GLENORCHY CITY COUNCIL CORPORATE CLIMATE CHANGE ADAPTATION PLAN

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David Taylor	Bushfire modelling based BRAM model (Parks &Wildlife Service) with Climate Futures Tasmania data.
Tony Davidson	Sea level rise mapping - Climate Futures Tasmania and Tasmanian Planning Commission.
Shaun McElwaine	Legal comment
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Disclaimer

Citing this Climate Change Adaptation Plan

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Executive Summary (Key Risks, Priority Actions)

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 has a key role in working with its communities to manage and prepare for the impacts of climate change. This is facilitated by 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 the Glenorchy's City Council's municipal area (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** and for greater extremes.
- **Inundation** along the Derwent Estuary frontage **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 the Glenorchy's City Council's municipal area in relation to the climate change risks include the following:

- **Increased damage to Council assets** such as stormwater **from flooding**.
- **Inundation and degradation** of low-lying road and **stormwater assets in flood and storm surge**.
- **Exacerbated impact** on foreshore when **flood** and **storm surge coincide**.
- **Bushfire impacts** on **natural areas** and **urban fringe**.
- **Injury and loss of life in major bushfire events**.
- **Bushfire impacts** on natural assets leading to **decline in visitor numbers**.

In taking action to address Glenorchy's vulnerabilities a key overarching consideration is the potential liability exposure for an adopted action, or inaction in particular circumstances. Legal advice to the Regional Climate Change Adaptation Project 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. However 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.

Overall the RCCAP advocates that the Council undertake the following actions to minimize potential exposure to liability:

- **exercising reasonable care when making planning decisions**, which involves taking care to ensure all relevant facts are known and understood, that relevant law is identified and understood, and that reasons for decisions are expressed in clear and accurate terms

- **keeping up to date with general climate change science and information**, particularly in relation to potential risks from natural hazards, relevant to their local government area
- developing **clear and certain criteria for decision making** to increase public confidence that decisions are made on the basis of the best available scientific evidence
- **increasing public consultation**, as this may improve transparency around decision-making processes and limit administrative review, however, this should be weighed against resource implications of the increased consultation
- **facilitating the provision of information to property owners** on potential risks to property enabling opportunity to adjust their expectations about appropriate use and avid challenges to planning decisions

This Adaptation Plan provides an introduction to local government adaptation planning. It presents specific adaptation actions across climate change risk treatments to provide for an integrated and whole of Council response. Council staff defined a total of 35 adaptation actions in response to Glenorchy's 24 priority climate change risks. The strongest adaptation treatment theme was 'Regulatory and Institutional' where 16 actions are proposed. Other strong themes were 'Engineering and Technological' with 9 actions, 'Education and Awareness' with 5 actions and 'Advocacy' with 2 actions.

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.
- 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.
- 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. The 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 and environment strategy); 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 Glenorchy City Council

Tasmania is fortunate to have the highest resolution climate modelling conducted in Australia. The recent 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. The Climate Futures for Tasmania project detailed a specific climate profile for the Glenorchy City Council that is provided as an accompanying report to this Plan. Key points from the report are summarised below.

Current climate and recent trends

Glenorchy 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**

Although there is a marked rainfall gradient from Mt Wellington to the Derwent Estuary, on average, Glenorchy's municipal area receives around **700 mm of rainfall a year** with no strong seasonal cycle (around 40-60 mm each month). There has been a **decline in average annual rainfall** since the mid 1970s, and this decline has been **strongest in autumn**

Projected change in conditions by 2100 (A2 emissions scenario)

Table 1: Projected changes for Glenorchy City by 2090 - 2099 relative to the baseline period (1980-1999)

Climate Change Variable	Change	Relative change
Temperature (annual average)	+2.6 to 3.3°C	
Summer days (>25°C)	+22 days	+120%
Warm spells (days)	2-6 days longer	+50 - 150%
Hottest day of the year	+3°C	
Frost risk days/year	-9 days	-90%
Rainfall (annual average)	Increase in all seasons	
Rainfall (wettest day of the year)		+25%
Rainfall extreme (ARI-200)	+30-40 mm	+30-40%
Evaporation		+19%
Runoff	Increase in all seasons	
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 the Council's infrastructure, roads, and the local community and environment are a magnification in intensity of extreme events. Specific impacts on Glenorchy are as follows:

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 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 30-40%.**

Inundation along Derwent estuary frontage **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.**

Glenorchy City Council Risk Map

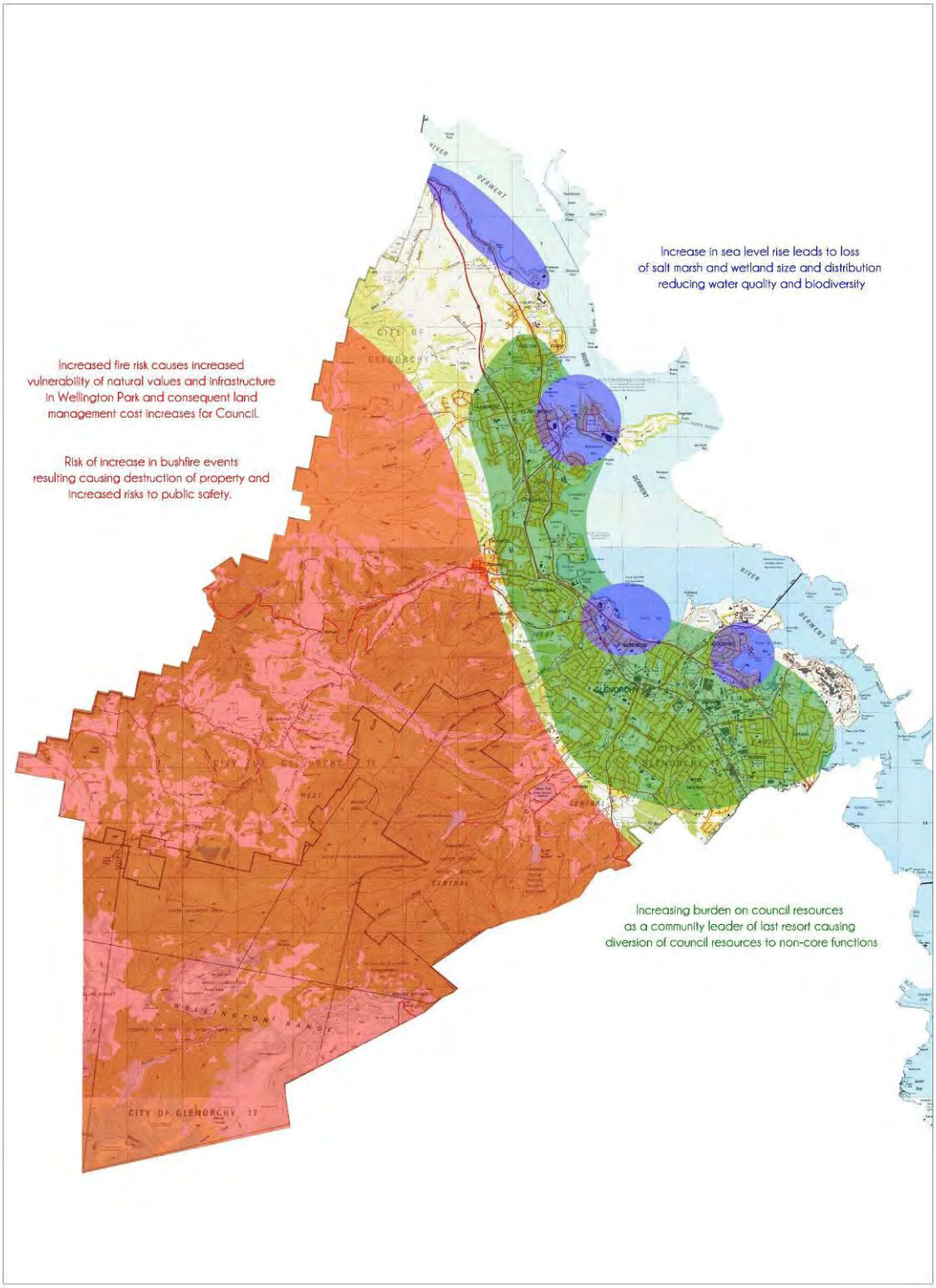

Figure 1 Glenorchy City Council Risk Map

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Abbreviations

ALGA	Australian Local Government Association
BMK	Baker and MacKenzie
CFT	Climate futures Tasmania
CCAP	Corporate Climate Change Adaptation Plan
LGRF	Local Government Reform Fund
RCAS	Regional Climate Adaptation Strategy
RCCAP	Regional Councils Climate Change Adaptation Project
RCCI	Regional Climate Change Initiative
SMA	Shaun MacElwaine + Associates
STCA	Southern Tasmanian Councils Authority
TCCO	Tasmanian climate Change Office

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 to assist review of Council's Adaptation Plans and to facilitate the extension of the project to Cradle Coast and Northern Councils.

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

The project was initiated by the Southern Tasmanian Councils Authority's (STCA) Regional Climate Change Initiative, a working group with representatives from each of the 12 southern councils. It was delivered by the STCA in partnership with the Tasmanian Climate Change Office and the Local Government Association of Tasmania.

1.2 Project Context

The global climate is changing and extreme weather events and sea level rise will increase in the 21st century[1]. 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 ºC[2]. Under a 'best case scenario' where significant reductions in greenhouse gas emissions are achieved it is still necessary to initiate an adaptation response in order to minimise climate change impacts associated with the warming climate on infrastructure, economy, community and the environment.

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

[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.)].

climate change and their engagement will be a critical part of any national reform agenda[3]. It has produced publications aimed at assisting local government manage climate change risk[4] and implement adaptation actions[5]. 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 the Clarence City Council with its community identified local government as the most trusted tier of government with regards to information on climate change[7].

