



Sorell Council Climate Change Adaptation Plan

March 2012







Project Sponsor



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Australian Government Department of Regional Australia, Local Government, Arts and Sport





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David Taylor Bushfire		modelling based BRAM model (P&WS) augmented with Climate Futures data.				
Tony Davidson	Sea leve	l rise mapping from Climate Futures Tasmania and Tasmanian Planning Commission.				
Shaun McElwaine	2	Legal comment				
Louise Gilfedder		Natural values at particular risk from climate change, specific to each municipality.				
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Executive Summary

There is an expansive and growing body of scientific evidence that the global climate is changing and that extreme weather events and sea level rise will increase in the 21st century. Local Government is well positioned to work with communities in managing and preparing for the impacts of climate for a number of reasons, particularly its local knowledge and experience, its understanding of community needs and vulnerabilities, and its key role in responding to emergencies.

Key climate change risks for Sorell municipality (by 2100) include the following:

- The temperature of very hot days to increase by up to 3°C.
- Extended heat waves and more extreme temperatures are likely to enhance the occurrence and intensity of bushfire.
- Rainfall trending towards heavier events interspersed by longer dry periods.
- Rainfall volume in a 200-year average recurrence interval event to increase by up to 30%.
- Coastal inundation to increase.
- The current 100-year storm tide event (0.9 to 1.4 m above average sea level) may become a 50-year event by 2030, and a 2 to 6-year event by 2090.

Key vulnerabilities for Sorell municipality in relation to the climate change risks include the following:

- Increased damage to roads and timber bridges from flooding.
- Over-loading of on-site wastewater treatment systems in extreme rainfall.
- Inundation and degradation of low-lying road, property and stormwater assets in relation to sea level rise and storm surge.
- Impacts on the coastal environment (beaches, dunes, saltmarsh, Ramsar wetlands).
- Impact on the regional economy due to agricultural impacts such as soil erosion and crop damage.
- Bushfire impacts on rural property, infrastructure and people.

In taking action to address Sorell Council's vulnerabilities a key overarching consideration is the potential liability exposure in relation to an adopted action, or inaction in particular circumstances. Advice to the Regional Climate Change Adaptation Project overall is that councils will not be liable for existing use or development, nor will liability be incurred for 'no action' in response to climate impacts. Should council take action there could be liability if that action causes harm or damage. Council may also be found liable for operational advice such as in the assessment of planning applications and new developments.

This Adaptation Plan presents specific adaptation actions for each of Council's business areas. The actions were defined by Council staff in relation to Sorell Council's priority climate change risks. For Engineering Services the need



for flood modelling was recognised in order to define high risk areas for flood impact. Additionally, the vulnerability of Council infrastructure and community assets in relation to flood, sea level rise and storm surge was recognised, together with the need to review design standards to determine the adequacy of infrastructure to cope with extreme events.

In relation to Planning and Development, the need for mapping to define impact zones of sea level rise and storm surge was recognised, together with the importance of planning scheme review in relation to guiding appropriate future development in relation to identified high risk areas. In relation to vulnerable existing property the need/potential was recognised to investigate options for protection (advocacy to higher levels of government) or retreat of high risk properties. The need to review council's risk register and emergency management plan was also viewed as important in relation to erosion events at the coast and exacerbated bushfire risk.

In all, this Adaptation Plan proposes 27 actions to address priority climate change risks specific to Council business. The Plan also recognises the significant body of work currently being undertaken by Council's 'stakeholders' across the community that contribute to meeting climate change adaptation objectives for Southern Tasmania. The Plan identifies stakeholder linkages to assist in identifying collaborative opportunities, resource sharing and to avoid duplication of efforts wherever possible. For example, Southern Water raised the following points:

- Consideration of periodic and gradual inundation needs to be made when approving developments adjacent to the coast or flood prone areas to ensure an adequate setback for water and sewer infrastructure.
- 2. Reduced water availability is identified as a key climate change risk and requires better collaboration in relation to setting growth boundaries around towns so that population limitations are set within the sustainable yield profile of the drinking water catchment.
- 3. Bushfire management is a key strategic risk as it has huge effects upon drinking water catchments, service provision, abnormal demand management spikes, hydrant performance, and power outages to water and wastewater infrastructure. Council and Tasmania Fire Service could jointly help manage these risks with Southern Water in a number of ways and would benefit from further discussion.

This Adaptation Plan incorporates an approach to implementation, key components of which include: incorporation of key risks and adaptation actions into established council documents and processes (e.g. risk register, strategic plan, asset management plan); identification of a mechanism to implement sub-regional and regional adaptation actions through advocacy or collaboration; and a mechanism for plan review and updating.



Climate Change Snapshot for Sorell Council

Tasmania is fortunate to have had the highest resolution climate modelling conducted in Australia. The recently completed Climate Futures for Tasmania project provides a sound knowledge base for identifying climate related risks at a local level and subsequently in informing appropriate decisions to manage the risks. Climate Futures for Tasmania prepared a detailed report specifically for Sorell municipality, this report is included in the package of supporting documents provided to Council with this Plan.. The material provided below is a summary of key points from the report.

Current climate and recent trends

- Sorell has a temperate, maritime climate with relatively mild winters. Long-term average temperatures have risen in the decades since the 1950s, at a rate of up to 0.1 °C per decade.
- Sorell receives an average of 550 mm of rainfall per year. There has been a decline in average rainfall and a lack of very wet years in the municipality since the mid 1970s, and this decline has been strongest in autumn.

Projected change in conditions by 2100 (A2 emissions scenario)

	Change	Relative change
Temperature (annual average)	+2.6 to 3.3°C	
Summer days (>25°C)	+22 days	+100%
Warm spells (days)	2-6 days longer	+50 - 150%
Hottest day of the year	+2.5°C	
Frost risk days/year	-13 days	-90%
Rainfall (annual average)	Increase in all seasons	+0 - 15%
Rainfall (wettest day of the year)		+25%
Rainfall extreme (ARI-200)	+30 mm	+30%
Evaporation		+19%
Runoff	Increase in all seasons	
River flows (Orielton Rivulet)		+40%
Coastal inundation	100-year event becomes a 2 to	
	6-year event	



Extreme events

The changes in climate that are most likely to impact upon council's infrastructure, roads, and the local community and environment is a magnification in intensity of extreme events. Specific impacts on Sorell are as follows:

- The temperature of very hot days to increase by up to 2.5°C. Warm spells (days in a row where temperatures are in their top 5%) currently last around 4 days and will increase by up to 6 days.
- Extended heat waves and more extreme temperatures are likely to enhance the occurrence and intensity of bushfires.
- Rainfall will trend towards heavier events interspersed by longer dry periods. High daily runoff events are likely to increase, including those that may lead to erosion or flooding. Rainfall volume in a 200-year average recurrence interval (ARI) event will increase by up to 30%.
- Inundation along the coastline will increase. The current 100-year storm tide event is around 0.9 to 1.4 m above average sea level, and accounting for sea level rise (0.82 m), the current 100-year coastal inundation event may become a 50-year event by 2030, and a 2 to 6-year event by 2090.



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1. Introduction

1.1 Project Background

The Regional Councils Climate Adaptation Project (RCCAP) aims to improve the capability and resilience of Tasmanian councils to manage the risks of climate change. The 'pilot' phase of the project was conducted in Tasmania's Southern Region. The project's key outputs are:

- Council (corporate) Climate Change Adaptation Plans for each of the 12 southern councils;
- a Regional Climate Change Adaptation Strategy covering themes common to all councils; and
- a Climate Adaptation Toolkit for review of Council's Adaptation Plans and extension to Cradle Coast and Northern Councils.

RCCAP was funded by the Australian Government's Local Government Reform Fund (LGRF), administered by the Department of Regional Australia, Local Government, Arts and Sport. The Hobart City Council also provided a financial contribution of 20% of the overall project funds.

The project was delivered by the Southern Tasmanian Councils Authority (STCA) in partnership with the Tasmanian Climate Change Office and the Local Government Association of Tasmania.

The project was initiated by the Southern Tasmanian Councils Authority's Regional Climate Change Initiative, a working group with representatives from each of the 12 Southern councils.

1.2 Project Context

There is an expansive and growing body of scientific evidence that the global climate is changing and that extreme weather events and sea level rise will increase in the 21st century¹. It is now recognised that there are a range of potential future climate scenarios dependent upon the scale of effort achieved in reducing greenhouse gas emissions. Even if the composition of today's atmosphere was fixed (which would imply a dramatic reduction in current emissions), surface air temperatures would continue to warm by up to 0.9 °C². Under a 'best case scenario' where significant reductions in greenhouse gas emissions are achieved it is still pertinent to initiate an adaptation response in order to minimise climate change impacts associated with the warming climate on infrastructure, economy, community and the environment.

¹ IPCC, 2011: Summary for Policymakers. In: Intergovernmental Panel on Climate Change Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C. B., Barros, V., Stocker, T.F., Qin, D., Dokken, D., Ebi, K.L., Mastrandrea, M. D., Mach, K. J., Plattner, G.-K., Allen, S., Tignor, M. and P. M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

² IPCC, 2007: Climate Change, 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning (eds.)].



In Australia, it is recognised by all tiers of government that it is appropriate and effective to manage climate change at a 'local' scale. The Australian Government recognises that Local Governments will be key actors in adapting to the local impacts of climate change and their engagement will be a critical part of any national reform agenda³. It has produced publications aimed at assisting local government manage climate change risk⁴ and implement adaptation actions⁵. The Tasmanian Climate Change Office also works in a collaborative manner to support local government in climate change adaptation projects.

Scope is also afforded to Tasmanian councils to address climate change under the *Local Government Act* (Tas) 1993, which describes the role of councils to provide for the health, safety and welfare of the community; as well as represent and promote the interests of the community; and provide for the peace, order and good government of its municipal area.⁶

In managing and preparing for the impacts of climate change, Local Government is well positioned to work with communities due to its:

- core function to directly support and assist local communities;
- local knowledge and experience;
- understanding of community needs and vulnerabilities;
- key role in responding to emergencies;
- role in infrastructure design, construction and maintenance;
- role in review and update of planning schemes (in relation to identified local impacts and threats); and
- ability to effectively disseminate information and provide support to the community.

Pioneering work undertaken by Clarence City Council with its community identified local government as the most trusted tier of government with regards to information on climate change⁷.

