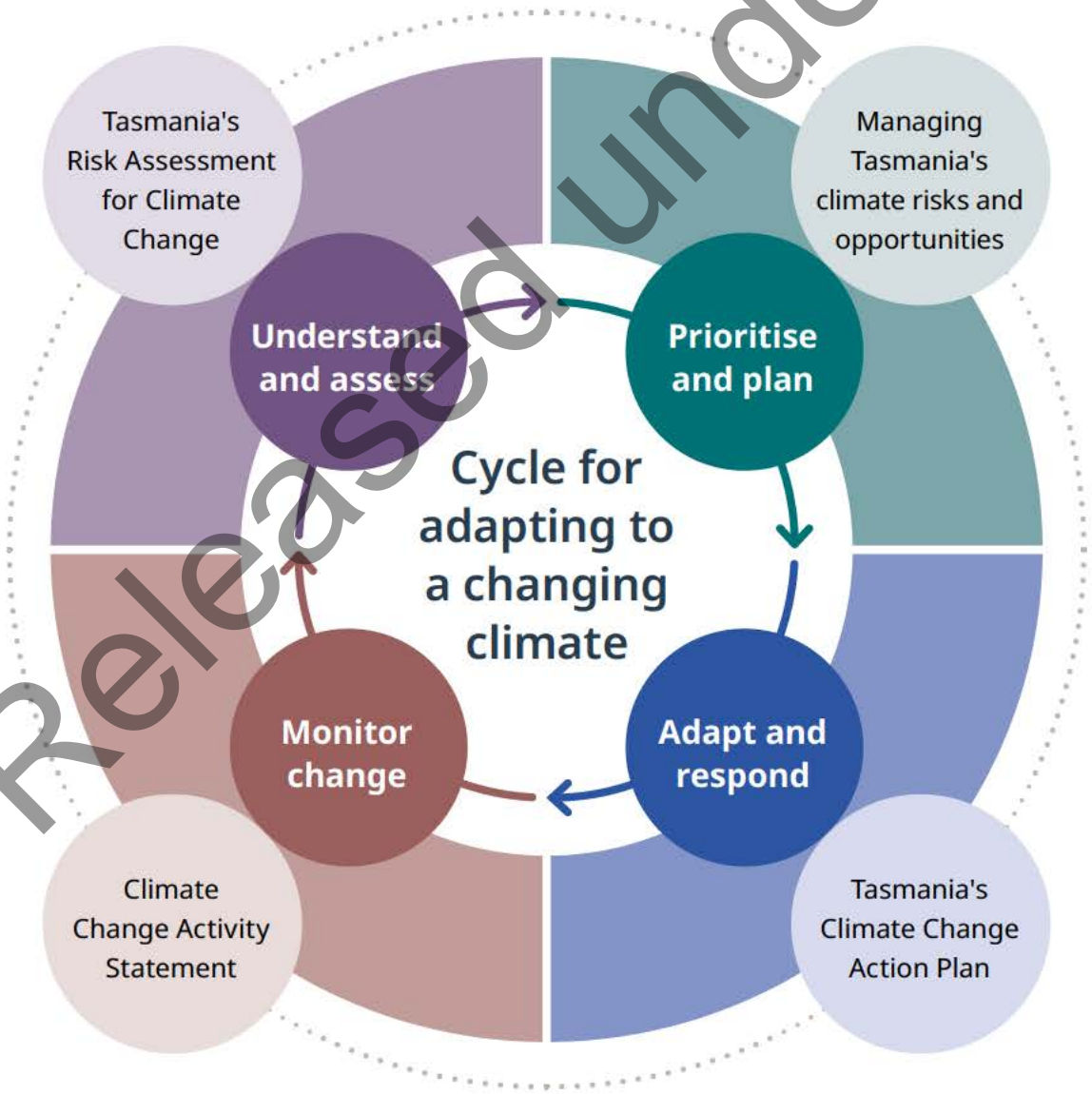
Actions

Objective	Status	Delivered by
Learn from experience		
Review the Risk Assessment process and outcomes and apply learnings to the next iteration of the statewide climate change risk assessment.	NEW	ReCFIT (CCO)
Foster engagement with Tasmanian Aboriginal communities to support an improved, culturally appropriate understanding and representation of climate risks, and adaptation priorities and challenges.	NEW	ReCFIT (CCO)



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Objective	Status	Delivered by
Support measurement of adaptation activities		
Develop tools and resources to enable better monitoring and evaluation of climate adaptation initiatives.	FUTURE FUNDING OPPORTUNITY	ReCFIT (CCO)
Learn from and share knowledge with others		
Continue working with the Australian Government and other jurisdictions on key national and state policies relating to climate adaptation, including through the Adaptation Working Group, reporting to the Energy and Climate Change Ministerial Council, and other forums.	IN PROGRESS	ReCFIT (CCO)
Continue working with the Australian Government to understand climate risks and adapt to a changing climate, including following the publication of the National Climate Risk Assessment and National Adaptation Plan.	IN PROGRESS	ReCFIT (CCO)

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New commitments to build resilience and support the transition to a low emissions future through the sectoral Emissions Reduction and Resilience Plans

Over 2023-24, we developed six sectoral plans for:

Transport

Waste

IPPU
(industrial processes and product use)

Energy

Agriculture

LULUCF
(land use, land use change and forestry)

The sectoral plans outline the priority actions for the government to support each sector over the next five years to:

- reduce greenhouse gas emissions to support Tasmania achieving its target of net zero emissions, or lower, from 2030
- transition to a low emissions economy
- build resilience to the impacts of climate change.

The plans have been produced in consultation with governments, business, industry, and the community.

We have developed *Tasmania's Emissions Reduction and Resilience Roadmap 2024-29* to link together the six sectoral plans and the risk assessment, and set out our pathway for emissions reduction and resilience across the economy.

The roadmap includes new commitments to support businesses and industries to address issues and opportunities that affect all sectors. It sets out how we will maintain our target of net zero emissions across our economy through to 2030 and beyond.

New commitments in the sectoral plans that will support our businesses, industries and communities in the transition to low emissions, and increase our resilience to the changing climate include:

- support the transport industry to develop a skills transition plan to support the switch to electric vehicles
- develop information and resources to support landlords to improve energy efficiency in rental properties
- work with partners to support households to make informed decisions about reducing or electrifying their gas and other fossil fuel use

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- work with partners to deliver workshops for community sector professionals to assist vulnerable clients to manage their energy use and power bills
- work with relevant peak bodies and industry to map the strategic transition requirements for Tasmanian businesses to reduce emissions from their energy use and industrial processes
- develop a program to support agri-food businesses to better understand climate-related risks to meet changing regulatory and market demands
- establish a group or partner with existing networks to coordinate action between Tasmania's primary industries
- work with key partners to develop resources to increase understanding for landowners to participate in carbon and other emerging markets
- work with local government, regional development authorities and other institutions to plant climate-tolerant trees in urban environments, to increase carbon storage and build resilience during high temperatures.

We are also developing a sectoral plan for the government's own operations, which we expect to publish in mid-2025.

Find out more about the sectoral plans on the ReCFIT website: recfit.tas.gov.au/policies_strategies_plans/emissions_reduction

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Next steps

Implementation

Some actions in this response are fully funded and ready to be progressed, and some are already underway. Other opportunities require additional funding before they can be progressed and are listed as a 'future funding opportunity'. The status of each action is identified in this response.

Future funding opportunities will be considered for funding through the next climate change action plan, the annual state budget process, and a range of other funding avenues.

Further work will be done to identify gaps and opportunities for the development of Tasmania's next climate change action plan.

Reporting

Every year, we prepare and table in Parliament:

- a greenhouse gas emissions report detailing Tasmania's emissions for each sector
- a climate change activity statement, showing the status of each sectoral plan and actions in the action plan.

The actions in this response will be incorporated in the next climate change action plan and reported on annually as part of the climate change activity statement.

Continued engagement with government, business, industry and the community

We will continue to engage with key partners and the community on the development and implementation of future opportunities as required.

We will keep stakeholders and the community informed through the ReCFIT website, Climate Change Office newsletter and social media.

We encourage you to sign up for our newsletter through our website: recfit.tas.gov.au/cc_newsletter and follow the Tasmanian Climate Change Office on Facebook to stay informed about opportunities to participate in relevant programs.

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RECFIT
Renewables, Climate and
Future Industries Tasmania

Department of State Growth

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Incoming Government Package

The Hon Kerry Vincent MLC

HOUSING AND PLANNING

Department of State Growth
August 2025

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Contents

The following package has been prepared as an Incoming Government Brief for your information.