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 impacts.[8] 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. A particular concern is the potential liability that councils are exposed to through their adopted action or inaction in particular circumstances.

Baker and McKenzie (BMK), in a report to the Australian Local Governments Authority on the risk of councils' climate change liability, outline a number of actions that councils may follow to reduce liability.[9] These include:

- **exercising reasonable care when making planning decisions**, which involves taking care to ensure all relevant facts are known and understood, that relevant law is identified and understood, and that reasons for decisions are expressed in clear and accurate terms
- **keeping up to date with general climate change science and information**, particularly in relation to potential risks from natural hazards, relevant to their local government area
- **developing clear and certain criteria for decision making** to increase public confidence that decisions are made on the basis of the best available scientific evidence
- **increasing public consultation**, as this may improve transparency around decision-making processes and limit administrative review; and
- facilitating the **provision of information to property owners** on potential risks to property.

Baker and McKenzie also noted that there are a number legislative and policy frameworks that create barriers to effective climate change adaptation by councils. These included: lack of decision-making power, lack of consistency, and lack of clear guidance, materials, expertise and funding.[10] They particularly advocated for a nationally consistent approach to managing climate change impacts on the coastal zone.

The RCCAP engaged Shaun McElwaine + Associates (SMA)[11] to provide advice on the legal context within which the impacts of climate change reside and how they relate to Tasmanian councils as a whole.[12] The advice received is provided as an accompanying report to this plan. The advice, dated 18 December 2011, established that overall councils are not liable for existing use or development, nor are they likely to 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.

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[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.

[9] *Ibid* pp 82 – 83.

[10] *Ibid* pp 75- 81

[11] A copy of the legal advice can be obtained by contacting the STCA

[12] This legal advice was considered alongside two similar reports:

- 'Legal issues for Local Government in addressing coastal erosion risks, a research report for Clarence City Council', Dr. McDonald, 18 March 2011
- '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.

Overall SMA's advice is consistent with the legal comments provided in these two reports.

The advice also noted that while the development and adoption of a [council's CCAP] 'climate risk plan and/or climate change adaptation action(s)' was positive it would also set the standard for the discharge of the duty of care. Thus if a council did not take the climate risk plan and or action(s) into consideration when making operational decisions it may become liable for the consequences of the operational decision.[13]

The advice contained three actions that could be undertaken by the State Government to reduce Tasmanian council's exposure and potential liability.

1. Amendment to the *Local Government Act (Tas) 1996* by the State Government to insert an equivalent section to that of the s733 *Local Government Act (NSW)* that exempts local governments from civil liability for the impacts of climate change where statutory powers, planning scheme provisions and assessment of development applications are undertaken in good faith and in accordance with manual(s) prepared by the State Government.
2. Review of the State Coastal Policy 1996 by the State Government so as to provide clarity on what is required to satisfy its requirements, i.e.
   - how planning schemes must deal with the impacts of climate change
   - provide specific recommendations and guidelines to manage climate change impacts
   - set prescribed levels for sea level rise in developed coastal regions throughout the State.
3. Formulation of a state-wide code to deal with climate change impacts (with the 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
   - sets prescribed levels for seal level rise in developed coastal regions throughout the State.

It is considered that the SMA's recommendations whilst reasonable and sound are unlikely to be successful or progressed in timely or efficient manner. Therefore reflecting on SMA's full advice, and to address the barriers to effective climate change adaptation identified by BMK, it is prudent and sagacious for the Council, through the STCA's RCCI or as an individual council to advocate for the Tasmanian Government to:

- play a more active role in the provision of information and guidance in relation to climate change and natural hazards, particularly in coastal areas; and
- consider exempting local governments from civil liability for the impacts of climate change where statutory powers, planning scheme provisions and assessment of development applications are undertaken in good faith and in accordance with manual(s) prepared by the Tasmanian Government.

The progression of this advice is considered through section 3 of this Plan: Corporate Adaptation Actions and the Regional Adaptation Strategy.

Disclaimer

The purpose of this advice is for the Council generally and the Council should not rely upon it. No liability is accepted for the content of the advice, or for the consequences of any actions taken on the basis of the information provided. If the Council wishes to rely upon the advice it is recommended that they seek their own advice prior to doing so.

[13] **McElwaine, 2011, p. 24.**

1.4 Purpose and scope

This adaptation plan is the foundational climate adaptation plan for the Glenorchy City Council. It introduces adaptation planning methods and aims to improve the capability of the Council to manage the risks associated with climate change.

The risks and adaptation actions identified through this Plan are based on council-specific, climate projection data provided by the Antarctic Climate and Ecosystems Cooperative Research Centre (ACE CRC) 'Climate Futures for Tasmania' (CFT) program. Detail of the climate projections for Glenorchy City Council is given in Section 2. 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 Glenorchy, 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 documented in Appendix A.

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 risk treatment themes that apply across the Council. Each Adaptation action has associated roles, responsibilities and timeframes.

The Plan also presents adaptation actions to manage risks that are within the 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 adaptation planning by the southern regions councils;
- a logical way for incorporation of key local risks and adaptation actions into the Council's 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. Projected Climate Change & Council's Corporate Risks

This section presents:

- An overview of the Council's corporate risks
- Summarised scientific climate projections for each of the key climate impacts: Temperature, Rainfall, Sea level rise, Bushfire and Other
- Risk statements for the priority climate change risks identified by Council staff through two corporate climate risk assessment workshops

The climate risk assessment workshop, undertaken with the Council's staff, resulted in the development of 116 initial risk statements as follows:

- **7 Extreme risks**
- **22 High risks**
- **47 Moderate risks**
- **40 Low risks**

Figure 2 outlines the likelihood and consequence distributions of the initial risk suite, prior to their evaluation.

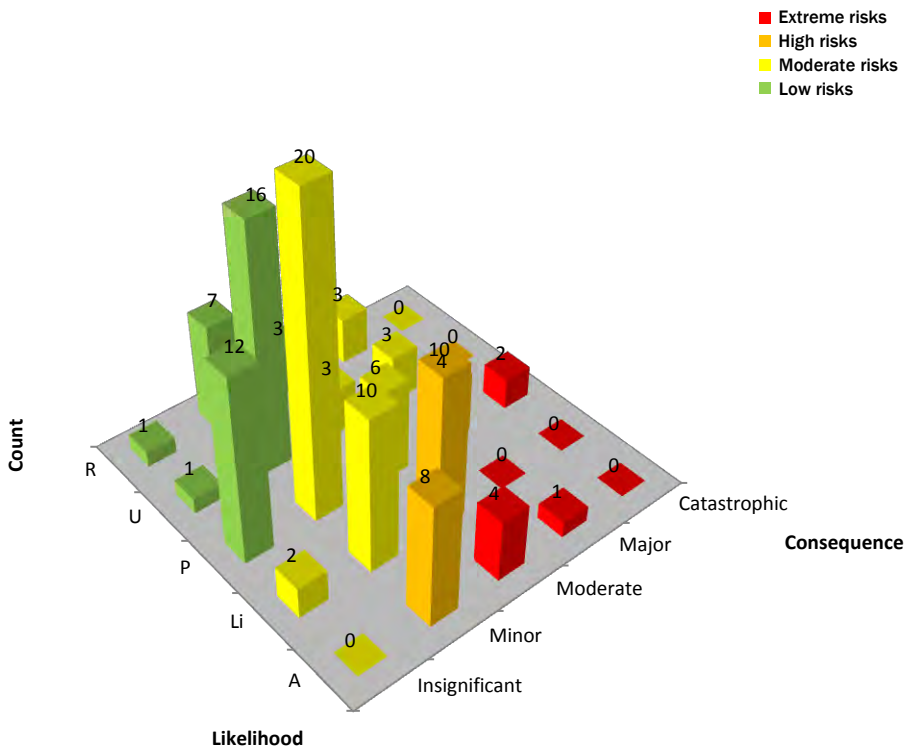

Figure 2: Distribution of climate change risk ratings for Glenorchy City Council

During the risk evaluation session, particular attention was paid to the moderate and high risks to determine whether any inconsistency had not inadvertently promoted or relegated a priority risk (high and extreme). Following evaluation, the 29 initial priority risks were reduced to 24.

These were considered as priority risks and adaptation actions were developed around these in the next stage of the project (Section 3). The distribution of risks across climate impact is shown in Figure 3.

