

Climate Change Strategy - A Plan for Council's Operations



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Prepared for
Bayside City Council

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7 September 2011

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Executive Summary

Background

In recent decades Australia has experienced a range of observable climatic changes including an increase in average temperatures, an increase in the frequency of hot nights, a reduction in average rainfall and runoff and sea level rise. Bayside City Council (Council) has acknowledged the importance of considering and preparing for the inevitable impacts of climate change, as demonstrated by the following Strategic Objectives of the *Council Plan 2009-13*:

Strategic Objective 4.1 *"we will improve the quality of our natural environment and open spaces and meet the challenges of climate change"*.

Strategic Objective 4.2.1 *"we will achieve carbon neutrality for council's operations by 2020"*.

In line with Council's strategic objectives, Council continued the process of addressing the challenges of climate change early in 2011 by appointing AECOM to undertake a risk assessment and develop adaptation actions to inform the development of a "whole of Council" Climate Change Strategy. This Strategy builds on existing work Council has completed, including:

- community engagement activities regarding climate change impacts
- adaptation plans developed for specific issues such as heat waves
- goals and initiatives to reduce greenhouse gas emissions and assist the Bayside community to reduce its own greenhouse gas emissions.

This document provides the detailed background, technical analysis, risk assessment, strategies and actions for the Bayside City Council Climate Change Strategy. It also provides an initial assessment of the resources required for responding to the challenges of climate change. A summary document will be developed outlining the activities, plans and actions that Council will implement to further its commitment for meeting the challenges associated with climate change. The summary document will be the key document for educating and engaging the community and external stakeholders about climate change.

Identifying Risks

The climate change risk assessment identified and rated risks based on the most recent and applicable climate change projections available for 2030 and 2070, which indicate that Bayside is likely to experience:

- an increase in average temperatures and in the number of very hot days
- a reduction in average annual rainfall and an increase in the number of dry days
- an increase in the frequency and intensity of storm events
- sea level rise and an increase in the frequency and intensity of storm surge events
- an increase in the annual number of very high or extreme fire danger days.

A total of 73 risks were identified across Council's four divisions (Corporate Services, Community Services, Infrastructure and City Strategy) and for the Council as a whole (Whole of Organisation risks). In order to prioritise the risks for consideration in adaptation planning, risks were rated using Council's risk management framework. The climate change risks identified through this project will be included in Council's Risk register. Figure 1 illustrates Council's risk profile, including the number of risks for each division and the change in risk ratings between 2030 and 2070.

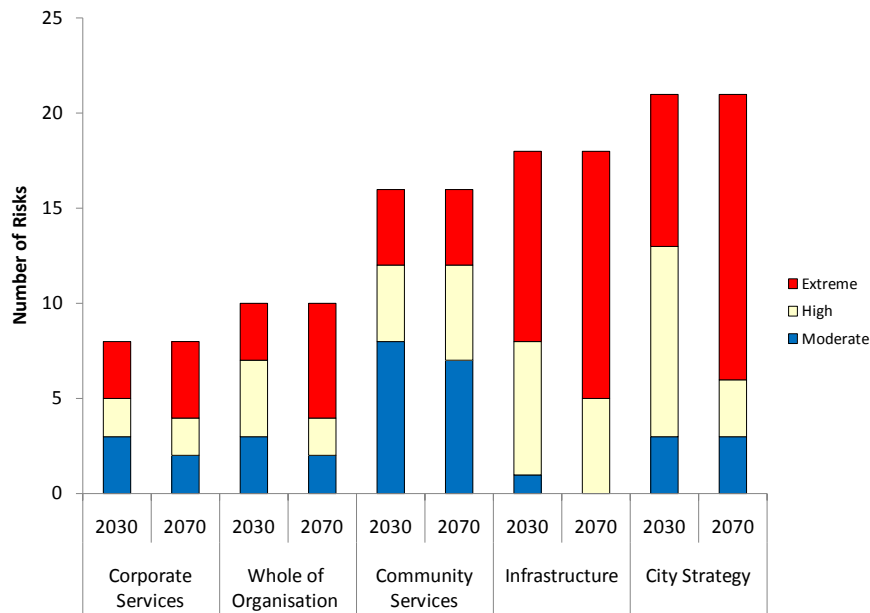


Figure 1: Bayside City Council's climate change risk profile at 2030 and 2070.

The majority of risks identified relate to:

- health impacts to council staff or the community (14 risks, including two extreme risks in 2030)
- financial impacts, including increasing costs to Council or loss of revenue (13 risks, including four extreme risks in 2030)
- increased property damage (11 risks, including six extreme risks in 2030)
- disruption to council service delivery, such as open space maintenance and health care services (10 risks, two extreme risks in 2030).

To effectively develop a strategy that responds to Council's highest priority risks, the twenty-eight risks rated extreme at 2030 were the primary focus of adaptation planning.

Taking Action

An effective response to the impacts of climate change requires both mitigation and adaptation initiatives.

For many years Council has been actively addressing climate change, initially focusing its efforts on reducing greenhouse gas emissions (i.e. mitigation) in line with its Greenhouse Gas Action Plan, first completed in 2004. The Greenhouse Action Plan is regularly reviewed in response to changing circumstances such as government policy. The primary focus of Council's current Greenhouse Gas Action Plan is to achieve emission reductions at the lowest cost.

Council recently reviewed and updated its greenhouse gas emissions reporting framework so that it is consistent with national reporting frameworks such as the National Greenhouse Gas and Energy Reporting System. Council's new framework will provide the basis for measuring progress towards achieving its goal of carbon neutrality for its operations by 2020.

This strategy includes adaptation actions that Council can implement to address the identified risks and build resilience of Council's assets and operations, as well as the resilience of the Bayside community as a whole. It is a significant milestone in the evolution of Council's climate change agenda. A priority in developing the Climate Change Strategy was to reduce what might become extreme risks in future years (e.g. 2030, 2070) by implementing a range of adaptation actions to adapt to climate change. Developed with participation from Council staff and the community, this Climate Change Strategy also identifies opportunities that may arise as a result of climate change.

A number of interactive forums were held with Council management and representatives from each department to utilise their local knowledge and to seek their commitment to address climate change issues in Council's strategic, operational and capital programs. Input from the community was drawn from previous consultation on the topic of climate change, and from a session with the Bayside Climate Change Action Group (BCCAG). To ensure the quality and robustness of the Climate Change Strategy and to utilise climate change expertise within the Bayside community, an expert peer review panel was established and consulted at key stages of the project.

This consultation process identified a wide range of potential adaptation actions that Council could implement. These actions were supplemented by research into adaptation measures undertaken by other municipalities and businesses.

Council's adaptation actions will involve all sections of Council and require collaboration with external stakeholders, including Bayside's residents and businesses. Other stakeholders that will need to be engaged for the successful delivery of this Strategy include emergency service agencies, neighbouring councils and state government. The Climate Change Strategy will complement existing strategies and Council plans. To ensure the successful implementation of the identified adaptation actions these actions have been linked to existing mechanisms, such as Council plans, strategies and management frameworks.

This strategy identifies 51 adaptation actions tailored to address Council's extreme rated risks. The proposed actions address the following broad areas:

- water and energy efficiency and other sustainable design issues
- the climate resilience of essential infrastructure
- the long term protection and enhancement of public open space
- the protection of local properties and assets from sea level rise
- community resilience to increased heat and flooding risks
- the management of coastal assets and habitats at risk from flooding
- weed and pest control and the protection of biodiversity corridors.

The 48 adaptation actions are grouped into three implementation timeframes: within the next 2 years, within the next 3 to 7 years, and beyond 7 years. It is important to keep in mind that all adaptation actions and their designated timeframes may be affected by some factors outside Council's control (i.e. funding related factors).

Key examples of the identified adaptation actions for each timeframe are summarised below:

Adaptation actions to be completed within the next two years

- Ensure the next review and update of the Municipal Emergency Management Plan clarifies roles and responsibilities, and that these are effectively communicated to relevant stakeholders
- Develop a Community Engagement Plan to assist the community to understand climate change issues and take appropriate action. This could be linked with the Bayside Environment Forum
- Review and update existing planning overlays including Land Subject to Inundation Overlay (LSIO), Special Building Overlays (SBO) and Flood Overlays (FO)
- Continue Council's involvement in the federally funded 'Choosing a Preferred Pathway for Port Phillip Bay' project, and liaise with the state government regarding future coastal projects to provide guidance on the development of coastal vulnerability assessments and guidelines
- Revise public open space strategies and service level agreements to facilitate the uptake of water wise practices (e.g. mulching) and the replacement of water intensive landscapes with water wise landscapes (e.g. rock gardens)
- Promote programs and services that support good community connections (such as youth services, community groups, children and family services and aged care and disability services) and promote community resilience in times of need.

Adaptation actions to be completed in three to seven years

- Develop planning guidelines and a simple climate change checklist to be completed for all new infrastructure and infrastructure upgrade projects to ensure project managers are aware of the projected climatic conditions and their potential implications and consider ESD as part of the capital works process
- Develop a long-term drainage and flood management plan, considering the current risk profile, the capacity of the drainage network and future growth and development. This would include setting new draining standards with consideration given to the likely future climate, diverting flows into defined flood storage areas and assisting households in avoiding or dealing with potential home water invasion
- Undertake a detailed coastal vulnerability assessment to identify locations most vulnerable to sea level rise, storm surge inundation and erosion, and develop a long term plan for management that considers avoiding (e.g. set backs from the coast), adapting (e.g. raising building and infrastructure heights), defending (e.g. beach stabilisation, nourishment, restoration, groins), and retreat (e.g. purchasing land to move development back from the shoreline)
- Ensure people are adequately informed and have access to relevant information, enabling them to develop individual plans and procedures to respond during extreme weather events (i.e alternative locations or cool spaces).

Adaptation actions to be completed beyond seven years

- Develop a training and recruitment program for community leaders / local advocates to act as information providers to the community for Council initiatives and neighbourhood resilience programs (e.g. neighbourhood watch response to extreme weather events)
- Coordinate community events that enable the community to come together to learn, discuss, plan and provide meaningful input on adaptation policy measures, council initiatives, and community actions to respond to the changing climate.

The Bayside City Council's climate change risks will change over time. To ensure that Council's adaptation responses and approaches remain valid and relevant to local priorities and climate conditions, the Climate Change Strategy will be reviewed and updated. Future reviews should re-assess Council's risk profile in consideration of changes to climate change information, policy, Council assets and activities. Reviews should also consider new opportunities that may arise as a result of the changing climate or policy environment.

Adopting this Climate Change Strategy will be a significant step towards building the resilience of Council and the Bayside community. Local residents will need guidance and assistance to develop the strategies, structures and networks required to build their resilience. They must be encouraged to build their skill levels and be given opportunities to share these skills and their local knowledge. Timely implementation of the plan will require continued leadership by Council and ongoing engagement with the community.

1.0 Introduction

1.1 Background

Almost all sectors of society and the economy are likely to be impacted by climate change. Indeed many changes are already being observed in Australia, and scientific consensus warns with increasing confidence of many more serious impacts to come. Even with considerable cuts to global greenhouse gas emissions, the lag in the climatic system means some impacts are unavoidable and communities must prepare to address them.

There is increasing public interest in extreme weather events and climate change, particularly with local flooding events in February 2011 and the associated wider-scale flooding in north-western Victoria and Queensland. Bayside City Council (Council) has acknowledged the importance of considering and preparing for the inevitable impacts of climate change through Strategic Objective 4.1 of the *Council Plan 2009-13* which states 'We will improve the quality of our natural environment and open spaces and meet the challenges of climate change': (Bayside City Council, 2011).

Many of Council's existing strategies and programs for responding to specific climate change issues provide a foundation for responding to climate change, including the *Greenhouse Action Plan 2005*, the *Heatwave Plan 2009* and the *Health and Wellbeing Plan 2009-2013*. Council's initial focus has been on reducing Council's contribution to climate change (i.e. mitigation) through efforts to reduce greenhouse gas emissions, as well as on a range of preliminary specific responses such as heat waves.

While Council's existing strategies and programs list some mitigation and adaptation responses to climate change, it was determined that a more comprehensive and integrated "whole of Council" response was required. As a result, in March 2011 Council commissioned AECOM to assist with the development of this Climate Change Strategy (the Strategy), aiming to identify the risks climate change presents to Council's services, manage its vulnerability to the impacts of climate change, enhance the resilience of the Bayside community, and identify any opportunities that climate change may present.

The Strategy will build on work that Council has completed and will continue to pursue meeting the challenges of climate change:

- community engagement activities regarding climate change impacts
- adaptation plans that have been developed for specific issues such as heat waves
- goals and measures to reduce greenhouse gas emissions and assist the Bayside community reduce greenhouse gas emissions.

1.2 Municipal Profile

The City of Bayside is located along the coastline of Port Phillip Bay in the southern region of Melbourne, with a population of 97,283 people (as at June 2010). The predominately residential municipality comprises the suburbs of Brighton, Brighton East, Hampton, Hampton East, Sandringham, Black Rock, Beaumaris and parts of Highett and Cheltenham. It is home to attractive foreshore areas, parks and open spaces, as well as vibrant retail centres, and is considered one of Melbourne's most attractive areas.

At the time of the 2006 Census of Population and Housing, children aged 0-14 years represented 19 per cent and young people aged 15-24 years represented 12 per cent of the Bayside population. The median age of Bayside residents was 41 years, with 40 per cent of the population aged 25-54 years, and with 29 per cent aged 55 and over. Compared to metropolitan Melbourne, Bayside has fewer young adults aged 20-34 years, more mature adults aged 45-64 years and more elderly adults aged 80 years and over.

The majority (70 per cent) of Bayside's 33,000 households are family households, mostly couples without children and couples with children under 15 years of age. Lone person households comprised 25 per cent of all Bayside households in 2006, many being older adults aged 55-84 years.

During the last several decades, Bayside's population aged 65 years and over has increased considerably, in both absolute and relative terms (AIHW 2008). Whilst Bayside is forecast to have minimal overall population growth over the next ten years, the 65-74 year cohort is expected to grow by 39 per cent. Average household size (persons per household) will continue to decrease, with decreasing proportions of couple families with children and increasing proportions of lone person households. The fastest growing suburbs in the next ten years are expected to be Highett and Hampton East.

Bayside's residents come from more than 144 different countries and more than 96 different linguistic backgrounds. Australian-born residents account for 72 per cent of the population, with the main overseas countries of birth being the United Kingdom (7 per cent), New Zealand (2 per cent) and South Africa (1 per cent). The main non-English languages spoken are Greek, Italian and Russian. The ten years from 1996 to 2006 saw a growth in the Russian and Mandarin speaking populations.

Most of the dwellings in Bayside are detached houses (63 per cent), followed by one-two storey terrace and townhouses (15 per cent) and flats and apartments in one-two storey blocks (12 per cent). There is a small percentage of flats and apartments in three-four storey blocks and a small percentage of flats attached to shops, offices or houses. According to the 2006 Census the City of Bayside has 58 non-private dwellings (such as aged care, hotels, boarding schools), housing 1,667 people. Nursing homes and aged care accommodation make up the majority of these non-private dwellings, and are located mainly in the suburbs of Brighton, Brighton East and Sandringham.

There are also 1,256 public housing dwellings in Bayside owned by the Victorian Department of Human Services, and mostly located in the suburbs of Hampton East, Hampton, and Highett. Compared to the age profile of the overall Bayside population, residents in public housing are older, with higher percentages of persons aged 50–59 years, 60–69 years and 70–79 years.

Bayside is a relatively affluent area, as measured by the Australian Bureau of Statistics Index of Relative Socio-Economic Disadvantage in 2006. Bayside is ranked third highest of all 31 metropolitan Melbourne municipalities on the Index, meaning it is one of the *least disadvantaged*. Of the nine Bayside suburbs, Beaumaris is the least disadvantaged and Hampton East, the most disadvantaged. However, Bayside does have scattered pockets or neighbourhoods experiencing disadvantage, which is masked by the affluence across the municipality. Many of these disadvantaged neighbourhoods contain higher proportions of public housing and/or households in housing stress.

In 2006, 3,534 persons living in Bayside (4 per cent) reported that they needed assistance in their day-to-day lives because of a disability, a long-term health condition or old age. A further 8,083 persons (12 per cent) were carers, providing unpaid assistance to an elderly person, a person with a disability or a person with long term illness.

In 2006, nearly 24,000 persons (both residents and non-residents) were working in the City of Bayside. The most common industries located in Bayside are health care and assistance, retail trade, professional services and education and training.

Bayside is an ageing community, and chronic disease and disability are therefore expected to increase in prevalence. The increase in the incidence of mental illness and age-specific diseases such as dementia suggests additional support or targeted interventions will need to be considered.

The impact of climate change, including extreme weather events such as heatwaves, fires, storms and floods may adversely affect health and wellbeing, with possible threats to homes and community facilities, air and water quality, spread of infectious diseases, and levels of ultraviolet radiation. The aged and the very young may be particularly at risk in these circumstances.

The following groups have been identified as particularly vulnerable to increased health risks within the Bayside municipality:

- Older and frail adults
- Families with young children
- Young people
- People living in public housing
- People with a low socio-economic status
- People with a disability

- People whose first language is not English.

1.3 Policy Environment

Council will continue working with government and other key stakeholders to achieve its climate change objectives. Key climate change issues such as coastal management, drainage management and emergency management require collaboration with numerous government agencies. Over the last five years there has been significant change in national and state legislation and policy relating to climate change mitigation and adaptation. A high level discussion of the relevant legislation and policy environment is provided below.

1.3.1 Federal Government

'Securing a Clean Energy Future'

In July 2011 Prime Minister Julia Gillard announced the 'Securing a Clean Energy Future' package, containing the following elements:

- A carbon pricing framework, with compensation for households and businesses
 - The carbon tax will operate for three years with a fixed price (starting at \$23 per tonne in 2012)
 - From July 2015 the price will be set by the market under a cap and trade scheme
 - More than 50% of revenue from the carbon tax will be used to assist households
 - The Jobs and Competitiveness Program and the Clean Technology Program will be established to provide assistance to the most emissions-intensive and trade-exposed businesses
- Consolidation of support for renewable energy, and energy efficiency measures:
 - The Government will negotiate with energy generating companies for an early shutdown of 2000MW of the most emissions intensive generation capacity
 - A Clean Energy Finance Corporation, A Clean Technology Innovation Program and the Australian Renewable Energy Agency will be established to support the development of renewable energy resources
- Initiatives for land use related carbon abatement, and a Biodiversity Fund additional to the existing Carbon Farming Initiative
- Additional Government-only measures (programs yet to be agreed to by non-Government parliamentary parties).