In addition to this initial package the department, through the Secretary, will provide regular briefings, ongoing information, and advice to support decision making and the implementation of your Ministerial responsibilities.

This package includes:

Agency Overview

Information on the department and its roles and responsibilities.

Portfolio Overview

For each of your portfolios, an overview is provided, which includes key context and organisational support, information on relevant Boards and Committees, legislative responsibilities, and a list of Question Time Briefs (QTBs) that will be regularly updated and provided to your office.

Key Issues

An initial overview of critical issues for the portfolio.

Agency Overview

The department's role is to support diverse and sustainable economic growth and facilitate the creation of job opportunities for the benefit of our community.

The Secretary, Craig Limkin, is supported by the following senior executives: Angela Conway, Vanessa Pinto, Jenna Cairney, Cynthia Heydon Brett Stewart and Denise McIntyre.

State Growth's Corporate Plan 2023-26 (the Corporate Plan)

The Corporate Plan identifies five key objectives. These are to:

- work with Tasmanian businesses, industries and communities to support sustainable growth and strategic workforce opportunities
- contribute to Tasmania's brand as the best place in the country to live, work, visit, study, invest and raise a family
- strategically develop our infrastructure, digital networks, transport and renewable energy systems to support industry, businesses and our community
- enhance resilience and rapid recovery from economic, environmental and social shocks and stresses across industry, businesses and our community
- continue to build our organisational capacity by working collaboratively and developing our people, safety, culture and systems, including our use of technology.

A key focus of the Corporate Plan is to drive a collaborative, coordinated and client-centric approach across the agency's broad range of services, programs, and portfolio areas, supported by an agile and flexible workforce.

The department had commenced work on a new Corporate Plan however this was paused early in 2025.

The department is a values-based organisation and seeks to undertake its roles and responsibilities with the **courage** to make a difference through **teamwork**, **respect**, **excellence**, and **integrity.**

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Organisational Structure

The department has five business areas:

- **Economic Development** (Acting Deputy Secretary – Jenna Cairney) – Provides advice and assistance to businesses to aid economic growth and partners with communities to remove barriers to employment, training, and workforce participation.
- **Strategy, Housing, Infrastructure and Planning** (Acting Deputy Secretary – Denise McIntyre) – Provides an integrated and strategic approach to planning, infrastructure and projects throughout the regions. Brings together the economic levers that will shape our state's future.
- **Creative Industries, Sport and Visitor Economy** (Deputy Secretary – Brett Stewart) – The principal advisory, development and funding body in Tasmania for the cultural and creative industries, sport and the visitor economy by supporting sector development, delivery of services, stimulation of demand and provision of funding.
- **Transport** (Deputy Secretary – Cynthia Heydon) – Delivers a strategic, coordinated and state-wide approach to the policy, planning and delivery of the state's transport system and transport infrastructure.
- **Renewables, Climate and Future Industries Tasmania (ReCFIT) and Resources** (Acting Chief Executive Officer – Vanessa Pinto) – Provides strategic advice on energy, climate change, mining and forest policy through key strategies, plans and projects, and supports new and emerging industries, with an emphasis on growing Tasmania's renewable energy and resource industries.
- **Business Services** (Deputy Secretary – Angela Conway) –Leads the development of organisational culture, business improvement and emergency management in the department through delivery of quality financial, communication, human, information, spatial, asset management and portfolio services.

A number of Deputy Secretary positions were in active recruitment and have been paused due to the 2025 election. It is the intention of the Secretary is to finalise recruitment as quickly as possible to ensure stability for the organisation.

The department also supports and works closely with the following area.

- **The Office of the Coordinator-General** (Coordinator-General – John Perry) The principal entity in Tasmania to attract and support investment in the state, facilitate major projects and reduce red tape.

Working with Ministerial Offices

The department has a protocol in place for engagement with ministerial and political offices. In general, all contact between Ministerial Offices and the department is facilitated via the Office of the Secretary (OTS), relevant Deputy Secretaries or the Communications team.

There will be some instances where a Ministerial Office will work with a Deputy Secretary to agree an officer contact for quick clarification or factual information that can be given over the phone or via email.

This ensures that the department provides accurate advice, in a consistent format, and that any issues which cross portfolios or other business areas are taken into account.

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Workforce Profile

As at 30 June 2025, the department had an employee headcount of 1,118 employees (964.59 paid Full Time Equivalents (FTE)). A summary of this information by business area is provided in the below table.

As at 30 June 2025, the workforce demographic for the department remains relatively constant, with an average age of 46.90 years and an average length of employment in the Tasmanian State Service of 7.93 years.

The department's gender profile is 56.03 per cent female, 43.62 per cent male and 0.27 per cent not specified. The gender profile for the department's senior roles - Senior Executives, Equivalent Specialists and General Stream Band 9's is 44 per cent female and 56 per cent male.

	Headcount	Paid FTE
Business Services Numbers include 45 staff who have relinquished roles and are held against Business Services so could return to Agency.	158	140.05
Office of the Coordinator General	16	14.60
Creative Industries, Sport and Visitor Economy	3	1.9
• Active Tasmania	19	18.71
• Arts Tasmania	10	8.20
• Events Tasmania	8	7.80
• Operations & Client Engagement	5	3.80
• Screen Tasmania	6	5.02
• Tasmanian Institute of Sport	25	22.14
• Tasmanian Museum and Art Gallery (TMAG)	85	73.67
• Tourism and Hospitality	4	3
Economic Development	4	3.9
• Business, Industry and Investment	50	46.25
• Jobs Tasmania	12	11.4
• Skills and Workforce	74	67.2
• Trade	21	17.94
Office of the Secretary	5	3.8
• Secretariat	9	9.29
ReCFIT and Resources	6	5
• Climate Change	15	12.27
• Energy	40	38.74
• Mineral Resources Tasmania	46	44.49
• Mining Policy	1	0.8
• Forest Policy	8	7.7
• Forest Practices Authority	18	16.12
• Private Forests Tasmania	10	8.31
Strategy, Housing, Infrastructure and Planning	2	2
• Infrastructure Tasmania	29	26.23
• New Bridgewater Bridge	7	6.89
• Policy, Strategy and Projects	25	23.47
• State Planning Office	13	9.78
Transport	5	4
• Road User Services	220	146.55
• State Roads	156	147.53
• Transport Systems and Policy	7	6.04
TOTALS	**1122**	**964.59**

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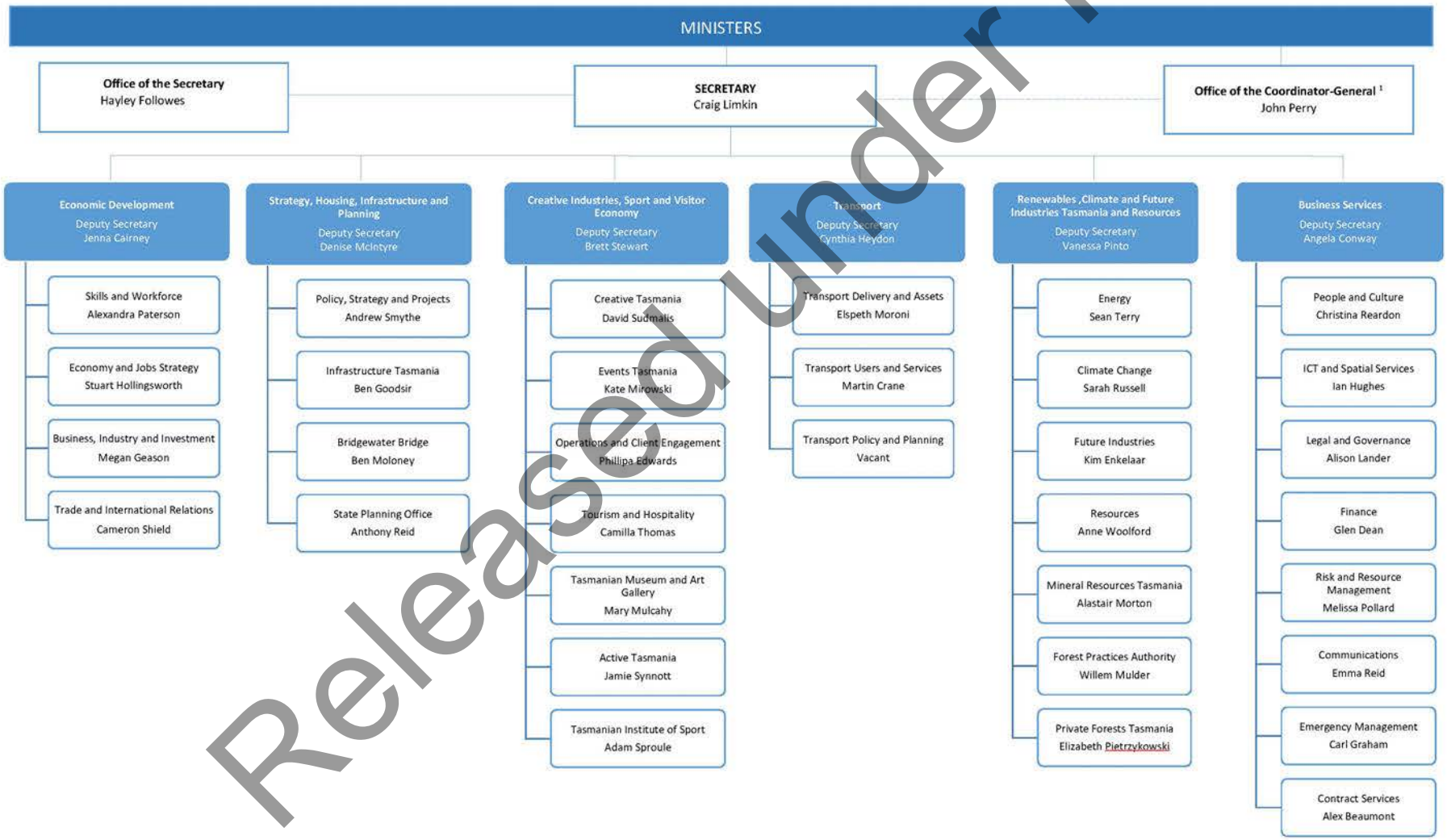
Department of State Growth Organisational Structure as at 30 June 2025