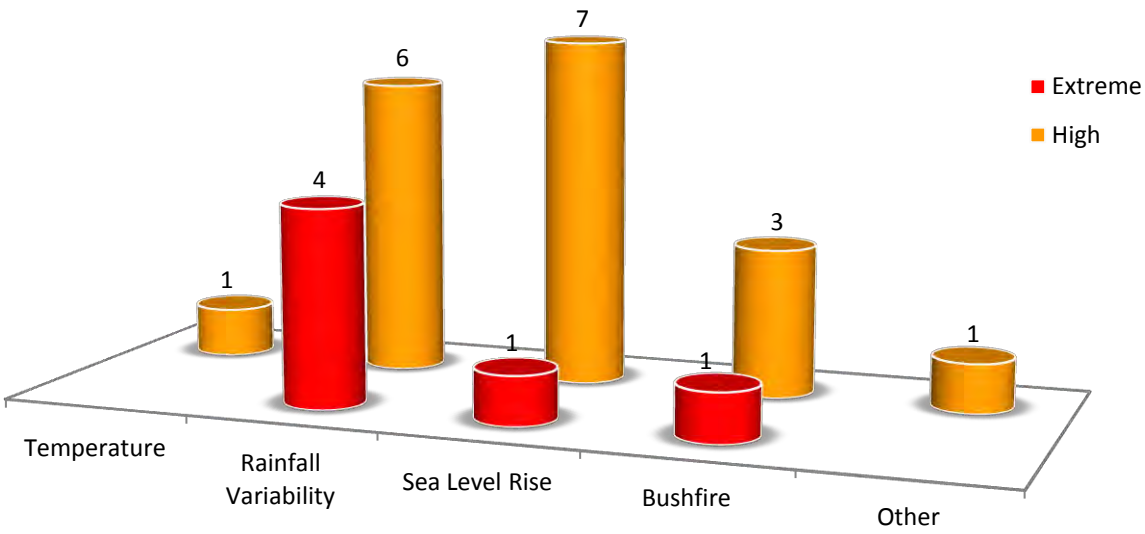

Figure 3: Distribution of Glenorchy City Council priority risks across climate impact

TEMPERATURE

at a Glance

Climate Change Projections

(A2 emission scenario)

By 2100 across Glenorchy's municipal area:

- 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 120% or 22 days.
- 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%) will increase by up to 6 days.
- Extended heat waves and more extreme temperatures are likely to enhance the occurrence and intensity of bushfires.
- Frosts incidents will reduce by 9 days

(from Local Climate Profile Glenorchy - Climate Futures Tasmania)

Key Vulnerabilities

Increased heat in Glenorchy may result in:

- Greater frequency and intensity of bushfires
- Degradation of Council owned assets such as roads and footpaths
- Increased incidences of food related illness in households
- Increase in vector borne disease as their ranges increase
- An increase in heat related mortality particularly in vulnerable demographics such as the elderly, very young and chronically ill
- New invasive weed and pathogen species impacting on local biodiversity

2.1 Temperature

Rising average temperatures and more frequent extreme temperature events have the potential to contribute to a variety of impacts including heat related illness and mortality, particularly in vulnerable demographics such as the very young, elderly and chronically ill, along with an increase in the range of vector related diseases such as Ross River fever. Impacts may also be incurred on the Council's infrastructure and property as well as the natural environment.

2.1.1 Identified risk - Temperature

The identified risk, relating to increase incidences of food poisoning by residents, in relation to hot days and increasing average temperature is provided in Table 1.

Examples of temperature related climate risks include: reduction in the lifecycle of assets and public safety issues, increased prevalence of vector borne diseases and increased pressure on resource allocation associated with people moving to Glenorchy.

Table 1: Priority risks associated with an increase in average temperature, hot days and drought for the Glenorchy City Council

Risk Code	Risk Statement	Success criteria	Risk Level	Council services primarily affected	• Other stakeholders
• **Community Wellbeing**					
AT1	Increases in average temperature leading to increased incidence of food poisoning in the homes within the municipal area resulting in increased need for environmental health resources	Financial	High	• Environmental Health	• DHHS

RAINFALL

at a Glance

Climate Change Projections

(A2 emission scenario from Climate Futures Tasmania)

By 2100 across Glenorchy's municipal area there will be:

- A tendency for heavier rainfall interspersed by longer and more severe droughts
- An increase in average rainfall in all seasons
- Wettest days of the year will increase by 25%
- Extreme rainfall events (200 yr ARI) will increase by 30 – 40 %
- Current coastal inundations 100 year ARI events will become 2 – 6 year ARI events
- Pan evaporation will increase by 19%

(from Local Climate Profile Glenorchy - Climate Futures Tasmania)

Key Vulnerabilities

Increased rainfall variability across Glenorchy's municipal area may result in:

- Reduced water availability due to droughts impacting on recreation and local amenity of parks and recreational reserves
- Impacts on biodiversity as rainfall variability is outside of resilience of natural systems
- Increased in flooding and landslip incidents
- Reduced relative capacity of the Council's stormwater infrastructure leading to a need for greater expenditure in order to maintain current service levels
- Low lying areas being subject to increased flooding
- Increased incidence in erosion and sedimentation of waterways

2.2 Rainfall

Potential impacts associated with changes in rainfall and runoff are variable and will depend on the direction and intensity of change. Examples of impacts in Glenorchy's municipal area will likely include flooding of infrastructure and property, increased erosion of waterways, water security decline and environmental quality decline.

2.2.1 Identified risks - rainfall variability

Climate change is projected to bring about increased rainfall variability for Glenorchy's municipal area that includes increased annual and seasonal rainfall combined with more frequent and intense peak rainfall events. Examples of priority rainfall variability risks for Glenorchy include increased drought periods impacting on maintenance of parks and gardens and social isolation arising from extreme events, particularly for vulnerable community groups. Priority risks associated with increased rainfall variability in Glenorchy City are provided in Table 3.

Table 3: Priority risks associated with increased rainfall variability for Glenorchy's municipal area.

Risk Code	Risk Statement	Success criteria	Risk Level	Council services primarily affected	Other stakeholders
Community Wellbeing					
RV1	Increasing drought periods resulting in increasing water restrictions leading to reduced community amenity due to poor maintenance of parks and gardens	Service Delivery	High	• Infrastructure and Property	

2.2.2 Identified risks - Increased flooding

Increased flooding was viewed as the most significant climate impact for the Council, accounting for 9 (36 %) of the total number of priority climate change risks. Table 4 shows the priority flooding risks applicable to the Council including impacts on infrastructure and environment.

Table 4 Priority risk associated with increased flooding for Glenorchy's municipal area.

Risk Code	Risk Statement	Success criteria	Risk Level	Council services primarily affected	Other stakeholders
Natural Values – Aquatic					
FL1	Increased intense rainfall and flood events resulting in water quality decline and loss of aquatic biodiversity	Environmental	Extreme	• Environment • Environmental Health	• Department of Primary Industries, Parks, Water and Environment • Derwent Estuary Program • Community Groups
FL2	Increase in peak flows resulting in: flash flooding events, reduced recreational water quality and associated decrease in public safety	Public Safety	High	• Environmental Health	• Department of Primary Industries, Parks, Water and Environment • Derwent estuary Program • Community Groups

Risk Code	Risk Statement	Success criteria	Risk Level	Council services primarily affected	Other stakeholders
Community Wellbeing					
FL3	Increased intense rainfall and flood events resulting in loss of life	Public Safety	Extreme	• Community Development	• Department of Health and Human Services • NGO's • State Emergency Services
FL4	Increased intense rainfall leading to community displacement requiring increased community counselling	Service Delivery	Extreme	• Community Development	• Department of Health and Human Services • NGO's
Infrastructure general					
FL5	Increased flooding causing infrastructure damage resulting in increased maintenance/capital costs	Service Delivery	High	• Infrastructure and Property	
FL6	Increased flooding causing property damage resulting in increased litigation	Service Delivery	High	• Finance	
FL7	Increased flooding causing property damage resulting in negative impact on reputation	Service Delivery	Extreme	• Infrastructure and Property	
Infrastructure – Roads					
FL8	Increased rainfall variability resulting in damage to roads integrity causing increased maintenance costs	Financial	High	• Infrastructure and Property	
Infrastructure – Stormwater					
FL9	Increased rainfall variability resulting in exceedence of stormwater design capacity causing increased incidence of litigation	Financial	High	• Infrastructure and Property	

Case Study – Flooding in Glenorchy's Municipal area

Flood events in Humphreys Rivulet, Islet Rivulet and Barossa Creek have triggered significant impacts on the municipalities built up areas in the past 20 years. Council's response following such events is to undertake emergency works at a number of locations due to impacts on roads, bridges and stormwater, while at the same time embarking on a staged program to develop and implement a comprehensive flood mitigation strategy for its streams and watercourses. Climate change is predicted to exacerbate the frequency and intensity of flood events.

A photo from a recent flood event in Glenorchy is shown below.

SEA LEVEL RISE & STORM SURGE

at a Glance

Climate Change Projections

(A2 emission scenario from Climate Future Tasmania)

- Sea level is predicted globally to increase by 0.82 m by 2100
- The current 100-year ARI storm tide event is around 0.9 to 1.4 m above average sea level and is projected to be 1.87 m in 2090
- The current 100-year ARI coastal inundation event may become a 50 year ARI event by 2030 and a 2 to 6 year ARI event by 2090

Key Vulnerabilities

Sea level rise and storm surge impacts on Glenorchy's municipal area may result in:

- Increased erosion of foreshore areas within the municipal area
- Increased damage and replacement costs of council infrastructure such as roads, stormwater systems and recreational facilities
- Flooding due to reduced capacity of stormwater infrastructure during storm surge events
- Litigation for impacted developments in vulnerable areas

2.3 Sea Level Rise and Storm Surge

Sea levels around the Tasmanian coastline have risen 18 centimetres over the past 100 years. This trend is projected to continue with inundation along Glenorchy's coastal frontage increasing.

The current 100-year ARI storm tide event is around 0.9 to 1.4 m above average sea level, and accounting for sea level rise (0.82 m) and high-river flows, the current 100-year ARI coastal inundation event may become a 50-year ARI event by 2030, and a 2 to 6-year ARI event by 2090.

Changes in gradual sea level combined with more extreme storm surge events will trigger a range of impacts on Glenorchy's municipal area such as degradation of stormwater and road infrastructure and impacts on residential property assets.

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 Climate Futures for 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 Glenorchy's municipal area is presented in Figure 4.

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.

Figure 4: Sea level rise inundation mapping for Glenorchy's municipal area for the year 2100

Identified Sea level rise and storm surge risks

Sea level rise and storm surge was viewed as a significant impact associated with climate change for Glenorchy, accounting for 8 priority risks shown in Table 5. These show a wide range of potential impacts such as inundation of estuarine and salt marsh communities, damage to property and infrastructure and inappropriate landuse planning decisions which do not account for potential impacts of sea level rise and/or storm surge.

Table 5: Priority risk associated with an increase in sea level rise and storm surge risk for Glenorchy.