The Government will consult on the legislation and regulations, and aims to legislate by late 2011. The package has specific implications for the local government sector and presents several opportunities, as follows:

- A price on carbon will strengthen measures to reduce greenhouse gas emissions at least cost via energy conservation measures for buildings and street lighting
- Grants to help councils and communities improve energy efficiency in council and community-use buildings and facilities and to assist low income households
- Recognition of voluntary measures such as GreenPower as additional actions to reduce Australia's total greenhouse gas emissions
- Recognition of land based measures for reducing greenhouse gas emissions, for example opportunities for accessing carbon offsets through initiatives such as the National Carbon Farming Initiative.

A price on carbon will increase operating costs for some local governments, particularly those which directly control landfill sites. A carbon price will also affect local communities, particularly the more vulnerable ones. The policy package contains a suite of measures to assist households, small businesses, vulnerable groups and local communities absorb the cost of a price on carbon. Council will continue to advocate for the Australian Government to work collaboratively with local government to fund and implement these initiatives.

'Adapting to Climate Change in Australia'

In February 2010 the Australian Government released a position paper, *Adapting to Climate Change in Australia*, which sets out the Government's vision for adapting to the impacts of climate change and proposes practical steps to realise that vision (DCCEE, 2011). The position paper identifies six national priority areas for action, namely water, coasts, infrastructure, natural ecosystems, natural disaster management, and agriculture. In line with these identified priorities, the Australian Government is supporting a broad range of initiatives and activities including the following:

- **Australian Government Science Program** – a \$31m program helping to better understand global and regional climate change and its potential impact on Australia's natural and managed systems
- **Marine and Climate Super Science Initiative** - \$387m to further enhance research in marine and climate science
- **Water for the Future** - \$12.9b to secure Australia's water supply
- **Farming Futures Program** - aiming to improve the ability of primary producers to respond to climate change and manage their emissions
- **Caring for our Coasts** – a commitment supporting coastal communities to prepare for and adapt to the impacts of climate change, including the first pass national coastal risk assessment (DCCEE, 2011).

National Climate Change Adaptation Framework

In April 2007, the Council of Australian Governments (COAG) endorsed the *National Climate Change Adaptation Framework* (NCCAF), providing the basis for government action up to 2014. The NCCAF's long term goal is to position Australia to both reduce the potential impacts of climate change and realise potential related opportunities. The two key priority areas for action were identified as:

- building understanding and adaptive capacity
- reducing vulnerability in key sectors and regions (DCCEE, 2011).

Implementation of the NCCAF will be driven by the Commonwealth Department of Climate Change. Up to \$126 million has been committed to funding NCCAF's initiatives, including the following:

- Grant programs for local councils and professionals
 - **Local Adaptation Pathways Program** - provided around \$2m in funding to help local governments build their capacity to respond to the likely impacts of climate change.
 - **Integrated Assessment of Human Settlements sub-program** - five projects have been funded to help build the capacity of local governments to identify climate change challenges and develop responses.
 - **Climate Change Adaptation Skills for Professionals Program** - an investment of almost \$2m to fund tertiary education, training institutions and professional associations to revise or develop professional development and accreditation programs for architects, planners, engineers and natural resource managers.
- Major national vulnerability assessments
 - National Coastal Risk Assessment
 - Biodiversity Vulnerability Assessment
 - Implications of Climate Change for Australia's World Heritage Properties
 - Implications of Climate Change for Australia's National Reserve System
 - Interactions between Climate Change, Fire Regimes and Biodiversity in Australia: A Preliminary Assessment

For more information on Federal Government climate change adaptation initiatives and programs, refer to www.climatechange.gov.au/en/government/initiatives/climate-change-adaptation-program.

Coastal Adaptation Decisions Pathways projects

Funding of up to \$4.5m has been committed to support practical approaches in managing climate change impacts on infrastructure and critical assets. The funding will support 13 successful project applications on climate change adaptation decision-making in coastal communities.

Of relevance to Bayside City Council is the successful funding application of the *Choosing a preferred pathway for Port Phillip Bay Project*, submitted by the Municipal Association of Victoria and the Association of Bayside Municipalities. This project will help develop adaptation options and decision-making tools for councils surrounding Port Phillip Bay. It will be important for informing Council's planning scheme and its coastal management strategy (refer to Section 3.6 and Figure 4).

For more information on the successful coastal adaptation projects, refer to <http://www.climatechange.gov.au/en/media/whats-new/coastal-communities.aspx>

Renewable Energy Target

In August 2009, the Government implemented the Renewable Energy Target (RET) scheme, designed to deliver on the Government's commitment to ensure that 20 per cent of Australia's electricity supply will come from renewable sources by 2020. In ten years' time the amount of electricity coming from sources like solar, wind and geothermal will be around the same as all of Australia's current household electricity use.

The RET expands on the previous Mandatory Renewable Energy Target (MRET), which began in 2001. The RET now also incorporates the Victorian Renewable Energy target (VRET), which was transitioned into RET during 2010.

For more information on the RET refer to;

<http://www.climatechange.gov.au/government/initiatives/renewable-target.aspx>

1.3.2 State Government

The Victorian Climate Change Act was passed by the Victorian Parliament with broad support in September 2010 and came into effect on 1 July 2011.

The *Climate Change Act* creates a legal framework for key actions and initiatives in responding to climate change in Victoria. It:

- Repeals the Forestry Rights Act 1996 and creates new arrangements for the ownership, registration and transfer of forestry and carbon sequestration rights to facilitate development of the emerging carbon sequestration industry
- Brings Victoria's legal framework in line with national approaches and allow Victorians to easily participate in State and national sequestration efforts
- Requires the government to develop a Climate Change Adaptation Plan every four years, outlining the climate change impacts and risks to Victoria and the government's priority response areas
- Requires the government to report every two years on climate change science and on emissions data
- Enables the government to enter into Climate Covenants with communities, regions, industry and other stakeholders, enabling them to take ownership of climate change issues and empowering them to be innovative and proactive in their response to climate change
- Requires decision makers to take climate change into account when making specified decisions under the Catchment and Land Protection Act 1994, Coastal Management Act 1995, Environment Protection Act 1970, Flora and Fauna Guarantee Act 1988, Public Health and Wellbeing Act 2008 and Water Act 1989
- Amends the Environment Protection Act 1970 to enable the Environment Protection Authority Victoria to regulate greenhouse gases
- Legislates Victoria's new emissions reduction target of 20% by 2020 (based on 2000 levels).

For more detail on the Victorian Climate Change Act refer to the Victorian Legislation and Parliamentary Documents website on <http://www.legislation.vic.gov.au/>

The State Government has recently announced policy initiatives relating to the location of wind farms and the state's solar feed-in tariff. Council will continue to monitor these matters.

1.3.3 Bayside City Council

The Bayside City Council has a number of policies and action plans, such as the *Heatwave Plan 2009* and the *Health and Wellbeing Plan 2009-2013*, which will complement the actions in the Climate Change Strategy. Interlinking Council plans and policies will help ensure that duplicate actions are avoided and that implementation is effective.

To ensure actions outlined in this Climate Change Strategy are successfully implemented, they will be integrated with existing Council plans, policies and management frameworks (e.g. the Risk Register). The Climate Change Strategy will essentially become an overarching guiding document which refers to Council's enabling plans and strategies already in place. Refer to Table 16 for an overview of all of Council's major plans and strategies.

1.4 Objectives and Scope of the Strategy

The objectives of the Strategy are to:

- identify and prioritise climate change risks posed to Council operations, services and activities
- identify adaptation actions to improve the resilience of Council
- summarise Council's existing greenhouse mitigation work
- develop measures for communicating climate change issues to stakeholders and the community
- create an overarching document that clearly articulates Council's role and commitment in responding to climate change.

The scope of the Strategy is limited to addressing actions that Council can take in managing assets, delivering services and assisting the community. It includes a summary of Council's climate change mitigation actions (i.e. greenhouse gas reduction and energy efficiency activities). Adaptation actions designed to assist Council to prepare for the impacts of climate change are the focus of the adaptation actions outlined in the Strategy.

2.0 Methodology

The approach used to prepare this Strategy was based on AECOM's Climate Change Management Cycle (illustrated in Figure 2), which reflects the principles of the *Australian and New Zealand Standards AS/NZ ISO 31000:2009¹ Risk management – Principles and guidelines*. This standard is recommended in the Australian Government's *Climate Change Impacts and Risk Management Guide for Business and Government* (AGO, 2006).

The approach uses climate science (i.e. the range of climatic changes projected over various future timeframes) to underpin the identification and analysis of risks to Council operations, services and activities, and to inform the development of adaptation measures.

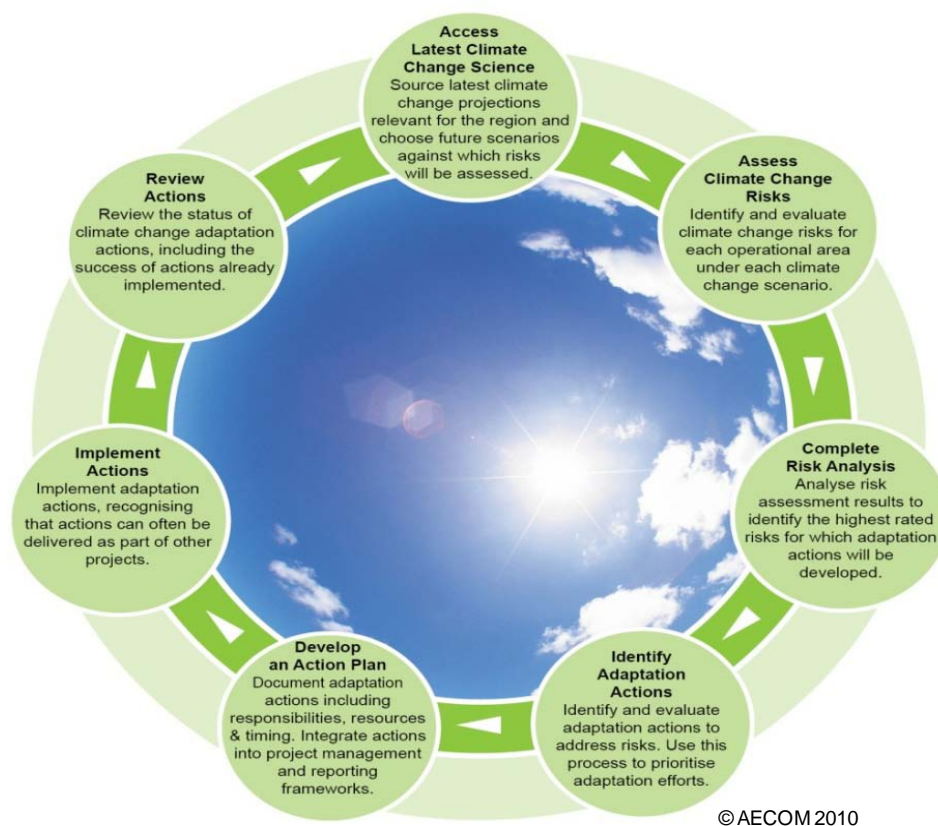


Figure 2: AECOM's Climate Change Management Cycle

The Strategy was developed using a four stage process, as follows:

- Stage 1 - Project Inception and Planning: this involved identifying the climate change scenarios to be used as a basis for the risk assessment. Initial consultation was undertaken with staff from across Council's service divisions, supported by a review of existing Council programs and strategies. A workshop was also held with the Bayside Climate Change Action Group on 27 April 2011, the results of which are summarised in Appendix B. Information from previous Council climate change community engagement activities was also utilised. These activities informed the development of the Issues and Directions Paper.
- Stage 2 - Risk Assessment: this stage was centred on the risk assessment workshop (held 16 May 2011) designed to engage staff in the risk identification and prioritisation process. The outcomes of the workshop were reviewed by AECOM to consolidate similar risks and add additional relevant risks not identified through the workshop process. The findings of this stage were presented in the climate change risk report.

¹ Formerly AS/NZS 4360 Risk Management Process

- Stage 3 - Drafting the Climate Change Strategy: a suite of adaptation options was identified through research and an adaptation workshop with Council staff (held 23 June 2011). The outcomes of the adaptation workshop were combined with the Risk Assessment Report to develop the Draft Climate Change Strategy. Feedback on the Draft Strategy was sought from key Council staff and from the expert peer review panel, established for this project, consisting of climate change industry leaders.
- Stage 4 - Consultation and Finalisation: this final stage will involve targeted consultation with Council's external stakeholders that may assist in the implementation of the Strategy (e.g. the Association of Bayside Municipalities and Melbourne Water). The Strategy will also be made available to the community for comment. Once the Strategy is finalised, a summary strategy document for the Community will be developed to help engage the community on this complex topic and to communicate Council's position in responding to climate change.

2.1 Stage 1: Project Inception and Planning

To establish the context of the risk assessment and to establish whole of Council support for the overall project, the following steps were completed:

2.1.1 Identification of climate change scenarios initial risk identification and consultation

AECOM worked in collaboration with CSIRO, using the Climate Futures tool, to identify the most appropriate climate change scenarios to inform the risk assessment (see Section 3.2 for a detailed outline of the climate change scenario identification process).

Following the identification of the climate change scenarios AECOM began the process of reviewing the pressures, impacts and risks that climate change pose to Council. Initial consultation was undertaken with staff from Council's four service divisions including Council's Risk manager and a workshop was held with the Bayside Climate Change Action Group.

2.1.2 Issues and Directions Report

An Issues and Directions report was developed targeting senior management and other key stakeholders and outlined the project's context. The Issues and Directions Report provided an indication of the findings of the initial high level risk identification and initial consultation processes. Specifically the report outlined:

- the project's strategic and organisational goals in the context of Council's current responsibilities and policy objectives
- the regional climate change scenarios to be used in the risk assessment process
- the risk assessment framework to be used in the assessment
- a preliminary list of climate change risks.

2.2 Stage 2: Climate Change Risk Assessment

The methodology for undertaking the risk assessment is described in the following sections.

2.2.1 Defining climate change risks

A 'risk' is defined in the Australian/New Zealand Standard for Risk Management as the 'chance of something happening that will have an impact on objectives' (Standards Australia and Standards New Zealand 2004). An identified climate change risk for Bayside City Council is therefore a climate-related event or phenomenon which affects the organisations operations, services and activities, either negatively (in the traditional meaning of risk as a hazard or a loss), or positively (implying a potential opportunity).

Climate change risks do not arise directly from changes in climatic variables, but from a causal chain as illustrated in Figure 3.

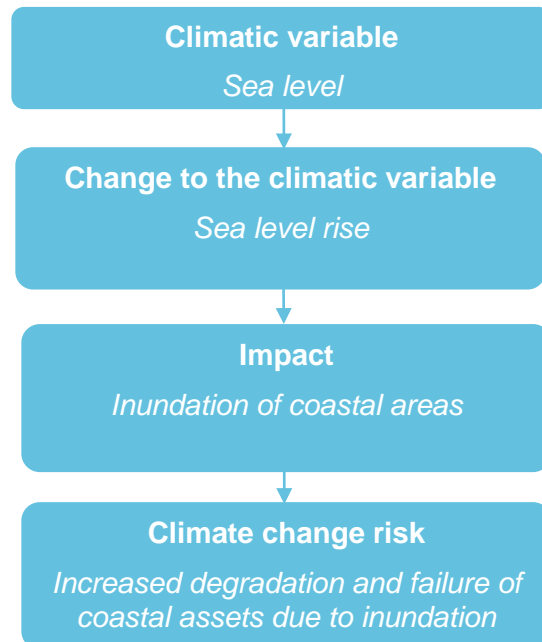


Figure 3 An example of the link between climate change, its impacts and the risks they may pose (adapted from Australian Greenhouse Office, 2006).

2.2.2 Council introductory presentation

An internal Council introductory presentation was delivered to the Council project reference group, councillors and senior management to enlist whole of Council support for the development of the Climate Change Strategy. The Issues and Directions Report was provided to all attendees prior to the workshop. The objectives of the internal workshop were to formally introduce the project, its scope and objectives and to gain support from Council's key decision makers.

2.2.3 The risk assessment workshop

The risk assessment workshop was held on 16 May 2011 and was designed to engage staff in the risk identification and prioritisation process.

The workshop aimed to expand and confirm the preliminary list of risks identified in the Issues and Directions Report in the project's initial stage. Participants were also encouraged to identify new risks as part of this exercise. The process undertaken in the workshop included the following steps;

- Listing of climate change related risks. A total of 73 risks relating to Council's operations were identified. The risks were grouped under the following five Council operating areas;
 - Whole of Organisation
 - Corporate Services
 - Community Services
 - Infrastructure
 - City Strategy
- Risks were listed under the climatic variable they were most related to, and were tagged as follows;
 - 'H' for increased temperatures and urban fire related risks
 - "RR" for reduced rainfall and runoff related risks
 - SLR' for sea level rise and storm surge related risks
 - 'ST' for risks related to storms

- Existing risk controls were identified, namely policies or strategies that already exist within Council to address identified risks. These controls were considered in rating the risks to determine the risk rating (residual risk) and in the project's adaptation planning stage.
- To prioritise Council's response, workshop participants were asked to rate each risk using Council's risk assessment framework. Each risk was rated in consideration of both 2030 and 2070 time horizons. Bayside City Council's risk management framework was used for the risk rating undertaken in this assessment. It is acknowledged that this framework is currently undergoing a review.

The risk rating evaluation process involved:

- defining the likelihood of the risk occurring (see Table 12)
 - defining the consequences should the risk materialise (see Table 13)
 - determining a risk rating by combining the likelihood and consequence scores (see Table 14).
- Risk information gathered at the risk assessment workshop was collated by AECOM. The process of data compilation included the following steps:
 - the removal of duplicated risks to avoid 'double counting' in the analysis process
 - the re-assignment of some risks to a more appropriate divisions
 - the splitting of long and complex risk statements into more specific risks
 - re-rating of some risks based on AECOM's experience in undertaking numerous risk assessments.

2.2.4 Climate Change Risk Report

Following the risk assessment workshop and the data compilation all risks were categorised as follows:

- Extreme rated risks: risks to be explicitly addressed in the Climate Change Strategy, as they require additional treatment.
- Low, Medium and High rated risks: risks which Council should continue to monitor and review, but which currently don't call for additional risk treatments.

A risk report was developed to provide a visual analysis of the Bayside City Council climate change risk profile. Risks were broken down by division and climatic variable, assisting Council to fully understand its climate change risk profile. The climate change risk report clearly identified the highest priority risks (those rated 'extreme').

Of the 73 risks identified, 28 were rated as 'extreme' in 2030, while 42 were projected to be 'extreme' in 2070. The 'extreme' rated risks are the priority for Council and as such provide the foundation of the adaptation stage of the project (Stage 3).