[1] The Coordinator-General reports directly to the relevant Minister

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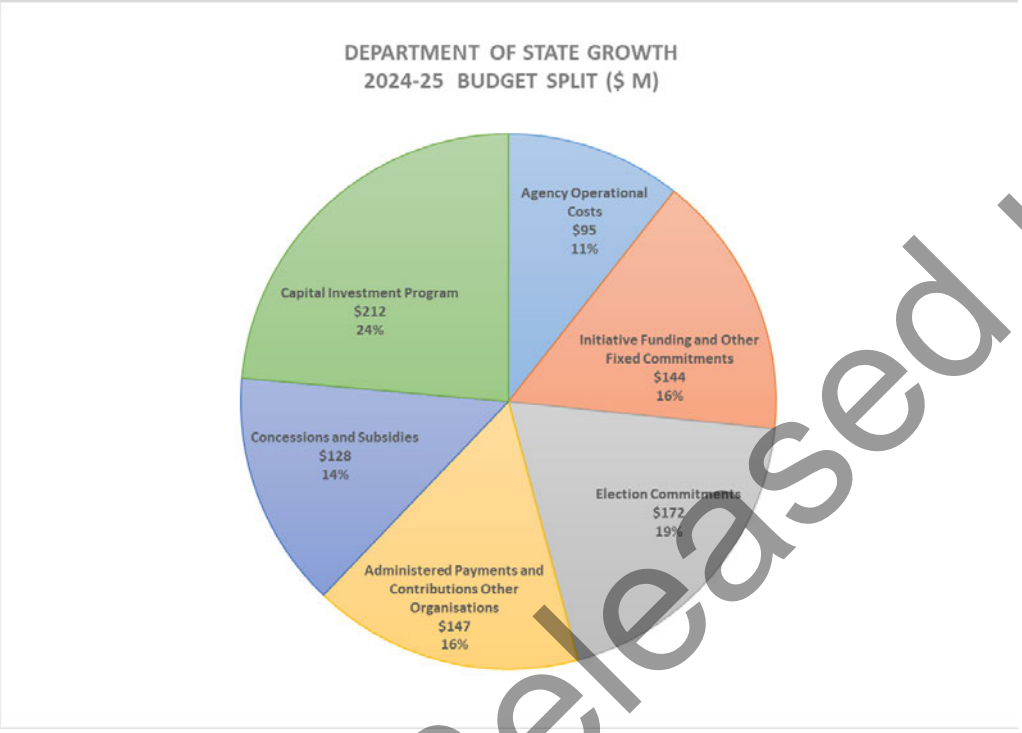
DEPARTMENT OVERVIEW

Budget Information

The department's total Appropriation (Final) in 2024-25 was $897.9 million, as shown in the table below.



2024-25 Budget

Forward Estimate Appropriation allocations included in the 2024-25 Budget Papers for the department are as follows:

2025-26 - $849.3 million
2026-27 - $714.7 million
2027-28 - $634.1 million

These figures include the Capital Investment Program.

2025-26 Budget

A total of $663.2 million has been allocated to the department through the *Supply Act (No.1) 2025* which allows for the interim provision of appropriation from the Public Account to enable the provision of Government Services until the 2025-26 Budget Appropriation Acts are in place. The amount of appropriation provided reflects funding to continue the normal services of Government for a period of up to six months from 1 July 2025 to 31 December 2025.

In addition to the amount allocated through the *Supply Act (No.1) 2025*, the department has approved Budget Rollovers of $48.1 million (as per Section 23 of *Financial Management Act 2016*).

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PORTFOLIO OVERVIEW

The Housing, Planning and Consumer Affairs portfolio is primarily supported in the department by Strategy, Housing, Infrastructure and Planning (SHIP), led by Deputy Secretary, Denise McIntyre through the following business units:

- Policy, Strategy, and Projects, led by General Manager, Andrew Smythe
- State Planning Office, led by Director, Anthony Reid

Policy, Strategy, and Projects (PSP)

PSP is an expert advisory division that develops and delivers significant Tasmanian Government initiatives, performing a broad range of functions to ensure the department delivers on its priorities.

In respect of the Housing, Planning and Consumer Affairs portfolio, PSP:

- Leads whole of government strategic housing policy and stewardship across the housing sector and associated intergovernmental relations and is responsible for the Tasmanian Housing Strategy and Action Plan.
- Manages settlement planning, housing, urban infill and renewal, the Population Policy, coordination of the Hobart City Deal and the work of the Greater Hobart Committee (*Greater Hobart Act 2019)*.
- Administers the following housing initiatives: Ancillary Dwelling Grants Program, the Residential Land Rebate, the Density Incentive Grants Scheme, and the King Island Subdivision Scheme.
- The General Manager, PSP is also the statutory Registrar under the *Community Housing Providers National Law (Tasmania) Act 2013.*

State Planning Office (SPO)

The SPO provides legislative, regulatory and policy advice on land use planning and other aspects of the Resource Management and Planning System. Key activities include:

- Supporting and advising the Minister with responsibility for the Planning Portfolio in relation to planning policy, maintenance of the Tasmanian Planning Scheme and statutory responsibilities and functions under the *Land Use Planning and Approvals Act 1993* (LUPA Act).
- Legislative amendments to the LUPA Act and associated planning legislation and regulation.
- Preparation of the Tasmanian Planning Policies.
- Collaboration with regional bodies and local government on the comprehensive reviews of Tasmania's three regional land use strategies
- Preparation of amendments to the State Planning Provisions in the statewide Tasmanian Planning Scheme.
- Supporting the Department of Premier and Cabinet on State Policies and Projects of State Significance (POSS) processes under the *State Policies and Projects Act 1993*.
- Processing declarations for major projects under the LUPA Act and major infrastructure developments under the *Major Infrastructure Development Approvals Act 1999*.
- Assessment of Housing Land Supply Orders under the *Housing Land Supply Act 2018*.
- Maintenance of the Planning in Tasmania website which provides a comprehensive information resource on Tasmania's land use planning system.
- General advice to Ministers, State Agencies, local government, key stakeholders and the community on land use planning matters.

Question Time Briefs

The current index of Question Time Briefs for 2025 is provided below.