Risk Code	Risk Statement	Success criteria	Risk Level	Council services primarily affected	Other stakeholders
Natural Values					
SL1	Increase in sea level rise leads to loss of saltmarsh and wetland size and distribution reducing water quality and biodiversity	• Environmental	Extreme	• Environment	• Department of Primary Industries, Parks, Water & Environment • Crown Land

Risk Code	Risk Statement	Success criteria	Risk Level	Council services primarily affected	Other stakeholders
SL2	Increase in sea level rise leads to loss of saltmarsh and wetland size and distribution reducing water quality and loss of amenity over time	• Community and lifestyle	High	• Environment	• Dept. of Infrastructure Energy & Resources
Roads					
SL3	Severance of low lying road networks due to flooding resulting in reduced asset lifecycle and infrastructure maintenance/replacement costs	• Financial	High	• Infrastructure and Property	• Dept. of Infrastructure Energy & Resources
Community Wellbeing					
SL4	Inundation of foreshore reserves resulting in elevated complaint levels from public	• Reputation	High	• Infrastructure and Property	• Dept. of Infrastructure Energy & Resources
Parks and Reserves					
SL5	Inundation of foreshore reserves resulting in loss of recreational assets resulting in maintenance costs and asset replacement costs	• Financial	High	• Infrastructure and Property	
Stormwater					
SL6	Backing up of stormwater drains resulting in property flooding causing increased costs to Council	• Financial	High	• Infrastructure and Property	
Legal					
SL7	Approval of development in vulnerable areas as a result of inadequate planning controls causing potential litigation issues	• Financial	High	• Planning	
Corporate					
SL8	Increasing burden on Council causing diversion of resources to non-core functions	• Service Delivery	High	• Finance	• Dept. of Infrastructure Energy & Resources • Southern Water • State Emergency Services

BUSHFIRE

at a Glance

Climate Change Projections

(A2 emission scenario)

- An increase in projected bushfire likelihood and intensity across Southern Tasmania's central and western regions

(BRAM; Antarctic Climate Ecosystems 2011)

Key Vulnerabilities

- Significant community disruption leading to a range of public health and safety issues
- An increase in the maintenance and replacement costs of council and community infrastructure and assets

2.4 Bushfire

It is recognised that a number of key climate change projections including higher temperatures, longer heat waves and drier summer conditions align with conditions suitable for bushfire. On that basis, bushfire modelling has been conducted for the southern region using the Tasmanian Bushfire Risk Assessment (BRAM), developed by the Tasmanian Parks and Wildlife Service specifically for the RCCAP. Climate change projections from the CFT project (A2 scenario) were entered into the BRAM to model bushfire scenarios for the following periods: baseline (1969 – 1990); near future (2010- 2039); mid century (2040 – 2069) and end of century (2070 -2099).

Outputs from the model demonstrate that climate change may result in increased bushfire risk across Tasmanian, particularly within the central plateau and areas to the west of the southern region. With Tasmania's large scale weather pattern predominantly bringing weather to the southern region, the entire region is placed at greater risk. This is likely to be exacerbated with changes to, and intensification of, land use activities.

2.3.1 Identified risks - bushfire

Priority risks identified with regard to bushfire in the Glenorchy municipal area are given in Table 6

Table 6: Priority risks associated with bushfire risk for the Glenorchy City Council

	Risk Statement	Success criteria	Risk Level	Council services primarily affected	Other stakeholders
Community wellbeing					
FR1	Increased bushfires resulting in the loss of life	• Public Safety	Extreme	Community Development	• Department of Health and Human Services • NGOs • State Emergency Services
Natural Values					
FR2	Increased bushfire leading to loss of habitat and long-term loss of biodiversity (1 in 100-year events turning into 1 in 50 year events)	• Environmental	High	• Environment	• Dept. of Primary Industry, Parks, Water and Environment • Industry Groups • Forestry Tasmania • Community Groups
FR3	Increased fire risk causes increased vulnerability of natural values and infrastructure in Wellington Park and resulting in increased costs for the Council's natural resources and asset functions	• Financial	High	• Infrastructure and Property	• Department of Infrastructure, Energy and Resources
Infrastructure					
FR4	Risk of bushfire damaging transmission lines and causing electricity outages and impacting on the delivery of services	• Service Delivery	High	• Finance	• Aurora • Transend

2.4 Other

2.4.1 Increase in atmospheric CO_2

The Australian Governments introduction of a carbon tax was the only priority climate change risk associated with increases in atmospheric CO_2. The biggest challenge to Glenorchy City Council associated with the introduction of a carbon tax includes costs associated with fleet and plant fuel, and the cost of energy supply for the services it provides to the community.

Table 7: Priority risk associated with an increase in atmospheric CO_2 for the Glenorchy City Council

Risk Code	Risk Statement	Success criteria	Risk Level	Council services primarily affected	Other stakeholders
Corporate					
CO1	Introduction of carbon cost will impact upon implementation of Councils corporate strategic plan	• Strategy	High	• Finance	

3.0 Corporate Adaptation Actions

This section presents Strategic Adaptation Actions and Corporate Adaptation Actions for treatment of priority climate change risks (those rated as 'extreme' or 'high') identified by Glenorchy City Council staff.

3.1 Strategic Adaptation Actions

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 dependent on senior management support. Implementation of strategic actions will provide the 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 identified by the Council, described in subsequent sections.

3.1.1 Legal liability

A key consideration for the Council in the face of climate change is the potential liability that it is exposed to through its various statutory roles, powers and functions. A key 'legal' concern is the potential liability that it is exposed to through its adopted action or inaction in particular circumstances. Legal advice by BMK to ALGA established (refer to Section 1.3) that councils may reduce its liability by:

- exercising reasonable care when making planning decisions,
- keeping up to date with general climate change science and information,
- developing clear and certain criteria for decision making;
- increased public consultation within resource constraints, and
- facilitating the provision of information to property owners on potential risks to property

Legal advice sought by RCCAP, specific to the circumstance of Tasmanian councils, established overall councils will not be liable for existing use or development, nor are they likely to 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.

The legal advice contained three options (refer to Table 8) that could be pursued with the State Government and/or in their own capacity to reduce their exposure and potential liability.

Table 8: Potential corporate actions for the Council to pursue in relation to minimisation of its potential 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.

Overall it was considered that these actions are more appropriately pursued through a regional approach (refer to the Regional Climate Change Adaptation Strategy compiled under the Regional Climate Change Adaptation Project) and that in the near future they are unlikely to have timely or satisfactory outcome. To this end it is proposed that in addition to the above recommendations that the Council directly advocate to the State government to:

- Play a more active role in the provision of information and guidance in relation to climate change and natural hazards, particularly in coastal areas
- Consider exempting local governments from civil liability for the impacts of climate change where statutory powers, planning scheme provisions and assessment of development applications are undertaken in good faith and in accordance with manual(s) prepared by the Tasmanian Government

3.1.2 Strategic Corporate Actions

There are key overarching corporate functions that minimise the Council's risk in the face of extreme events posed by climate change including: incorporation of climate change risks into the 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. Success of such actions is dependant the allocation of suitable resources and 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. Potential overarching corporate actions for the Council to pursue are provided in Table 9.

Table 9: Potential overarching corporate actions

1	**Corporate Climate Adaptation Implementation Team** Establish a Corporate Climate Adaptation Implementation Team to coordinate the Plan's implementation, review and update
2	**Risk Register** Migrate corporate climate risks and treatments, over time as they become more fully established, into the Council's existing risk management framework
3	**Emergency Management Planning and Recovery Management** Ensure that the projected impacts of climate change are properly considered in Council's emergency management planning. Emergency response and recovery plans should consider the best available climate change projections. Up to date emergency response and recovery procedures can minimise consequences when extreme events occur
4	**Communication** Develop and implement a climate change communication and education plan for the Council's staff that will form the basis for a broader community communication. Increased staff capacity and awareness, particularly in land use planning assessment, will assist in incorporating climate change scenarios and impacts into policy and decision making processes
5	**Other Council Plans & Strategies** Integration of climate risks and adaptation actions into Council's Strategic and Annual Plans, strategies and policies. The climate 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
6	**Reporting** Develop climate adaptation related key performance indicators into the Council's Annual Report and provide biannual summary report to Executive Leadership Team
7	**Regional Action** Support the STCA in engaging with relevant State Government departments to identify and address gaps in planning instruments, policies, funding and legislation and where required, support the implementation of the Regional Councils Climate Change Adaptation Strategy

3.2 Corporate Adaptation Actions

A total of 35 actions were identified for management of the Glenorchy City Council priority risks. Climate change adaptation actions have been documented in this Section of the Plan according to the type of adaptation action. These include:

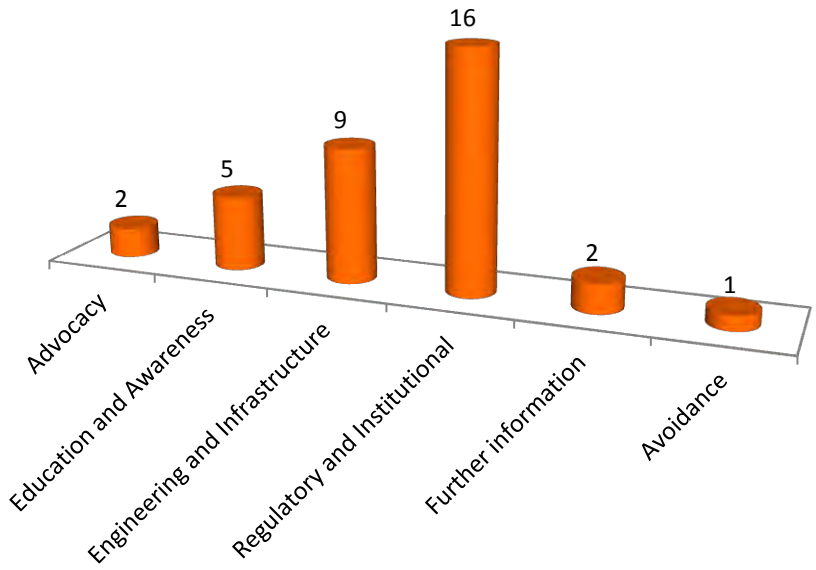

Figure 5 Glenorchy City Council's corporate adaptation actions grouped by treatment types.