Local experience, in combination with relevant scientific data and technical expertise, provides the key inputs for undertaking a well informed 'risk management' approach to climate change. Moreover, effective adaptation requires a portfolio of actions, ranging from fortifying infrastructure, building capacity (individual and institutional) to advocacy and collaboration. There is also an appreciation that managing current and future risks in relation to climate change can have benefits (such as improving human well-being and protecting biodiversity) regardless of the magnitude of climate change that occurs. It is in this context that the RCCAP is based.

³ Department of Climate Change, 2010: Adapting to climate change in Australia, an Australian Government Position Paper

⁴ Australian Greenhouse Office, 2006: Climate Change Impacts and Risk Management – a Guide for Business and Government.

⁵ Department of Climate Change, 2009: Climate Change Adaptation Actions for Local Government.

⁶ Local Government Act (Tas) 1993.Section 20 Function and Powers.

⁷ SGS Economics and Planning, July 2007: Socioeconomic Assessment and Response for the climate change impacts on Clarence's Foreshore, for the Clarence City Council



1.3 Legal Implications of Climate Change Action

Councils are at the forefront of responding to climate change impacts and increasingly local communities are looking to their councils to provide solutions to adapt to, manage, transfer or share the risks associated with climate change impacts⁸. A key consideration of councils in the face of climate change is potential liability that they are exposed to through their various statutory roles, powers and functions.

To this end the RCCAP engaged Shaun McElwaine + Associates (SMA) to provide advice on the legal context within the impacts of climate change reside and how they relate to local government as a whole. Councils are encouraged to consider the advice in full which is included in the package of supporting documents provided to Council with this Plan.

Overall the advice is consistent with the legal comments provided to Clarence City Council and the Australian Local Government Authority:

- Legal issues for local government in addressing coastal erosion risks, A research report for Clarence City Council, Dr. Jan McDonald, 18 March 2011; and
- Local Councils Risk of Liability in the Face of Climate Change Resolving Uncertainties; a report for the Australian Local Government Association, Baker and McKenzie, 22 July 2011.

The main 'legal' concern for councils is the potential liability that they are exposed to through their adopted action or inaction in particular circumstances. The advice established that overall councils will not be liable for existing use or development, nor will they incur liability for 'no action' in response to climate impacts, however should they take action they could be liable should that action cause harm or damage. It also considered that councils may be found liable for operational advice such as the assessment of planning applications and new developments. It contained three options for councils to pursue, with the State Government (1 & 2 below) and in their own capacity (point 3 below) 3, to reduce their exposure and potential liability:

- Amendment to *Local Government Act* (Tas) 1996, by the State Government, to insert an equivalent section to s733 *Local Government Act* (NSW) that exempts local governments for civil liability for the impacts of climate change where statutory powers, planning scheme provisions and assessment of development applications are done in good faith and in accordance with manual/s prepared by the State Government.
- 2. Review State Coastal Policy 1996 needs to be more specific about what is required i.e.:
 - how planning schemes must deal with the impacts of climate change;
 - specific recommendations and guidelines to manage climate change impacts; and
 - set prescribed levels for sea level rise in developed coastal regions throughout the State.

⁸ Baker and McKenzie; 22 July 2011, 'Local Council Risk of Liability in the Face of Climate Change – Resolving uncertainties' A report for the Australian Local Government Association



- 3. Formulation of state-wide code to deal with climate change impacts (Outcome to achieve a uniform set of provisions across the State) that:
 - is measureable i.e. contains specific development controls;
 - removes decision making from planning authorities;
 - does not require risk analysis; and
 - sets prescribed levels for sea level rise in developed coastal regions throughout the State.

Refer to Section 3.3.1 for more specific information regarding the state of play in regard to a 'coastal hazards code'.

1.4 Purpose and scope

This adaptation plan aims to improve the capability of Sorell Council to manage the risks associated with climate change.

The development of this plan was based upon council-specific, climate projection data provided by the Antarctic Climate and Ecosystems Cooperative Research Centre (ACE CRC) 'Climate Futures for Tasmania' program. Detail of the climate projections for Sorell Council is given in Section 3. The plan identifies potential climate change risks within the context of currently available climate change data. Scientific research and modelling of climate change is continually evolving. Therefore, there is a potential that future climate change projection data may require reassessment of the risks, actions and timeframes identified in this Plan.

Specific outputs from the modelled climate scenario for Sorell, such as future rainfall patterns, extreme events, bushfire likelihood and projected sea level rise formed the basis of 'risk management' and 'adaptation action' workshops held with council staff in development of this plan. Workshops were conducted in a manner consistent with the International Organisation for Standardisation (ISO) 31000:2009 Standard for Risk Management as well as the Australian Government publication *Climate Change Impacts and Risk Management: A Guide for Business and Government*. Full details of the project methodology are included in the package of supporting documents provided to Council with this Plan.

Outputs of the workshops conducted with council staff underlie the content of this plan. The plan is structured so that prioritised adaptation actions have been allocated to specific business units within Council. Each priority action has associated roles, responsibilities and timeframes.

The plan also presents adaptation actions to manage risks that are within council's sphere of influence, but are the responsibility, to some degree, of other organisations (such as State Government Agencies, Community Groups and Private Corporations). The primary purpose of the 'stakeholder' section of this plan is to ensure there is: clear understanding of roles and responsibilities; clarity as to where partner organisations are at in managing climate



change risk; and identification of collaborative opportunities for managing risks that are relevant to local communities.

This adaptation plan incorporates an 'implementation plan' to ensure there is:

- a consistent process for plan endorsement by all councils of the region;
- a logical way for incorporation of key local risks and adaptation actions into council documents and processes such as risk registers, strategic plans, annual plans or asset management plans;
- an appropriate mechanism to implement sub-regional and regional adaptation actions either through advocacy or collaboration; and
- a mechanism for plan review and updating.



2. Climate Change & Council's Corporate Risks

A 'risk assessment' workshop conducted with Sorell Council staff resulted in the development of 32 risk statements. A 'likelihood' and 'consequence' rating was assigned to each risk statement to determine relative risk ratings resulting in the following: 2 Extreme risks, 4 High risks, 19 Moderate risks and 7 Low risks (Figure 1).

Figure 1: Distribution of climate change risk ratings for Sorell Council



Following evaluation, the 6 initial priority risks (extreme & high) were increased to 9. These were considered as the priority risks for subsequent development of adaptation actions (Section 3). The distribution of priority risks in relation to climate impact is shown in Figure 2.





Figure 2: Distribution of Sorell Council priority risks in relation to climate impact

2.1 Heat Risks

Rising average temperatures and more frequent extreme temperatures have the potential to contribute to a variety of impacts including heat related illness and mortality, particularly in vulnerable demographics such as the elderly. Impacts may also be incurred on council's infrastructure and property, on agricultural industries that are important to the region's economy, as well as on the environment.

Climate Change Projections HEAT

By 2100 in Sorell:

- Average annual temperatures are projected to increase by 2.6°C 3.3°C.
- The number of days over 25°C is expected to increase by 100%.
- The temperature of very hot days to increase by up to 3°C.
- Warm spells (days in a row where temperatures are in their top 5%) currently lasting around 4 days will increase by up to 6 days.
- Extended heat waves and more extreme temperatures are likely to enhance the occurrence and intensity of bushfires.

(Antarctic Climate and Ecosystems, 2011 – A2 emission scenario)



Vulnerabilities **DEAT** Changes to average and extreme temperatures in Sorell may result in: • New invasive weed and pathogen species leading to loss of agricultural production and natural habitats. • Higher temperatures and reduced 'chill hours' will create both benefits & setbacks for agricultural enterprises. • An increase in heat related illness and mortality, particularly in vulnerable demographics such as the elderly. • Greater frequency and intensity of bushfires & drought.

No priority risks were identified by Sorell staff in the 'Risk Identification' workshop in relation to heat. Risk statements for all risks, including lower priority are presented in Appendix A.

2.2 Rainfall Risks

Increased rainfall variability, primarily increased rainfall intensity and flooding, was the climate change impact of most concern for Sorell Council. Rainfall events and flooding of a magnitude & frequency not experienced before have the potential to be devastating for infrastructure, agriculture, public safety and the regional economy.

Climate Change Projections RAINFALL

By 2100 in Sorell:

- Rainfall is expected to trend towards heavier events interspersed by longer dry periods.
- Rainfall on the wettest day of the year to increase by about 25%.
- Rainfall volume in a 200-year average recurrence interval event will increase by up to 30%.
- Flow in the Orielton Rivulet is expected to increase by about 40%.

(Antarctic Climate and Ecosystems, 2011 – A2 emission scenario)



The key vulnerabilities for Sorell Municipality identified from the risk workshop are listed below with detail of the workshop outputs (priority risks) presented in Table 1. Lower priority risks are presented in Appendix A.



Table 1: Identified priority 'rainfall' risks for Sorell Council

Risk Code	Risk Statement	Success criteria	Risk Level	Council services affected	Other stakeholders
INFR	ASTRUCTURE				
FL1	Increased risk of damage to existing	Financial	High	Engineering	DIER
	infrastructure due to flooding resulting in			Services	
	increased maintenance and lifecycle costs.				

2.3 Sea Level Rise and Storm Surge Risks

Climate Change Projections SEA LEVEL RISE & STORM SURGE

By 2100 in Sorell:

- Inundation along the coastline is expected to increase.
- The current 100-year storm tide event (0.9 to 1.4 m above average sea level) may become a 50-year event by 2030, and a 2 to 6-year event by 2090.

(Antarctic Climate and Ecosystems, 2011 – A2 emission scenario)



Sea level has been rising recently at approximately 3.3 mm/year. A rise of 0.82 metres in global average sea level is expected by 2100 under continuing high emissions of greenhouse gases (Climate Futures Tasmania Municipal Profile).

Case Study: Sorell

Wetlands and saltmarshes in the municipality provide refuge for many species, including migratory birds. The most extensive saltmarshes in the region are at Orielton, Pittwater, Carlton River, Primrose Sands and Marion Bay. The wetlands and saltmarshes at Pittwater and Orielton are one of ten Ramsar sites in Tasmania. Ramsar is the name of the Convention on Wetlands of International Significance. Rare coastal plant and bird species are at risk from sea level rise unless conditions are maintained to allow the landward migration of saltmarsh and sand-dunes that are their habitat.