2.3 Stage 3: Drafting the Climate Change Strategy

The methodology for undertaking the adaptation planning stage of the project is described in the following sections.

2.3.1 Defining climate change adaptation

Responses to climate change can be categorised as either climate change mitigation or adaptation. While climate change mitigation relates to reducing the extent of changes in climatic conditions (by limiting greenhouse gas emissions), adaptation measures aim to increase the resilience of a system to projected climatic changes. Some mitigation measures can also assist with climate change adaptation. For example, a house that employs passive cooling uses less energy (and therefore emits less greenhouse gas emissions) by reducing its air conditioning demand, while also increasing its resilience to extreme temperatures due to the slower transfer of heat into the building.

The primary objectives of adaptation measures are outlined in Table 1.

Table 1 Primary objectives of adaptation measures.

Area	Adaptation Objective
Administrative	To adapt policies and plans to reduce vulnerability to, and increase benefits from, the impacts of climate change.
Operational	To introduce technical, structural or economic adjustments to reduce or prevent loss and other negative effects of climatic change on assets and operations (including economic appraisals that consider the potential impacts of climate change over the lifetime of the investment, or the consideration of relocation).
Standards and regulation	To adapt standards, regulations and guidance to include the consideration of impacts from the changing climate.
Research and monitoring	To support relevant research on the impacts of climate change and adaptation, and appropriate monitoring of effects.
Education and communication	To raise awareness of the impacts of climate change and adaptation at all appropriate levels and encourage behaviour modification.
Stakeholder partnerships	To work cooperatively across organisational, regional and sectoral boundaries to deliver robust adaptation (including emergency management and seeking external funding).

(Source: adapted from AEA Technology Environment, et.al., 2005)

Council's adaptation responses have been specifically developed for the risks identified as 'extreme' in either 2030 or 2070. Additionally, several other measures were developed to respond to other risks. This adaptation plan presents a set of actions covering all six of the primary adaptation objectives listed in Table 1

2.3.2 Adaptation Workshop

Research was undertaken into adaptation options which are specific to local government and their responsibilities. The findings from this research formed a foundation of knowledge used for the adaptation workshop.

The adaptation workshop was held with staff representation from all Council departments to obtain input into the adaptation planning process. The workshop emphasised the risks climate change presents to Council and to the Bayside community. Participants drew upon their experience and local knowledge to identify adaptation responses as well as identify which Council department should 'own' the action and which departments or stakeholders should assist in its implementation. Importantly, participants were asked to identify enabling tools (existing Council plans and programs) to which to link each adaptation action in order to enable its successful implementation.

To prioritise the identified adaptation actions, each action was scored against the following four criteria:

- 'Win-win': The extent to which the action would benefit multiple Council operations or asset types or respond to multiple climate change risks. For example, engaging contractors and volunteers to provide extra resources during and following extreme weather events addresses multiple climate change risks associated with clean-up backlogs, health risks to the vulnerable and resourcing pressures for Council.
- 'No regrets': The extent to which the action would provide opportunities or benefits regardless of the degree of climate change that occurs. For example, selecting drought tolerant plants for parks and gardens reduces watering costs at the same time as increasing their resilience to reduced rainfall.
- 'Cost-effectiveness': The extent to which the action's costs could be justified considering its benefits and the ease with which it can be implemented. For example, developing a community climate change communication and engagement strategy is considered to be cost effective given the extensive benefits that would arise following the dissemination of information and engagement of the community at all levels.
- 'Preparatory or foundation tasks': The extent to which other adaptation actions rely on a given task being completed first. For example, a foundation task might be to ensure that existing Council staff and volunteers have appropriate training and knowledge to respond to extreme weather events. Alternatively an action could be a continuation of an existing Council program or match an existing priority.

The overall scores were then used as a first filter to assess the timing for implementation of each adaptation action. Council then gave consideration to its existing program and budgetary commitments assigning each action to one of three timeframes. The following timeframe designations indicate when adaptation actions should be completed. It may therefore be necessary to commence work on adaptation actions earlier than the recommended timeframes depending upon when identified actions are operationalised.

0-2 years

The implementation of adaptation actions that align with the proven and effective existing budgeted Council programs and commitments is a priority. The adaptation actions described in this section represent actions that can be achieved within the current approved Council budget and should be completed within the next two years. The majority of adaptation actions in this category met the following criteria:

- Directly benefits a number of groups, services, operations or asset types (multiple beneficiaries).
- Beneficial regardless of the extent of climate change that ends up occurring (benefits regardless of extent of climate change).
- Associated costs can easily be justified considering its benefits (good value for money).
- Other adaptation actions require this to be done first and/or the action aligns with existing Council priorities or programs.

3-7 years

Adaptation actions for implementation within 3-7 years met three or four of the criteria listed under '0-2 years'. The majority of these actions require the extension of existing work programs and practices with some initiatives being new to Council.

7+ years

The adaptation actions for implementation beyond 7 years met between one and three out of four criteria listed under '0-2 years'. The majority of these actions represent new initiatives to Council or require the completion of earlier actions to determine the appropriate scope, staging and resource requirements.

2.3.3 Classification of costs

Cost ranges were estimated for each adaptation action, the classification of which is shown in Table 2. These costs are approximated and should only be used indicatively. Costs have been calculated as net costs over a ten year period (i.e. where costs are incurred on an annual basis, these have been summed).

Table 2 Classification of cost indications for adaptation actions.

Estimated cost	Classification
0 – \$20,000	\$
\$20,000 – \$100,000	\$\$
\$100,000+	\$\$\$

The actions outlined in this strategy will be reviewed on an annual basis and a more detailed costing will be prepared by Council for those considered a priority for implementation. This will occur as part of Council's capital works or operational budget processes. The implementation of adaptation actions must satisfy cost benefit criteria and be affordable within Council's annual and long-term financial budget parameters.

2.3.4 Climate Change Mitigation

In developing the Climate Change Strategy an overview was compiled of Council's existing greenhouse gas mitigation goals, strategies and actions and progress made towards its 2020 goal of carbon neutrality. This information was summarised into the climate change mitigation chapter of the Climate Change Strategy.

2.4 Stage 4: Consultation and Finalisation

A key factor in ensuring the Strategy's successful delivery is engagement and feedback from the community, key stakeholders and Council. A range of consultation activities have been undertaken recently and as part of this study including;

- The Council ran a community climate change workshop in 2010 and a range of community forums in developing the community plan. This provided the starting point for further consultation work that was undertaken for developing the Climate Change Strategy.
- Key Council staff were involved in the development of the Strategy through their attendance at the risk and adaptation workshops. Key Council staff have undertaken a detailed review and provided feedback on the draft Climate Change Strategy.
- An expert peer review group has been established for the project, consisting of climate change experts within the community. This group was consulted with at key stages of the project and its feedback and recommendations have been integrated into the draft and final Climate Change Strategy. A key recommendation from the peer review panel was to use the Climate Change Strategy as a key technical document for Council and develop a Climate Change Strategy Summary for engaging with the community.
- A summary of the Climate Change Strategy will be released for public consultation and feedback will be integrated into the Final Climate Change Strategy.

3.0 Climate Change and Bayside City Council

3.1 Overview

Naturally occurring greenhouse gases help maintain environmental conditions which allow life to exist on Earth. However, human activities, predominantly the burning of fossil fuels, intensive agriculture and land clearing are causing greenhouse gas concentrations to rise above natural levels, further heating the planet. Atmospheric concentrations of carbon dioxide, a key greenhouse gas, are higher now than at any time in the last 420,000 years (DSE, 2009). These raised levels of greenhouse gases correspond closely to increases in fossil fuel burning and land clearance.

Australia has already experienced a range of observable changes in climate in recent decades, as outlined below:

- Australian average temperatures increased by 0.9°C between 1910 and 2004, with the majority of the increase occurring after 1950 (Nicholls and Collins 2005).
- The frequency of hot days and nights has increased while the frequency of cold days and nights has declined (Collins et al. 2000).
- Patterns of rainfall have changed over the last 50 years, with rainfall decreasing in most of eastern Australia and the far south-west and increasing in the north-west.
- Despite heavy rainfall in Victoria during the second half of the year, Melbourne recorded its 14th consecutive year of below average inflows to water storages during 2010, (CSIRO 2011).
- Global mean sea levels are estimated to be rising by approximately 3.2 mm per year compared to the global average rate of 1.7 mm per year over the last 100 years (CSIRO, 2011).

These climatic changes pose significant threats to natural and built environments, as outlined below:

- Higher temperatures, increased humidity, flooding and subsidence are likely to lead to the accelerated deterioration of buildings, bridges and other structures.
- An increased frequency and intensity of extreme weather events, bushfires and very high temperatures is likely to disrupt key infrastructure such as roads, railways and energy and water assets.
- Increases in the frequency and intensity of destructive storms, flooding and bushfires are likely to increase insurance costs as the insurance and finance industries re-evaluate risks.
- Reductions in rainfall are likely to place communities and water intensive activities under increased stress, particularly when combined with higher temperatures and evaporation.
- Rising sea levels and storm surge events are likely to cause inundation and erosion, affecting coastal infrastructure and environments.

Even with considerable future reductions in global greenhouse gas emissions, the lag in the climatic system means that many of these impacts are now unavoidable, requiring communities and organisations to adapt to these impacts.

3.2 Climate Change Scenario and Model Selection

3.2.1 Emission Scenarios

The Intergovernmental Panel on Climate Change (IPCC) has prepared emission scenarios for the 21st Century. Each scenario is based on assumptions about demographic, economic and technological factors likely to influence future greenhouse gas emissions. In selecting emissions scenarios for the assessment, consideration needs to be given to whether or not projections are available for:

- the relevant time periods (i.e. now, 2030 and 2070)
- the region being assessed (to account for regionally specific projections)
- specific climate variables of interest (e.g. extreme rainfall, extreme temperature or average temperatures).

The scenarios used for this assessment are taken from the *Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (IPCC, 2007). The IPCC 'A1FI' global emissions scenario has been used for 2030. This scenario assumes a 'fossil intensive' future with relatively high greenhouse gas emissions. No other scenario was used for 2030 because current greenhouse gas emissions are tracking above the 'A1FI' emissions pathway (CSIRO, 2011).

The 'A1FI' and 'A1B' scenarios will be considered for 2070. The 'A1B' scenario assumes a medium greenhouse gas emissions growth scenario with a balanced use of energy sources, not just fossil fuels. This scenario provides a lower range of climate projections.

While projections for each climatic variable will be presented for 2070, the high emissions scenario (A1FI) should be used to guide the risk assessment, with the lower emissions scenario (A1B) used to highlight the potential range in climatic variables. It is also noted that shifts in the climate may not be linear resulting in sudden 'step' changes occurring.

At the recent 'Four Degrees or More?' conference numerous papers were presented that highlight that emissions are tracking above the 'A1FI' emissions scenario and greater changes in climate can be expected. For more detailed information refer to the 'Four Degrees or More?' conference website at <http://www.sustainable.unimelb.edu.au/content/pages/conference-four-degrees-or-more-australia-hot-world>

3.2.2 Climate Models

Climate models are mathematical representations of the Earth's climate system based on well-established laws of physics. The effects of each emissions scenario can be simulated using climate models. For each emissions scenario, projections from up to 23 global climate models are available.

Due to the complex nature of developing climate projections using these models, a key challenge in undertaking climate change risk assessments is the availability of locally specific projections. This study will use two primary sources of information:

- CSIRO's Climate Futures tool which identifies representative future regional climates by focussing on changes in annual temperature and rainfall. The identified representative future regional climates provide a high level description of the plausible future climate (i.e. 'warmer and drier') but also provide more detail on specific climatic variables based on the models that fit within the statistical 'likely' range of occurrence. This reduces the range of models considered, by removing those that are considered less likely for this region.
- *Climate Change in Port Phillip and Westernport* produced by the Victorian Department of Sustainability and Environment (DSE, 2008). Where climatic projections were not available from Climate Futures, this paper was used to fill in the gaps. This paper draws upon projections collated by CSIRO that are consistent with the Australian climate change projections released in late 2007, incorporating results from the IPCC's Fourth Assessment Report. The DSE projections include results from up to 23 models.

Projections relating to sea level rise, storm surge and bushfires are not available from the above sources and therefore are drawn from other reputable studies. Table 3 provides a summary of the sources of projections for each climatic variable used in this assessment.

Table 3 Source of climate change projections for the Bayside Climate Change Strategy.

Source	Climate Variables
CSIRO Climate Futures (CSIRO, 2011a)	- Average temperature - Average rainfall - Extreme wind
Climate Change in Port Phillip and Westernport (DSE, 2008)	- Extreme temperature - Extreme rainfall
Estimating Sea-Level Extremes Under Conditions of Uncertain Sea-Level Rise (Hunter, 2009)	- Mean sea level rise
The Effect of Climate Change on Extreme Sea Levels along Victoria's Coast (CSIRO, 2009)	- Storm surge
Bushfire Weather in Southeast Australia: Recent Trends and Projected Climate Change Impacts (Bushfire Cooperative Research Centre, Australian Bureau of Meteorology and CSIRO Marine and Atmospheric Research Centre, 2007)	- Bushfire

To provide high level context, or a story describing the changing climate in Bayside, the Climate Futures tool identified the following 'likely' future climates for the Bayside municipality:

- 2030: Warmer with little change in average rainfall (A1FI scenario)
- 2070: Much hotter with the potential for a much drier climate (A1FI scenario)
- 2070: Hotter with the potential for a drier to much drier climate (A1B scenario).

The futures described above represent the 'likely' stories based on the groupings of the projections from the 23 climate models. However, in undertaking a more detailed assessment of specific risks, it is important to consider other plausible, but less likely, projections that may be of greater consequence (i.e. decision making regarding future water supplies should consider the projections with the greatest reduction in average rainfall). For this reason, Sections 3.3 to 3.10 present the projected changes for both the 'likely' futures and the 'hottest' and driest futures.

3.3 Average Temperature

Victoria is expected to warm slightly faster than the global average, especially in the north and east of the state (CSIRO, 2011). By 2030, average annual temperatures in Bayside may rise by between 0.66°C and 1.46°C (CSIRO, 2011). CSIRO indicates that slightly more warming may occur in summer and less warming in winter, with the greatest variability seasonal warming occurring in the southern areas of the state (CSIRO, 2007). By 2070, Greater Melbourne's temperatures are expected to resemble those of present day Echuca (DSE, 2008). Table 4 summarises the projected changes in annual average temperature.

Table 4 Projected change in annual average temperature for Bayside (CSIRO, 2011).

Average Temperature	2030 A1FI	2070 A1FI	2070 A1B
Likely future	+0.66°C to +1.46°C	+3.20°C to +5.81°C	+1.53°C to +2.99°C
Hottest and Driest future	+1.62°C*	+2.78°C*	+3.58°C to +5.41°C

* Projections from only one model exist for this future, therefore no range is presented.

In addition to increasing temperatures, evaporation is also likely to increase which will reduce soil moisture content having implications for ground movement, infrastructure design and the availability of water.

3.4 Extreme Temperature

As the Port Phillip region's average temperatures rise, the frequency of hot days in the Bayside municipality is also likely to increase. There are no specific extreme temperature projections available for Bayside. However, to illustrate the potential range of increases in extreme temperature, projections for Melbourne and Cape Schanck are provided.

In Melbourne, the annual average number of days above 30°C may increase from the current 30 days to 34 days in 2030 and to 49 days in 2070. The number of days above 40°C may increase from the current 1 day, to 2 days in 2030 and to 5 days in 2070 (see Table 5).

Cape Schanck's annual average number of days above 30°C may increase from the current 11 days to 14 days in 2030 and to 22 days in 2070. The number of days above 35°C may increase from the current 2 days to 3 days in 2030 and to 6 days in 2070 (see Table 6).

As well as the frequency of hot days increasing, it is expected that hot spells (periods of three to five consecutive days where the temperature exceeds 35°C) will also increase. Night time temperatures in Australia are expected to rise with the number of warm nights projected to increase between 15% and 50% by the end of the 21st Century (CSIRO, 2007). These changes in the frequency of hot summer days, hot spells and warm nights is of importance to the occurrence of heat stress, and has implications for energy demand for cooling (CSIRO, 2011). Melbourne's heat related deaths of those aged over 65 are expected to rise from the current 289 deaths per annum to between 582 and 604 deaths by 2020 and between 980 and 1,318 deaths by 2050 (McMichael *et al.*, 2003 in CSIRO, 2006). Heat stress deaths may soon exceed the Victorian annual road toll (332 fatalities, five year annual average (2005-2009) (The Age, 2008). This is particularly relevant to Bayside City Council as over the next 10 years it is expected to experience a substantial population growth amongst the 65-74 year age group (a 39 per cent increase for this age group).

Table 5 Current and projected number of extreme heat days in Melbourne (DSE, 2008) ².

Number of Days	Current	2030 (A1B)	2070 (A1FI)
Over 30°	30	34	49
Over 35°C	9	11	20
Over 40°C	1	2	5

Table 6 Current and projected number of extreme heat days in Cape Schanck (DSE, 2008) ³.

Number of Days	Current	2030 (A1B)	2070 (A1FI)
Over 30°C	11	14	22
Over 35°C	2	3	6
Over 40°C	0	0	1

3.5 Mean Sea Level Rise

Global mean sea levels are estimated to be rising by approximately 3.2 mm per year compared to the global average rate of 1.7 mm per year over the last 100 years (CSIRO, 2011). Current sea level rise is considered to be partly due to increasing ocean temperatures causing thermal expansion of water, and partly due to addition of water to the oceans from the melting of terrestrial ice sheets.

The IPCC's Fourth Assessment Report (AR4) (2007) estimated global mean sea level rise of between 19 mm and 59 mm in 2100. More recent changes to ice sheet melting rates and dynamics will likely raise sea levels beyond current IPCC projections (CSIRO and BoM, 2009). Unlike the IPCC third assessment report (TAR), the AR4 does not provide time series of sea-level projections through the 21st century, but does provide maximum and minimum projections for the decade 2090-2099 and considers the potential dynamic response of the Greenland and Antarctic Ice Sheets. Work by Hunter (2009) estimated time series of the maximum and minimum IPCC AR4 projections⁴. The resulting scaled maximum and minimum values are indicated for 2030, 2070 and 2100 in Table 7.

Table 7 Adjusted projections of sea-level rise, based on the A1FI scenario (Hunter, 2009).

Climate Variable	Baseline (1990)	2030	2070	2100
Sea level rise	0	+48 mm to +146 mm	+165 mm to +471 mm	+266 mm to +819 mm

For the 2100 timeframe, the upper limit of the CSIRO projections used above is consistent with the Victorian Coastal Strategy (Victorian Coastal Council, 2008), which recommends implementing a policy of planning for sea level rise of not less than 0.8 metres by 2100. In terms of policy, it is also important to consider that a sea level rise value of 1.1 metres in 2100 was selected for the National Coastal Vulnerability Assessment published by the Department of Climate Change and Energy Efficiency in 2009 (DCCEE, 2009b).