The grouping of actions by treatment types seeks to drive a Council-wide approach to adaptation planning. This will facilitate cost effective pathways for the Council to implement common adaptation actions (e.g. Further Information, Communication Plans) that cross multiple Council Divisions. Notwithstanding this in some cases there are adaptation actions that are discreet (e.g. hard engineering measures) and relate only to a particular Division, where this is the case these actions are clearly identified within this Plan.

The ultimate objective of this adaptation action plan is to provide an initial framework of actions for the Council. To guide implementation, each action is complimented with the following information:

- Timeline for delivery
- Other stakeholders responsible for delivery
- Estimated cost for implementation
- Relevant Council documents and strategies
- Ease of implementation
- Risks treated

3.2.1 Advocacy

Advocacy actions are those that seek to influence and /or collaborate with other spheres of government on policy, resourcing and other issues to manage risks that may affect Glenorchy City Council and local government adaptation planning. Examples of actions include advocating to State Government for clearer direction on planning responses for sea level rise and flooding impacts and advocating to Southern Water to ensure that climate change risks are being factored into the design, engineering and operation of water and wastewater treatment plants.

Advocacy options for treatment of priority climate change risks impacting on Glenorchy City Council are documented below.

Table 10: Advocacy actions for Glenorchy City Council

Action Code	Adaptation Action	Relative cost of implementation	Ease of implementation	Timeline for delivery	Responsible Council areas	Relevant Council documents/strategies	Risks treated	Original risk level	Treated risk level
1	**Communicate with government, industry and non-government organisations on risks associated with climate change to develop and share management strategies and undertake monitoring programs**	Low	Difficult	Ongoing	• Environment • Community Development • I&ES	• **Strategic Plan** • **Community Engagement Strategy** • **Wellington Park Management Plan** • **Fire Management Plan** • **GCC Emergency Management Plan**	SL1	Extreme	Extreme
							SL2	High	High
							FL1	Extreme	Moderate
							FL2	High	Moderate
							FR3	High	Moderate
2	**Advocate to State Government for consistent and best practice State wide planning schemes and directives and state policies regarding climate change impacts**	Low	Moderate	Dec 2012	• Planning • Finance	• **Strategic Plan** • **Financial Sustainability Model**	SL7	High	High
							SL8	High	Moderate

3.2.2 Education and awareness:

Education and awareness raising actions are those where Council provides information to other stakeholders to drive climate change adaptation into areas beyond their sphere of influence. These actions typically consist of two aspects:

- *External* - increase public awareness about the potential impacts of climate change and climate change adaptation measures for treatment of priority climate change risks
- *Internal* - educate and inform Council management and personnel about climate change risks and adaptation measures

Examples of actions applicable to Glenorchy include public education campaigns to communicate high-risk areas associated with sea level rise and storm surge to the community, facilitation of workshops with local industry groups and communicating the findings from this Plan to key council staff. Education and awareness raising adaptation actions for treatment of priority climate change risks are provided below.

Table 11: Education and awareness actions for the Glenorchy City Council

Action Code	Adaptation Action	Relative cost of implementation	Ease of implementation	Timeline for delivery	Responsible Council areas	Relevant Council documents/strategies	Risks treated	Original risk level	Treated risk level
Natural Values									
3	**Implement education and awareness program about the importance of high value natural assets and environmental issues in Glenorchy (e.g. salt marsh, riparian and coastal environments, sea level rise)**	Low	Difficult	Ongoing	• Environment	• Strategic Plan • Community Engagement Strategy	FL3	Extreme	High
							SL1	High	Moderate
							FL3	Extreme	High
							FL2	High	Moderate
							SL2	High	High
Local Climate Awareness									
4	**Develop and implement community and stakeholder**	Low	Difficult	2014	• Community	• Strategic Plan	FL3	Extreme	High

Action Code	Adaptation Action	Relative cost of implementation	Ease of implementation	Timeline for delivery	Responsible Council areas	Relevant Council documents/strategies	Risks treated	Original risk level	Treated risk level
	program to raise awareness of potential climate change impacts and local actions for mitigation of impacts				Development / Inclusion	• Emergency Management Plan • Community Recovery Plan • Safer Communities	FL7	Extreme	High
							RV1	High	Moderate
							AT1	High	Moderate
Flooding									
5	**Identify flood prone areas and install appropriate warning system**	Medium	Moderate	2013	• Emergency management • Hydraulics	• Strategic Plan • Community Engagement Strategy • Emerg' Management Plan • Community Recovery Plan • Safer Communities	FL3	Extreme	High
6	**Identify vulnerable persons/groups who are most at risk from displacement due to flood events, to support them in an emergency event**	Low	Difficult	2013	• Community Development	• Planning Scheme • Emergency Management Plan • Community Recovery Plan	FL4	Extreme	Moderate
Environmental Health									
7	**Actively participate in food safety week and other health promotion events to raise awareness of the increased risk of food poisoning in the home.**	Low	Difficult	ongoing	• Environmental Health • Community Development	• Strategic Plan • Community Engagement Strategy	AT1	High	Moderate

3.2.3 Engineering and technological:

Engineering and technological actions aim to prevent impacts posed by climate change through hard and soft engineering solutions and changed practices. These actions focus on reducing the exposure and vulnerability of current and planned infrastructure, including natural systems to the potential risks posed by climate change. Examples of engineering and technological adaptation actions identified by the Glenorchy City Council include redesigning roads, re-design and retrofit of stormwater infrastructure and inclusion of riparian setbacks in new development areas. Engineering and technological adaptation actions are shown below.

Table 12: Engineering and technological actions for Glenorchy City Council

Action Code	Adaptation Action	Relative cost of implementation	Ease of implementation	Timeline for delivery	Responsible Council areas	Relevant Council documents/strategies	Risks treated	Original risk level	Treated risk level
Infrastructure and assets									
8	**Develop an asset management system to identify priority asset remediation required as a result of the impacts of climate change.**	Medium	Moderate	2014	• Asset Management • Property • W&S	• Emergency Management Plan • Community Recovery Plan • Strategic Plan • Community Engagement Strategy • Strategic Plan • Condition Manuals • Stormwater Policy • Planning Scheme • Service Level Charter	FL4	Extreme	Moderate
							SL3	High	Moderate
							FL8	High	High
							FL9	High	Low
							FL6	High	Low

Action Code	Adaptation Action	Relative cost of implementation	Ease of implementation	Timeline for delivery	Responsible Council areas	Relevant Council documents/strategies	Risks treated	Original risk level	Treated risk level
						• Liability Audit			
9	**Identify appropriate control measures for high risk/impact areas (e.g. sea walls, rock gabions)**	Low	Easy	2014	• Asset Management • Hydraulics	• Financial Sustainability Model	SL3	High	Moderate
							SL 6	High	Moderate
10	**Implement appropriate control measures for high risk/impact areas (e.g. sea walls, rock gabions)**	High	Difficult	>10 years	• Asset Management • Hydraulics • W&S	• Financial Sustainability Model	SL3	High	Moderate
							SL 6	High	Moderate
11	**Undertake post event condition assessment of vulnerable assets**	Low	Difficult	As required	• Asset Management • Property • Environment	• Condition Manuals	SL 3	High	Moderate
							SL5	High	Moderate
							SL6	High	Moderate
Stormwater									
12	**Undertake a review of stormwater infrastructure to identify high risk systems**	Low	Difficult	Jul 2015	• Hydraulics	• Open Space Strategy • Service Level Charter • Liability Audit	SL6	High	Moderate
13	**Implement upgrade programs for stormwater infrastructure**	High	Difficult	As required	• W&S	• Annual Plan	SL6	High	Moderate

Action Code	Adaptation Action	Relative cost of implementation	Ease of implementation	Timeline for delivery	Responsible Council areas	Relevant Council documents/strategies	Risks treated	Original risk level	Treated risk level
14	**Ensure Council's stormwater infrastructure is safe to members of the public**	Medium	Moderate	2013	• Hydraulics • W&S	• Strategic Plan • Community Engagement Strategy • Emergency Management & Community Recovery Plan • Safer Communities	FL3	Extreme	Moderate
Design									
15	**Ensure the design, engineering and planning controls of future development and assets considers climate change impacts**	Low	Difficult	Jun 2015	• Engineering Projects • Transport • Property • Environment • Planning	• Strategic Plan • Planning Scheme • Road Design Standard	SL6	High	Moderate
							FL8	High	Low
Flood modelling									
16	**Undertake flood modelling for specific areas and catchments to determine climate change impacts and implement appropriate control measures (i.e. prohibit, protect, purchase)**	Medium	Difficult	Jun 2015	• Hydraulics • Finance • Planning	• Strategic Plan • Planning Scheme • Service level Charter	FL5	High	Moderate
							SL7	High	Moderate
							SL8	High	Moderate

3.2.4 Regulatory and institutional:

Regulatory and institutional adaptation actions focus on prevention or mitigation of potential climate change impacts through revisions to regulations and planning. Examples of adaptation actions applicable to the Council include amending local planning provisions, updating emergency management response plans and updating insurance policies to accommodate for impacts posed by climate change. Regulatory and institutional adaptation actions for treatment of priority climate change risks are detailed below.