Department of Primary Industries, Parks, Water and Environment, Resource Management and Conservation Division (2010).Vulnerability of Tasmania's Natural Environment to Climate Change: An Overview. Unpublished report. Department of Primary Industries, Parks, Water and Environment, Hobart, Tasmania. Image: tasmanianplants.com



Sea level rise mapping overlays were produced by 'LiDAR' digital elevation modelling (DEM) as part of the Tasmanian Coastal Inundation Mapping Project (A component of the Climate Futures Tasmania project). The DEM is currently limited to about a third of the Tasmania coast including most of the populated areas. Sea level rise mapping for Sorell Municipality is presented in Figures 3-9.





Figure 3: Sea level rise inundation mapping for Sorell Council – Pitt Water

Figure 4: Sea level rise inundation mapping for Sorell Council – Iron Creek Bay







Figure 5: Sea level rise inundation mapping for Sorell Council – Lewisham

Figure 6: Sea level rise inundation mapping for Sorell Council – Primrose Sands







Figure 7: Sea level rise inundation mapping for Sorell Council – Dunalley

Figure 8: Sea level rise inundation mapping for Sorell Council – Blackman Bay

Figure 9: Sea level rise inundation mapping for Sorell Council – Marion Bay

The sea levels modelled under the project were at set heights above the National Tidal Centre (NTC) high water mark and were: 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.6 and 2.0 metres. The landward edge of the mapped sea level rise 'footprints' indicates the potential location of the 'back of the beach' or upper part of the shore in the future. These height values were set by the Tasmanian Planning Commission to enable visualisation of these heights and evaluation of the impact of such sea levels.

Limitations

The 'permanent sea level rise' approach makes use of a simple geographic modelling method that includes a limited set of the contributing factors to inundation of the shoreline. This 'bathtub' method is essentially a passive model and assumes a calm sea surface. The method does not account for the complexity of the full range of interacting factors and forces that actually occur on the shoreline such as erosion, soil types, wave climate, wind, freshwater flooding or event timing and clustering.

Specific sea level rise and storm surge vulnerabilities for Sorell Municipality are listed below with detail of the workshop outputs presented in Table 2 - lower priority risks are provided in Appendix A.

Table 2: Priority risks associated sea level rise & storm surge for Sorell Council

CodeservicesservicesstakeholdersCodeincreased storm surge events leading to increased erosion of beaches resulting in loss of foreshore access.ServiceExtreme DeliveryEngineering ServicesCrown Land ServicesSL1Increasing impact on coastal recreation areas, particularly beaches, resulting in loss of Council reputation (media, increased complaints).ReputationExtreme Planning & ManagementPlanning & ServicesCrown Land ServicesSL2Increased storm surge events leading to increased erosion of beaches, resulting in loss of Council reputation (media, increased complaints).ReputationExtreme Planning & ServicesPlanning & ServicesSL2Increased storm surge events leading to increased complaints).Reputation PlantionHigh ServicesEngineering ServicesCrown Land ServicesSL3Service storm surge events leading to increased complaints).ReputationHigh Planning Planning ServicesServicesSL4Increased storm surge events leading to increased complaints).ReputationHigh Planning Plan	Risk	Risk Statement	Success	Risk Level	Council	Other
COASTAL EROSIONServiceExtremeEngineeringCrown LandSL1Increased storm surge events leading to increased erosion of beaches resulting in loss of foreshore access.ServiceExtremeEngineeringCrown LandSL7Increasing impact on coastal recreation areas, particularly beaches, resulting in loss of Council reputation (media, increased complaints).ReputationExtremePlanning & Building; Risk ManagementCrown LandSL2Increased storm surge events leading to increased erosion of beachfront properties resulting in loss of Council reputation (media, increased complaints).ReputationHighEngineering ServicesCrown Land ServicesSL2Increased storm surge events leading to increased complaints).ReputationHighEngineering ServicesCrown Land ServicesSL5Sea level rise and storm surge causing increased flooding of low-lying roads leading to increased maintenance costs and reduced asset lifecycle.FinancialHighEngineering ServicesServices	Code		criteria		services	stakeholders
COASTAL EROSIONSL1Increased storm surge events leading to increased erosion of beaches resulting in loss of foreshore access.ServiceExtreme DeliveryEngineering ServicesCrown Land ServicesSL7Increasing impact on coastal recreation areas, particularly beaches, resulting in loss of Council reputation (media, increased complaints).ReputationExtreme Planning & Building; Risk ManagementCrown Land Building; Risk ManagementSL2Increased storm surge events leading to increased erosion of beachfront properties resulting in loss of Council reputation (media, increased complaints).Reputation PlantionHigh ServicesEngineering ServicesSL2Increased storm surge events leading to increased erosion of beachfront properties resulting in loss of Council reputation (media, increased complaints).FinancialHigh ServicesEngineering ServicesSL5Sea level rise and storm surge causing increased flooding of low-lying roads leading to increased maintenance costs and reduced asset lifecycle.FinancialHigh ServicesEngineering Services					primarily	
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maintenance costs and reduced asset lifecycle.		flooding of low-lying roads leading to increased			Services	
		maintenance costs and reduced asset lifecycle.				
SL6 Increased risk of surcharge to stormwater Service Extreme Engineering	SL6	Increased risk of surcharge to stormwater	Service	Extreme	Engineering	
system due to sea level rise resulting in localised Delivery Services		system due to sea level rise resulting in localised	Delivery		Services	
impacts in low-lying areas.		impacts in low-lying areas.				

Risk Code	Risk Statement	Success criteria	Risk Level	Council services primarily affected	Other stakeholders
PLAN	INING SCHEME				
SL3	Increased coastal erosion & inundation resulting in pressures to update the planning scheme to	Service Delivery	Extreme	Planning & Building	Crown Land Services
	improve certainty in approval decision making.				
SL4	Political pressures leading to information not being integrated into planning policies and instruments resulting in inadequate future	Strategy	High	Planning & Building; Finance &	
	development and potential liability issues for council.			Administration	

2.4 Bushfire

Climate change may result in increased bushfire risk in Sorell Municipality, particularly when considering planned changes in land use activities. Bushfire modelling has been conducted for the Southern Region using the Tasmanian Bushfire Risk Assessment Model (BRAM), developed by the Tasmanian Parks and Wildlife Service specifically for the RCCAP. Weather data from the Climate Futures for Tasmania Project (A2 scenario) was entered into the BRAM to enable modelling of bushfire scenarios for periods defined as: baseline (1969-1990); near future (2010-2039); mid-century (2040-2069); and end of century (2070-2099).

The following past and projected data (for December to March) was used for modelling each period: 90th percentile temperature; 90th Percentile wind speed; and 10th percentile relative humidity. It is believed that the alignment of conditions of high temperature, high wind speed and low humidity would adequately frame the BRAM outputs of interest such as 'fire behaviour' and 'bushfire likelihood'.

A summary of the key inputs and outputs of the BRAM model for the Regional Climate Change Adaptation Project is provided in Figure 10.

Figure 10: Inputs and outputs of BRAM model

The modelled near future (2010-2039) 'bushfire likelihood' output for Sorell municipality is shown in Figure 11.

Figure 11: Modelled near future (2010-2039) 'bushfire likelihood' output for Sorell municipality

There was no discernable difference between the modelled outputs of 'bushfire likelihood' for each of the time periods for Sorell. There was however some difference between baseline and end-of-century for 'fire behaviour' as depicted in Figure 12. It should be noted that while the modeled change to bushfire likelihood presented here is not great as a result of climate change, there is a very real and significant existing danger. Small increases in likelihood may therefore be sufficient to trigger a major event. Moreover, the model's projections do not consider the increase in extreme temperatures, rather the projected change to average summertime temperatures. Projected increases to peak temperatures is a factor that is particularly difficult to input into the model however may have significant impact on the actual likelihood of a bushfire igniting. Furthermore, there exists other factors that have not been considered in the model, which may contribute to an increase in likelihood and severity of bushfire, for example:

- changes to land-use could lead to changes in fuel density and distribution as well as a change to the vulnerability of particular vegetation communities; and
- potential increase in vegetation growth as a result of increases in atmospheric CO₂.

Figure 12: Modelled 'bushfire behaviour' output (difference between baseline period and end of century) for the Southern Region

The key vulnerabilities in relation to bushfire for Sorell Municipality are listed below with detail of the workshop outputs (priority risks) presented in Table 3.

Table 3: Priority risks associated with bushfire for Sorell Council

Risk	Risk Statement	Success criteria	Risk Level	Council	Other
Code				services	stakeholders
				primarily	
				affected	
FR1	Increased fuel loads and fire risk leading to	Public Safety	High	Risk	Tasmania Fire
	destruction of residential property and loss of			Management;	Service
	life within the community.			Public Health	

3. Corporate Adaptation Actions

3.1 Strategic Actions / corporate services

Strategic priorities are broad level climate change adaptation actions that do not specifically address a particular area or risk and fall across numerous Council service areas. Success of such actions is dependant on senior management support. Implementation of strategic actions will provide Council with a solid framework in climate change adaptation and will build an internal culture that supports the implementation of the more specific adaptation actions described in subsequent sections.

3.1.1 Legal liability

A key consideration of councils in the face of climate change is potential liability that they are exposed to through their various statutory roles, powers and functions. The main 'legal' concern for councils is the potential liability that they are exposed to through their adopted action or inaction in particular circumstances. The advice established (refer to Section 1.3) that overall councils will not be liable for existing use or development, nor will they incur liability for 'no action' in response to climate impacts, however should they take action they could be liable should that action cause harm or damage. It also considered that councils may be found liable for operational advice such as the assessment of planning applications and new developments. Legal advice to this Project contained three options for councils to pursue, with the State Government and in their own capacity to reduce their exposure and potential liability (Table 4), bearing in mind that these actions may be more appropriately pursued through a regional approach (refer to the Regional Climate Change Adaptation Plan compiled under the Regional Climate Change Adaptation Project).

Table 4: Potential corporate actions for Council to pursue in relation to legal liability

Amendment to *Local Government Act* (Tas) 1996, by the State Government, to insert an equivalent section to s733 *Local Government Act* (NSW) that exempts local governments for civil liability for the impacts of climate change where statutory powers, planning scheme provisions and assessment of development applications are done in good faith and in accordance with manual/s prepared by the State Government.

Review State Coastal Policy 1996 or develop and appropriate Framework that is specific about: how planning schemes must deal with the impacts of climate change; provides specific recommendations and guidelines for managing climate change impacts; and sets prescribed levels for sea level rise in developed coastal regions.

Formulation of state-wide codes to deal with climate change impacts to achieve a uniform set of provisions across the State that: contain specific development controls; removes decision making from planning authorities; does not require risk analysis; and sets prescribed levels for sea level rise in developed coastal regions throughout the State.