These briefs are currently being updated by the department and will be forwarded to your office before Parliament commences:

Policy, Strategy, and Projects (PSP)

- Election Commitments/100-day plan
- Macquarie Point Urban Renewal project
- State of the Housing System 2025
- Miscellaneous Grant Programs

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- Population Policy and Demographic Data
- Homes Tasmania Review

** Homes Tasmania provides a significant number of QTBs to the Minister on matters for which they are directly responsible.*

State Planning Office (SPO)

- Regional Land Use Strategies
- Planning System Performance
- Planning Review Overview (Summary)
- On farm worker accommodation
- Major Projects
- Housing Land Supply Orders
- Greater Hobart Urban Growth Boundary
- Development Assessment Panel
- Tiny Homes
- Tasmanian Planning Scheme Progress
- Tasmanian Planning Policies
- Strategic and Regional Planning Initiatives
- Stony Rise Supermarket Devonport
- State Planning Provisions Review
- SPO Resourcing
- Short Stay Accommodation

Key Stakeholders

The following are the key stakeholders for PSP:

- **Australian Government**, Department of Treasury, and Department of Social Services
- **Homes Tasmania,** Ben Wilson (Board Chair), Eleri Morgan-Thomas (CEO)
- **Clarence City Council**, led by CEO, Ian Nelson. Mayor: Cr Brendan Blomeley. Hobart City Deal and Greater Hobart Committee partner
- **Hobart City Council**, led by CEO, Michael Stretton. Lord Mayor: Cr Anna Reynolds. Hobart City Deal and Greater Hobart Committee partner
- **Glenorchy City Council**, led by CEO, Emilio Reale. Mayor: Ald Sue Hickey. Hobart City Deal and Greater Hobart Committee partner
- **Kingborough Council**, led by CEO, Dave Stewart. Mayor: Cr Paula Wriedt. Hobart City Deal and Greater Hobart Committee partner.

Key non-industry organisations

- **Shelter Tasmania,** Pattie Chugg (CEO)
- **Tasmanian Council on Social Service (TasCOSS)**, Adrienne Picone, CEO
- **Tenants Union of Tasmania,** Ben Bartl (Principal Solicitor)
- **Local Government Association of Tasmania**, Dion Lester, CEO
- **Tasmanian Aboriginal Centre,** Heather Sculthorpe, CEO

Key Industry organisations

- **Property Council of Australia Tasmania**, Rebecca Ellston, Executive Director
- **Housing Industry Association,** Benjamin Price, Executive Director Tasmania
- **Master Builders Association Tasmania**, Vacant, CEO
- **Planning Institute of Australia (Tasmania)**, Michael Purves, President

The following are the key stakeholders for the SPO:

- **Councils and council organisations (all councils)**
- **Local Government Association of Tasmania**, led by CEO Dion Lester. The body representing Tasmanian councils
- **Cradle Coast Authority**, led by CEO Philip Reid. The body representing the councils in the north west region
- **Northern Tasmanian Development Corporation**, led by CEO Chris Griffin. The body the councils in the northern region
- **Southern Tasmanian Council Authority**, led by Executive Officer Jen Newman. The body representing the councils in the southern region

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Industry and professional associations

- **Property Council of Australia Tasmania**, led by Executive Director, Rebecca Ellston
- **Housing Industry Association**, led by Executive Director Tasmania, Benjamin Price
- **Master Builders Association Tasmania,** led by CEO, Vacant.
- **Planning Institute of Australia** (Tasmania), led by President, Michael Purves
- **Australian Institute of Architects** (Tasmania), led by President, Stuart Tanner

Community and Environmental Groups:

- **Planning Matters Alliance Tasmania**, led by State President, Kerry Burns and State Convenor, Sophie Underwood
- **Environmental Defenders Office**
- **Tasmanian Conservation Trust**, led by Director, Peter McGlone

Key councils for current projects:

- **Local Government Association of Tasmania**, led by CEO Dion Lester. The body representing Tasmanian councils
- **Clarence City Council**, led by CEO, Ian Nelson. Mayor: Cr Brendan Blomeley. Hobart City Deal and Greater Hobart Committee partner
- **Hobart City Council**, led by CEO, Michael Stretton. Lord Mayor: Cr Anna Reynolds. Hobart City Deal and Greater Hobart Committee partner
- **Glenorchy City Council**, led by CEO, Emilio Reale. Mayor: Ald Sue Hickey. Hobart City Deal and Greater Hobart Committee partner
- **Kingborough Council**, led by CEO, Dave Stewart. Mayor: Cr Paula Wriedt. Hobart City Deal and Greater Hobart Committee partner
- **Southern Tasmanian Council Authority** – note all southern councils except Clarence, Glenorchy and Kingborough are members

Regional development

- Regional Development Australia – Tasmania, James McKee (CEO) and Professor Sue Kilpatrick (Chair)

Key Industry Representative Groups

The following are the primary representative groups:

- **Tasmanian Development and Resources Board,** Chair Mike Wallas
- **Tasmanian Chamber and Commerce and Industry,** CEO Michael Bailey
- **Tasmanian Small Business Council (TSBC),** CEO Robert Mallet
- **Launceston Chamber of Commerce and Industry,** Chairman Tim Holder

Councils and council organisations

- **Cradle Coast Authority**, led by CEO Daryl Connelly. The body representing the nine councils[1] on the north west and west of the state delivering regional economic development
- **Launceston City Council**, led by CEO Sam Johnson. Key partner in delivering Launceston City Deal
- **Northern Tasmanian Development Corporation**, led by CEO Chris Griffin. The body funded by seven council[2] to facilitate improvements in the north and north east
- **Local Government Association of Tasmania**, led by CEO Dion Lester. The body representing Tasmanian councils

[1] Nine councils comprising West Coast, Circular Head, King Island., Waratah-Wynyard, Burnie, Central Coast, Devonport, Kentish and Latrobe
[2] Seven councils comprising Launceston, Northern Midlands, Meander Valley, Flinders Island, Break O'Day, George Town and West Tamar

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Legislation Administered by the department

The following list identifies relevant portfolio legislation for which the department has responsibility.

Minister for Housing and Planning

- *Community Housing Providers National Law (Tasmania) Act 2013*
- *Fire Damage Relief Act 1967*
- *Homes Tasmania Act 2022*
  except in so far as it relates to the lending of funds for home ownership *(see Department of Treasury and Finance under the Treasurer)*
- *Housing Land Supply Act 2018*
- *Land Use Planning and Approvals Act 1993*
- *Land Use Planning and Approvals (Stony Rise Development Approval) Act 2024*
- *Local Government (Building and Miscellaneous Provisions) Act 1993*
  except Part 7 *(see Department of Justice under this Minister)*
- *Local Government (Subdivision Approval Validation) Act 1995*
- *Major Infrastructure Development Approvals Act 1999*
- *Public Land (Administration and Forests) Act 1991*
  Part 2 *(otherwise see Department of State Growth under the Minister for Business, Industry and Resources)*
- *State Policies and Projects Act 1993*
  Part 4 and the making of regulations under section 46, in so far as those regulations relate to Part 4 *(otherwise see Department of Premier and Cabinet under the Premier)*
- *Sullivans Cove Waterfront Authority (Repeal) Act 2011*

Portfolio Boards and Committees

Minister for Housing and Planning

The following provides a brief description and current membership of the boards in this portfolio

Homes Tasmania Board

Homes Tasmania is Tasmania's housing and homelessness system manager. Homes Tasmania works with government, industry, the private sector, and the social housing and homelessness sector to improve the housing market and provide more housing opportunities for people in need. Its objectives include to deliver 10,000 new social and affordable homes by 2032.

Name	Position	Appointment Expires	Terms (years) at expiry
Ben Wilson	Chair	30/11/2025	1 (0.8)
Tim Gourlay	Director	30/11/2025	1 (3)
Daryl Lamb	Director	30/11/2025	1 (3)
Robert Pradolin	Director	12/05/2028	2 (5.5)
Sarah Courtney	Director	12/05/2028	1 (3)
Ellen Witte	Director	30/11/2026	2 (4)
Kerry Adby	Director	28/02/2027	1 (3)

Statutory Offices supported by the department

The following list identifies relevant Statutory Offices under the portfolios for which the department has responsibility.