Table 13: Regulatory and institutional actions for Glenorchy City Council

Action Code	Adaptation Action	Relative cost of implementation	Ease of implementation	Timeline for delivery	Responsible Council areas	Relevant Council documents/strategies	Risks treated	Original risk level	Treated risk level
Natural Values – coastal									
17	**Develop a retreat strategy, where other cost effective alternatives are unavailable which contains actions that facilitate transgression for high value natural assets (e.g. salt marshes) at specific locations**	Low	Moderate	2014	• Environment • Property	• Planning Scheme • Strategic Plan • Open Space Strategy	SL1	Extreme	Moderate
							SL2	High	Moderate
18	**Develop policy to enhance and protect riparian and coastal vegetation**	Low	Moderate	2014	• Environment • Property	• Strategic Plan • Community Engagement Strategy	FL1	Extreme	Moderate
19	**Identify areas of coastline at high risk of erosion and sea level rise**	Low	Easy	2014	• Environment	• Environment Strategy	SL5	High	Low
20	**Develop appropriate solutions to decrease impacts of sea level rise on high risk areas of coastline (e.g. sea walls, rock gabions)**	High	Difficult	> 5 years	• I&ES • W&S • Property	• Financial Sustainability Model	SL5	High	Low

Action Code	Adaptation Action	Relative cost of implementation	Ease of implementation	Timeline for delivery	Responsible Council areas	Relevant Council documents/strategies	Risks treated	Original risk level	Treated risk level
Drought									
21	**Develop a rationalisation strategy for Council's parks and gardens to reduce maintenance requirements**	Low	Moderate	2014	• Environment • W&S	• Environment Strategy • Open Space Strategy	RV1	High	Moderate
22	**Investigate stormwater re-use options to reduce the reliance on potable water**	High	Difficult	2013	• EID • W&S	• Environment Strategy	RV1	High	Moderate
Bushfire									
23	**Review and implement Council and interagency bushfire management plans to address elevated fire risk posed by climate change**	Low	Difficult	2014	• Environment	• Strategic Plan, • Mt Faulkner Fire Mgt Plan • Wellington Park Fire Mgt Plan • Goat Hills Fire Mgt Plan • Greater Hobart Fire Mgt Plan • GCCC Emergency Mgt Plan	FR2 FR3	High High	Moderate Moderate
Policy - engineering									
24	**Design future assets to consider climate change impacts**	Medium	Moderate	ongoing	• Engineering Projects	• Strategic Plan	SL5 SL3	High High	Moderate Moderate

Action Code	Adaptation Action	Relative cost of implementation	Ease of implementation	Timeline for delivery	Responsible Council areas	Relevant Council documents/strategies	Risks treated	Original risk level	Treated risk level
25	**Identify vulnerable services/assets and implement Business Continuity Plans**	Medium	Moderate	2014	• HR/Risk	• BCP • Emergency Mgt Plan	FR4	High	Moderate
Policy – planning									
26	**Update Council planning controls to ensure appropriate mechanisms are in place to prevent impacts associated with climate change**	Low	Moderate	2013	• Planning • Community Development	• Strategic Plan • Community Engagement Strategy • Emergency Management & Community Recovery Plan • Safer Communities • Open Space Strategy • New planning scheme & codes	FL3	Extreme	High
							SL7	High	Moderate
Policy – Emergency Management									
27	**Review and exercise Council's emergency management and community recovery plan and communicate council's role in emergency management and recovery plans across the organisation and to the public**	Low	Difficult	Ongoing	• Emergency Management	• Strategic Plan • Community Engagement Strategy • Emergency Management & Community Recovery Plan • Safer Communities	FL3	Extreme	High
							FL4	Extreme	Moderate
							FL8	High	Moderate
Customer Service									

Action Code	Adaptation Action	Relative cost of implementation	Ease of implementation	Timeline for delivery	Responsible Council areas	Relevant Council documents/strategies	Risks treated	Original risk level	Treated risk level
28	**Implement a management system for recording and prioritising complaints**	Low	Difficult	Immediate	• GM's unit	• Customer Service Standards	SL4	High	Moderate
Funding									
29	**Investigate alternative revenue sources (e.g. environment levy) to fund climate change adaptation projects**	Low	Moderate	June 2015	• Finance • Environment • Asset Management	• Financial Sustainability Model	FL5	High	Moderate
							SL8	High	Moderate
30	**Ensure appropriate budget provisions are in place to respond to additional impacts on council infrastructure/assets for funding climate change adaptation projects**	Medium	Moderate	June 2015	• I&ES • Finance	• Financial Sustainability Model • Budget • Asset Management Plans	FL8	High	Moderate
Insurance									
31	**Review Council's insurance policies to ensure that these adequately address and respond to projected climate change impacts**	Low	Difficult	June 2013	• HR/Risk	• Insurance renewal handbook	FL9	High	Moderate
							FL6	High	Moderate
Carbon management									
32	**Develop an environment strategy, including options to reduce Council's carbon footprint and carbon cost.**	Low	Difficult	2013	• Environment	• Strategic Plan • Financial Sustainability Model	RV1	High	Moderate
							CO1	High	High

3.2.4 Further information identification:

Further information identification adaptation actions typically involve further research and information gathering to improve understanding of relationship between climate change and risk. Examples of actions include:

- Improve knowledge of relationship between past and present variations in climate and performance of economic, social and environmental systems
- Improve modelling of regionally-based climate change impacts
- Improve knowledge of the probability of frequency and magnitude of changes to extreme climate events and other climate variables under climate change
- Improve understanding of the relationship between changes to frequency and magnitude of extreme events and critical thresholds for individual risks

Further information identification adaptation actions for treatment of priority climate change risks are provided below.

Table 14: Further information identification actions for Glenorchy City Council

Action Code	Adaptation Action	Relative cost of implementation	Ease of implementation	Timeline for delivery	Responsible Council areas	Relevant Council documents/strategies	Risks treated	Original risk level	Treated risk level
Waterways									
33	**Identify riparian areas with high biodiversity and geomorphologic values to establish potentially sensitive areas**	Medium	Moderate	2014	• Environment	• Strategic Plan • Community Engagement Strategy • Open Space Strategy	FL1	Extreme	High
Coastal									
34	**Identify and document critical low lying reserves potentially affected by sea level rise inundation and storm surge**	Low	Difficult	June 2015	• Environment	• Open Space Strategy	SL5	High	High

3.2.5 Avoidance:

Avoidance actions are those where an organisation will relocate functions or activities to avoid the impact. Many of these actions are based around acceptance that the impact will occur and avoiding use of a particular area because of it. Avoidance options for treatment of priority climate change risks impacting on the Glenorchy City Council are documented below.

Table 15: Avoidance actions for Glenorchy City Council

Action Code	Adaptation Action	Relative cost of implementation	Ease of implementation	Timeline for delivery	Responsible Council areas	Relevant Council documents/strategies	Risks treated	Original risk level	Treated risk level
Biodiversity									
35	**Develop translocation strategy for vulnerable high value wetland species**	High	Moderate	2015	• Environment	• Strategic Plan • Open Space Strategy	SL1	Extreme	Moderate
							SL2	High	Moderate

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 Figure 6.

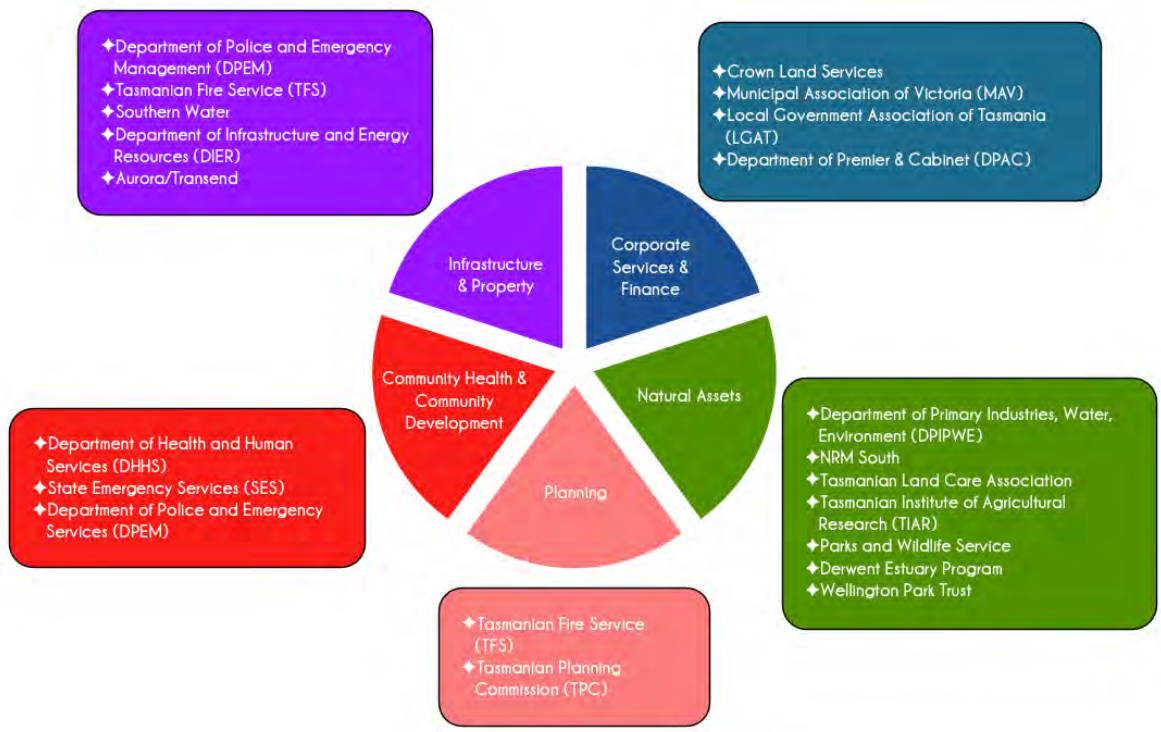

Figure 6: Stakeholder organisations identified during the council corporate risk and adaptation planning workshops

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. A summary of the Stakeholder Engagement is provided in Appendix B.