3.1.2 Other potential Corporate actions

There are key overarching corporate functions that are worth considering for minimising Council's risk in the face of extreme events posed by climate change including: incorporation of climate change risks into council's risk register in relation to minimising the risk of litigation in relation to extreme events; incorporation of climate change planning into strategic, annual and financial planning; and developing a process for communication. Potential overarching corporate actions for Council to pursue are provided in Table 5.

Table 5: Potential overarching corporate actions

Risk Register

Integrate climate change risk management into Council's existing risk assessment framework.

Emergency Management Planning

Ensure that the projected impacts of climate change are properly considered in Council's emergency management planning. Emergency response plans should be investigated, developed and implemented considering the best available climate change projections. Up to date emergency response procedures can minimise consequences when extreme events occur.

Communication

Develop and implement a climate change communication and education plan for Council staff. Increased staff capacity and awareness will assist in incorporating climate change scenarios and impacts into policy and decision making processes.

Other Council Plans & Strategies

Consideration of climate change risks and impacts in other Council strategies, policies and plans (Strategic & Annual Plan). The climate change impacts and risk process outlined throughout this Adaptation Plan should be considered in the development of future plans, policies and strategies. This will also ensure there are a range of potential internal mechanisms for important actions to be implemented.

Reporting

Consider developing climate change related performance Indicators which could be reported on through Council's annual report.

3.2 Engineering Services

Council's asset management team is responsible for overseeing the construction, maintenance and replacement of property and infrastructure assets, including roads, drains and culverts, bridges, stormwater infrastructure, council owned buildings and recreational infrastructure such as walking tracks. For councils, effective asset management is about understanding the required level of service and delivering it in the most cost effective manner. Managing this objective is core business for local government and is key to ensuring council sustainability. The projected impacts of climate change threaten conventional asset management both in terms of financial modelling, as well as the level of service that is acceptable or even achievable.

Projected increases in the intensity and frequency of extreme events directly impact on council asset base with significant and unpredictable financial and service delivery implications. Council's stormwater system for example is designed for historical climate and with projected climate change, will likely become significantly under capacity. Council will therefore need to consider the additional cost of managing stormwater at the current acceptable level of service and either fund that cost or accept that a greater frequency of inundation events is likely. Acknowledging this, public inconvenience and safety issues have been identified as a recurring risk theme in relation to the impact of extreme events on council infrastructure.

Further to the projected increases in extreme events, incremental changes to the climate such as increasing average temperatures or reduced average rainfall will also have implications to council's capacity to deliver its infrastructure based services. Such changes may result in accelerated structural fatigue in council's infrastructure. Design standards based upon past climate data and patterns may need to be reconsidered for new or replacement infrastructure to account for incremental climate change projections.

Sorell council's priority adaptation actions, and identified treatments, in relation to asset management are presented in Table 6.

Table 6: Asset management adaptation actions and treatments

Action Code	Adaptation Action	Responsibility	Relevant Council document	Relative cost	Ease of implementation	Timeline for delivery	Risks treated	Original risk level	Treated risk level	
DESIG	DESIGN STANDARDS									
12	Review municipal design standards to determine whether they are adequate for future climate change and change if appropriate.	Manager Engineering Services	Asset Management Plan, Strategic Plan	\$\$	Medium	Long term	(FL1) (SL5)	High	Moderate	
13	Monitor maintenance and capture data to integrate climate change impacts into asset management systems to determine appropriate engineering options.	Manager Engineering Services	Asset Management Plan	\$\$	Medium	Medium term	(SL5)	High	Moderate	
31	Audit of existing infrastructure to investigate re-design or relocation in relation to flooding.	Manager Engineering Services	Asset Management Plan; Strategic Plan	\$\$\$	Medium	Long term	(FL1)	High	High	
ROADS	& BRIDGES									
14	Re-engineering or rerouting roads away from high risk areas in relation to coastal storm surge.	Manager Engineering Services	Asset Management Plan, Strategic Plan	\$\$\$	Medium	Long term	(SL5)	High	High	
29	Modify existing infrastructure (roads, bridges) where possible to protect from flood impact.	Manager Engineering Services	Asset Management Plan	\$\$\$	Medium	Long term	(FL1)	High	High	
STORM	IWATER									
22	Modify existing stormwater infrastructure where possible to account for impacts of sea level rise.	Manager Engineering Services	Asset Management Plan	\$\$\$	Medium	Long term	(SL6)	Extreme	High	
23	Close stormwater outfalls affected by sea level rise and re-direct to alternative catchments via pumping.	Manager Engineering Services	Asset Management Plan	\$\$\$	Medium	Long term	(SL6)	Extreme	Moderate	

Action Code	Adaptation Action	Responsibility	Relevant Council document	Relative cost	Ease of implementation	Timeline for delivery	Risks treated	Original risk level	Treated risk level
25	Investigate alternative stormwater disposal technologies in affected areas including Water Sensitive Urban Design principles.	Manager Engineering Services	Asset Management Plan	\$\$	Medium	Medium term	(SL6)	Extreme	High
COAST	AL								
	Community Education to manage	Manager	Foreshore access management				(SL1)	Extreme	Moderate
2	expectations and concerns – particularly when these are not met in relation to extreme	Development;	Strategy, Asset Management Plan,	\$	High	Medium term	(SL2)	High	High
	events or changing coastal dynamics.	Engineering Services	Strategic Plan, Tracks and Trails Strategy				(SL6)	Extreme	Extreme
3	Integrate climate change data, identification of high-risk areas and information into foreshore access strategy (design specs, access points etc.).	Manager Engineering Services	Foreshore access management Strategy, Asset Management Plan, Strategic Plan, Tracks and Trails Strategy	\$\$	Medium	Short term	(SL1)	Extreme	Moderate
15	Mapping of potentially affected areas (sea level rise) in combination with local knowledge to determine high-risk areas.	Manager Engineering Services	Asset Management Plan	\$\$\$	Medium	Medium term	(SL6)	High	Moderate
24	Advocacy to state and federal government for funding for coastal infrastructure remediation requirements.	Manager Engineering Services	Strategic Plan	\$	High	Medium term	(SL6)	Extreme	Extreme
MODE	LLING								
30	Identify areas of high risk of exacerbated flooding – hydrological studies in relation to projected rainfall intensities may be required.	Manager Engineering Services	GIS database; Asset Management Plan	\$\$	Medium	Medium term	(FL1)	High	High

3.3 Economic Development & Risk Management

3.3.1 Economic Development

Local government has an important role in economic development, particularly through encouraging investment and job growth and enhancing liveability and environmental attributes. Climate change has the potential to impact upon the special environmental values and conditions which may influence individual's decisions to live in Sorell municipality and influence the amenity of some of the region's attractions, particularly the coast. Incremental and sudden impacts upon the coastal zone have the potential to impact upon Sorell's economic development vision. Identified adaptation actions in related to economic development are provided in Table 7.

3.3.2 Risk (emergency) Management

As the closest level of government to the community, together with having a responsibility for the wellbeing of their community, councils have an important role in emergency management. Although councils are not a provider of emergency services, council functions in relation to emergency management include:

- provision of recovery centres and relief services during emergencies or disasters;
- provision of resources and information to emergency service teams such as Tasmania Fire Service and the SES;
- informing the community of the current situation, developments and ongoing prognosis during emergency events; and
- local emergency planning and development of mitigation options using risk analysis, prioritisation and treatment approaches.

Risk (emergency) management planning may be coordinated through a special council committee who have the role of preparing and reviewing a municipal emergency management plan. For Sorell Council, Climate Futures Tasmania defined extreme events in relation to sea level rise, storm surge, and extreme rainfall and flooding as being of particular relevance to the municipality. Extreme events and associated emergencies are likely to increase as a result of climate change resulting in resources for emergency management being stretched. It also highlights the importance of regular review of council's risk register in relation to emerging scientific projections on climate change and the associated implications at a local level. Incorporation of climate change risks into council's risk register is of strategic importance in relation to minimising the risk of litigation in relation to extreme events.

Adaptation actions in relation to risk/emergency management identified by Sorell Council staff are provided in Table 7.

Table 7: Community Development & Risk Management adaptation options for treatment of priority climate change risks

Action Code	Adaptation Action	Responsibility	Relevant Council document	Relative cost	Ease of implementation	Timeline for delivery	Risks treated	Original risk level	Treated risk level	
ADVO	ADVOCACY & COMMUNICATION									
1	Advocacy to Crown Land Services (CLS) to determine strategies are in place regarding impacts of sea level rise & storm surge on Sorell's coastal areas. Development of an appropriate community education program with CLS may be necessary.	Manager Community / Economic Development; Risk Management coordinator	Foreshore access management Strategy, Strategic Plan, Risk Register	\$	High	Immediately	(SL1)	Extreme	High	
38	Advocacy to State and Federal government for funding for protection of key community assets.	Manager Community / Economic Development;	Foreshore access management Strategy, Strategic Plan,	\$	High	Medium term	(SL7)	Extreme	Extreme	
39	Develop a communication protocol for managing community concerns and complaints in relation to extreme events.	Risk Management Coordinator	Strategic Plan,	\$	High	Medium term	(SL7)	Extreme	Extreme	
BUSHF	IRE MANAGEMENT & EDUCATION									
16	Identify bushfire risk areas in relation to climate change and review relevant council documents accordingly.	Risk Management Coordinator; Manager Environment & Development	Risk Register, Planning Scheme, Emergency Management Plan	\$	High	Short term	(FR1)	High	High	
17	Community education to manage bushfire risk and identify hazards in collaboration with Tasmania Fire Service.	Risk Management Coordinator; Manager Environment & Development	Emergency Management Plan	\$	High	Medium term	(FR1)	High	Moderate	
20	Review and update emergency management plan to incorporate increased bush fire risk associated with climate change.	Risk Management Coordinator; Manager Environment & Development	Emergency Management Plan	\$	High	Short term	(FR1)	High	High	

3.4 Environment & Development - Planning & Building

Climate change risks have significant implications for council's role in planning and development control. In coastal areas, development in low lying areas vulnerable to sea level rise and storm surge needs to be managed appropriately to minimise risk to property and to eliminate risk to life and potential for litigation. Similarly, in relation to changes in flood and bushfire risk, planning schemes need to be well informed through scientific data and modelling to appropriately guide development in flood prone areas and in areas with high fire likelihood.