² The DSE report does not provide projections for the A1FI scenario at 2030, or the A1B scenario at 2070. However, at 2030, the concentrations of greenhouse gas emissions in the atmosphere under both the A1FI and A1B scenarios are very similar. Only projections for the A1FI scenario are provided for 2070 as the DSE report does not provide projections for the A1B scenario at 2070.

³ *ibid*

⁴ Refer to Table II.5 of the IPCC TAR, pp. 824-825.

3.5.1 Additional considerations of sea level rise

Since the development of the AR4 there have been a range of developments in considering projections of sea level rise:

- Global emissions of carbon dioxide have increased significantly since 2000, and are close to the A1FI emission scenarios.
- The sea level has been rising at close to the upper end of the IPCC projections as described by Church et al. (2008).
- There is increasing concern about the instability of the Greenland and the West Antarctic Ice Sheets leading to a more rapid rate of SLR than current climate models project.
- Research by Rahmstorf et al. (2007) indicates that the climate system, in particular sea level, may be responding more quickly to increasing global temperatures than current climate models project.

Based on the above developments, further work has been done to estimate potential sea level rise. Sea level rise SLR projections presented to the March 2009 Climate Change Science Congress in Copenhagen ranged from 75 cm to 190 cm by 2100 relative to 1990 (with a mid-range of 110 cm to 120 cm) (Rahmstorf, 2009). These projections are based on a statistical approach informed by the observed relationship between temperature and sea level.

The mid-range value of 110 cm was used in the DCCEE (2009) report Climate Change Risks to Australia's Coast. The report stated that 'A sea-level rise value of 110 cm by 2100 was selected for this assessment based on the plausible range of sea level rise values from post IPCC research' (DCCEE, 2009, p 28).

A paper by James Hansen (2007) presents a more dramatic increase in sea level rise. Hansen suggests that a 500 cm increase by 2100 is plausible. This projection is based on the premise that increases in global average temperatures will cause West Antarctica or Greenland ice sheets (or both) to begin disintegrating in a rapid, non-linear manner (Hansen, 2007). A selection of other recent sea level rise projections is provided in Table 8.

Table 8: Sea level rise projections and estimates for 2100.

Source	2100 projection or estimate
IPCC 4AR (2007)	Up to 79 cm
Hunter (2009)	27 cm to 82 cm
Copenhagen Congress (2009)	110 cm to 120 cm
Rahmstorf (2007)	140 cm
Hansen (2007)	500 cm

3.6 Storm Surge

Extreme sea levels in the Port Phillip Bay usually occur as a result of the combination of tides with storm surges associated with weather systems that bring westerly winds to the coast of South Australia (CSIRO 2009). Changes in sea levels as a result of climate change are expected to alter the frequency and intensity of storm surge events. Table 9 presents 1 in 100 year storm tide levels at the closest locations to Bayside for which data are available for 2030, 2070 and 2100. The projections incorporate the storm surge and tidal contributions to extreme sea levels, and do not include an assessment of wave run-up and wave setup.

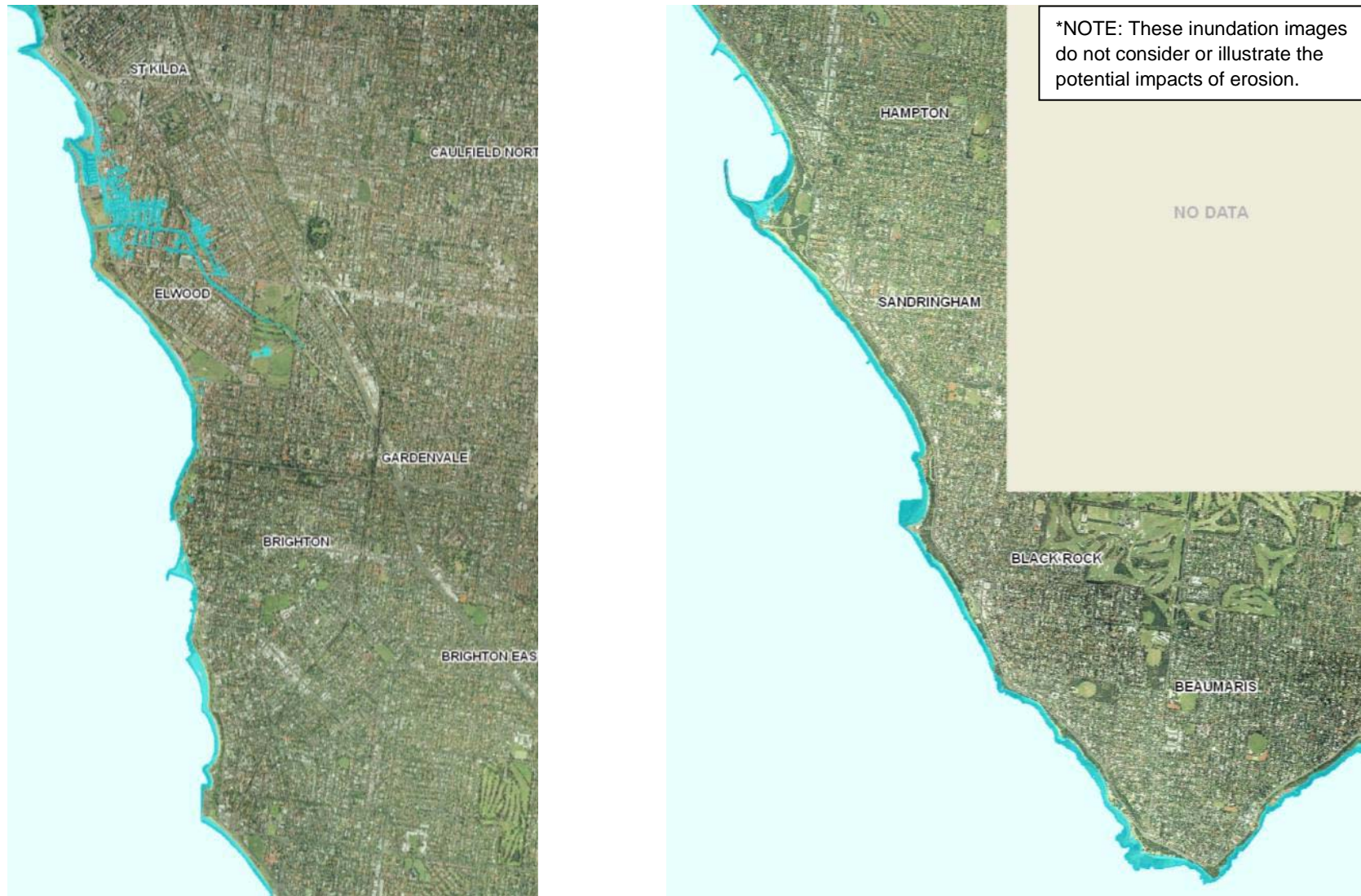
Table 9 1 in 100 year storm surge tide height return levels for St Kilda and Aspendale under current climate conditions, based on sea level rise projections show in Table 7.

Location	Future Climate Scenario	Current Climate	2030	2070	2100
St Kilda	Scenario 1: IPCC 2007 A1FI scenario Hunter (2009) (see Table 7)	1.15 m	1.30 m	1.62 m	1.97 m
Aspendale	Scenario 1: IPCC 2007 A1FI scenario Hunter (2009) (see Table 7)	1.14 m	1.29 m	1.61 m	1.96 m

NOTE: All values are in metres relative to late 20th Century mean sea level. Higher resolution studies of sections of the coastline using different methodologies may yield different return levels (CSIRO 2009).

To help communicate the potential impacts of sea level rise, the Australian Government has developed a series of initial sea level rise maps (context provided in section 1.3.1). The maps focus on key urban areas, illustrating areas at risk from sea level rise '...using a high resolution digital elevation model that shows how water will flow over the land' (DCCEE, 2010, p1). The maps have been developed for communication purposes and should be considered as approximate only. As a 1st pass assessment they do not allow for specific landscape, drainage and protection structures and their influence on overland flow and flooding dimensions. More detailed, second or third pass assessments would allow for a localised and detailed study based on landscape and infrastructure features. This would need to involve the impact of coastal processes, particularly beach and cliff erosion. Anecdotal observations by Council staff and a recent study by the Victorian Government (Office of the Environmental Monitor, 2011), entitled *Changes on the Coastline of Port Phillip Bay*, indicate that erosion is a significant issue. From the 1st pass assessment, Figure 4 illustrates the potential areas of inundation across Bayside at 1.6 m. This would be the equivalent of the projected 2070 increase in sea level rise and the 1:100 year storm surge occurring (refer to Table 9). Inundation due to storm surges could result in loss of beaches, inundation of coastal assets and further coastal erosion.

Figure 4: Approximate areas of inundation at 1.6 m increase in sea level for Brighton (left), Sandringham (right) and surrounding suburbs (DCC, 2010)*.



3.7 Average Rainfall

Bayside is expected to become drier with annual average rainfall changing by between +1.64% and -4.73% in 2030 and between -5.06% and -37.38% in 2070. There is a greater range in the projections for changes in average rainfall in 2070, particularly under the A1FI scenario (refer to Table 10). By 2070, Greater Melbourne's annual rainfall is expected to be similar to that of current day Seymour (DSE, 2008).

Table 10: Projected change in annual average rainfall for Bayside (CSIRO, 2011)

Average Rainfall	2030 A1FI	2070 A1FI	2070 A1B
Likely Future	+1.64% to -4.73%	-5.73% to -37.83%	-5.06% to -14.02%
Hottest and Driest Future	-11.35%*	-5.73% to -37.83%	-19.45%*

* Projections from only one model exist for this future, therefore no range is presented.

By 2030, the combination of decreased rainfall and increased evaporation may lead to a reduction of up to 45% in run-off to rivers in 29 Victorian catchments (Jones and Durack, 2005). For Melbourne, average stream flow is likely to drop by 10% in 2030 (CSIRO, 2011) and between 7% and 35% in 2050 (CSIRO, 2007). Regional projections for the Port Phillip and Westernport region indicate that by 2070, runoff into the Yarra, Maribyrnong, Werribee and Bunyip Rivers will decrease by up to 50% (DSE, 2008).

3.8 Extreme Rainfall

Even though rainfall for Victoria is expected to decrease overall, extreme rainfall events are projected to increase in Bayside by 0.9% by 2030 and 5.9% by 2070 (DSE, 2008) (based on projections for Melbourne). Whetton et al. indicate that the intensity of the 1-in-20 year daily-rainfall event may increase by 5% to 70% by 2050 in Victoria (Whetton et al., 2002). As suggested in the CSIRO Technical report 2007, the future precipitation regime will have longer dry spells interrupted by heavier precipitation events, especially in the summer and autumn (CSIRO, 2007).

Changes to extreme events would have the potential to increase erosion and flood frequency, with implications for agriculture, forestry, river flows, water quality, insurance risk and the design standards for bridges, roads, dams, storm water pipes and other infrastructure (CSIRO, 2007).

3.9 Extreme Wind

In comparison to projecting changes in temperature and rainfall, there is greater uncertainty around the model projections for wind speed. More severe storms may result in more extreme wind gusts. Projections from Climate Futures indicate that extreme wind, defined as the highest (99th percentile) mean daily wind speed in a season, is projected to change by between -1.70% and +0.69% in 2030 and between -5.81% and +4.90% in 2070 (see Table 11).

Table 11: Projected change in extreme wind for Bayside (CSIRO, 2011)

Extreme Wind	2030 A1FI	2070 A1FI	2070 A1B
Likely Future	-1.70% to +0.69%	-5.81% to +4.90%	-2.03% to +2.52%
Hottest and Driest Future	-1.74%*	-5.81% to +4.90%	-2.99%*

* Projections from only one model exist for this future, therefore no range is presented.

3.10 Bushfires

While bushfires are not considered to be a significant risk in Bayside, fire is still a relevant consideration as demonstrated by the coastal fires that occurred in the City of Bayside in 2009. Up to 2009, the CFA indicated that the number of fires, the number of incidents and intensity of fires had increased over the preceding five years (CFA, 2009). In addition, the number of 'very high' fire risk days and total fire ban (TFB) days ('extreme' fire risk), have increased in Victoria. These increases are attributed to a changing climate, specifically warmer temperatures and reduced rainfall. With southeast Australia predicted to become hotter and drier, the probability of bushfires in the region is likely to increase.

The bushfire season is likely to lengthen, and areas previously not considered to be prone to bushfires are likely to become threatened. The *Bushfire Trends in Southeast Australia: Recent Trends and Projected Climate Change Impacts* report (Lucas et al 2007) provides projections for Melbourne. This study indicates that there is likely to be an annual average of between 17 and 18 'very high' or 'extreme' fire risk days by 2020 and between 23 and 24 days by 2050. These projections are compared to the current annual average of between 14 and 15 days (over the period 1973-2007).

4.0 Bayside City Council's Climate Change Risks

This section of the Climate Change Strategy presents climate change risks to Council operations, services and activities.

Bayside City Council's organisational chart comprises four key service oriented divisions reporting through directors to the Chief Executive Officer. These divisions cover Council's major operational activities including services to the community, as well as business and governance functions necessary for an effective and publically accountable body. These include:

- **Corporate Services** (Finance, Information Services, Commercial Services and Governance)
- **Infrastructure Services** (City Works, Asset Management and Amenity Protection)
- **City Strategy** (Building Surveying, Statutory Planning, Urban Strategy and Environmental Sustainability and Open Space)
- **Community Services** (Family Services, Aged and Disability Services, Libraries and Culture and Recreation and Social Development)

The People and Performance and Communications and Engagement functions report directly to the Chief Executive Officer.

Council's climate change risks were aligned with Council's four service divisions, namely Corporate Services, Community Services, Infrastructure and City Strategy. A fifth category was used to present risks that are likely to impact all Council divisions – Whole of Organisation.

4.1 Bayside City Council Risk Management Framework

In order to prioritise the risks for consideration in adaptation planning, risks were rated using Council's risk management framework.

Definitions of likelihood, consequence and risk ratings as outlined in Council's Risk Management Framework are outlined in this section (Bayside City Council, 2009). The planning period, depending on the type of activity at risk, is either over an annual cycle or within a 5 year planning cycle considering medium term implications. The climate change risks identified through this project will be included in Council's Risk register.

Table 12 Risk likelihood ratings (Bayside City Council, 2009).

Rating	Rating	Likelihood of Occurrence Description
Almost Certain	5	The event is expected to occur during the planning period
Likely	4	The event will probably occur during the planning period
Possible	3	The event may occur at some time during the planning period
Unlikely	2	The event is not likely to occur during the planning period
Rare	1	The event may occur in exceptional circumstances

Table 13 Risk consequence ratings (Bayside City Council, 2009).

RATING		Area of Impact				
		Financial	Service Interruption	Environmental	Performance & Image	Human Resources/OH&S
Critical	5	Financial loss equal to or in excess of \$5,000,000	Critical Service failure and/or key revenue source removed	Irreversible damage to waterway or significant land mass and/or toxic contamination	Criminal negligence or misconduct by officers, culpable mismanagement; Appointment of Administrators	Negligent death(s); many critical injuries

RATING		Area of Impact				
		Financial	Service Interruption	Environmental	Performance & Image	Human Resources/OH&S
Major	4	Financial loss between \$5,000,000 and less than \$500,000	Service or provider needs to be replaced for essential service and/or contract over \$100K	Harm requiring restorative work, toxic or hazardous exposure	Investigation by the Ombudsman; Sanctioning of Councillors or senior officers; Widespread media coverage, LGA performance criteria not met	Accidental death; Multiple long term or critical injuries
Moderate	3	Financial loss between \$50,000 and less than \$500,000	Brief service interruption leading to data failure	Residual pollution requiring cleanup work	Recurring news coverage; significant increase in complaints; significant detriment to stakeholders; organisations plans /KPIs not met	Single minor disablement; Multiple temporary disablement
Minor	2	Financial loss between \$10,000 and less than \$50,000	Brief service interruption between 12 hours and 2 days	Remote, temporary pollution or emission	Media attention, stakeholder complaints	Injury requiring medical attention, lost time injury
Negligible	1	Financial loss up to \$10,000	Brief reduction or loss of service up to 12 hours	Brief, non hazardous, transient emission	No news coverage, No increase in complaints, no detriment to stakeholders	Minor First Aid/near miss

Table 14 Determination of risk ratings (Bayside City Council, 2009).

Likelihood	Consequence				
	Negligible 1	Minor 2	Moderate 3	Major 4	Critical 5
Almost Certain 5	6	7	8	9	10
Likely 4	5	6	7	8	9
Possible 3	4	5	6	7	8
Unlikely 2	3	4	5	6	7
Rare 1	2	3	4	5	6
Extreme (8-10)	Needs active management	A risk treatment plan must be established and implemented.			
High (7)	Needs regular monitoring	A treatment process should be adopted, primarily focused on paying close attention to the maintenance of excellent/ good controls.			
Moderate (5-6)	Needs periodic monitoring	A treatment process should be adopted, primarily focused on monitoring risks in conjunction with a review of existing control procedures.			
Low (2-4)	No major concerns	Significant management effort should not be directed towards the risk in this section of the risk matrix.			

4.2 Climate Change Risks by Council's Service Divisions

73 risks were identified independent of Council divisions. To assist in summarising Council's overall climate change risk profile, eleven themes were identified as outlined in . Examples of the risk themes include Financial, Open Space, Health and Service Disruption.

Table 15: Bayside City Council climate change risk themes.

Theme Summary	Theme Description
Financial Impacts	Financial impacts, including increasing costs to Council or the loss of revenue
Open Space	Reduced viability of public open space (including recreational or sporting grounds)
Property Damage	Increased property damage (including coastal private and publicly owned properties and facilities)
Erosion	Increased erosion of the foreshore area
Health	Health impacts to Council staff or the community
Service Disruption	Disruption of the ability to deliver council services
Drainage	Reduced effectiveness, or failure, of drainage assets
Service Demand	Increased demand on council services
Community Discontent	Community discontent due to Council's inability to maintain services delivery
Biodiversity	Impacts to biodiversity for example due to inundation of biodiversity corridors
Liability	Increase in potential financial or legal liabilities to Council due to sea level rise impacts on private property

The four themes with the most risks were Health Impacts (14 risks), Financial Impacts (13 risks), Property Damage (11 risks) and Service Disruption (10 risks), as illustrated in . Each identified risk was rated for the 2030 and 2070 timeframes as outlined in Section 2.2 – Climate Change Risk Assessment methodology. When considering the risk ratings at 2030, the themes of Property Damage and Financial Impacts were considered the most vulnerable, with six and four extreme rated risks respectively. Both Health Impacts and Disruption to Council Services had two extreme rated risks at 2030.