5. Implementation Plan

The implementation of this Plan requires a co-ordinated approach, both across the Council's corporate service areas and in partnership with other councils as well as public and private external stakeholders. Key components of the implementation plan 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.

Section 3 of this Plan contains 47 adaptation actions for addressing priority climate change risks. When implemented, these actions provide the Glenorchy City 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 the 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 of the Council's 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 3.2).

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 the Council will initially support implementation of those adaptation actions that are cost effective and align with current resource capacity and availability. Implementation of these actions i.e. 'low hanging fruit' will enable the 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 the Council will require its own funding, but will become embedded in the operational business of the 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 the 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 key aspects of the climate monitoring, evaluation, review and improvement cycle are highlighted in Figure 7.

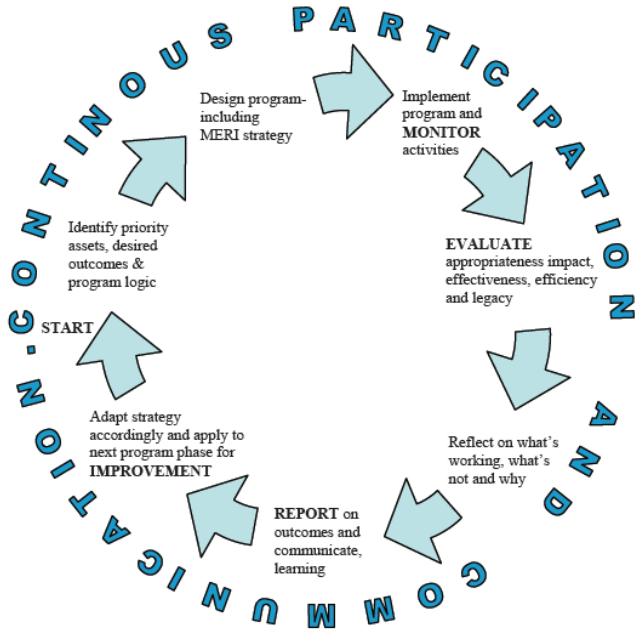

Figure 7: MER Framework to support climate change adaptation plan implementation14

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 risk treatments;
- Testing whether actions are still relevant;
- Consideration of barriers to implementing this Plan; and
- Consulting with external stakeholders to determine progress with regard to implementation of actions.
- Annual monitoring should be reported in Council's annual report.

[14] 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 initially after three years (earlier if circumstances required), at which time a review schedule is to be established. 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.

Appendices

Appendix A – Project Methodology

The development of this Plan has involved two key stages, including a climate change risk assessment and identification of adaptation actions for treatment of priority climate change risks. These two stages of the project were supported by five steps as shown in Figure 8. This framework is 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* (AGO 2007).

Figure 8: Process for risk assessment used in the Glenorchy City Climate Change Adaptation Plan.

This risk assessment process was developed to address priority climate change risks[15] which are primarily associated with the Council's assets and service areas. This Plan also identifies adaptation actions to manage risks that are within the Council's sphere of influence. Risks have been identified which must be managed in collaboration with other stakeholders (such as State Government Agencies, Community Groups and Private Corporations). Although these risks may not be directly managed by the Council, they remain as important risks to identify as they affect its service areas and assets

A more detailed outline of the project methodology is documented below for the above-mentioned steps.

Climate Change Risk Assessment

Establish the context

Establishing the context sets the scene for outlining the potential impacts of climate change to the Council from a risk perspective. This was undertaken by the following:

- Defining the business or organisation to be assessed and the scope of the assessment. In this case, identifying Council service areas and its sphere of influence
- Clarifying the Council's objectives

[15] Priority climate change risks are those risks rated as 'extreme' or 'high'. Other risks rated as 'moderate' or 'low' are not addressed in this Plan.

- Identifying stakeholders and their objectives and concerns
- Establishing success criteria against which risks to Council's objectives can be evaluated
- Determining relevant climate change scenarios for the climate change risk assessment (AGO 2007).

The climate change scenario adopted for Glenorchy City was the A2 scenario for the year 2100.

Senior management at Glenorchy City Council were engaged at this stage to encourage greater attendance and participation in the future stages of the project and to ensure the process was effectively owned by Council.

Identify the risks

The process of risk identification was undertaken to describe and list how climate change could impact on each of the key business areas within Glenorchy City Council. This was undertaken using the information gathered in the previous stage of establishing the context.

Risks were identified in a workshop format with key Council staff from the following areas:

- Natural Areas
- Planning
- Infrastructure and property
- Community health

The workshop participants were presented with information that established the context around climate change risk and Glenorchy City Council operations. Workshop participants were asked to consider the climate impacts specific to the Council's municipal area (outlined in Section 2) and brainstorm potential risks to their business areas based on their Council experience and local knowledge of the area. Risks were framed as cause and effect risk statements that include a hazard and its associated consequence. During the brainstorming session, all risk statements were considered and participants were encouraged to be open and build on each other's ideas. Generally, the following were considered when identifying risks to Council from climate change:

- ***What can happen*** - events or incidents that could occur whereby the source of risk or threat has an impact on the achievement of objectives?
- ***Where things can happen*** - The physical locations/assets where the event could occur or where the direct or indirect consequences may be experienced
- ***How it can happen*** - The manner or method in which the risk event or incident could occur
- ***When It can happen*** - the specific times or time periods when the event is likely to occur or the consequences realised
- ***Business areas/stakeholders affected*** - Which business units/stakeholders may be involved or impacted. Some risks may impact Council but may also involve external stakeholders and these should be considered
- ***Existing Controls*** - What controls currently exist to minimise the likelihood and consequence of each risk

In many cases, climate change related risks were similar to current weather related risks to Council. These risks are merely exacerbated with the effects of climate change and are assessed as more extreme as current controls become inadequate resulting in changes to the risk profile.

Analyse the risks

Following brainstorming of risks, participants analysed each of the identified risk statements in their business units using the agreed risk assessment framework. The framework provides Council with a comprehensive approach to identifying and managing risk. The framework is based on the processes and criteria outlined in *Climate change impacts and risk management - A guide for Business and Government* (AGO 2007). This guide has been adopted by a significant number of Councils and organisations across Australia and is consistent with the ISO 31000 standard for risk management.

Each risk statement was analysed using the likelihood and consequence scales outlined in Appendix A. Consequence ranged from insignificant to catastrophic and was rated based on the following success criteria (detailed further in Appendix A):

- Financial
- Public safety
- Reputation
- Community and lifestyle
- Environmental
- Strategy
- Service delivery

These success criteria were used to align consequence to Council objectives. Essentially, all risks can eventually lead to a financial consequence. However, associating success criteria to risk statements guides the development of adaptation actions that manage risks before they become purely financial. A level of risk was determined based on the likelihood and consequence criteria using the risk matrix outlined in Table .

Table 17: Matrix of likelihood and consequence for prioritisation of risks

Likelihood	Consequence					
		Insignificant	Minor	Moderate	Major	Catastrophic
	Almost Certain	Moderate Risk	High Risk	Extreme Risk	Extreme Risk	Extreme Risk
	Likely	Moderate Risk	Moderate Risk	High Risk	Extreme Risk	Extreme Risk
	Possible	Low Risk	Moderate Risk	Moderate Risk	High Risk	Extreme Risk
	Unlikely	Low Risk	Low Risk	Moderate Risk	Moderate Risk	High Risk
	Rare	Low Risk	Low Risk	Low Risk	Moderate Risk	Moderate Risk

A definition of risk categories is provided below (AGO 2007):

- **Extreme** priority risks demand urgent attention at the most senior level and cannot be simply accepted as part of routine operations without executive sanction.

- **High** priority risks are the most severe that can be accepted as part of routine operations without executive sanction but they will be the responsibility of the most senior operational management.
- **Moderate** risks can be expected to form part of routine operations although they will be explicitly assigned to relevant managers for action and maintained under review.
- **Low** risks will be maintained under review but it is expected that existing controls will be sufficient

During risk analysis, it was important to consider the current control measures implemented in Council to manage any current risks associated with climate and extreme weather events. For example, Glenorchy City Council currently has procedures in place to manage risks associated with the current bushfire regime to its assets. These procedures have been implemented to manage current risks to an acceptable level. Climate change has the potential to exacerbate these risks in the future. Increased temperatures and the incidence and/or the frequency of extreme weather events means that the climate change risks may increase to an unacceptable level where current controls may not be adequate. Adaptation responses for treating these risks will take the form of one or a number of actions in order to reduce the risk profile to a more acceptable level. This is illustrated in Figure 9.