To some extent, council's approach to managing climate change risks in relation to its planning responsibilities will be managed through the Regional Planning Project's Regional Land-use Strategy and also through specific state-wide hazards codes being developed by the Tasmanian Planning Commission. In some cases it may be pertinent for development of codes to address specific risks at a regional level to tie in with timelines for the Regional Planning Project (refer to Section 3.3.1).

Sorell's priority adaptation actions, and identified treatments, in relation to planning and building roles are presented in Table 8.

Table 8: Planning & Building adaptation options for treatment of priority climate change risks

Action Code	Adaptation Action	Responsibility	Relevant Council document	Relative cost	Ease of implementation	Timeline for delivery	Risks treated	Original risk level	Treated risk level	
COASTAL PROPERTY										
5	Investigate the feasibility of implementing a buy back scheme (in conjunction with other tiers of Government) for high risk properties in relation to sea level rise and storm surge (refer Section 3.3.1).	Manager Environment & Development	Strategic Plan; Planning Scheme	\$\$	Low	Long term	(SL2)	High	High	
6	Advocacy to state and federal government for funding - for adaptation options in relation to protection of properties or retreat from impact areas (refer Section 3.3.1).	Manager Environment & Development	Asset Management Plan, Strategic Plan	\$	High	Medium term	(SL2)	High	High	

ΡΙΔΙ	NNIN	IG S	CHE	MF
		0.0		

7	Advocacy to State Government for clear, consistent direction for Council planning instruments related to climate change (refer	Manager Environment & Development	Planning Scheme	\$	High	Short term	(SL3)	Extreme	Extreme
	Section 3.3.1).						(SL4)	High	High
8	Lobbying State Government for coastal inundation (and storm surge impact) mapping to guide planning scheme review and incorporation of appropriate overlays (See Section 3.4.1).	Manager Environment & Development	Planning Scheme; GIS layers	\$	High	Short term	(SL3)	Extreme	Extreme
9	Develop site specific assessment protocol in relation to sea level rise and storm surge to understand and communicate risks for approval. May be achieved through the Regional Planning Project (refer Section 3.4.1) or 'Coastal Adaptation Pathways' project (DPAC).	Manager Environment & Development	Planning Scheme	\$	High	Medium term	(SL3)	Extreme	High
21	Planning scheme to take account of potentially affected areas in relation to stormwater backlog in low-lying areas.	Manager Environment & Development	Planning Scheme	\$\$	Medium	Medium term	(SL6)	Extreme	Extreme
COMN	IUNITY EDUCATION								
11	Education and awareness building with decision makers to highlight the importance of managing risk in relation to projected climate change impacts.	Manager Environment & Development	Strategic Plan	\$	High	Medium term	(SL4)	High	High
	Community Education to manage expectations	Manager	Foreshore access		High	Medium term	(SL1)	Extreme	Moderate
2	and concerns – particularly when these are	Environment & Development:	Strategy, Asset	\$			(SL2)	High	High
-	not met in relation to extreme events or changing coastal dynamics.	Manager Engineering Services	Management Plan, Strategic Plan, Tracks and Trails Strategy				(SL6)	Extreme	Extreme

3.4.1 Regional 'Coastal Inundation & Hazards Code'

The Tasmanian Planning Commission is in the process of drafting a Coastal Hazards Code as part of its draft Coastal Planning Framework (which is replacing the Coastal Policy). As the timeframe for completion of this Coastal Hazards Code is uncertain – the STCA's Regional Planning Project is developing an interim regional 'Coastal Inundation & Hazards Code' in conjunction with Technical Reference Group representatives to ensure that there is guidance on this issue in the new planning schemes for coastal councils of the region.

The interim regional 'Coastal Inundation & Hazards Code' will:

- 1. Implement the Southern Tasmanian Land-use Strategy e.g.
 - Ensure use and development in coastal areas is responsive to effects of climate change including sea level rise, coastal inundation and shoreline recession.
 - Include provisions in planning schemes relating to minimising risk from sea level rise, storm surge and shoreline recession. Identify areas at high risk from these impacts through the use of overlays.
 - Ensure growth is located in areas that avoid exacerbating current risk to the community through local area or structure planning for settlements and the Urban Growth Boundary for the Greater Hobart metropolitan area.
 - Identify and protect areas that are likely to provide for the landward retreat of coastal habitats at risk from predicted sea level rise.
- 2. Align where possible with content planning scheme prescriptions already adopted by Clarence City Council and Hobart City Council.

Clarence City Council's coastal inundation and hazard prescriptions adopted in their planning scheme in 2011 includes:

- An 'inundation overlay' that, amongst other things, identifies areas subject to periodic inundation from the sea as at 2050 and 2100 (according to currently available data), and precludes development that will change coastal dynamics in a way detrimental to other property. Development within areas covered by the overlay to require floor level heights (in AHD) for the 'high' 2050 levels (site specific 2.1-3.0 m) and the 'high' 2100 levels (site specific 2.7 3.6 m).
- A 'Coastal Erosion Hazard' overlay to identify, amongst other things, areas potentially subject to erosion, recession or wave run-up related to coastal processes; and to control impacts on coastal infrastructure and development from coastal hazards.

3.5 Environment & Development - Public Health

Council's role in regard to environmental health may include: aged care, child health, special needs care, supported accommodation and counselling and support services.

Climate change has many implications for community health. Gradual shifts over time in temperature, humidity and rainfall patterns can create ideal conditions for disease vectors, such as mosquitos, in areas where there was no previous exposure. Direct impact of extreme events such as bushfire and heatwaves can result in emergency services and community support services being stretched beyond their capacity, at times leading to a spike in mortality. Severe seasonal conditions such as drought lead to tough environmental and economic outcomes for farmers often resulting in more widespread, mental illness, depression and suicide. Councils have an important community role in promoting and maintaining links to relevant support services in times of hardship. Sorell Council's priority adaptation actions, and identified treatments, in relation to environmental health are presented in Table 10.

There were no identified priority adaptation actions, and identified treatments, in relation to public health.

3.6 Environment & Development - NRM

The natural resource management (NRM) role of local government varies greatly between councils. For urban councils, NRM is often focused on management of local parks and reserves, particularly in relation to maintaining amenity, protecting local biodiversity, managing threats such as weeds, and running community programs in relation to enjoyment of, engagement with and interpretation of nature. For rural councils NRM functions are often conducted in collaboration with NRM South and can include: revegetation programs, protection of biodiversity, weed management, reserve management, community landcare and working with farmers on regenerative farming techniques.

Biodiverse natural environments are resilient and have been able to adjust and adapt in accordance with shifts in climate over many thousands of years by retracting and expanding accordingly. The climate change we are now experiencing is occurring relatively rapidly. In natural vegetation communities this change is likely to favour some species and disadvantage others. A likely outcome is local extinction of vulnerable species and changes in structure, function and composition of vegetation communities. Additionally, exacerbated threat to vegetation communities may occur through proliferation of weeds which may be favoured by changing temperature and rainfall conditions. Direct physical impacts on natural systems may also be exacerbated under climate change, for example, rivers and streams are likely to experience a higher frequency of flood flows creating vulnerability to erosion in riparian areas.

There may be a need to refocus NRM activities in the future away from addressing issues in isolation to a strategic approach that is well informed about landscape-scale ecological processes On this foundation limited resources can be deployed wisely and in ways that address multiple issues (e.g. landscape connectivity) not just those that occur at specific sites.

There were no identified priority adaptation actions, and identified treatments, in relation to natural resource management.

3.7 Multi-criteria analysis for prioritisation of actions

A 'multi-criteria analysis' (MCA) is a useful approach to begin the process of prioritising the implementation of defined actions. A multi-criteria analysis for Sorell Council's climate change adaptation actions was undertaken according to the following criteria:

- Relative cost the potential cost of implementing the action relative to the other actions (high, medium, low);
- Immediacy the timeframe required to implement the action (short-term, medium-term, long-term);
- Political feasibility how feasible the action is politically. This is dependent on Council views (leader, collaborator, influencer);
- Community acceptance the acceptance of the action by Councils rate payers (popular, indifferent, controversial); and
- Concurrent effects whether the action has associated benefits or costs associated with its implementation (positive, neutral, negative).

As cost is generally a key criterion in decision-making, this was assigned a weighting of 50%. The remaining 50% of weighting was distributed equally across the other four criteria. The adaptation actions were prioritised by plotting actual cost against the combined score of the combined criteria. The result of the MCA for Sorell is presented in Figure 13.

Figure 13: Distribution of Sorell Council adaptation actions across the MCA matrix for ease of implementation

4. Stakeholder involvement & collaboration

Climate change projections are likely to impact either directly or indirectly on all aspects of council function. Further to this, impacts are liable to be felt throughout the community and within many other organisations that council has direct involvement with. A collaborative adaptation response between all stakeholders is therefore essential for council to maintain its high service levels in a changing climate.

There is also a significant body of work currently being undertaken within other organisations throughout the community that contribute to meeting climate change adaptation objectives for Southern Tasmania, and that act to assist council in meeting its own objectives. It is therefore important that these linkages are identified; that complimentary processes value-add to one another and duplication of efforts is avoided wherever possible.

With these points in mind, through the 'risk management' and 'adaptation options' workshops, held with each of the twelve Councils in Southern Tasmania, a number of key stakeholders were identified as shown in 14.

Figure 14: Stakeholder organisations identified during the council corporate risk and adaptation planning workshops

In order for there to be clear understanding of roles and responsibilities in relation to management of the identified climate change risks, together with recognition of opportunities to develop or strengthen existing collaborations, RCCAP engaged with the identified stakeholders.

4.1 Aurora Energy

Aurora manages the local electricity distribution network around Tasmania and is the electricity provider for the majority of Tasmania's electricity usage. Many of council's services are dependent on the proper operation of Aurora's assets.

The Tasmanian Electricity Code governs Aurora, requiring it to maintain its infrastructure to minimise risks associated with the failure or reduced performance of assets. Thus, if the operating environment changes in a way that increases the risk of asset failure, as a result of climate change, then Aurora has an obligation to manage that change.

Aurora has not identified climate change as a key business risk, however the Distribution Business Division (responsible for managing Aurora's network) has identified climate change broadly as one of 19 divisional risks.

A key area of concern for Aurora is the lack of consultation during assessment of development applications in vulnerable areas. When new developments are approved by councils, Aurora is required under law to provide power to site. Aurora is not included in the planning assessment process and where proposals may be vulnerable to the projected impacts of climate change, delivery of this requirement may in the future become difficult. Collaboration in the planning approval stage could better manage these situations.