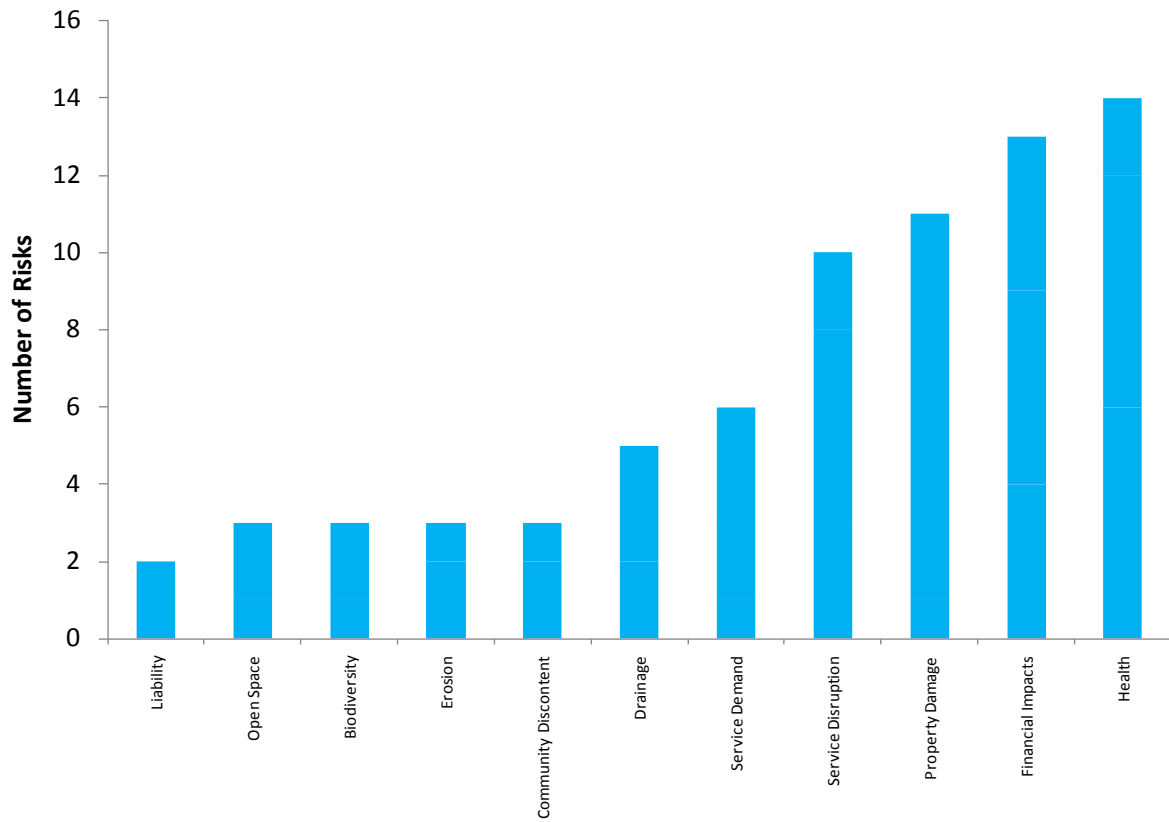


Figure 5: Bayside City Council's climate change risk profile sorted by risk theme for 2030 (refer to for a description of each theme).

Looking at the risks in terms of Council's service divisions, the City Strategy division (21 risks) and Infrastructure division (18 risks) accounted for more than half of the number of total risks (i.e. 39 of 73 risks). Council's risk profile is illustrated in Figure 6 showing the change in the severity of risks at 2030 and 2070 for each division.

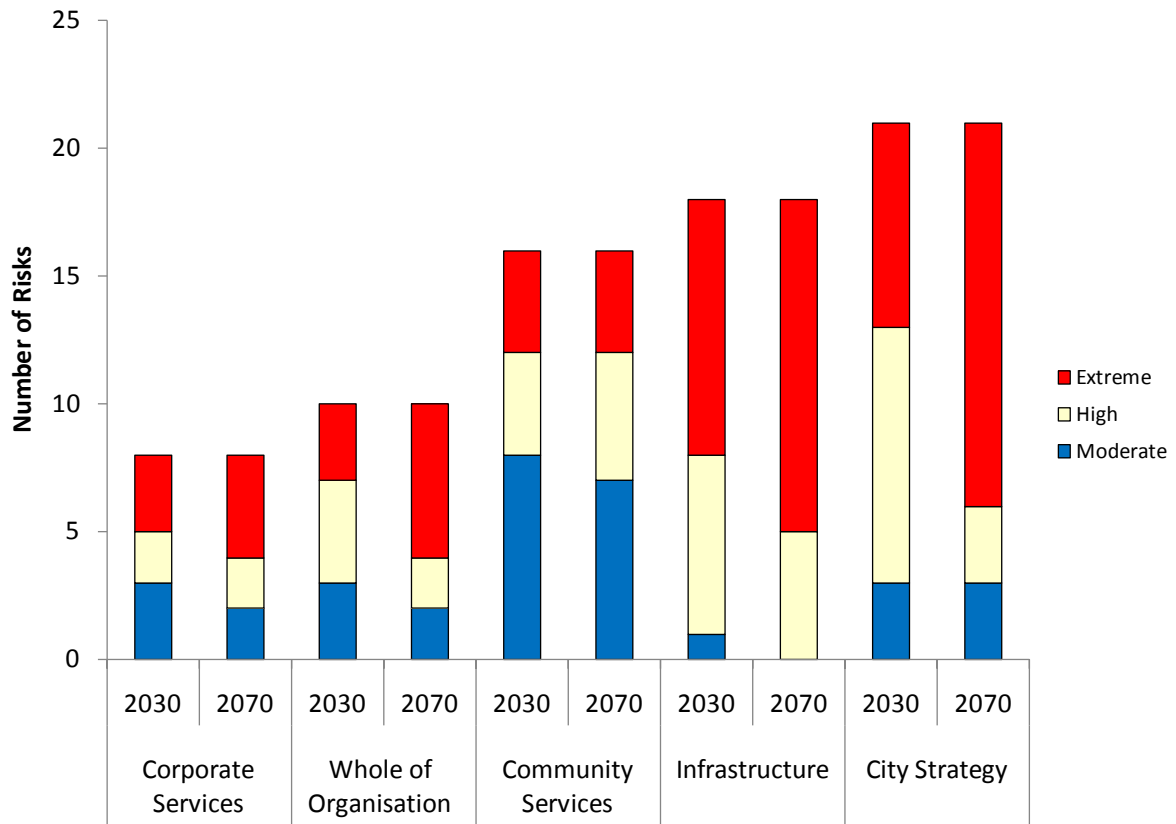


Figure 6: Bayside City Council's climate change risk profile by division at 2030 and 2070.

At 2030, approximately one-third of Council's climate change risks were rated extreme (28 risks) and 27 risks were rated high. At 2070 the number of risks rated extreme increased to 42, and the number of high risks reduced to 17. The number of moderate risks stayed relatively constant between the two time periods. There were no risks rated Low at either time period. Figure 7 illustrates Council's climate change risk profile at 2030 and 2070.

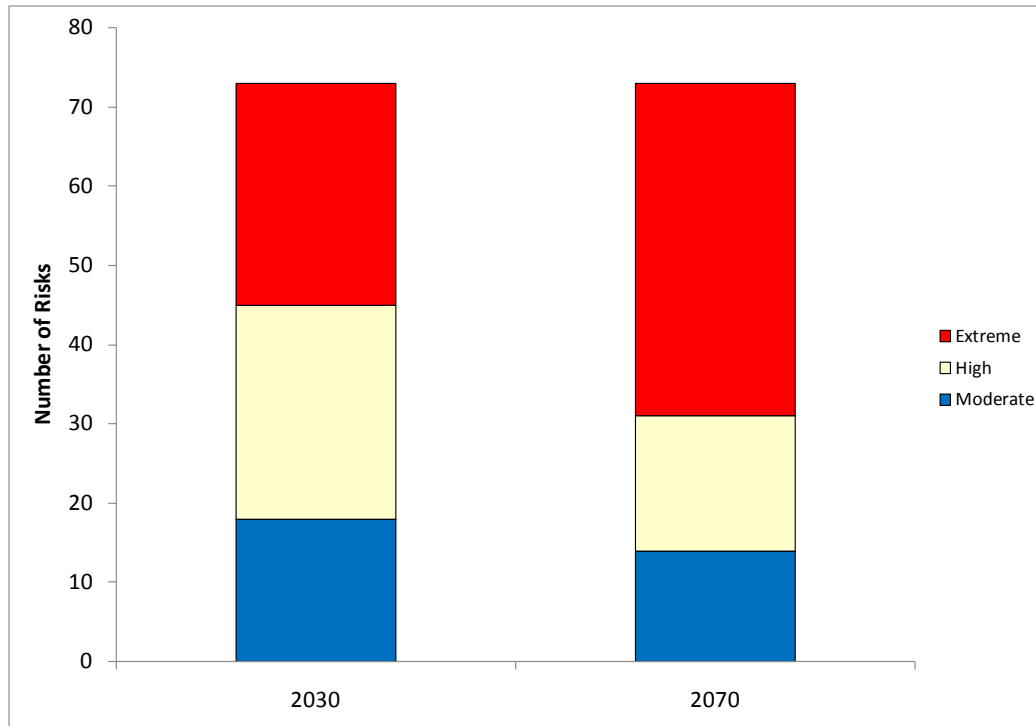


Figure 7: Bayside City Council's climate change risk profile at 2030 and 2070.

To help identify Council's risks, the relevant climatic variables were grouped into four 'climate drivers', as follows:

- Heat and urban fires (H)
- Reduced average rainfall and run-off (RR)
- Sea level rise and storm surge (SLR)
- Storms, including extreme wind and extreme rainfall (ST).

The highest number of risks was identified in relation to heat and urban fire and sea level rise and storm surge (both 21 out of the 73 risks). The category of Storms had a similar number of risks, namely 19. Figure 8 illustrates the spread of risks across the climate drivers and how the risk profile shifts over time.

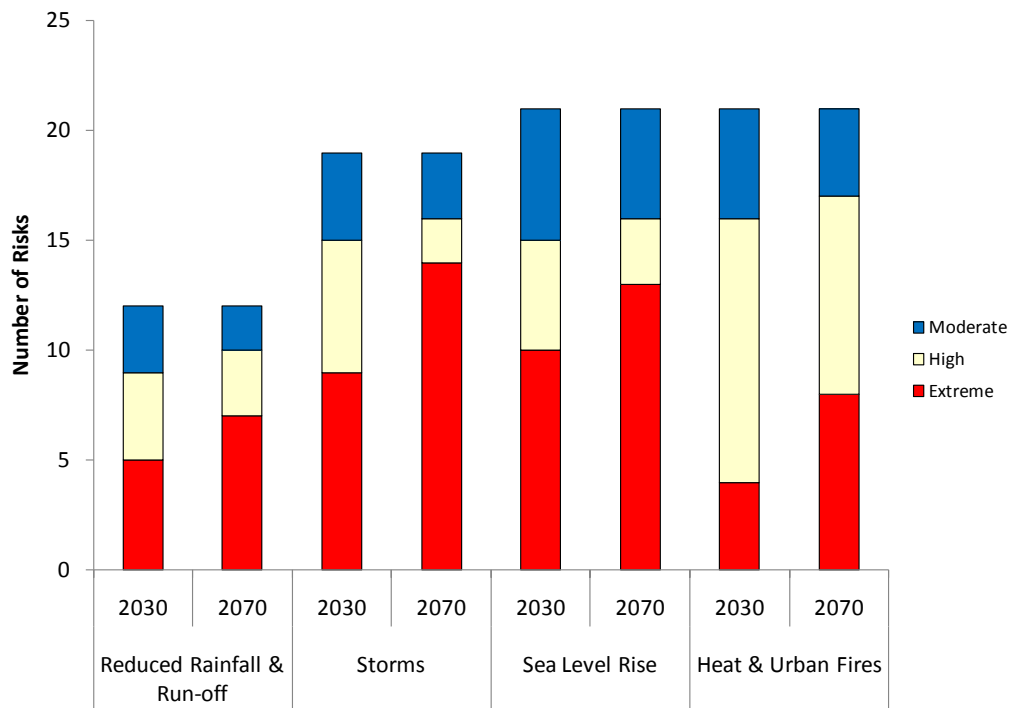


Figure 8: Bayside City Council's climate change risk profile by climate driver at 2030 and 2070.

Sections 4.3 to 4.7 present the risk profile of each division. Appendix B includes a detailed visual analysis of climate change risks to Bayside City Council and the complete climate change risk register.

4.3 Whole of Organisation

10 risks were identified that are considered to impact all four Council divisions. The majority of these risks relate to disruptions to Council services. At 2030, three risks were rated extreme and four risks were rated high. At 2070, six risks were rated extreme and two risks were rated high. The extreme risks at 2030 were:

- increased disruption to Council services from extreme events, including reduced predictability in the demand for Council clean up services
- need to relocate community infrastructure and services along the foreshore
- Increase in capital costs to maintain service standards during extreme weather events.

4.4 Corporate Services

Eight risks were identified for the Corporate Services division. The majority of these risks relate to financial impacts to Council, both in terms of increased costs and reductions in revenue. At 2030, three risks were rated extreme and two risks were rated high. At 2070, four risks were rated extreme and two risks were rated high. The extreme risks at 2030 were the following:

- Increased costs to Council due to policy changes increasing utility costs combined with increased need for cooling.
- Community outrage and reputational impacts to Council such as flood damage to private property and belief that Council should provide greater protection
- Potential liability issues for Council if land uses are approved in areas at future risk of flooding.

4.5 Community Services

16 risks were identified for the Community Services division. The majority of these risks relate to increasing demands on Council services (six risks) and health risks (five risks). The Community Services risk profile changed marginally from 2030 to 2070. At 2030, four risks were rated extreme and four risks were rated high. At 2070, four risks were rated extreme and five risks were rated high.

- direct and indirect effects of extreme weather events (e.g. power loss) on the health of vulnerable members of society
- increased demand for sheltered and/or air conditioned spaces
- increased demand for emergency relief response increasing Council service costs
- increased demand on the Municipal Recovery Manager's role, potentially drawing them away from other services.

4.6 Infrastructure

18 risks were identified for the Infrastructure division. The majority (eight risks) of these risks relate to property damage. At 2030, ten risks were rated extreme and seven risks were rated high. At 2070, thirteen risks were rated extreme and the remaining five risks were rated high. The extreme risks at 2030 are:

- financial impacts associated with upgrading the drainage system
- increase in coastal cliff erosion damaging infrastructure, including Beach Road, the Bay Trail and the Coastal Path
- damage to building foundations and other subterranean assets
- flood damage to building structures on the foreshore
- increase in damage to infrastructure including roads and buildings due to direct impacts of storm surge or inundation
- flooding damage to infrastructure and property, including homes, businesses, community facilities underground car parks, vehicles
- increase in build up of vegetation and litter in drainage systems leading to an increased risk of flooding
- flash flooding caused by reduced effectiveness of the municipality's drainage system arising from increased storm frequency and intensity and possible sea level rise
- potential increase in flooding due to back up of local drainage as the Elster Creek/Elwood Canal reaches capacity
- Insufficient water available for irrigation due to inadequate design of drainage and water capture systems.

4.7 City Strategy

21 risks were identified for the City Strategy division. The majority (8 risks) of these risks relate to health impacts. At 2030, eight risks were rated extreme and ten risks were rated high. At 2070, fifteen risks were rated extreme and three risks were rated high. The extreme risks at 2030 were:

- reduction in the resilience and value of natural areas and 'ecosystem function' as a result of heat stress, reduced rainfall and increases in range and occurrence of pest species
- reduced biodiversity and amenity values due to storm surge impacts and inundation
- increased capital costs for alternative water supplies to maintain public open space
- higher concentrations of accumulated pollutants being flushed into beaches and other public open spaces leading to restricted access or health risks
- Increased liabilities associated with building approvals such as inadequate design of buildings for flooding or extreme temperature
- Potential for increased risk to privately owned coastal property due to sea level rise and storm surges placing increased pressures and demands on the planning scheme
- Potential for increased exposure to liability from future development activity as a result of a lack of policy direction, coastal vulnerability assessments and regulatory controls for responding to sea level rise
- reduction in usable open space due to temporary or permanent inundation.

5.0 Mitigating the Impacts of Climate Change

Council has been actively addressing climate change, focusing its efforts on reducing greenhouse gas emissions (i.e. mitigation) in line with its Greenhouse Gas Action Plan. This Plan is regularly reviewed in response to changing circumstances such as government policy. The primary focus of the Greenhouse Gas Action Plan is to achieve emission reductions at the lowest cost. Council recently reviewed and updated its greenhouse gas emissions reporting framework so that it is consistent with national reporting frameworks such as the National Greenhouse Gas and Energy Reporting System. Council's new framework will provide the basis for measuring progress towards achieving its goal of carbon neutrality for its operations by 2020.

The Greenhouse Action Plan released in 2004 set out a range of objectives and targets for Council and the Community. An overview of Council's activities and progress to date is provided in this section.

5.1 Reporting Framework

Council's greenhouse gas reporting framework aligns with international standards such as the Greenhouse Gas Protocol, as well as with national reporting approaches including the National Carbon Offset Standard (NCOS) and the National Greenhouse and Energy Reporting System (NGERS).

Council collects greenhouse gas emissions data and reports on the following:

- assets that it directly manages and operates, such as buildings
- its vehicle fleet
- waste from its operations.