Minister for Housing and Planning

Registrar (*Community Housing Providers National Law (Tasmania) Act 2013*, s10)

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KEY ISSUES BRIEFS

Key Issue	Page
Housing Strategy and Policy	12
Tasmanian Planning Policies	13
Regional Land Use Strategy Reviews	15
Major Project Process Review	17

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Key Points

- The government's commitment to deliver 10,000 more social and affordable homes by 2032 remains a high strategic priority for implementation by Homes Tasmania, with the support of the department.
- Implementing the government's response to the Independent Review into Homes Tasmania is another high strategic priority. The department is in the process of forming an Oversight Committee to implement the Independent Review. This work includes:
    - Homes Tasmania retaining a focus on housing and homelessness services and delivering housing infrastructure
    - transferring responsibility for Tasmanian housing system stewardship, strategic policy and intergovernmental relations to a dedicated team within the department
    - commencing a financial review of Homes Tasmania, which is to be completed by the end of the calendar year 2025
    - updating the Ministerial Statement of Expectation by end of September 2025.
- Engagement in Australian Government housing initiatives includes:
    - endorsing an amendment to the Housing Support Program Federation Funding Agreement to allow payment for TasWater upgrades in Brighton (urgent)
    - the Australian Government's commitment to deliver 100,000 new homes for first home buyers over the next eight years (including nominating a single Ministerial lead)
    - considering if Tasmania adopts the new Help to Buy housing assistance (shared equity) program.
    - Homes Tasmania's board is exploring the transfer of a further 2,000 properties to Community Housing Providers and will likely seek to discuss this proposal with the Minister shortly.
- There is an evolving issue around the provision of funding of Aboriginal housing services on Cape Barron and Flinders Islands, as Homes Tasmania has flagged a $500,000 per annum funding shortfall from July 2025 of which 40 per cent should have been paid in July 2025.

Background

Governments here and elsewhere are grappling with housing challenges. This is most apparent in the high incidence of homelessness, the challenge of people being able to secure rental and affordable housing, and including increasing housing costs, low rental vacancy rates, growing housing supply pressures and structural imbalances across the market.

Homes Tasmania was established in 2022 (*Homes Tasmania Act 2022*), as a dedicated housing authority responsible for delivering improved housing services and increasing the supply of social and affordable homes across the state. A separate overview, prepared by Homes Tasmania, of their role in the Tasmanian housing sector, and what you can expect as Minister has been provided in the supporting documents attached to this package.

In November 2024, Ms Margaret Crawford PSM was appointed to lead an independent, targeted, review of Homes Tasmania. Additionally, under a Machinery of Government change, responsibility for housing policy moved from the Department of Premier and Cabinet to the department.

The Tasmanian Housing Strategy 2023-2043 establishes a mission to deliver a well-functioning housing system, providing safe, appropriate and affordable housing, including providing 10,000 social and affordable homes by 2032.

The department is preparing a progress report on actions under the Tasmanian Housing Strategy Action Plan (2023-2027) to 30 June 2025 to assist the Minister in consideration of the need to review the current Action Plan.

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Key Points

- The *Land Use Planning and Approvals Act 1993* (the Act) was amended in 2018 to establish the process for the making and implementation of the Tasmanian Planning Policies (TPPs).
- The purpose of the TPPs is to provide the overarching policy setting for the state's planning system that will guide planning outcomes primarily delivered through the Regional Land Use Strategies (RLUS) and the Tasmanian Planning Scheme (TPS).
- The TPPs are an expression of the Tasmanian Government's interest in the planning system and have been prepared in consultation with, and were endorsed by, all agencies.
- On the 9 March 2023, the then Minister for Planning approved the draft TPPs and directed the Tasmanian Planning Commission (Commission) to undertake a review and assessment of the TPPs.
- The Commission completed its assessment of the draft TPPs and provided a Report to the then Minister for Housing and Planning on 3 June 2024, recommending minor modifications and determining that the draft TPPs satisfied the TPP criteria under section 12B(4) of the Act, which is to further the Schedule 1 objectives of the Act and be consistent with State Policies.
- On 9 July 2024, a Minute was provided to the then Minister of Housing and Planning recommending that the draft TPPs, as modified in accordance with recommendations made by the Commission and a review of those recommendations by the State Planning Office, be made in accordance with section 12G(2) of the Act.
- Despite that Minute not being actioned, significant work has progressed on implementing the draft TPPs through reviews of the State Planning Provisions (SPPs) and RLUS.

Background

The Resource Management and Planning System (RMPS) is a suite of legislation that is underpinned by a common set of objectives that aim to achieve the sustainable use and development of resources. The RMPS was intended to be informed by State Policies which are made under the *State Policies and Projects Act 1993*. To date, only three State Policies (Protection of Agricultural Land, Coastal Policy and Water Quality Management) have been made leaving significant gaps in the policy framework to inform planning outcomes.

The TPPs seek to fill those policy gaps, but unlike State Policies, they don't apply directly to individual development applications, except for Major Projects. The TPPs are given effect to development applications by being assessed against the Tasmanian Planning Scheme, which is required to be consistent with the TPPs. The RLUS are also required to be consistent with the TPPs, both of which must be taken into consideration when making a planning scheme amendment.

The lack of state planning policy has been a source of contention for some time with councils, the community and the development sector lobbying Government to provide a comprehensive policy framework that provides a more transparent view of state interests in the planning system. Planning policy developed and applied at a local government or regional level by councils can cause frustration and uncertainty for the development sector, leading to inconsistent decisions being made which were often at odds with government's long-term plans for the provision of services and infrastructure.

The Act requires the TPPs to set out the aims and principles to be achieved and applied through the TPS and RLUS. This is achieved by setting out land use planning policies under the following seven topics: Settlement; Environmental Values, Environmental Hazards, Sustainable Economic Development, Physical Infrastructure, Cultural Heritage and Planning Processes. The policy content is delivered through an 'objective', setting out the aims of the policy, which is followed by a number of 'strategies' that set out the ways the objective can be achieved.

The then Minister for Planning approved the draft TPPs in March 2023, directing the Commission to undertake an assessment of them. Because they had Ministerial endorsement, there was a degree of certainty that the draft TPPs could be used to inform reviews of the SPPs and RLUS, allowing initial work to commence while the Commission undertook its assessment. The Commission released its report on the draft TPPs in June 2024 recommending only minor modifications which provided further assurance for the regions to progress the

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implementation of the land use policy established by the draft TPPs into their RLUS.

The then Minister for Housing and Planning was provided with draft TPPs modified to give effect to some of the recommendations of the Commission over 12 months ago. To date there has been no decision to make them in accordance with section 12G(2) of the Act, causing significant concern and uncertainty.

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KEY ISSUE 5 -

Key Points

- Tasmania's three Regional Land Use Strategies (RLUS) provide medium to longer term strategic direction for each region, showing how, when and where growth and development should occur.
- The RLUS provide certainty for government, industry and the broader community by shaping the planning and delivery of infrastructure and services at a regional level.
- The Tasmanian Government has been working in collaboration with the regions to progress full reviews of Tasmania's three RLUS, with the reviews now well underway
- To date the government has contributed almost $3 million to regional and local strategic planning, including the reviews, as well as providing support to the regions through guidance, data provision and preparation of land use studies to inform the reviews.
- In response to concerns raised by the Local Government Association of Tasmania, a new Program Manager has been appointed to lead the finalisation of the strategies, working with the respective regional coordinators, government agencies and local councils.
- The Program Manager has been tasked with overseeing the reviews and liaising with the regions to complete the RLUS reviews in a timely manner.
- In early May 2025 the Southern Tasmania Regional Land Use Strategies (STRLUS) Review Steering Committee (the committee) agreed to transfer responsibility for the comprehensive review, along with any unspent state funding for the project, back to the State Planning Office (SPO).
- The transfer will see the SPO assume responsibility for the final stages of the drafting and manage the review process from now through to the Minister's declaration of the new STRLUS in 2026.
- It is considered an appropriate time for the handover given the recent departure of the regional coordinator, and prior to commencement of the final stage of the drafting.
- Under the new arrangement, Councils will still have opportunities to provide input, both informally in the lead up to the public exhibition process, and formally through the public exhibition process itself.

Background

Tasmania is split into three planning regions, being Northern Tasmania, Southern Tasmania and Cradle Coast. Each region has a regional land use strategy.

The current regional land use strategies were established in 2011 to facilitate and manage change, growth, and development in Tasmania over a 25-year period.

While interim updates have been made to address some growth pressures, the government recognised the strategies need updating, particularly the growth strategies which were created in a time when Tasmania was not experiencing the demand for housing that now exists.

The RLUS review provides an opportunity to properly plan for and accommodate future growth. This supports regional economic development and prosperity and is consistent with underlying policy objectives such as liveability, sustainability, and community wellbeing.

Work on the reviews are well underway, with regional planning coordinators appointed in the Northern and Cradle Coast regions, along with a Memorandum of Understanding (MoU) in place between the state and local government in both regions. The MoUs set out the responsibilities of each party in relation to the project scope, priorities, governance, timeframes and resourcing.

The government also recently committed further resources to expedite the finalisation of all three regional land use strategy reviews, with a Program Manager appointed within the State Planning Office as a dedicated resource to lead this work.