4.2 Dept. of Health and Human Services (DHHS)

The Department of Health and Human Services (DHHS) is responsible for delivery of integrated services that maintain and improve the health and wellbeing of individual Tasmanians and the Tasmanian community.

A national process, coordinated by the Department of Health and Aging, which is developing a national human health climate change adaptation plan, drives climate action for DHHS. The internal draft climate change plan is to be developed by the Australian Health Protection Committee's Environmental Health Committee, however there is no clear timeframe for its completion. It is not expected that climate impacts will be as significant as that experienced by other States.

In lieu of the national plan the DHHS does not currently have any documents for the management of climate change risks.

4.3 Dept. of Infrastructure Energy and Resources (DIER)

DIER provides infrastructure and related services for the social and economic development of Tasmania. DIER reports to the Minister for Infrastructure, Hon David O'Byrne MP; the Minister for Energy and Resources and the Minister for Racing, Hon Bryan Green MP; and the Minister for Sustainable Transport, Hon Nick McKim MP. By providing a strategic approach to the provision of both physical infrastructure and regulatory frameworks, DIER aims to (amongst other unrelated factors):

- Enhance infrastructure decision-making across Government;
- Facilitate a safe, sustainable and efficient transport system that enhances economic and social development, in the context of the challenges of climate change, and
- Promote reliable, efficient, safe and sustainable energy systems.

The state road network is approximately 3700km in length and includes approximately 800 bridge structures and 500 culverts. The network is divided in to three regional networks; each network has its own Network Manager (NM) and three Network Supervisors (NS). This structure sees each NS responsible for the management of approximately 400km of road. Not surprisingly, these staff have an in-depth knowledge of their 'turf' and the direct/indirect effects of extreme weather events. Therefore it is fair to state that DIER staff have inadvertently been documenting and managing the effects of a changing climate for some time now and are thus well positioned to manage the road network in to the future. DIER acknowledges that climate change per se has not featured prominently in past decision-making; however, this is not to say that DIER is unaware of the impacts of a changing climate. Climate change is but one element of the 'risk assessment' (RA) process. DIER acknowledges the significance/weighting of climate change within the RA process is increasing in-line with DIER's continually improving awareness and understanding.

DIER acknowledges that the impacts of a changing climate are highly varied, but notes there are impacts more likely to affect the serviceability of the state road network. From a DIER perspective, the key threatening climate change related impacts are:

- Increased intensity of rainfall events (and the effects of);
- Sea level rise, and
- Storm surge.

DIER has chosen not to independently fund climate change research; instead, opting for a collaborative approach that has to date, proven quite successful. Given that DIER has limited financial resources (at present and into future) with particular reference to climate change type investments; DIER will continue to support and sponsor collaborative research and the development of tools and applications that have the capacity to make DIER a 'more informed' client. In terms of projects, DIER has co-funded/sponsored three climate change related projects in the past 18 months; these include:

- Climate Futures Tasmania Infrastructure (CFT-I);
- Greenhouse Gas Assessment Workbook for Road Projects Transport Authorities Greenhouse Group (TAGG), and

• 'Carbon Gauge – Calculating the Greenhouse Footprint of Roads'.

DIER is considering a whole-of-asset risk assessment to identify those sections of the road network more at risk from the effects of climate change over the next 20-40 years for road infrastructure, and 100 years for bridges. Outputs from this project would then assist development of DIER's work plan for the next 5-10 years. Anecdotally, DIER considers that in the absence of major construction projects, managing the road asset for the effects of climate change should in fact be affordable under historical road transport funding levels.

4.4 Dept. Primary Industries, Parks, Water & Environment (DPIPWE)

DPIPWE have three key programs in relation to climate change adaptation:

- Natural Systems Resilient to Climate Change Project;
- Climate Change and Coastal Vulnerability Program; and
- Climate Change Impact Monitoring Program for the World Heritage Area (WHA)

Key elements of the Natural Systems Resilient to Climate Change Project are the unpublished report: [DPIPWE (2010) Vulnerability of Tasmania's Natural Environment to Climate Change: An Overview], and a series of relevant spatial resources:

- spatial layer predicting spread/occurrence of WONS (weeds of national significance) in the future;
- 1. spatial layer predicting areas that are not vulnerable to the root-rot fungus (Phytophthora cinnamomi);
- 2. spatial layer as a predictor of biosecurity and disease issues related to the natural environment;
- 3. spatial layer identifying fire 'refugia' i.e. areas in the landscape with low vulnerability to wildfire; and
- 4. spatial layer highlighting past glacial 'refugia', i.e. where vegetation communities have contracted to in the past during changing climate.

In combination, the spatial layers may be used to refine or compliment the 'refugia' analysis conducted by NRM South. Once defined, 'refugia' have the potential to be protected through the planning scheme as special areas. Additionally, each individual spatial layer may be used to inform development decisions and would be useful additions to the GIS data libraries of Councils.

Components of the Climate Change and Coastal Vulnerability Program include:

- the Climate Change and Coastal Risk Assessment Project which has tools and resources to assist with riskbased management and planning for various assets and values in the coastal zone; and
- The 'Sharples' Report Indicative Mapping of Tasmanian Coastal Vulnerability to Climate Change and Sea Level Rise.

The Climate Change Impact Monitoring Program (WHA) includes:

• Vegetation community monitoring, particularly endemic conifers.

- Efforts to improve understanding of the effect of sea level changes on coastal geodiversity and biodiversity and identification of opportunities for adaptive management. There is alignment here with the NRM South saltmarsh inundation mapping project.
- A recently released report [Climate Change and Geodiversity in the World Heritage Area] which highlights how climate change may impact upon Tasmania's geological, geomorphological and soil features (and processes).

4.5 Derwent Estuary Program (DEP)

The Derwent Estuary Program (DEP) is a regional partnership between local governments, the Tasmanian state government, commercial and industrial enterprises, and community-based groups to restore and promote the Derwent Estuary.

The DEP has a strong interest in retaining environmental assets within the Derwent Estuary & improving estuary water quality, which appear to be at risk from climate change. Key areas of interest including the following:

- Sea level rise causing coastal squeeze and loss of tidal wetlands and saltmarshes. The DEP is advocating for planning consideration to be given to current, vulnerable areas and habitat retreat corridors.
- Potential reduced River Derwent flows (if rainfall decreases in the highlands & water extraction increases) causing reduced dissolved oxygen at depth with the estuary (releasing nutrients and heavy metals from estuary sediments). The DEP encourages research and information to assist discussion of this risk.
- Increased occurrence of intense rainfall events in Hobart's urban areas, causing stormwater management issues such as urban stream scour. The DEP is promoting retention of natural watercourses and local government application of the state stormwater strategy.

The DEP has written a discussion paper that looks at planning mechanisms that may apply the findings of scientific assessment and identification of the areas important for tidal wetland and saltmarsh retreat due to sea-level rise. The DEP wetland & saltmarsh discussion paper has been shared with stakeholders since Jan 2011, including the STCA, TPC, the DEP's six local government partners (DVC, GCC, HCC, KC, CCC, BC) and staff within DPAC working on climate change adaptation projects (John Harkin) and risk assessment (Luke Roberts), and experts looking at the social implications of climate change (e.g. Clive Attwater). A draft planning overlay was created for discussion. The science behind the creation of the overlay has been now been undertaken at other location in the state (e.g. Pittwater, Boulanger Bay) and will soon encompass many areas in the south of the state (project being undertaken by NRM South – employing Vishnu Prahalad (who also worked on the Derwent estuary study).

The DEP is advocating for a new 'Natural Coastal Processes' overlay, which would capture wetland and saltmarsh coastal types, and others at risk of recession due to climate change.

4.6 MAV Insurance Liability Mutual Insurance (LMI)

MAV Insurance Liability Mutual Insurance (LMI) is the primary insurer for all of the councils in Southern Tasmania. Many of the Councils have identified LMI as their most critical risk management framework that should be considered in climate change risk management and adaptation planning.

LMI does not have a statutory obligation to manage climate risks. They do however have a general commitment to assist member councils in effectively managing their risks with a focus on continuous improvement. LMI has developed a broad range of manuals and guidance documents for its members, although not specific and limited to climate change. These documents and support materials may be made available on request.

LMI conducts a biennial audit on all its members, part of which is an Organisational Risk Management section. As part of this section we examine the comprehensiveness of risk assessments for 4 risk areas of council in some detail, one of which is climate change.

LMI also has an internal risk register that includes risks to the scheme from a key claims driver view as well as unusual, new and emerging risks. Climate Change is one of the risks, and is being monitored by the Risk Committee. LMI is unable to provide this risk register to Councils, as it is an internal document only.

LMI does not dictate to members about how they manage their risks. Recommendations and suggestions for improvements may be made, however they have neither the power nor the inclination to 'demand' changes.

4.7 NRM South

The Southern regional NRM Strategy provides the primary framework through which NRM South prioritises and implements projects involving climate change adaptation.

NRM South is working in several ways to address the impact of climate change on natural systems and agricultural land of the southern region. In terms of natural systems NRM South has:

- Completed a preliminary report on 'refugia' (key places in the landscape that will be most resilient to effects of climate change and hence important reservoirs of genetic diversity) with a view to these areas receiving attention for protection and preservation into the future.
- Progressed saltmarsh inundation mapping and associated identification of opportunities for saltmarsh migration. This work has involved councils to determine a mechanism by which planning schemes may be used to facilitate the migration of this vulnerable vegetation community.

There is a potential role for local government in using planning instruments, such as planning scheme overlays, for protection of the identified 'refugia' and to make allowance for migration of vulnerable vegetation communities such as saltmarsh.

In terms of adaptation in agricultural systems, NRM South is working with the farming community, with involvement of local government, to assist in building resilience in soils and the landscape. Through NRM South's Sustainable Practices on Farms Program there has been a series of seminars and field days on the theme of 'living soils', and promotion and trialling of 'regenerative' techniques such as pasture cropping, holistic grazing, compost teas (making and application) & 'keyline' systems.

Other collaborations involving local government include:

- Healthy Catchments to Coast Program looking at management approaches that will help protect habitat.
 More specifically habitat protection for the 40-spotted pardalote and swift parrot under 'Mountains to Marine' (Kingborough & Hobart City).
- Protection of remnants of the endangered Miena cider gum (a victim of changing rainfall patterns) with Central Highlands Council.
- Development of a Biodiversity, Geodiversity & Landscape Regional Planning Code.

4.8 Southern Water

Southern Water is the council owned water and wastewater corporation for the Southern Tasmanian region. Southern Water is responsible for delivering water and wastewater services to the community and managing the associated asset base.