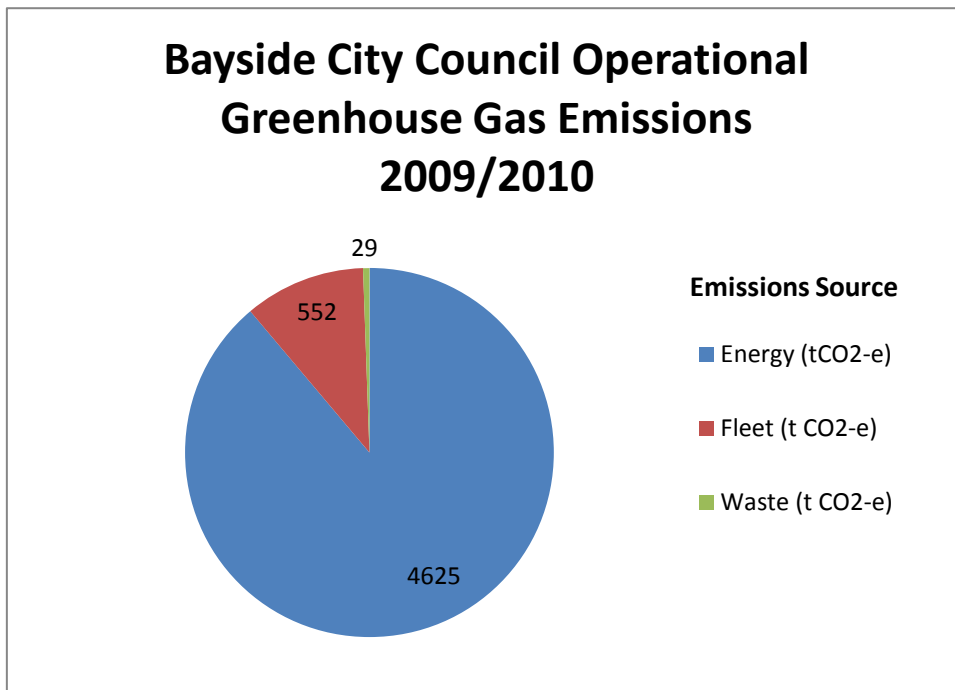
Council has set a goal to achieve carbon neutrality (zero net emissions) for these activities by 2020. Council also collects data and reports on the following activities:

- public street lighting
- paper use and staff travel
- leased facilities
- kerbside waste collection.

Historically, Council has included street lighting in the calculation for its operational greenhouse gas footprint. This was revised so that it is consistent with contemporary approaches for reporting of local government greenhouse gas emissions, such as that outlined in the *Victorian Local Government Guide to Reducing Carbon Emissions*, released by the Municipal Association of Victoria in 2010. This reporting framework will be continually reviewed over time so that it responds to changing policy and practice, for example the current review of the National Carbon Offset Standard. A consistent and transparent approach will be utilized for reporting and monitoring performance.

Council's greenhouse gas inventory utilises a baseline for monitoring and reporting against its greenhouse gas goals, strategies and actions. The base year for Council's reporting is 2009-10, when Council established a new greenhouse reporting framework to ensure consistency with wider reporting frameworks such as the National Energy and Greenhouse Reporting Framework and the National Carbon Offset Standard. Emissions for Council's base year are shown in Figure 9 Council's greenhouse gas emission reduction target is 5% by 2011-12.

Figure 9 Baseline Council emissions (tonnes of CO₂-e) from direct operations (2009-2010) (Bayside City Council, 2011)



*Note: Energy comprises of electricity and gas supply to buildings, water infrastructure and other facilities.

As part of Council's approach to greenhouse gas reporting, Council reports on greenhouse gas emissions for leased assets, public lighting and municipal waste collection. These emissions are not included in Council's carbon neutrality target, but will be reported on as part of Council's reporting framework. Like many other local governments in Victoria, Council does not have an accurate and up to date community greenhouse gas emissions profile. It is however working with government agencies and with other councils to improve community level information about greenhouse gas emissions.

5.2 Strategic Direction and Goals for Greenhouse Gas Mitigation

Bayside City Council's *Council Plan 2009-2013 (Revised 2010)* provides organisational direction for its greenhouse gas mitigation efforts as articulated in Strategy 4.2.1 "We will achieve carbon neutrality for Council's operations by 2020".

Council has key organisational strategies that provide direction supporting the community to reduce greenhouse gas emissions and adapt to climate change. The key strategies are:

- 4.2.3 We will educate and engage our community in environmental sustainability
- 4.2.4 Through effective partnerships, Council will advocate to achieve positive environmental outcomes.

5.3 Council's Strategy for Reducing its Operational Greenhouse Gas Emissions

Council's Greenhouse Action Plan sets out its approach and measures for achieving its greenhouse mitigation goals. The Greenhouse Action Plan was developed in 2004 and reviewed in 2008 and 2009 to address new and evolving matters that impact on Council's greenhouse mitigation efforts. These issues include climate change science, technological change, data availability, community interest, evolving government policy and regulatory changes.

Where possible and appropriate, Council is implementing the following Energy Hierarchy to prioritise actions and achieve its greenhouse gas reduction goals. The hierarchy is as follows:

- **Energy conservation** - meet needs and avoid waste
- **Energy Efficiency** - use energy efficiently
- **Renewable energy** - purchase accredited renewable energy, such as GreenPower
- **Offsets** - offset through accredited tree planting or energy efficiency programs (Bayside City Council, 2011).

Council's current approach is based on achieving greenhouse gas emission reductions at least cost, measured as dollar / volume of greenhouse gas emissions.

5.4 Key Issues and Measures

5.4.1 Buildings

Buildings are responsible for most of Council's direct operational emissions so reducing greenhouse gas emissions from buildings is a high priority. Council has a diverse buildings portfolio which includes libraries, pavilions, kindergartens, child care centres, bowling clubs, recreation centres, aged care facilities and public toilets. Council's *Sustainable Buildings Policy 2010* guides the implementation of ecologically sustainable improvements to its buildings and the reduction of their greenhouse gas emissions. It sets out performance standards, measurement and assessment systems and resource principles for incorporating Ecologically Sustainable Development (ESD) principles into Council's buildings.

Current local government best practice (such as reported by the City of Newcastle) and targets for the National Energy Efficiency Strategy indicate that a 30% reduction in greenhouse gas emissions may be achievable through the implementation of energy conservation measures. This requires substantial effort with complementary educational and behavioural change initiatives. Council's approach for achieving this goal will focus on the following three programs:

1. Large buildings program - implementing an energy conservation program for its largest buildings, through major upgrades for new buildings and through behaviour change.
2. Small buildings program - schedule of on-going improvements during upgrades, refurbishment and maintenance programs.
3. Developing organisational capacity for energy management in buildings.

Council has also reviewed its leasing policy, as the majority of Council's buildings are leased. This includes a wide range of buildings that are used by sporting clubs and other community groups. Council is working with lessees to ensure improvements in the operational performance of buildings.

5.4.2 Public Street Lighting

Council has a statutory role to provide lighting on local street networks and it pays for the power use and maintenance of lights. However, it does not own the lights or have direct operational control over their day-to-day operation. The current lights on local street networks are energy inefficient and produce a significant volume of greenhouse gas emissions. In 2009 - 2010 they produced approximately 3,978 tonnes of greenhouse gas emissions, which is more than the combined emissions from all of Council's direct operations.

Council's Sustainable Public Lighting Action Plan 2009 provides direction for reducing greenhouse gas emissions from local street lighting. The installation of energy efficient lights on local street networks is a high priority. The current up-front cost of installing energy efficient street lighting is in excess of \$2 million, and despite the longer term savings from reduced energy use, this is a significant up-front cost. Council has allocated funding in its forward financial planning for the installation of more energy efficient lights. This will be implemented over a four year period, commencing in 2011-12 with the allocation of \$500,000.

Public lighting technology is changing rapidly. It is anticipated for example that Light Emitting Diode (LED) technology will be implemented widely over the next five years. Council will continuously monitor and assess such emerging lighting technologies for relevance to its applications.

For many years Council has advocated for regulatory changes and financial support to install more energy efficient lighting on local street networks, such as the *Give Our Streets the Greenlight Campaign* that many Victorian councils participated in during 2010. Council is continuing to advocate for government funding and support and for regulatory changes that encourage the installation of more energy efficient lights.

5.4.3 Car Fleet

Council's vehicle fleet is responsible for around 10 per cent of its greenhouse gas emissions. Council's car fleet policy actively favours the use of more fuel efficient vehicles. Council has a *Green Travel Plan* for its Corporate Centre, which includes the provision of public transport tickets for travel to work, work related meetings and forums.

For many years Council has offset emissions from its car fleet by subscribing to Greenfleet, which plants trees to sequester carbon dioxide emissions from Council's car fleet. In addition to offset benefits this program also contributes to improving biodiversity and local economic goals. Government greenhouse gas policy and regulatory changes mean that there is uncertainty about the future of the carbon offset market and Council will continue to monitor these matters when considering future offset options.

5.4.4 Waste Recovery and Management

Waste from Council's direct operations is a relatively small component of its greenhouse gas emissions profile. Council recently rolled out a new Waste Wise Office program to ensure the maximum amount of waste generated at Council's main office building (the Corporate Centre) is either recycled or composted. Council's target of reducing its waste to landfill by 50% is well on its way, with almost 30 cubic metres of mixed recyclables and 15 cubic metres of organic materials recovered each week. The Waste Wise Office program will also be rolled out to all libraries in 2011.

Additionally, Council is offering a more comprehensive toner/cartridge collection along with a battery, paint, mobile phone, CD/DVD and light globe recycling program to ensure the appropriate resources are recovered effectively. This recycling program is available for use by Council staff and the community at the Corporate Centre in Sandringham.

5.4.5 Renewable Energy

Council previously purchased accredited Green Power as the primary means of reducing its operational greenhouse gas emissions. While the Green Power purchase resulted in reducing Council's net greenhouse gas emissions, Council's energy use increased as a result of its increased activity levels. Recent research and reports (e.g. Low Carbon Growth Plan for Australia, Climate Works Australia, 2010) indicate that measures for reducing energy use or improving energy efficiency are the most cost effective way of reducing greenhouse gas emissions. They also provide greater certainty in the current uncertain government policy environment. Council's priorities focus on reducing energy use through the most cost-effective measures, however it is recognised that purchase of renewable energy and offsets will be a key requirement for achieving Council's 2020 carbon neutrality goal. This will also involve examining local solutions and micro-generation options as measures for reducing greenhouse gas emissions. Measures such as installing photovoltaic cells (such as those installed on Council's Corporate Centre) are important for developing community awareness, supporting renewable technology industries and utilising government incentives. Council will implement these on a case-by-case basis, and in addition will investigate emerging technologies such as fuel cells and co/tri-generation.

5.5 Supporting the Community to Reduce its Emissions

Council has an important leadership role in supporting the community to reduce its greenhouse gas emissions. It leads by example in reducing its greenhouse gas emissions and provides information and education to the community. This includes community education and behavior change programs, such as the Sustainable Homes Program that will be implemented over the next two years. Council will also continue with its advocacy role on behalf of the community regarding government climate change policy and initiatives. Additionally, Council participates in the South East Councils Climate Change Alliance to develop the capacity of local governments and consolidate a regional approach for responding to climate change.

Council has a regulatory role in improving the environmental sustainability of the built form in the City of Bayside via the planning and building approval system. The State Government provides the policy and regulatory framework for requiring improved environmental performance in the planning and building approval system, and Council has consistently advocated for higher environmental performance standards in the planning system. Planning applications in the City of Bayside are required to reduce stormwater pollution, and applicants are also encouraged to achieve higher overall environmental performance. This includes a range of measures for improving the environmental performance of buildings, such as use of passive design principles, renewable energy, more sustainable materials and appropriate technology. Via its Built Environment Awards, Council promotes and encourages the incorporation of ESD principles into built form throughout the City of Bayside.

6.0 Opportunities Presented by Climate Change

Climate change may present a range of opportunities to Council and the Bayside community. Through the risk assessment process the following six opportunities were identified across Council's four divisions:

- potential reduction in open space maintenance costs including mowing and pruning due to reduced plant growth (City Strategy)
- reduced sedimentation in drainage pits and ponds (City Strategy)
- increase in the number of people attending libraries and other air-conditioned community services during hot days (Community Services)
- increase in employment opportunities for waste management suppliers, gardeners, builders and other maintenance professions (Community services)
- early consideration of climate change and ability to accommodate and plan reducing costs and cover exposure (Corporate Services)
- increase in the number of people using foreshore facilities due to warmer weather (Infrastructure).
- Increase in funding opportunities from Federal and State government programs
- Increase in opportunity for new local business or commercial opportunities focussed on mitigation and adaptation.
- Further exploration and analysis of these options is required to consider impacts such as vegetation loss on the foreshore and erosion. Other opportunities such as seasonal changes (e.g. warmer autumns and spring seasons) also require consideration.

7.0 Adapting to Climate Change

7.1 What Council is Already Doing

Bayside City Council has developed a 'purpose' and 'aim' to guide the achievement of its Council Plan and its major strategies, as follows:

"Our purpose is to work with the community to make Bayside a better place. By setting out our commitments and establishing what we need to do to address these, we can, with the community, make Bayside a better place.

Our aim, as an organisation, is to:

- build and participate in partnerships
- demonstrate leadership to empower the community to achieve their aspirations
- adapt to challenges and changes in our internal and external environments
- advocate and influence decision makers
- strive for organisational excellence and professionalism
- respond in a strategic manner
- actively engage people
- deliver a range of appropriate and well-planned services" (Bayside City Council, 2011).

Adapting and responding to the impacts of climate change is not new to Council, as there are already a range of adaptation initiatives and actions embedded within Council's plans and strategies. This strategy is intended to build on and progress the adaptation work that has already been done by Council. The following initiatives are examples taken out of approved Council strategies and out of plans (or draft plans) not yet endorsed by Council:

- Adopt sustainable practices in managing Council's assets, operations and services in order to adapt to changing climate conditions and reduce negative impacts on health and wellbeing (The City of Bayside's Health and Wellbeing Plan 2009-2013)
- Encourage and facilitate responsible and sustainable natural resource consumption by the community in order to reduce environmental impacts (The City of Bayside's Health and Wellbeing Plan 2009-2013)
- Increase community awareness and ability to adapt to climate change, particularly for vulnerable communities (The City of Bayside's Health and Wellbeing Plan 2009-2013)
- Develop a walkable city, designed to be attractive and safe with accessible, connected walking and cycling paths (The City of Bayside's Health and Wellbeing Plan 2009-2013)
- Highly visible actions by Council that are clearly directed at climate change will help make climate consciousness mainstream, help overcome strong psychological barriers that prevent people from taking action and help counter the inaction at other levels of government (Bayside 2020 Community Plan).
- New developments should have a five or six star environmentally friendly rating (Bayside 2020 Community Plan).
- Educative actions need to include reference to climate change mitigation and adaptation. Adaptation should mean changing behaviour that is mal-adapted to our world situation (Bayside 2020 Community Plan).
- Encourage more energy efficient building applications and water catchment for all new buildings (Bayside 2020 Community Plan).
- Coordinate heatwave awareness campaign. Advise key stakeholders of roles and responsibilities (Heatwave Plan 2009)
- Review Water Sensitive Urban design policy to determine whether the objectives and policy directions should be incorporated in the Municipal Strategic Statement (MSS) (Planning Scheme Review - Draft Report)
- Develop a stormwater management plan to enhance water conservation and control quality of surface water runoff (Planning Scheme Review- Draft Report)

- Implement Special Building Overlay to protect urban areas from flooding caused by a major storm event (Planning Scheme Review- Draft Report)
- Undertake further strategic work to indentify the potential impacts associated with SLR of not less than 0.8 metres (Planning Scheme Review- Draft Report)
- Council will need to continue to deploy a range of strategies that take into account the prolonged impact of climate change. Some of these include:
 - replacement of sports ground natural turf with warm season grasses
 - inclusion of rain gardens in car park areas to minimise the impact of surface water run off
 - drought tolerant species selection
 - harvesting of rain water (Open Space Sustainable Water Management Strategy 2011)

The key council documents relevant to this Strategy have been summarised in Table 16. These documents form the enabling pathway to many of the actions contained within this strategy.

Table 16 Key Bayside Council plans and strategies

Council Document	Description	Timeframe
The City of Bayside's Health and Wellbeing Plan 2009-2013	The municipal public health and wellbeing plan for Bayside City Council. This plan strives to achieve the highest level of health and wellbeing for the Bayside community. Broad priorities, goals and strategies have been developed by Council, in partnership with stakeholders. It contains strategies and actions for the Bayside community to live more sustainably and adapt to climate change.	2009-2013
Bayside 2020 Community Plan	The Bayside 2020 Community Plan expresses the community's vision for the next ten years. It sits at the heart of Bayside City Councils Planning Framework and provides a reference Council's plans, policies and strategies. It also provides an orientation for Council's community engagement for now and into the future. It sets out the community' expectations for responding to climate change.	2020
Heatwave Plan 2010 – Sub Plan of the Bayside Municipal Emergency Management Plan	The Heatwave Plan has been developed to enable Council to develop a framework to assist the community implement strategies in the event of a heatwave occurring. The three core elements of the plan include preparation, alert and readiness and response/actions.	Ongoing
Planning Scheme Review- Draft Report 2011	Bayside City Council is undertaking a review of the Bayside Planning Scheme. A Draft Planning Scheme Review Report has been completed for the review. It addresses several specific issues that relate to climate change and proposes the development of a climate change policy and related actions for ensuring that climate change is addressed in land use planning decisions.	Scheduled for completion in 2011
Sustainable Buildings Policy 2010	The Policy provides guidance for incorporating ecologically sustainable development principles into Council owned or managed buildings (e.g bowling clubs). It is a key policy for implementing Council's Greenhouse Action Plan. It defines the principles for asset management, resource allocation, rating tools, performance standards, building size and technology.	Scheduled for review in 2012
Flood Management Plan (under preparation)	A Draft Plan is being developed that provides a high level overview of Bayside City Council's and Melbourne Water's key flood management planning and management activities. The Plan identifies a series of specific actions to improve flood management in the City of Bayside over the next five years. It is scheduled for completion in the second half of 2011. Information collected for this Plan will inform the development of a Flood Emergency Plan for the Emergency Municipal Emergency Management Plan.	Five years
Open Space Sustainable Water Management Strategy 2011	Provides direction, targets and action plan for alternative water supplies in the City of Bayside. It establishes a flexible target to source 55-85% of water supplies from alternative sources. The target is expressed as a range to address climate variability and climate change. It is based on a sustainable water budget for Council's open space, which addresses social, economic and environmental needs.	2030

Council Document	Description	Timeframe
Municipal Emergency Management Plan	The Municipal Emergency Management Plan (MEMP) is Council's primary guide in the management of emergencies with the municipality. The MEMP was developed in accordance with the requirements of the Local Government Act 1989, The Emergency Management Act 1986 and the Emergency Management Manual Victoria. It identifies analyses and provides control mechanisms for dealing with emergencies. The MEMP is being reviewed	Currently under review.
Sustainable Public Streetlighting Plan 2009	The Plan provides strategies and actions to reduce greenhouse gas emissions from public street lighting on local streets. A key action from the Plan is to replace around 6000 inefficient street lights with a new lighting scheme that includes more energy efficient street lights, over a four year period commencing 2011-12. It may also involve the removal of some streetlights where appropriate.	10 Years
Bayside Coastal Strategy 1997	The Coastal Management Strategy outlines how Council will manage the coast to protect and enhance its environment and public enjoyment, for the benefit of the Bayside and broader Melbourne communities. More specific action plans (e.g. Sandringham Foreshore Coastal Management Plan) provide detail of how it will be implemented. Work from the Climate Change Strategy will inform the development of this strategy.	Scheduled for review in 2011-12
Council Plan	Four year plan that sets out how Council will deliver on the vision of the Community Plan	4 years
Municipal Strategic Statement	Council's 10-15 year vision for land use, planning and development of the municipality	10-15 years
Long Term Financial Plan	Key long term (ten year) financial plan that sets the financial framework upon which sound financial decisions (annual budget) are made	Annual
Annual Action Plan & Budget	Annual plan of how the organisation will fund and deliver the commitments of Council Plan (both operational and capital budget)	Annual
Organisational Business Plan	Identifies activities the organisation will undertake to improve culture and service delivery. All activities align to one of the seven categories of the Business Excellence Framework and although this process is not directly aligned to the planning framework, the activities within it support the way in which we deliver our commitments to the community	Annual
Service Plans	Annual Plan of how departments will deliver on the commitments of Council Plan	Annual

7.2 Identification and Prioritisation of Adaptation Actions

The impacts of climate change go beyond municipal boundaries requiring a planned response greater than the resources (or responsibilities) of the Council. This plan focuses on the short, medium and long term actions that Council:

- can implement within the scope of its own responsibilities and apply to its assets, services, operations and programs
- can engage the community with and empower it to act on
- needs to advocate to or partner with other organisations and agencies to build resilience.