The Program Manager will provide direct support to the regional planning coordinators and local councils, and coordinate government input into the regional land use strategy reviews. The Program Manager will be supported by the planning expertise within the State Planning Office.

Significant work has already been completed including settlement planning, land availability and growth analysis. This will help address immediate issues and

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ensure that there is sufficient land for housing, particularly in the short to medium term.

The Southern Tasmania region commenced early consultation for the review of the STRLUS, releasing a State of Play report and consultation platform in September 2024.

The government recently amended the STRLUS through an update to the Urban Growth Boundary, providing an additional 615 hectares of land for potential urban development across greater Hobart. It is important to continue making appropriate updates while the new strategies are being finalised.

Notwithstanding the MoU and funding arrangements described above, the government has recently agreed to take back management and funding for the STRLUS review project. The State Planning Office will now assume responsibility for the final stages of drafting and manage the remainder of the process through to declaration of the new strategy in 2026.

The government will use the learnings from the advanced work in the southern region to support the regional land use strategy reviews in Northern Tasmania and the Cradle Coast regions.

The Northern Tasmania region will soon commence public consultation for the Northern Tasmania Regional Land Use Strategy with a State of Play report in the final stages of preparation.

Similarly, the Cradle Coast region is also progressing towards its early consultation and is in the process of finalising its State of Play report.

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Key Points

- The Major projects assessment process was developed and introduced in 2020 to replace the existing “Projects of Regional Significance” process under the *Land Use Planning and Approvals Act 1993* (the Act).
- The process is available to projects deemed eligible by the Minister based on a number of criteria in the Act, with guidance provided from the Tasmanian Planning Commission (Commission) in the form of Determination Guidelines.
- The process is comprehensive and rigorous, with the final decision resting with the independent Commission, following a public exhibition and hearings process.
- Section 60ZZZI of the Act requires a review of Division 2A – Major projects - to occur as soon as practicable after 1 January 2025.
- Prior to the 2025 election being called, work was underway to appoint an appropriate reviewer as specified under the Act, and terms of reference analogous to Section 60ZZZI of the Act.
- The Act effectively focuses the proposed review to consider matters in relation to efficiency and effectiveness, the declaration process and applicability of the Determination Guidelines to the declaration process.
- There is no impediment to expanding the terms of reference for the review beyond the requirements of the Act, should there be a desire to do so.
- It was initially intended that the review would also serve as a bringing together of a number of improvements identified from the Bridgewater Bridge Major Project Assessment and internal reviews commissioned by the Department, with a particular focus on renewable energy projects.
- It was proposed that all improvements and reforms identified through the review and the other work to date could be addressed in a single amendment to the Act.

Background

Under section 60ZZZI(1) of the Act, as soon as practicable after 1 January 2025, the Minister is required to conduct a review of the Major projects assessment process.

The Act limits the review to the following matters -

a) Whether the granting of any Major projects permits has been efficient and effective, noting that to date there has only been one major project permit issued for the Bridgewater Bridge project;
b) The exercise of the power under section 60O of the Act, which is the ability for the Minister to declare projects to be assessed as a Major project under the Act;
c) The effectiveness of the determination guidelines, which were issued by the Tasmanian Planning Commission in August 2021 for the purposes of guiding the Minister to make decisions under section 60O of the Act; and
d) Whether, and the extent to which, Division 2A of Part 4 of the Act provides an efficient and effective process for the approval of developments.

The review is to be conducted by a person who is not employed by the Tasmanian Government or a Tasmanian Government Business Enterprise, and that person or persons must, in the Minister’s opinion, have the appropriate qualifications or experience to conduct the review. If the review is conducted by multiple people, then at least one of those persons must have separation from government employment, as described above.

When conducting the review the chosen person, the Minister must cause notice of the review to be placed in newspapers circulating in the state inviting comments from the public. The persons must consider all submissions and provide a report to the Minister within six months of being appointed to conduct the review. The Act does not specify a period for how long the public have to comment, but best practice would suggest 8 weeks as appropriate.

When the Minister receives the report, it must be tabled in both houses of Parliament within five sitting days of receipt.

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ATTACHMENTS

The following key supporting documents are attached to this package for your information:

- State Growth Corporate Plan
- Incoming Government Briefing on Homes Tasmania
- National Housing Accord (2022)
- National Agreement on Social Housing and Homelessness (NASHH)
- *Homes Tasmania Act 2022*
- Homes Tasmania – Statement of expectation (2023)
- Independent Review into Homes Tasmania (2025)
- Government Response to the Independent Review into Homes Tasmania (2025)
- Tasmanian Housing Strategy (2023-2043)
- Tasmanian Housing Strategy – Action Plan (2023-2027)
- Medium Density Design Guidelines

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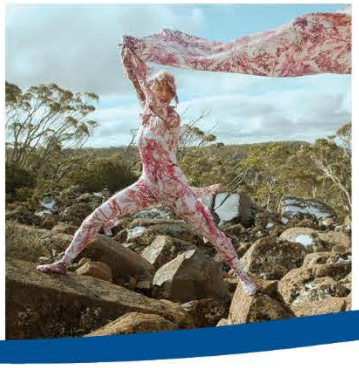
Corporate Plan 2023–26



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Department of State Growth

Tasmanian Government

We acknowledge the Tasmanian Aboriginal people as the original owners and continuing custodians of lutruwita (Tasmania). We pay our deepest respects to their Elders, past and present. We honour the care and connection to their land, sea, waterways and sky which was never ceded. We value the history, culture and strength of the Tasmanian Aboriginal community, and commit to listen deeply to their story and be respectful of Country in our collaborations with them.

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Image credit:
Photo by Michael Gissing of Felicity Bott, as part of Deborah Wace's Arts and Screen Digital Production Fund Project.

From the Secretary

It is my pleasure to present the Department of State Growth's Corporate Plan 2023-26. I am excited to keep building on our achievements, shared capacity, values and sense of purpose.

As our organisation evolves, it is vital we work together and take advantage of the opportunity this department presents. The resilience and dedication shown by the State Growth team since the start of the COVID-19 pandemic has been amazing, and together we can carry this energy forward.

State Growth provides a broad range of services to the Tasmanian community: building and keeping us safe on our roads; working with and supporting growth in our businesses and industries; supporting our vibrant arts, tourism, sporting and cultural communities; responsibly harnessing the natural advantages provided by our mineral resources; providing key services and infrastructure; supporting sustainable development; delivering future-focused energy policy; and facilitating the provision of targeted training and migration programs.

This spectrum of services and roles creates immense opportunity. Our response to the COVID-19 pandemic and subsequent support of our community and economy's recovery, shows we can take advantage of our collective expertise to collaborate and deliver a client-centric approach. The Corporate Plan for 2023-26 builds on this momentum and seeks to ensure we continue to perform at the high level expected of us by the government of the day and the Tasmanian community.

Our clients and their needs – be they Ministers, the community, or businesses – are the focus of our advice and we need to apply insightful and pragmatic policy analysis to reconcile differing interests. Our approach ensures we provide the information our diverse stakeholders need to make decisions and to invest in a manner that is implementable and compliant with relevant legislation.

Each of our outputs are valuable and contribute to the wellbeing of Tasmanians and the liveability of our cities and regions. Our work is aspirational and focused on delivering better outcomes for Tasmanians, harnessing the competitive advantages that set us apart from the rest of the world. We will ensure our organisation has the right culture, tools, support and technology in place to drive these results and take full advantage of new opportunities.

Being able to deliver our objectives starts with our people and ensuring we are an organisation that values and supports the individual to thrive. This means creating a workplace culture where people feel supported, valued, included and empowered to do their best work and be their best selves. Our Corporate Plan recognises the importance of working together and being united in the same goal. When we get this right, our people feel better, they perform better, and the organisation achieves great outcomes.

The Corporate Plan 2023-26 responds to key cultural, environmental and economic shifts since the last version. We have renewed our focus on sustainability and how our work supports liveability and vibrancy in our community and economy. We also turn our attention to how we can respond to and build resilience against the impacts of climate change and other emergencies and disruptions, both internally and externally across Tasmania.

I am proud of what we have achieved in the four years since the 2019-22 Corporate Plan, and how we have gone about it together. As we embark on this next chapter, I am confident we have the tools, environment and team to continue to take full advantage of the opportunity State Growth's broad range of services present.

Kim Evans
Secretary

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Our role

To support diverse and sustainable economic growth and facilitate the creation of job opportunities for the benefit of our community.