Southern Water is beginning to actively manage climate change in its operations and strategic planning. This is primarily being driven by a recognition that climate change may compromise achieving level of service standards and since a commitment has been made to achieving service level provisions, the organisation must therefore adopt an adaptation response. The following actions are currently being implemented:

- Desktop risk register (completed)
- Climate change strategy (mitigation and adaptation) with a view to develop precinct plans (currently being developed)
- Policy to include climate change as a key part of corporate plan goals and actions.

In terms of collaboration in climate change adaptation and effective service delivery, Southern Water has raised the following points:

- Loss of critical infrastructure around coast lines due to inundation as a result of sea level rise and storm surge is identified as a key climate change risk to Southern Water. Better consideration needs to be made when approving a development adjacent to the coast or creek where adequate setback for water and sewer infrastructure may not be provided to ensure protection from erosion/inundation.
- Reduced water availability is identified as a key climate change risk to Southern Water and better collaboration needs to be achieved in setting growth boundaries around towns so that population limitations are set within the sustainable yield profile of the drinking water catchment and/or reservations are put in place for additional drinking water catchments.
- Better management of bushfire risk needs to be achieved, allowing for approval of critical asset protection measures (e.g. creating buffers around pump stations) within council planning.
- Bushfire management is a key strategic risk for southern water as it has huge effects upon drinking water catchments, service provision, abnormal demand management spikes, hydrant performance, and power outages to water and wastewater infrastructure. Council and TFS could jointly help manage these risks with Southern Water in a number of ways, and probably requires further discussion.

4.9 State Emergency Services (SES)

The State Emergency Services is the statutory authority that coordinates emergency management responses Tasmania-wide. It is a division of the Department of Police and Emergency Management and is comprised of both paid staff and volunteers. It has four core functions that are set out in the Emergency Management Act (Tas) 2006 s.26 as follows:

- The provision of advice and services relating to emergency management in accordance with emergency management plans or as otherwise authorised by the State Controller or Minister in writing provided to the Director SES, other than the provision of a service provided by another statutory service.
- The provision of services relating to rescue and retrieval operations as authorised by the Minister or State Controller.
- The provision of administrative services for the State Committee and each Regional Committee, including support in the preparation and review of emergency management plans as required by the State Committee and Regional Committees.
- The recruitment, training and support of volunteer members of the State Emergency Service.

Local Government is an important stakeholder in the delivery of emergency management responses and planning. It is identified in key SES documents and plans that set out the key roles and responsibilities of stakeholders. Pursuant to section 34 of the EMA each Council must: prepare an Emergency Management Plan: review the EMP every 2 years; appoint an emergency management coordinator and establish and maintain voluntary units.

The SES's response to climate change, through the 'Natural Disaster Resilience Program and other funding programs, has been to fund and engage in research initiatives that identify and seek to quantify key climate risks as they apply across Tasmania, including:

- Climate Futures Tasmania Bushfire.
- Climate Futures Tasmania Extreme Events.
- Clarence City Council study into the effect of sea level rise this was the precursor to the current work that CCC has undertaken.
- Tasmanian Extreme Wind Hazards Stand-alone Tool (TEWHST).
- State Framework for natural hazards and Land Use Planning Project.

The SES is the custodian of a significant body of climate change data as a result of its involvement in the Climate Futures Tasmania project and collaboration with Geoscience Australia (Extreme Wind Hazard Project). Opportunities exist for the utilisation of this data to inform local, regional and state emergency management planning.

4.10 Tasmania Fire Service (TFS)

Tasmania Fire Service (TFS) is involved with multiple forums dealing with the impacts of climate change and the potential risks associated with the onset of climate change. Through the bushfire cooperative research council (BCRC) and the Australasian Fire & Emergency Service Council (AFAC), TFS is participating in research and modelling for bushfire. The research being conducted includes, looking at current bushfire risks and assessing current prediction tools to determine modelling for the future. This research will have a bearing on issues such as:

- resource to risk modelling;
- community protection planning;
- bushfire prediction tools;
- bushfire weather modelling;
- prescribed burning modelling; and
- fire management planning.

TFS has also participated in the Climate Futures for Tasmania Project, especially the 'Extreme Events' component. TFS will use this to map a pathway forward for future strategic planning.

Currently, TFS is reviewing the State Fire Protection Plan in which the above issues are called up. Additionally, as part of another review process, TFS is incorporating these developed strategies into its operational corporate plan.

From TFS's perspective the relationship with local government will be important, if not critical for future directions in climate change. Through the State Fire Management Council (SFMC), where LGAT is represented, TFS will engage with local government to ensure they are consulted regarding climate change and bushfire risk into the future. SFMC is currently lobbying State Government for funding to assist with additional programs to develop strategies for vegetation management for the mitigation of bushfires. This also includes legislative changes. Although currently in its infancy, this program will include climate change contingencies as part of the planning process. LGAT are an identified key stakeholder in this program and will be consulted throughout the development of this strategy.

SFMC provides a forum for local government to work with TFS and other land management agencies in relation to climate change and bushfire mitigation. At a 'coal face' level TFS will need to work closely with local government for the development of fire management planning, prescribed burning programs and development planning, especially in bushfire prone areas.

4.11 Tasmanian Landcare Association (TLCA)

The Tasmanian Landcare Fund and Tasmanian Landcaring Grants administered by the TLCA have provided financial support to care groups and landowners for a range of Landcare projects. Often local government NRM facilitators work with groups and landowners to develop applications and implement projects that address climate change risk themes.

4.12 Tasmanian Planning Commission (TPC)

The TPC has formed a Coastal Planning Advisory Committee comprising two Commissioners, John Ramsay and Roger Howlett, the head of the Tasmanian Climate Change Office, Wendy Spencer, and the Deputy Secretary of DPIPWE, John Whittington, to:

- prepare a Coastal Planning Framework for consideration by Cabinet (The TPC has been requested by the Premier to prepare the framework following the Premier's decision to accept the TPC's recommendation to reject the revised draft State Coastal Policy);
- peer review and conduct community and stakeholder consultation on a draft 'coastal hazards' code prepared by the TPC's Policy Division; and
- coordinate the state-wide 'coastal hazards' code review with the formal assessment and determination of a state-wide 'flooding' code.

The Advisory Committee has commenced its review of a draft Coastal Planning Framework prepared by the TPC's Policy Division and is due to report to the Commission in the first half of 2012. It is anticipated that the draft 'coastal hazards' code will be released for informal comment in the first half of 2012 and submitted to the Minister for approval as a draft Planning Directive for formal advertising for representations and formal assessment and determination in the second half of 2012.

In terms of other natural hazards and risks, the TPC formed an Assessment Panel in the second half of 2011 to formally assess draft state-wide planning codes prepared by the TPC's Policy Division covering bushfire prone areas, flooding and landslide. These draft codes have been formally advertised and public hearings have been held involving local government representatives.

5. Implementation of this Plan

The implementation of this Plan requires a co-ordinated approach, both across council business, in partnership with other councils, and with external stakeholders. Key components of implementation include:

- a consistent process for plan endorsement by all councils of the region;
- a logical way for incorporation of key local risks and adaptation actions into council documents and processes such as risk registers, strategic plans, annual plans or asset management plans;
- an appropriate mechanism to implement sub-regional and regional adaptation actions either through advocacy or collaboration; and
- a mechanism for plan review and updating.

Implementation of the adaptation actions in this plan will provide Sorell Council with an initial response to the challenges posed by climate change. Effective implementation does not mean 're-inventing the wheel', to the contrary many of Council's current activities/operational practices can be modified to assist in managing future climate variability. To this end, it will be important that outcomes from the risk assessment process used to support the development of this Plan are integrated with other Sorell Council strategic risk management and planning activities. It is recommended that a climate change 'champion' is appointed to oversee implementation of the actions included in this Plan. Senior management will also provide a key role in Plan implementation by remaining engaged with this process and through assuming responsibility for maintaining the risk assessment and implementing adaptation actions (see Strategic Priorities – Section 5.4).

5.1 Financial and resource requirements

Financial and resource availability are critical factors for enabling implementation of adaptation actions. The adaptation options identified in this Plan will come at varying degrees of cost and resource requirement. It is likely that Sorell Council will initially support implementation of those adaptation actions which are cost effective and align with current resource capacity and availability. Implementation of these actions i.e. 'low hanging fruit' will enable Council to gain some initial momentum in responding to impacts posed by climate change.

It is important to recognise that not all climate change action within Council will require its own funding, but will become embedded in the operational business of Council through appropriate governance arrangements, planning and policy. Notwithstanding this some of the more complex adaptation options will require substantial financial support and resources. For these actions, pursuing grant funding and establishing partnerships for collaborative or common actions can be effective in reducing the overall cost of action for Council, enabling the full cost of action to be offset.

5.2 Monitoring and Evaluation

Monitoring and evaluating the implementation of actions contained within this Plan will be critical in tracking progress with regard to the appropriateness and effectiveness of actions. Monitoring, evaluation and reporting (MER) is a systematic and objective review of either (or a combination of) the appropriateness, efficiency, effectiveness and impact of a set of actions. An example of the key aspects of the climate monitoring, evaluation, review and improvement cycle are highlighted in Figure 15.

Figure 15: MER Framework to support climate change adaptation plan implementation9

Tracking progress against actions in this Plan is important to determine:

- Whether actions need to be reviewed; and
- Whether actions are being implemented via operational plans.

Ongoing monitoring of this Plan should include the following:

- Reporting of implementation of adaptation actions;
- Reviewing progress for each council business area;
- Testing whether actions are still relevant;
- Consideration of barriers and barriers to implementing this Plan; and
- Consulting with external stakeholders to determine progress with regard to implementation of actions of a collaborative nature.

Annual monitoring of this Plan should be reported in Council's annual report.

⁹ Department of Environment, Water, Heritage and the Arts (2008). Australian Government Natural Resource Management Monitoring, Evaluation, Reporting and Improvement Framework, May 2008.

As discussed in the previous sections, this Plan focuses on the treatment or priority climate change risks. Although non-priority risks are not addressed in this Plan they should not be ignored. Council should maintain a 'watching brief' on non-priority risks rated as 'moderate' or 'low' as part of the Plan review process. This would include:

- Reviewing the ratings of non-priority risks should new information become available; and
- Upgrading risks to priority risks and developing adaptation actions where appropriate.