This chapter outlines the adaptation actions that Council intends to take to help build the resilience of Council and the Bayside community to the impacts of climate change. The actions are categorised according to their relative priority and the timeframes within which implementation should occur. Each adaptation action is listed in table Table 17 which also indicates the risks that the action responds to and an estimated cost range to implement the response. The methodology for identifying timeframes and costs is outlined in Section 2.3 – Climate Change Adaptation Methodology. Details of the risks which correspond to the risk codes referred to in this chapter can be found in Appendix B.

There are some adaptation actions that may create opportunities for Council which are not limited to reducing its vulnerability to climate change. For example, planting additional trees in the municipality can help reduce the heat island effect by providing shading and reducing the amount of light reflected from other surfaces (such as bitumen or concrete). Additionally, trees increase the amenity of the municipality, provide habitat for wildlife and can help improve local air quality. Consideration of such mutual benefits and opportunities will have been captured as they form part of the 'win-win' criterion used to assess the adaptation actions (refer Section 2.3 – Climate Change Adaptation Methodology for further details).

7.3 Adaptation Actions to be Completed Within the Next Two Years

A total of 23 adaptation actions meet the criteria for implementation within the next two years (as outlined in Section 2.3 – Climate Change Adaptation Methodology). The proposed actions include a range of activities spanning communication and collaboration initiatives, updating existing Council Management Plans and programs, updating planning guidelines and a range of stormwater re-use and biodiversity initiatives for Council's open spaces.

Key examples include:

- Ensure the next review and update of the Municipal Emergency Management Plan clarifies roles and responsibilities, and that these are effectively communicated to relevant stakeholders
- Develop a Community Engagement Plan to assist the community to understand climate change issues and take appropriate action. This could be linked in with the Bayside Environment forum
- Review and update existing planning overlays including Land Subject to Inundation Overlay (LSIO), Special Building Overlays (SBO) and Flood Overlays (FO)
- Continue Council's involvement in the federally funded 'Choosing a Preferred Pathway for Port Phillip Bay' project, and liaise with the state government regarding future coastal projects to provide guidance on the development of coastal vulnerability assessments and guidelines
- Revise public open space strategies and service level agreements to facilitate the uptake of water wise practices (e.g. mulching) and the replacement of water intensive landscapes with water wise landscapes (e.g. rock gardens)
- Promote programs and services that support good community connections (such as youth services, community groups, children and family services and aged care and disability services) and promote community resilience in times of need

7.4 Adaptation Actions to be Completed in Three to Seven Years

A total of 23 adaptation actions have been identified for implementation within three to seven years. The proposed actions cover a range of activities including undertaking a detailed coastal vulnerability assessment, improved communication with both Council staff and the community and developing climate change checklists for all new infrastructure.

Key examples include:

- Develop planning guidelines and a simple climate change checklist to be completed for all new infrastructure and infrastructure upgrade projects to ensure project managers are aware of the projected climatic conditions and their potential implications and consider ESD as part of the capital works process
- Develop a long term drainage and flood management plan, considering the current risk profile, the capacity of the drainage network and future growth and development. This would include setting new draining standards with consideration given to the likely future climate, diverting flows into defined flood storage areas and assisting households in avoiding or dealing with potential home water invasion
- Undertake a detailed coastal vulnerability assessment to identify locations most vulnerable to sea level rise, storm surge inundation and erosion and develop a long term plan for management that considers avoiding (e.g. set backs from the coast), adapting (e.g. raising building and infrastructure heights), defending (e.g. beach stabilisation, nourishment, restoration, groins), and retreat (e.g. purchasing land to move development back from the shoreline)

- Ensure people are adequately informed and have access to relevant information enabling them to develop individual plans and procedures on how to respond during extreme weather events (i.e. Alternative locations of cool spaces).

7.5 Adaption Actions to be Completed Beyond Seven Years

The two adaptation actions to be implemented in this timeframe are:

- Develop a training and recruitment program for community leaders / local advocates to be information providers to the community for Council initiatives and neighbourhood resilience programs (e.g. neighbourhood watch response to extreme weather events)
- Coordinate community events that enable the community to come together to learn, discuss, plan and provide meaningful input on adaptation policy measures, council initiatives, and community actions to respond to a changing climate

Table 17 outlines the recommended actions that Council can implement to adapt to climate change under the three implementation timeframes. Note that the risks corresponding to adaptation actions and referred to in which table are listed in Appendix B.

Table 17 Recommended adaptation actions for Bayside City Council for three implementation timeframes (0-2 years, 2-7 years and beyond 7 years).

Adaptation Action	Related risks (Appendix B)	Budgetary Implication	Lead Division	Enabling Documents
0-2 years				
Continue to implement water sensitive cities principles as set out in the Open Space Sustainable Water Management Plan, which includes assessing the viability of capturing stormwater for the irrigation of parks and sportsgrounds.	R6, R24	\$\$\$	Infrastructure Services	Long Term Financial Plan Open Space Sustainable Water Management Plan
Ensure new community recreational facilities and upgrades along the coast are designed to be easily protected, raised or relocated, or have a shorter design life	R2	\$\$	Infrastructure Services	Bayside Coastal Strategy
Continue to work with Melbourne Water to investigate areas of greatest risk from flooding due to extreme events and drainage failure, and investigate site specific solutions (i.e. evaluate viability of soakage pits in specific areas or require dwellings to buffer storm water runoff through rain water tanks).	R17, R19, R20, R21, R23, R24, R26, R27, R28	\$\$\$	Infrastructure Services	Draft Flood Management Plan
Ensure the next review and update of the Municipal Emergency Management Plan clarifies roles and responsibilities, and that these are effectively communicated to relevant stakeholders	R14, R15	\$	Infrastructure Services	Municipal Emergency management Plan & Heatwave Plan
Update the Municipal Emergency Management Plan to ensure future emergency management 'exercising' (scenario planning) is undertaken with consideration of multiple events occurring simultaneously or in short timeframes (e.g. coastal erosion and flash flooding restricting access to the coast)	R1, R14, R15	\$\$	Infrastructure Services	Municipal Emergency Management Plan & Heatwave Plan
Proactively engage with secondary agencies such as the SES and MFB and review their capacity to assist Council in collectively responding to climate change risks.	R14, R15	\$	Infrastructure Services	Municipal Emergency Management Plan and Heatwave Plan
Initiate a program to encourage the progressive replacement of inefficient irrigation systems through improved communication and education	R6, R24	\$	City Strategy	Open Space Sustainable Water Management Strategy
Review and update existing planning overlays including Land Subject to Inundation Overlay (LSIO), Special Building Overlays (SBO) and Flood Overlays (FO).	R17, R18, R25, R26, R27, R28	\$	City Strategy	Draft Flood Management Strategy Planning Scheme Review

Adaptation Action	Related risks (Appendix B)	Budgetary Implication	Lead Division	Enabling Documents
Ensure Council's forward budgeting reflects likely increases in water, waste and energy costs due to climate change	R1, R16	\$\$\$	City Strategy	Long term Financial Plan Annual Action Plan and Budget
Continue membership and involvement in advocacy groups (South East Councils Climate Change Alliance and Association of Bayside Municipalities) to facilitate Council's adaptation efforts	R10, R17	\$\$	City Strategy	Council Plan
Ensure future updates to the Municipal Emergency Management Plan include consideration of risks noted in the climate change strategy	R1, R3, R14, R15, R17	\$	City Strategy	Municipal Emergency Management Plan & Heatwave Plan
Continue Council's involvement in the federally funded 'Choosing a Preferred Pathway for Port Phillip Bay' project, and liaise with the state government regarding future coastal projects to provide guidance on the development of coastal vulnerability assessments and guidelines	R2, R10, R11, R18, R22, R25, R26, R27, R28	\$	City Strategy	Bayside Coastal Strategy
Work with appropriate partner agencies to enhance and extend biodiversity corridors throughout the region, prioritising those currently at high risk from climate change	R4, R5	\$\$	City Strategy	Bayside Coastal Strategy
Where appropriate, consider drought tolerant species for planning and revegetation of council-managed open spaces	R4, R5, R6, R24	\$\$	City Strategy	Street Tree Strategy Native Vegetation Works Policy
Promote emergency management planning (such as the FloodSmart program) to the community and encourage residents and businesses to develop their own emergency management plans (potentially rewarding participants)	R1, R3, R14, R15, R17, R18, R25, R28	\$\$	City Strategy	Municipal Emergency Management Plan Flood Emergency Plan Heatwave Plan

Adaptation Action	Related risks (Appendix B)	Budgetary Implication	Lead Division	Enabling Documents
Develop (voluntary) guidelines for design and material selection for development in coastal areas to be integrated into the planning assessment process to reduce climate change vulnerability and increase resilience (Note: if coupled with coastal vulnerability assessment this would become redundant - as SPPF & Assessment already contain standards for development as a result of vulnerability assessment).	R9, R10, R11, R17, R18, R25, R26, R27, R28	\$\$	City Strategy	Planning Scheme Coastal Management Strategy Municipal Emergency Management Plan and Heatwave Plan Municipal Strategic Statement
Ensure the Coastal Management Strategy (to be developed) and the underpinning foreshore management plans address the long term resilience of biodiversity to projected climatic changes	R2, R4, R5	\$\$	City Strategy	Coastal Management Strategy Native Vegetation Works Program Bushland Strategy Individual Bushland Management Plans
Revise public open space strategies and service level agreements to facilitate the uptake of water wise practices (e.g. mulching) and the replacement of water intensive landscapes with water wise landscapes (e.g. rock gardens)	R4, R6, R24	\$	City Strategy	Open Space Sustainable Water Management Plan
Update Council's corporate risk register to reflect climate change risks	R1	\$\$	Corporate Services	Risk Register
Review increased costs (through heightened insurance premiums) and liability to Council due to climate change related issues	R1	\$	Corporate Services	Financial Plan
Provide training and support to relevant council staff to support implementation of the Municipal Emergency Management Plan and the Heat Wave Plan	R12, R13, R14,	\$\$	Corporate Services	Municipal Emergency Management Plan

Adaptation Action	Related risks (Appendix B)	Budgetary Implication	Lead Division	Enabling Documents
Promote programs and services that support good community connections (such as youth services, community groups, children and family services and aged care and disability services) and promote community resilience in times of need	R3, R12, R13, R14, R17	\$	Community Services	Municipal Emergency Management Plan and Heatwave Plan Community Grants Program
Provide information at Council outdoor events to ensure adequate shading and drinking facilities	R12, R13, R14, R15	\$	Community Services	Municipal Emergency Management Plan and Heatwave Plan
Develop a Community Engagement Plan to assist the community to understand climate change issues and take appropriate action. This could be linked in with the Bayside Environment Forum	R2, R7, R12, R14, R15, R17	\$\$	City Strategy	Climate Change Strategy
3-7 years				
Complete the audit program of Council's buildings and implement improvement recommendations as set out in the Sustainable Buildings Policy.	R16	\$\$\$	Infrastructure services	Sustainable Buildings Policy (2010)
Develop a simple climate change checklist to be completed for all new infrastructure and infrastructure upgrade projects to ensure project managers are aware of the projected climatic conditions and their potential implications and consider ESD as part of the capital works process.	R1, R2, R3, R9, R20, R21, R22, R25, R26, R27, R28	\$	Infrastructure Services	Sustainable Buildings Policy (2010)
Identify and monitor infrastructure assets at risk due to climate change as part of ongoing condition audits – the asset management system will identify assets due for increased maintenance, repair, replacement or removal according to both risk and condition factors	R1, R3, R19, R20, R23, R27, R28	\$	Infrastructure Services	Asset Management Strategy
Keep up to date with the latest infrastructure design standards and enable this in design briefs to ensure Council is using the most suitable materials and is designing infrastructure that can cope with future climate change	R1, R20, R21, R25, R26, R27, R28	\$	Infrastructure Services	Asset Management Strategy
Progressively integrate practical climate change advice and information into the Municipal Emergency Management Plan to ensure flood prone and storm surge risk areas are identified and managed appropriately (including possible construction of additional physical protection structures)	R2, R3, R9, R10, R11, R14, R15, R17, R18, R19, R20, R21, R22, R23, R25, R26, R27, R28	\$\$	Infrastructure Services	Municipal Emergency Management Plan

Adaptation Action	Related risks (Appendix B)	Budgetary Implication	Lead Division	Enabling Documents
Develop a long term drainage and flood management plan, considering the current risk profile, the capacity of the drainage network and future growth and development. This would include setting new draining standards with consideration given to the likely future climate, diverting flows into defined flood storage areas and assisting households in avoiding or dealing with potential home water invasion.	R17, R19, R20, R21, R23, R24, R26, R27, R28	\$\$\$	Infrastructure Services	Draft Flood Management Strategy.
Review provision of drinking fountains and trees/shading structures in public recreational areas with a view to progressively increase their numbers to enhance user comfort during extremely hot days	R6, R12, R13	\$\$\$	Infrastructure Services	Municipal Emergency Management Plan and Heatwave Plan Municipal Strategic Statement Long Term Financial Plan
Review the relevant maintenance regime to ensure it is adequate and prioritises critical drains and areas prone to flooding.	R19, R20, R21, R23	\$	Infrastructure Services	Draft Flood Management Strategy
Undertake a review audit of all ponds and dams and determine their use and risk and impacts of potential failure or over capacity.	R19, R20, R21, R23	\$\$	City Strategy	Open Space Sustainable Water Management Strategy
Develop a contingency plan for accessing additional resources (or on-call agency/contractors) to respond to clean up requirements following extreme weather events	R1, R3, R14, R15	\$\$	City Strategy	Municipal Emergency Management Plan and Heatwave Plan
Undertake a cost benefit analysis to assess the viability of installing renewable energy sources on Council owned land or buildings including through partnerships with other agencies.	R16	\$\$	City Strategy	Sustainable Buildings Policy (2010)

Adaptation Action	Related risks (Appendix B)	Budgetary Implication	Lead Division	Enabling Documents
Work with relevant agencies to monitor weeds and pests in order to adjust approaches in response to climatic changes as they arise	R4, R5	\$\$	City Strategy	Coastal Management Strategy, Native Vegetation Works Program Bushland Strategy Individual Bushland Management Plans
Conduct an energy-price risk assessment for the next 5-10 years to inform major capital investment decisions (e.g. buildings and vehicles) and compare costs to change equipment/systems to improve energy efficiency.	R1, R16	\$\$	City Strategy	Long term Financial Plan Annual Action Plan and Budget
Develop a corporate education program to clarify to all staff what climate change means to their day-to-day roles and how specifically they can help Council and the community mitigate climate change and adapt to it	R15, R17	\$\$	City Strategy	Organisational business plan/corporate learning program
Undertake a detailed coastal vulnerability assessment to identify locations most vulnerable to sea level rise, storm surge inundation and erosion and develop a long term plan for management that considers avoiding (e.g. set backs from the coast), adapting (e.g. raising building and infrastructure heights), defending (e.g. beach stabilisation, nourishment, restoration, groins), and retreat (e.g. purchasing land to move development back from the shoreline)	R8, R9, R10, R11, R17, R18, R22, R25, R26, R27, R28	\$\$	City Strategy	Bayside Coastal Strategy
Prepare a local planning policy response and permit trigger requirements to manage the risks of sea level rise, storm surge inundation and erosion to any new development.	R8, R9, R10, R11, R17, R18, R22, R25, R26, R27, R28	\$\$	City Strategy	Bayside Planning Scheme and Municipal Strategic statement

Adaptation Action	Related risks (Appendix B)	Budgetary Implication	Lead Division	Enabling Documents
Review tree monitoring practices to ensure mature trees managed by Council are regularly checked for health and potential safety hazards (e.g. shedding of limbs due to dry or stormy conditions) by qualified specialists	R4	\$	City Strategy	Street Tree Strategy
Include consideration of climate change risks in risk assessments for events and projects	R3, R14, R15	\$	Corporate Services	Health and safety working procedures and guidelines
Proactively engage with community organisations, community centres and neighbourhood houses to develop collaborative approaches and appropriate information for the community in relation to climate change	R14, R15	\$\$	City Strategy	Climate Change Strategy
Review opportunities for using Council managed spaces during extreme weather events (e.g. community centres and libraries) that have the capacity to cater for increased community demand, and develop plans to upgrade them if required	R13, R16	\$	Infrastructure Services	Municipal Emergency Management Plan Heat Wave Plan Health and Well Being Plan
Ensure people are adequately informed and have access to relevant information enabling them to develop individual plans and procedures on how to respond during extreme weather events (i.e. Alternative locations of cool spaces).	R13, R16, R14, R15	\$	Infrastructure Services	Emergency Management Plan Heat Wave Plan
Collaborate with local media that provide news and information about climate change and energy tailored to the local and regional needs	R17	\$\$	City Strategy	Climate Change Strategy
Encourage community grant applications to support initiatives around climate change adaptation	R17	\$\$	City Strategy	Climate Change Strategy

Adaptation Action	Related risks (Appendix B)	Budgetary Implication	Lead Division	Enabling Documents
Beyond 7 years				
Develop a training and recruitment program for community leaders / local advocates to be information providers to the community for Council initiatives and neighbourhood resilience programs (e.g. neighbourhood watch response to extreme weather events).	R17	\$\$	City Strategy	Climate Change Strategy
Coordinate community events that enable the community to come together to learn, discuss, plan and provide meaningful input on adaptation policy measures, council initiatives, and community actions to respond to a changing climate.	R10, R11, R17	\$\$	City Strategy	Climate Change Strategy

8.0 The Role of the Community in Adapting to Climate Change

The community should be informed about potential climate change impacts and encouraged to participate in appropriate responses. It is important that the community, including residents and businesses, be empowered to build resilience, take ownership of the outcomes, and become more self-reliant.