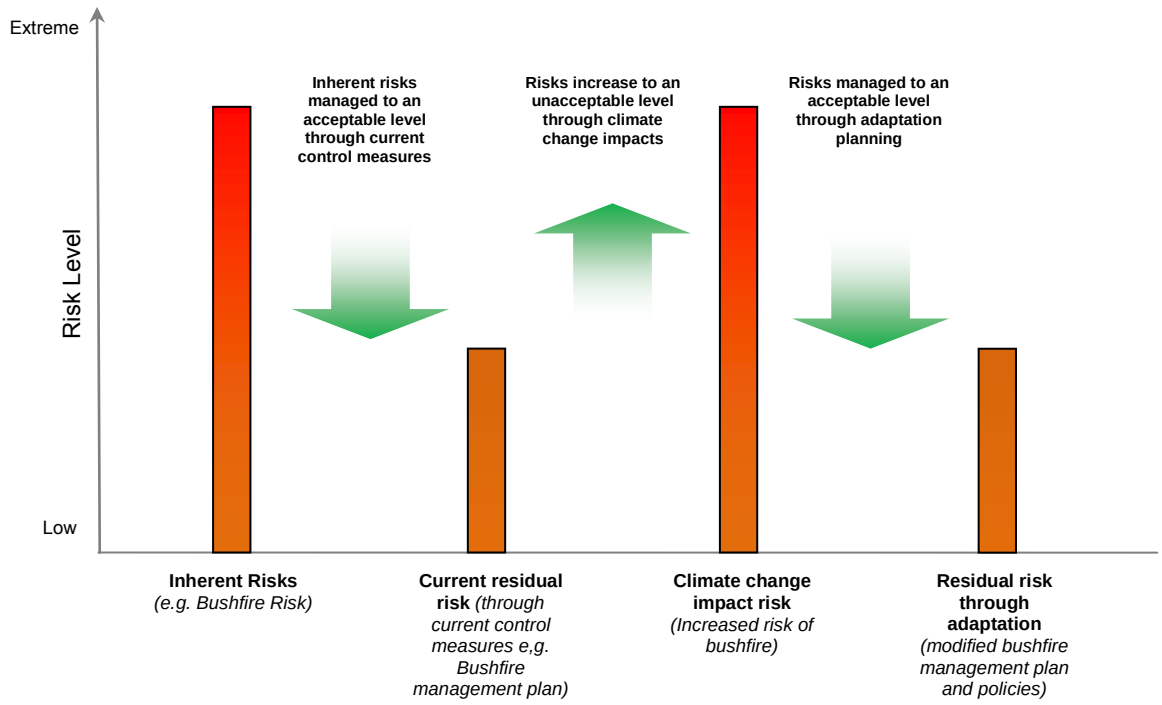

Figure 9: Managing risks through current controls and adaptation planning

Evaluate the risks

Following the identification and analysis of the risks, it is important to evaluate the risks and reassess them in relation to each other. Often, brainstorming and initial assessment of risks can lead to some inconsistency in the way likelihood and consequence scales are applied. Following the risk analysis session, key Council staff were brought together to consider the

final risk ratings. These participants were asked to evaluate the relative risk ratings to ensure that they were consistent, and agreed upon across Council. The risk evaluation step assists to gain general consensus on the final risk ratings.

Climate change adaptation planning

Treat the risks

The treatment of priority risks involves the development of adaptation actions designed to help manage risks to an acceptable level.

Figure 10: Adaptation actions against increasing time, cost and effort

A brainstorming exercise was undertaken in workshop format with key Council staff to develop adaptation actions for the priority risks. As with brainstorming in the previous risk assessment exercise, all actions were considered and participants were encouraged to be open and build on each other's ideas. Once actions had been identified for the priority risks, participants re-rated the likelihood and consequence of each priority risk while considering the impact of the adaptation action. Implementation of adaptation actions vary in terms of cost, time, effort and other criteria. Figure shows that educational type actions such as provision of information to the community are generally easier to implement when compared to engineering or redevelopment type actions. Each action was prioritised based on the following screening criteria:

- **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)
- **Concurrent effects** - whether the action has associated benefits or costs associated with its implementation (positive, neutral, negative).

Each adaptation action was scored for each of the above criteria using a multi criteria assessment (MCA) approach. As cost is generally a key criterion in decision-making, this was weighted as 50% of the weighting in prioritising the actions. The remaining 50% of weighting was distributed equally across the other four criteria. The adaptation actions were prioritised by plotting cost against the combined score of the other four criteria in the priority matrix presented in Figure 11

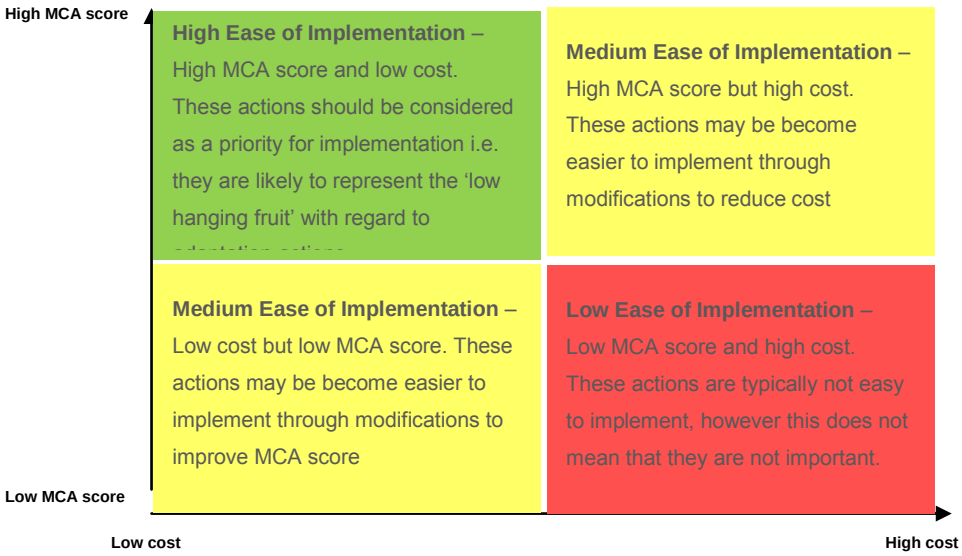

Figure 11: Prioritisation matrix for adaptation actions incorporating cost and four non-monetary criteria.

Consultation and communication

Stakeholder engagement was paramount in the development of this climate change adaptation action plan. Local knowledge of the area and Council activity is just as important as climate change projections to develop a relevant Plan for Glenorchy City Council. The stakeholder consultation rounds were designed to engage Council staff and incorporate their knowledge and expertise to develop a Plan that has Council input and ownership. Engagement of key Council staff and other relevant stakeholders resulted in increased support and will therefore lead to more success during implementation.

The consultation approach consisted of three distinct rounds outlined in Table 18

Table 18: Description of consultation rounds during plan development

Consultation Round	Stage	Description
Round 1	Briefing RCCI and Minister for Climate Change	Two-hour briefing of the STCA Regional Councils Climate Initiative who form the Technical Working group to the Project and the Minister for Climate Change - with possible attendance from the Minister for Local Government and Planning subject to availability.
	Engagement of senior council management	One-on-one meetings with the senior management team at each council, to encourage greater attendance in the future consultation rounds and to ensure the process is effectively owned by key stakeholders.
Round 2	Risk assessment	Designed to identify and assess risks associated with future climate change at each council. This was undertaken in a focus group or workshop setting with decision makers from each council business unit. During this Round, risks were identified and assessed for both Council corporate activities and for the associated four land use themes (Rural, Natural, Urban, Peri-Urban).
Round 3	Adaptation option prioritisation	Primarily to fine tune and prioritise adaptation options for inclusion into the adaptation plan. In addition, this engagement defined process and system changes within each council that will be required to see actual change eventuate from adoption of the adaptation plan. It included the same participants as those in Round 2 and was in a workshop or focus group setting. Adaptation options were prioritised for both Council corporate activities and for the community and associated four land use themes.

Consultation Round	Stage	Description
	Engagement with external stakeholders	Targeted consultation with external stakeholders that operate across council boundaries, providing additional input to the adaptation plans. External stakeholders were consulted to engage them in the development of the land use adaptation plans and to determine their role in implementation (i.e. Public Private Partnerships, funding, rebates, education etc.).

Appendix B – Stakeholder Summary

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.

Dept. of Health and Human Services

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 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.

Dept. of Infrastructure Energy and Resources

The Departments of Infrastructure, Energy and Resources (DIER) provide 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 3,700 km's 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's 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.

Dept. Primary Industries, Parks, Water & Environment

Department of Primary Industries, Parks, Water & Environment (DPIPWE) have three key programs in relation to climate change adaptation:

1. Natural Systems Resilient to Climate Change Project;
2. Climate Change and Coastal Vulnerability Program; and
3. 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;
- spatial layer predicting areas that are not vulnerable to the root-rot fungus (Phytophthora cinnamomi);
- spatial layer as a predictor of biosecurity and disease issues related to the natural environment;
- spatial layer identifying fire 'refugia' i.e. areas in the landscape with low vulnerability to wildfire; and
- 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 risk-based 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 salt marsh inundation-mapping project.
- A recently released report [Climate Change and Geodiversity in the World Heritage Area] that highlights how climate change may impact upon Tasmania's geological, geomorphological and soil features (and processes).

Derwent Estuary Program

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 salt marshes. 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 Glenorchy'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 salt marsh retreat due to sea-level rise. The DEP wetland & salt marsh 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 salt marsh coastal types and others at risk of recession due to climate change.

Municipal Association Victoria Insurance Liability Mutual Insurance

Municipal Association Victoria (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.

Natural Resource Management South

The Southern regional Natural Resource Management Strategy provides the primary framework through which Natural Resource Management (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 salt marsh inundation mapping and associated identification of opportunities for salt marsh 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 salt marsh.

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 Glenorchy City Council.
- Development of a Biodiversity, Geodiversity & Landscape Regional Planning Code.

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 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.

State Emergency Services

The State Emergency Services (SES) 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; and
- 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 Standalone 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.

Tasmania Fire Service

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.

Tasmanian Landcare Association

The Tasmanian Landcare Association (TCLA) provides financial support to care groups and landowners for a range of Landcare projects through the Tasmanian Landcare Fund and Tasmanian Landcaring Grants that it administers. Often local government NRM facilitators work with groups and landowners to develop applications and implement projects that address climate change risk themes.

Tasmanian Planning Commission

The Tasmanian Planning Commission (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:

1. 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);
2. peer review and conduct community and stakeholder consultation on a draft 'coastal hazards' code prepared by the TPC's Policy Division; and
3. 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.

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