5.3 Review

This Plan should be reviewed every three years, or earlier if circumstances require. Plan review will be required in context of:

- progress on initial actions;
- updated information on climate science and its relevance at the municipal scale;
- progress in regional and state-wide planning instruments, particularly in relation to codes that guide development in areas likely to be impacted by climate change e.g. the coastal zone;
- developments in State policy in relation to climate change and the coastal zone;
- changes to the legal framework in relation to council's liability in relation to managing climate change risk and implementing actions;

The 'Toolkit' developed as part of the Regional Climate Change Adaptation Project will guide Council staff in revisiting the risk assessment and adaptation action processes used in the development of this Plan.

5.4 Strategic Priorities

Strategic priorities are broad level climate change adaptation actions that do not specifically address a particular area or risk and fall across numerous Council service areas. Success of such actions is dependant on senior management support. Implementation of strategic actions will provide Council with a solid framework in climate change adaptation and will build an internal culture that supports the implementation of the more specific adaptation actions described earlier. Strategic priority examples are provided in Table 10.

Table 9: Broad level climate change adaptation actions that may be implemented across Council (Strategic Priorities)

Strategic Priority Description	Reasoning
Integrate climate change risk management	Climate change risks should be incorporated into Council's existing risk management
into existing Council wide risk assessment	processes. From a process point of view this will ensure that climate change risks continue
framework.	to be properly addressed.
Appoint a climate change officer or	A representative from Council is recommended to be appointed to oversee the
'champion' to oversee implementation of this	implementation of actions outlined in the Plan.
Plan.	
Consideration of climate change risks and	The climate change impacts and risk process outlined throughout this adaptation action plan
impacts during the development of other	should be considered in the development of future plans, policies and strategies to ensure
Council strategies, policies and plans.	that these issues are incorporated throughout all of Council's service areas. This will also
	ensure there are mechanisms for actions to be implemented.
Support the STCA in engaging with relevant	State Government has a significant influence over planning and policy at the local
State Government departments to identify	Government level. By engaging state government and establishing clear lines of
and address gaps in planning instruments,	communication, Sorell Council, in partnership with the STCA, may be able to inform and
policies, funding and legislation.	influence relevant State Government departments to assist in local climate change impact
	adaptation.
Develop and implement a climate change	Educating staff and communicating initiatives on climate change will strengthen the profile of
communication and education plan for	climate change within local government. Increased staff capacity and awareness will assist in
Council staff.	incorporating climate change scenarios and impacts into policy and decision making
	processes.
Integration of adaptation action plan and	Ensure that future emissions are considered in the decision making process of prioritising
greenhouse gas mitigation measures to	adaptation actions. Often dual benefits can be achieved for climate change mitigation and
prioritise projects that have dual benefits.	adaptation.
Implement the monitoring and review process	An adequate monitoring and review process, set up as periodic Council process, will ensure
outlined in the 'implementation' section of	that the most up to date climate change information is always considered and that climate
this Plan.	change adaptation becomes ingrained into council's business.
Report on climate change adaptation	Reporting on climate change adaptation progress will assist in engaging the community and
progress into any future publicly available	informing other Councils on Sorell Council's progress.
documents or reports.	
Consider developing climate change related	Consider developing climate change related Key Performance Indicators (KPI's) which would
KPI's which would be reported on through	be reported on through Council's annual report.
Council's annual report.	
Ensure that the projected impacts of climate	Emergency response plans should be investigated, developed and implemented considering
change are properly considered in Council's	the best available climate change projections. Up to date emergency response procedures
emergency management planning.	can minimise consequences when extreme events occur.
Where required, support the implementation	Administered through the STCA, the Regional Councils Climate Change Adaptation Strategy
of the Regional Councils Climate Change	aims to drive adaptation in local government for the region and deliver on a number of
Adaptation Strategy.	common actions that are relevant to its member councils. The success of this strategy is
	dependent on a high level of buy in from each of the Councils across Southern Tasmania.

Appendices

Appendix A – All Council's Risks (low to extreme)

	Climate Impact	Risk Statement	Success Criteria	Business Area	Likelihood	Consequence	Risk	Comments
1	Sea level rise and storm surge	Increased storm surge events leading to increased erosion of beach resulting in loss of infrastructure (foreshore access) resulting in inability to meet community expectations	Service Delivery	Engineering Services	Possible	Catastrophic	Extreme	
2	Sea level rise and storm surge	Increased storm surge events leading to increased erosion resulting in inadequacy of land use planning instruments (uncertainty in approval decision making)	Service Delivery	Planning	Likely	Major	Extreme	
3	Increased fire risk	Increased fuel loads and fire risk leading to destruction of residential property and loss of life within the community	Public Safety	Community Health	Likely	Moderate	High	
4	Sea level rise and storm surge	Sea level rise and storm surge causing increased flooding of roads leading to increased maintenance costs and reduced asset lifecycle	Financial	Engineering Services	Likely	Moderate	High	
5	Sea level rise and storm surge	Increased storm surge events leading to increased erosion of beachfront properties resulting in loss of Council reputation (media, increased complaints)	Reputation	Engineering Services	Likely	Moderate	High	
6	Sea level rise and storm surge	Political pressures leading to information not being integrated into planning policies and instruments resulting in inadequate future development and potential liability issues for council	Strategy	Planning	Possible	Major	High	
7	Increased atmospheric CO2	Increasing cost of Council activities due to the introduction of the carbon tax	Financial	Finance	Likely	Insignificant	Moderate	

	Climate Impact	Risk Statement	Success Criteria	Business Area	Likelihood	Consequence	Risk	Comments
8	Increased atmospheric CO2	Introduction of the carbon tax resulting on reputational issues associated with passing the cost through to the rate base	Reputation	Finance	Likely	Insignificant	Moderate	
9	Increased fire risk	Increased fuel loads and fire risk leading to loss of property resulting in increased incidences of litigation	Financial	Finance	Possible	Minor	Moderate	
10	Increased fire risk	Current inadequacy of water storages to fight fires leading to destruction of property and infrastructure and public safety issues	Public Safety	Engineering Services	Possible	Moderate	Moderate	
11	Increased fire risk	Increased fuel loads and fire risk leading to uncontrolled fire events which result in loss of biodiversity and environmental amenity	Environmental	Natural Assets	Possible	Minor	Moderate	
12	Increased fire risk	Inadequacy of land use planning instruments for bush fire risk resulting in increased litigation	Financial	Planning	Likely	Minor	Moderate	
13	Increased flooding	Increased flooding resulting in uncontrolled overflows from septic tanks leading to public health issues	Public Safety	Community Health	Possible	Minor	Moderate	
14	Increased flooding	Localised flooding leading to degradation of assets (e.g. roads) resulting in increased maintenance costs for council assets	Financial	Engineering Services	Likely	Minor	Moderate	
15	Increased flooding	Increased river flows combined with other climate change related issues (sea level rise & storm surge) leading to causeway inundation and increased community complaints	Service Delivery	Engineering Services	Likely	Minor	Moderate	
16	Sea level rise and storm surge	Sea level rise and storm surge events impacting wetland areas leading to increased incidence of mosquito borne disease triggering increased public health issues	Public Safety	Community Health	Possible	Minor	Moderate	

	Climate Impact	Risk Statement	Success Criteria	Business Area	Likelihood	Consequence	Risk	Comments
17	Sea level rise and storm surge	Sea level rise and storm surge events leading to inundation of sewerage lagoons/wastewater treatment facilities resulting in uncontrolled discharge events triggering health related impacts	Reputation	Community Health	Unlikely	Major	Moderate	
18	Sea level rise and storm surge	Sea level rise and storm surge events impacting wetland areas leading to increased incidences of mosquito borne disease leading to reduced reputation of Council	Reputation	Community Health	Possible	Minor	Moderate	
19	Sea level rise and storm surge	Increased storm surge events leading to increased erosion of beachfront properties resulting in litigation from property owners	Financial	Finance	Possible	Moderate	Moderate	
20	Sea level rise and storm surge	Sea level rise and storm surge events leading to inundation of sewerage lagoons/wastewater treatment facilities resulting in increased expenditure through southern water	Financial	Finance	Possible	Minor	Moderate	
21	Sea level rise and storm surge	Increased storm surge events leading to increased erosion of beach resulting in loss of infrastructure (Stormwater outlets) and increased maintenance and replacement costs	Financial	Engineering Services	Likely	Minor	Moderate	
22	Sea level rise and storm surge	Rising groundwater associated with sea level rise inundation leading to increased maintenance costs	Financial	Engineering Services	Possible	Minor	Moderate	
23	Sea level rise and storm surge	Sea level rise and storm surge events leading to inundation of sewerage lagoons/wastewater treatment facilities resulting in uncontrolled discharge events and indirect reputational issues for Council	Reputation	Engineering Services	Likely	Minor	Moderate	
24	Sea level rise and storm surge	Sea level rise and storm surge events leading to degradation of RAMSAR wetlands environmental amenity	Environmental	Natural Assets	Likely	Insignificant	Moderate	

	Climate Impact	Risk Statement	Success Criteria	Business Area	Likelihood	Consequence	Risk	Comments
25	Sea level rise and storm surge	Sea level rise and storm surge events leading to migration of RAMSAR wetlands area onto other areas leading to required changes in development controls (e.g. EPBC act referral)	Strategy	Planning	Likely	Minor	Moderate	
26	Increased fire risk	Increased fuel loads and fire risk leading to decline on local economy as the area is no longer viewed as an attractive place to live	Community and lifestyle	Finance	Unlikely	Minor	Low	
27	Increased fire risk	Increased financial risk due to reduced rate base from loss of homes and reduced population as a result of fire risk	Financial	Finance	Unlikely	Minor	Low	
28	Increased fire risk	Increase maintenance/replacement costs for council assets in bushfire prone areas	Financial	Engineering Services	Possible	Insignificant	Low	
29	Increased rainfall variability	Impacts on productivity/viability of agricultural enterprises resulting in increased political pressures (increased lobbying for rebates) and financial issues	Financial	Finance	Unlikely	Minor	Low	
30	Increased rainfall variability	Impacts on productivity/viability of agricultural enterprises resulting in increased political pressures (increased lobbying for rebates) and reputational issues	Reputation	Finance	Unlikely	Minor	Low	
31	Sea level rise and storm surge	Rising groundwater associated with sea level rise inundation leading to increased requirements for asset replacement and impacts on council budgets	Financial	Engineering Services	Possible	Insignificant	Low	
32	Sea level rise and storm surge	Sea level rise and storm surge events leading to degradation of RAMSAR wetlands and reputational impacts for council	Reputation	Natural Assets	Possible	Insignificant	Low	