Who we are

Our agency has the following core focus areas:

- **Business and Jobs** – drives industry capability and regional development for growth including small business support, workforce development, trade, science and technology, advanced manufacturing and defence, international education, business and skilled migration, and tourism and hospitality support.
- **Resources, Strategy and Policy** – provides whole-of-agency strategic policy, project and coordination functions including Antarctic science and research, population strategy, and urban renewal and growth initiatives that build on urban transformation. This area also provides strategic advice on Tasmania's mining policies and resource industries, and is responsible for the sustainable management of mineral resources in Tasmania.
- **Culture, Arts and Sport** – develops policy and programs to deliver economic and social outcomes by supporting development, delivering services, providing funding and stimulating demand for the cultural, creative and sporting sectors in Tasmania.
- **Transport and Infrastructure** – promotes and enables the safe, reliable and efficient transport of people and goods, to connect Tasmanian communities, promote freight efficiency and growth in the Tasmanian economy, and improve the visitor experience. This group also supports state-wide planning and coordination of major stadium projects and infrastructure delivery.
- **Business Services** – working with our partners, Business Services leads the development of organisational culture, business improvement and emergency management in the department through delivery of quality financial, communication, human, information, spatial, asset management and portfolio services.

Our agency also supports and works closely with the following areas:

- **The Office of the Coordinator-General** – the principal entity in Tasmania to attract and support investment in the state, facilitate major projects and reduce red tape.
- **Renewables, Climate and Future Industries Tasmania (ReCFIT)** – is responsible for providing advice on the state's strategic direction on climate change, renewable energy growth and emissions reduction to help shape Tasmania's future while maintaining a secure, sustainable and affordable energy system.
- **The Tasmanian Development Board –** the board's primary focus is the creation of investment and associated employment through working closely with State Growth to implement government policies.

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Our approach

We will be guided by the following principles:

Client-centric

We will provide integrated advice and services that are informed by the full range of services our agency provides and the needs of our clients.

Collaborative and coordinated

We will work together and across portfolios to provide informed whole-of-agency advice and services. This will be supported by the strong relationships we will build and maintain with our partners across all three levels of government, business, industry and the community.

Results driven

In keeping with our purpose, we will strategically manage risks to deliver the big and small tasks that support the delivery of the government's priorities and meet the needs of the community.

Efficient

We will make the best use of available resources to give effect to our purpose.

Innovative and creative

We will support innovation and creativity in the work we do and the activities we encourage and promote.

Diverse and supportive

We will encourage and demonstrate leadership as a welcoming, supportive and inclusive organisation. We will continue our investment in driving diversity and building an inclusive workplace as well as continuing to prioritise the accessibility of our services.

Values based

We are a values-based organisation. We will live by, exemplify and demonstrate our values in the way we work with and support each other, and our clients.

Adaptable and agile

We will respond quickly and effectively to changing demands and emerging challenges and opportunities.

Our values

At State Growth, we live by the following values. **Courage** to make a difference through:

Teamwork

Our *teams are diverse, caring and productive*

- We listen, learn and share.
- We support each other by stepping up and sharing the load.
- We bring out the best in people through strong and supportive leadership.
- We collaborate to get the best outcome.

Integrity

We are ethical and accountable in all we do

- We are transparent and consistent in our decision making.
- We take responsibility for our actions.
- We speak up when things aren't right.
- We do what we say we are going to do.

Respect

We are fair, trusting and appreciative

- We create a diverse and inclusive workplace.
- We care for the health, safety and wellbeing of each other.
- We listen without judgement and seek to understand.
- We resolve issues constructively.

Excellence

We take pride in our work and encourage new ideas to deliver public value

- We innovate, adapt and set ambitious goals.
- We seek continuous improvement and learn from experience.
- We actively engage with our stakeholders, clients and the community.
- We promote sensible risk taking.

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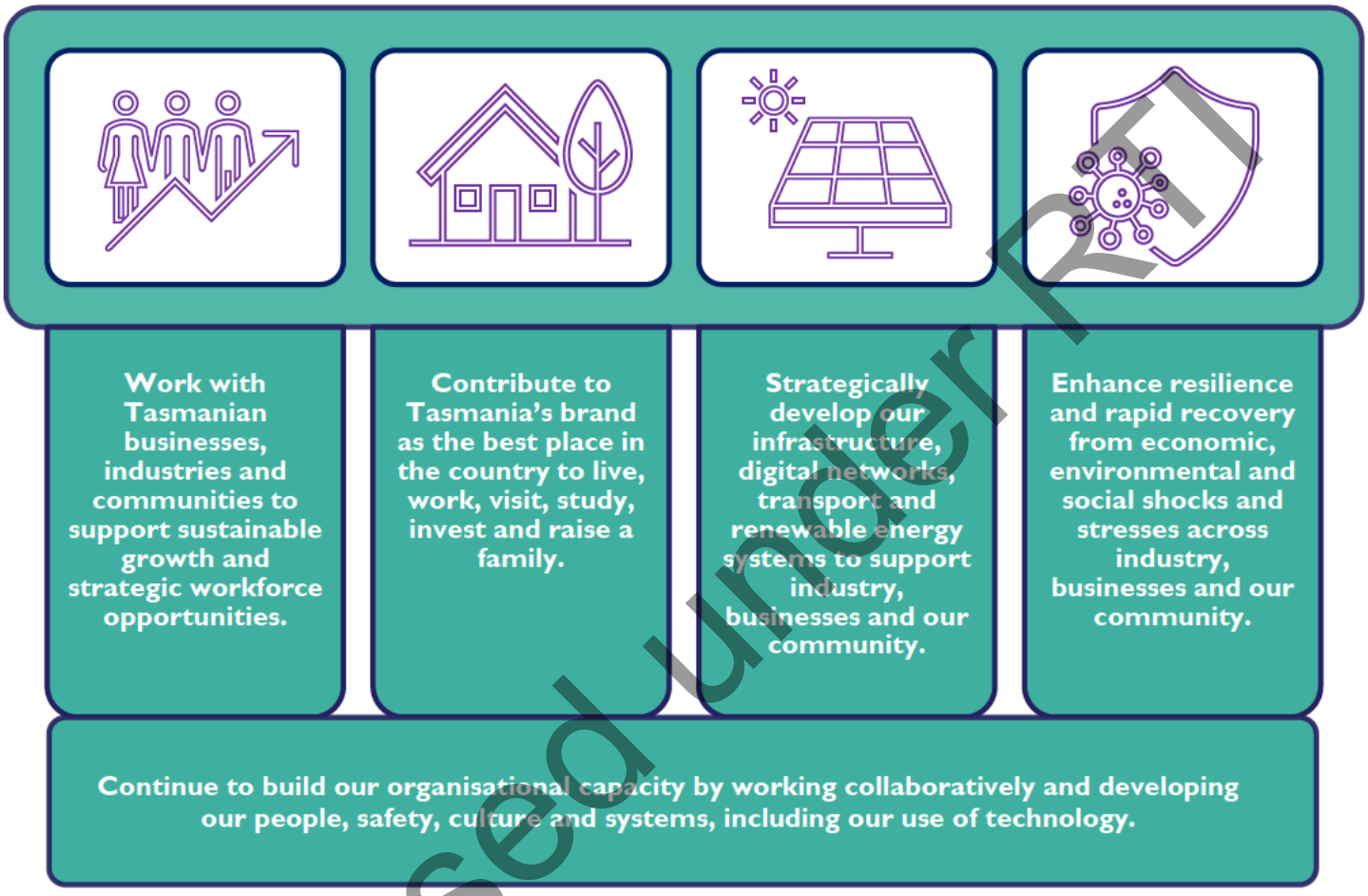
Our objectives

Our work will be guided by the following five objectives. In addressing these objectives, the Department will work with businesses, industries and communities to reduce Tasmania's greenhouse gas emissions and build resilience to the effects of climate change.



We will:

Work with Tasmanian businesses, industries and communities to support sustainable growth and strategic workforce opportunities

This will include:

- leveraging partnerships and engaging the community to **build the workforce of the future** by supporting training, job opportunities, pathways to employment and access to a skilled workforce.
- encouraging innovation and facilitating new opportunities in **technology use and digital transformation.**
- **attracting new businesses** to the state and **retaining and promoting investment** in Tasmania.
- **delivering targeted programs and accessible information services**, particularly for small businesses.
- exploring options to **best manage and use our mineral resources and land.**
- encouraging innovation and supporting growth in the **advanced manufacturing, defence and future industries.**

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- supporting market expansion, and domestic and international trade through **coordinating Tasmania's whole-of-government Trade Strategy.**
- supporting and facilitating **Tasmania's tourism, hospitality and events industry.**
- **reducing the regulatory burden** for small business and the wider Tasmania community to **make doing business in our state easier.**
- delivering our statutory functions by **adopting best practice methodology and principles to effectively regulate** the laws we are responsible for.
- identifying opportunities to **reduce our emissions and build resilience to the impacts of climate change** in the transition to a low carbon economy.

Contribute to Tasmania's brand as the best place in the country to live, work, visit, study, invest and raise a family

This will include:

- **being recognised as a diverse, welcoming and supportive community**, focusing our population growth on addressing skills shortages and embracing opportunities in regional areas.
- developing new, enhancing existing and supporting emerging **tourism experiences and destinations** that reimagine and encourage investment, renewal and visitation to our regions.
- promoting and delivering **programs, events and activities** that celebrate our communities across all seasons, showcase our regions and **promote artistic, cultural, hospitality and sporting excellence and participation.**
- promoting and delivering support for our **creative and cultural industries** to build industry and individual capacity, and provide opportunities to **drive local investment** and to **build on our brand.**
- **promoting and growing business-related events** hosted in Tasmania.
- working with Brand Tasmania to **promote the state's strengths, brand and opportunities.**
- working in partnership with all levels of government and businesses to **maintain and enhance Tasmania's liveability**, harness opportunities and **drive strategic land use decisions** that support sustainable growth.

Strategically develop our infrastructure, digital networks, transport and renewable energy systems to support industry, businesses and our community

This will include:

- ensuring the right **infrastructure** is built at the right time, in the right place, as efficiently as possible, and with resilience to the impacts of climate change, to **support urban renewal and liveability** for our growing population.
- **managing the State Road Network** as part of an integrated transport system to serve the community, business and industry, including our tourism sector.
- **providing access to the transport system**, enabling access to employment, education, services and social participation.
- **promoting road safe behaviours and working to prevent crashes** that result in death or serious injury.
- boosting our capacity to **host international arts, entertainment, cultural and sporting events** through the development and promotion of our major stadiums.

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- **harnessing our renewable energy capability and monitoring Tasmania's energy security** by providing strategic advice on energy policy, regulatory arrangements, climate change and emissions reduction.
- delivering programs that **support renewable energy related industry development** such as Battery of the Nation, Marinus Link and future industries such as green hydrogen production.
- investing in becoming the **Tasmanian Government's leading digital agency** by making strategic improvements to our digital networks and how we use them.
- **ensuring our policy and regulatory programs align** and support these outcomes, including encouraging the uptake of new technology to reduce transport emissions.

Enhance resilience and rapid recovery from economic, environmental and social shocks and stresses across industry, businesses and our community

This will include:

- identifying how short-term disruptions and long-term systemic stresses impact our ability to provide support to Tasmanians, and **proactively building resilience within businesses, the community and State Growth.**
- **building climate change adaptation and mitigation** into our long-term planning so that business, industry and our community are **prepared for the impacts of climate change.**
- **developing thorough and robust emergency management procedures** to enhance our responsiveness and coordination in times of crisis.
- incorporating our learnings from responding to the COVID-19 pandemic and other emergencies into our **business support and community assistance strategies and protocols.**

Continue to build our organisational capacity by working collaboratively and developing our people, safety, culture and systems, including our use of technology

This will include:

- ensuring that the **health, safety and wellbeing of our people** is paramount in all that we do.
- making **collaboration and communication** central to how we work within the department and across government at all levels, breaking down silos to **deliver integrated outcomes.**
- investing in and supporting the **active engagement and development of our people** and building our leadership capability and agility at all levels.
- building an **inclusive workplace** that promotes and supports a **diverse workforce.**
- **strengthening our governance and accountability frameworks**, promoting leadership in good decision making and a culture of risk management.
- through **responsible and careful financial management**, supporting the delivery of priorities and programs.
- **delivering business improvement initiatives that embrace the latest technology**, enhance digital literacy and support flexible and efficient work solutions.
- **upholding a client-centric culture** by being dependable and collaborative, communicating clearly, building trust and working with pace and probity.
- **living by our shared values** to build on our strengths as a department to improve the way we work together and **drive success across all other objectives.**

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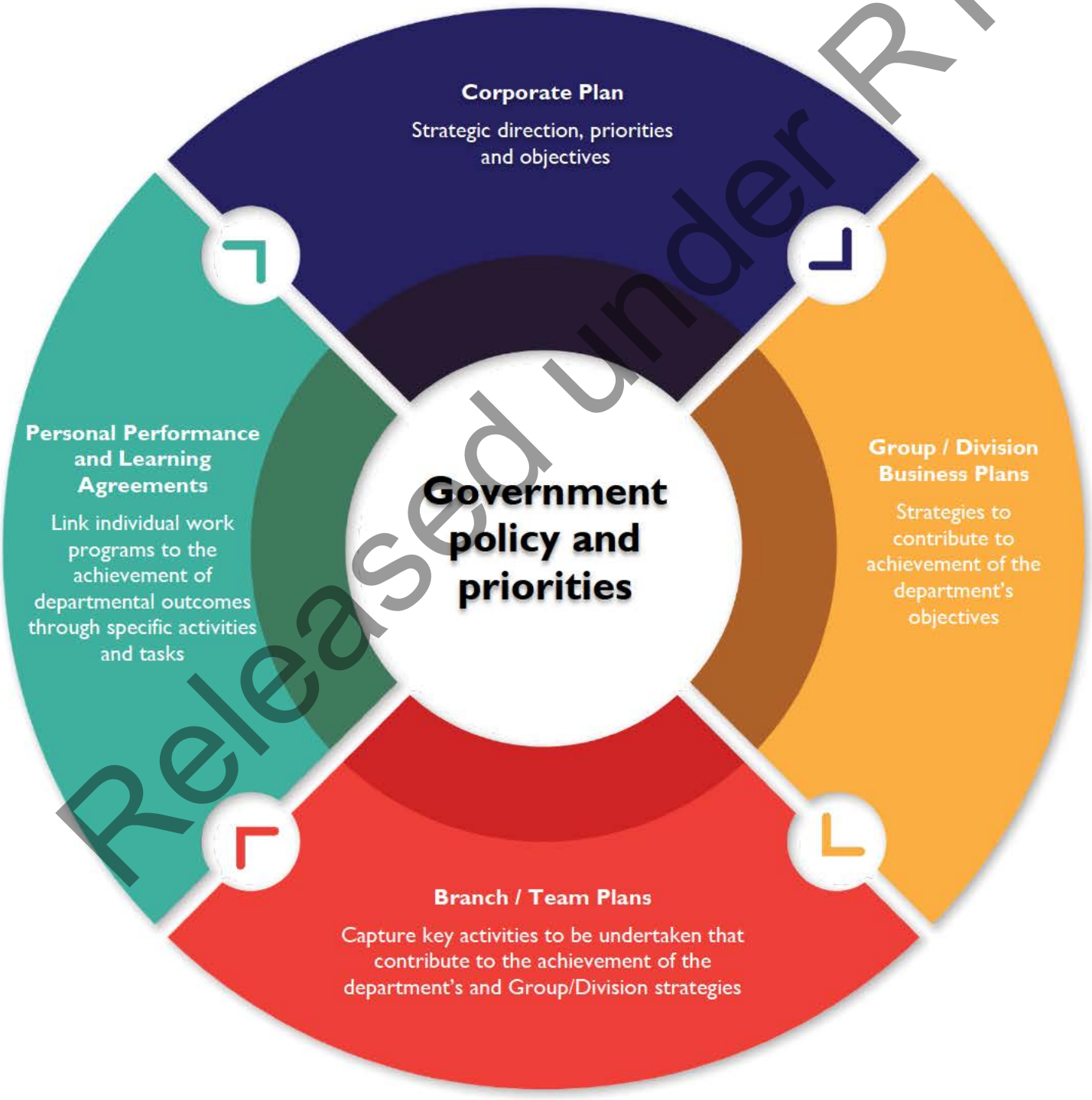
Our Corporate Plan in action

Our Corporate Plan is part of our planning and strategic framework. Our purpose, objectives and approach inform our planning at a whole-of-agency level, guide our Group and Division Business Plans and inform branch, team and individual work programs.

To support this planning framework, the Executive Committee will review our Corporate Plan on an annual basis and update it as necessary. This review will be informed by our ongoing work and engagement with our people, Ministers and stakeholders and will also consider our effectiveness in delivering on our roles, responsibilities and priorities. Managers should consider the objectives of this Plan in work program discussions with their teams.



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