People often want to be involved in actions but do not know how. This creates anxiety and barriers that must be addressed for real outcomes to be achieved. Council has implemented community engagement processes to identify and overcome barriers and to support the community as they take the steps required to become more resilient.

Opportunities for local, respectful and well informed discussions require a truly democratic approach. All sectors of the community should be engaged, including minority groups, children and the elderly, homeless, indigenous groups, culturally diverse groups and the socially isolated. Bayside City Council is using its connections to the community to help reach these people and include them in the development of community-based adaptation responses.

With the local community taking ownership and with local, tailored planning policies, support for adaptation responses will be strengthened, leading to sustainable adaptation outcomes and a 'social licence' for Council to act. This coordinated approach will build trust in the community and enhance Bayside City Council's reputation as a leader in sustainable practices.

However, this will not be easy and will require social innovation, Council resources and the consideration of evolving concerns and issues. Council will ensure that the community has access to reliable and current information and should provide opportunities for feedback to help residents make decisions about their future. Conversations must take place at a local level in a well informed, respectful atmosphere. Leadership within the local community is essential.

The community will need guidance and assistance to develop the strategies, structures and networks required to build its resilience. It must be encouraged to build its skill levels and should be given opportunities to share its skills and its local knowledge.

8.1 Bayside City Council's Climate Change Community Engagement

Bayside City Council has already actively engaged with the community in relation to climate change issues. Over the last 18 months Council has undertaken a series of community engagement forums to educate and assist the ability of the Bayside community to respond to climate change.

Through its involvement in the South East Councils Climate Change Alliance (SECCCA), Council has undertaken a community consultation and engagement project on climate change. For Bayside City Council this involved a workshop with community leaders and community forum. A report (Protecting the Western Port Community from the Impacts of Climate Change, Community consultation and Communication: A Local Government Perspective Final Report June 2010) was produced for the project and provides a reference for future community engagement activities on climate change. Key messages for Council from this project included:

- Provide information and resources about climate change in a central location that is consistent, clear and credible. Communicate climate change issues more actively
- Recognise the work that community members are undertaking on climate change and work more effectively with them
- Provide leadership in climate change by implementing visible projects where it has direct control
- Actively advocate on behalf of the community to government around issues associated with climate change impacts
- Provide support and assistance to community groups that are assisting individual s to respond to climate change.

These activities and key messages have provided input into the development of the Strategy and form a foundation for further engagement activities that will be undertaken following the implementation of this Strategy.

8.2 Community Actions to Adapt

While Council may be able to assist in initiating and managing some community responses, the success of many actions will be dependent on the level of interest and engagement shown by the community (e.g. individuals developing home response plans). Other community oriented actions will involve Council having a larger role, such as developing and implementing communication and engagement programs which raise awareness of climate change impacts and potential responses. The development of a Community Engagement Plan will be a key step in Council assisting the community to adapt to climate change. However, Table 18 outlines a range of actions that the community can lead and begin taking action on.

Table 18 Community climate change adaptation responses and actions.

Climate Change Impact	Adaptation Response	Actions	Potential Resources
Negative impacts on community health, safety and wellbeing	Be informed	<ul style="list-style-type: none"> Obtain information on climate change including: <ul style="list-style-type: none"> the anticipated impacts in the Bayside City Council the areas that are most vulnerable reducing climate change risks at home reducing climate change risks to businesses improving water and energy efficiency. Attend Bayside City Council information sessions, shopping centre displays, market displays community meetings, sustainability expo's, BBQs etc 	Bayside City Council http://www.bayside.vic.gov.au Storm Safe and Flood Safe (Vic SES) www.ses.vic.gov.au Heatwave Plan for Victoria www.health.vic.gov.au/environment/downloads/heatwave_plan_vic.pdf Safety Victoria www.safety.vic.gov.au Red Cross REDiPlan www.recross.org.au
	Build a strong sense of community	<ul style="list-style-type: none"> Consider being a climate change ambassador that can be a connection between Council and the community. Look into opportunities to participate in the 'Transition Towns' movement. Know your neighbours, especially the vulnerable. Make sure that they are informed and considered during and after an extreme weather event. Consider creating a Regional Climate Change Adaptation Taskforce (to be led by Bayside City Council). Consider creating a local business Regional Climate Change Adaptation Taskforce (e.g. builders, plumbers, arborists, electricians, bricklayers, labourers). 	Bayside City Council http://www.bayside.vic.gov.au Transition Towns www.transitiontown.com.au Food Service, Home care, Rotary, Lions, APEX groups
Damage and disruptions to private property	Develop a home response plan	<ul style="list-style-type: none"> Discuss your options with your family and make sure that in the event of a severe weather event, you have a common understanding of the best responses. Develop a plan and review it after an extreme weather event. Have a list of emergency numbers. Have an alternative, safe destination in mind and make sure it is consistent with Council's, Emergency Services' and the SES's advice. 	Storm Safe and Flood Safe (Vic SES) www.ses.vic.gov.au Red Cross REDiPlan www.recross.org.au

Climate Change Impact	Adaptation Response	Actions	Potential Resources
	Prepare your home and business and assess your assets	<ul style="list-style-type: none"> Ensure that your roof, gutters and drains are well maintained. Ensure that you have drought resistant trees and bushes to reduce the impact of extreme wind and rainfall events, but do not have these too high or close to the house to avoid damage. Install insulation and low-energy light globes, awnings, curtains and external shade structures and promote cross-ventilation. Have a tarpaulin, battery powered radio and lights, long-life food and water available. Install and regularly test back up or emergency power and telecommunications. Ensure that your insurance covers you, your home and your vehicles for fire, flood, storm, hail, wind. 	<p>Storm Safe and Flood Safe (Vic SES) www.ses.vic.gov.au</p> <p>Bayside City Council http://www.bayside.vic.gov.au Red Cross REDiPlan www.recross.org.au</p>
	Prepare your community group	<ul style="list-style-type: none"> Discuss potential impacts with your group. Assess asset vulnerability, insurance, liability, adaptation options, communication channels, etc. Develop a plan to respond to potential impacts. Ensure that your response is consistent with Council's, Emergency Services' and SES's objectives. Develop the skills required to respond to an emergency, including first aid, how to secure your home, how to use two-way radios, how to avoid risks, etc. 	<p>Storm Safe and Flood Safe (Vic SES) www.ses.vic.gov.au Red Cross REDiPlan www.recross.org.au</p>
Decreased ability for the Council to respond following extreme weather events	Empowering the community	<ul style="list-style-type: none"> Seek information on the risks and appropriate responses in the case of an extreme weather event. Develop a community or neighbourhood response plan – assess effectiveness after an event. Develop a response network of people with suitable skills in the community. 	<p>Climate Communities www.sustainability.vic.gov.au/www/html/2864-climate-communities.asp</p>
Reduction in capacity or loss of Council services	Empowering the community	<ul style="list-style-type: none"> Be part of a community or neighbourhood response group. Make sure that you are connected with other groups in the Bayside City Council and neighbouring shires. Know your neighbours, especially the vulnerable. Make sure that they are informed and considered during and after an extreme weather event. Volunteer for the Regional Climate Change Adaptation Taskforce (to be led by Bayside City Council). Enlist or volunteer your business for the Regional Climate Change Adaptation Taskforce (e.g. builders, plumbers, arborists, electricians, bricklayers, labourers). Discuss education opportunities and emergency response plans with your children's school, your grandparent's retirement home, etc. 	<p>Bayside City Council http://www.bayside.vic.gov.au</p>

9.0 Review and Progress Reporting

The Bayside City Council's climate change risks and associated opportunities will alter over time. To ensure that Council's adaptation responses and approaches remain valid and relevant to local priorities and climatic conditions, the Climate Change Strategy will be reviewed and updated.

The Strategy will be continually reviewed. The review will re-assess Council's risk profile in consideration of changes to climate change information, policy or Council's assets and activities. Reviews will inform updates for Council's climate change risk profile. Consideration will also be given to the potential opportunities and benefits that may arise as a result of the changing climate and policy environment (e.g. new funding sources, opportunities for the development of renewable energy or green business precincts). The reviews will also monitor the implementation of adaptation actions.

Regular and ongoing reporting of Council's climate change adaptation performance is critical to inform decision making and motivate changes in behaviour. To ensure that decision-makers, staff and the community are aware of how Council is implementing the adaptation actions outlined in this strategy reporting should be undertaken internally once a quarter and externally on an annual basis. The relevant actions within the strategy will be considered as part of Council's annual budget process. Reporting will cover changes in risks, opportunities, the implementation of actions and challenges that have arisen in the interim.

Table 19 outlines the suggested planned reporting process including the audience, information to be reported, forum, responsibility and timing.

Table 19: Plan for review and reporting Bayside climate change adaptation progress.

Audience	Information to be included	Forum	Responsibility	Frequency
Internal				
City Strategy Division Manager	<ul style="list-style-type: none"> Progress of the Climate Change Strategy implementation Key challenges and successes 	<ul style="list-style-type: none"> Team meeting 	Manager Environmental Sustainability and Open Space	Monthly
Executive and Senior Managers	<ul style="list-style-type: none"> Implementation Issues Key upcoming actions 	<ul style="list-style-type: none"> Management Team Meeting 	Manager Environmental Sustainability and Open Space	Quarterly
Councillors	<ul style="list-style-type: none"> Implementation issues Key upcoming actions 	<ul style="list-style-type: none"> Council Meeting 	Manager Environmental Sustainability and Open Space	Quarterly
Executive and Senior Managers	<ul style="list-style-type: none"> Budget planning requirements for adaptation action implementation 	<ul style="list-style-type: none"> Annual budget process 	Manager Environmental Sustainability and Open Space	Annually
Executive and Senior Managers	<ul style="list-style-type: none"> Full review of the Climate Change Strategy in light of new climate change information and changed conditions 	<ul style="list-style-type: none"> Election of a new Council 	Manager Environmental Sustainability and Open Space	Every four years
External				
The Bayside community	<ul style="list-style-type: none"> Summary of actions Priorities for the next year 	<ul style="list-style-type: none"> Council Annual Report 	Manager Environmental Sustainability and Open Space	Annually

10.0 Conclusion

The Bayside Climate Change Strategy summarises the results of the climate change risk assessment and adaptation planning process. This strategy analyses the ratings and distribution of 73 risks across Council's four divisions highlights 28 extreme rated risks by 2030 and 42 extreme rated risks by 2070 for which adaptation actions have been identified.

The majority of risks identified relate to:

- health impacts to council staff or the community (14 risks, including two extreme risks in 2030)
- financial impacts, including increasing costs to Council or loss of revenue (13 risks, including four extreme risks in 2030)
- increased property damage (11 risks, including six extreme risks in 2030)
- disruption to council service delivery (e.g. open space maintenance, aged and health care services) (10 risks, two extreme risks in 2030).

In summary, the Strategy outlines 49 proposed adaptation actions tailored to address Council's extreme rated climate change risks. These 49 adaptation actions are grouped within three timeframes for implementation; within the next 2 years, within the next 3 to 7 years and beyond 7 years. It is important that the adaptation actions and their designated timeframes are considered in the context of external factors outside Council's control (e.g. not having the required funding available).

The actions proposed in this Strategy address the following areas:

- water and energy efficiency and other sustainable design issues
- the climate resilience of essential infrastructure
- the long term protection and enhancement of public open space
- the protection of local properties and assets from sea level rise
- community resilience to increased heat and flooding risks
- the management coastal assets and habitats at risk from flooding
- weed and pest control and the protection of biodiversity corridors.

The proposed response involves a range of different activities including community and council staff education, collaboration with advocacy groups and partner agencies, provision of incentives and revisions and changes to Council policies and plans.

Bayside City Council's climate change risks will alter over time, as will the potential opportunities presented by a changing climate and policy environment. To ensure Council's adaptation responses and approach remain valid and relevant to local priorities and climate conditions, the Climate Change Strategy will need to be reviewed and updated. The review should re-assess Council's risk profile in consideration of changes to climate change information, policy or Council assets and activities. In addition, consideration should be given to the potential opportunities that may arise (e.g. new funding sources).

Adopting this Strategy will be a significant step towards building the resilience of Council and the Bayside community. Local residents will need guidance and assistance to develop the strategies, structures and networks required to build their resilience. They must be encouraged to build their skill levels and should be given opportunities to share their skills and their local knowledge. Timely implementation of the plan will therefore include ongoing engagement with the community, and this will be critical to the success of Council's overall climate change response.

11.0 References

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Appendix A

Bayside Climate Change Action Group Summary of Workshop Outcomes

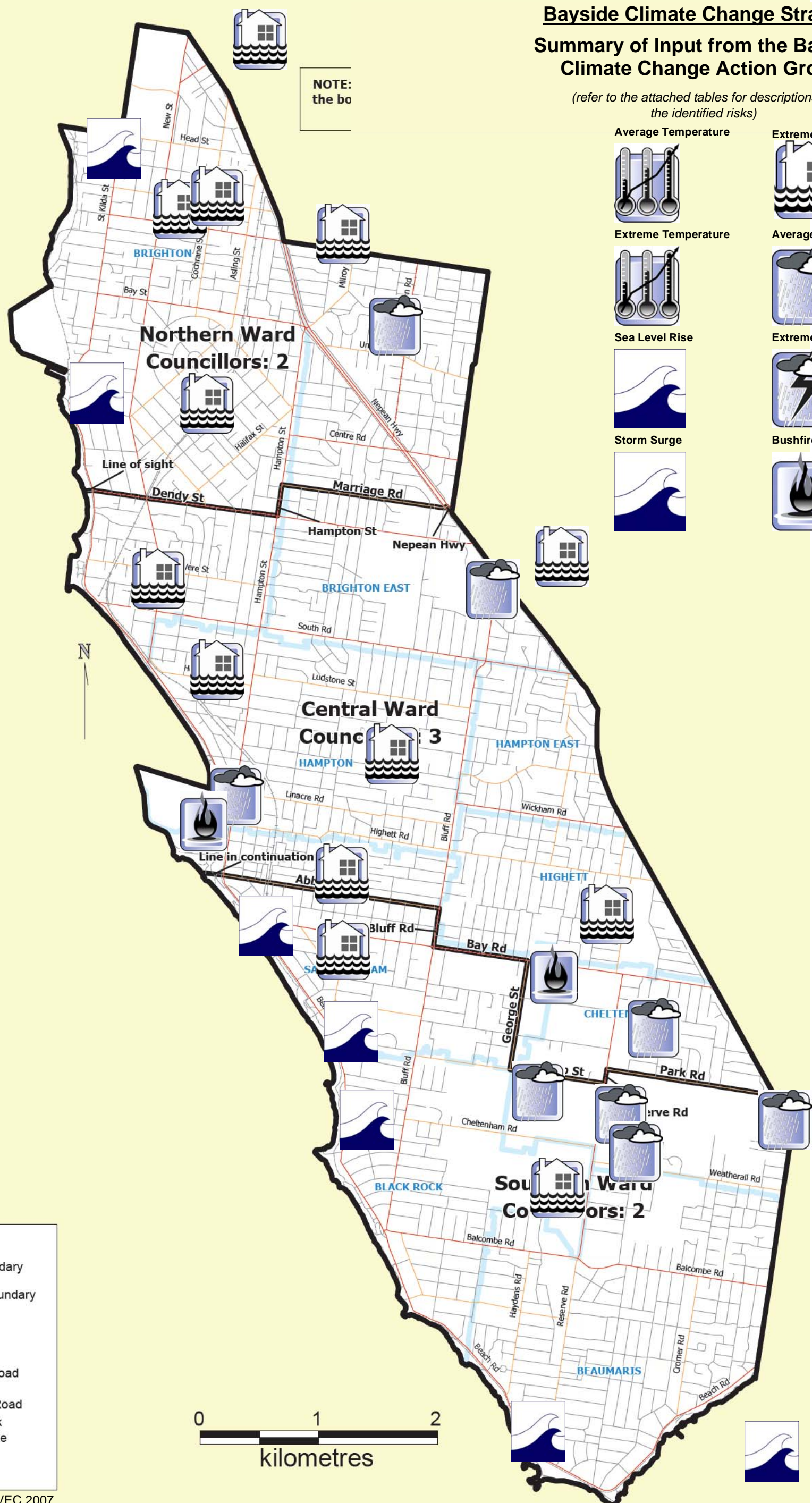
Appendix A Bayside Climate Change Action Group Summary of Workshop Outcomes

Bayside Climate Change Strategy
Summary of Input from the Bayside
Climate Change Action Group



(refer to the attached tables for descriptions of the identified risks)

- Average Temperature 
- Extreme Temperature 
- Sea Level Rise 
- Storm Surge 
- Extreme Rainfall 
- Average Rainfall 
- Extreme Wind 
- Bushfire 









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Legend









-  Ward Boundary
-  Locality Boundary

Map Symbols

-  Freeway
-  Main Road
-  Collector Road
-  Road
-  Unsealed Road
-  River/Creek
-  Railway Line
-  Lake

Source: VEC 2007

Summary of Risks

Climatic Variable	Comments
<p>Average Temperature</p> 	<ul style="list-style-type: none"> - Drying of reserves and vegetation - Increased heat radiating from the ground - Increased demand on water supplies - Increase in mosquitoes (particularly following warm weather after heavy rains)
<p>Extreme Temperature</p> 	<ul style="list-style-type: none"> - Increased water consumption - Paint peeling - Higher energy consumption (use of air conditioners in cars and houses) - More cars on the road - Buckling railway lines - Health risk (particularly of elderly), higher mortality rate - Increased demand on water supplies
<p>Sea Level Rise</p> 	<ul style="list-style-type: none"> - Coastal Erosion impacting on public buildings and roads - Inundation near Middle Brighton Beach - High tide flooding of coast line
<p>Storm Surge</p> 	<ul style="list-style-type: none"> - Inundation and Erosion near Sandringham Life Saving Club and Rickett's Point, Red Bluff and Keefer's Cove - Beaches washed away or covered - Damage to bike tracks from flooding (near Elwood beach)
<p>Extreme Rainfall</p> 	<ul style="list-style-type: none"> - Flash flooding damaging property due to less absorption of water (more concrete surfaces) - Sandringham Railway line closed due to flooding at Windsor Station, twice in 2011 (Feb 2011) - Disruption of train line near New Street and Holyrood St - Flooding in Highett - Flooding of Beach road - Erosion of footpaths along coast - Hampton is in a flood plain - Rail underpass near North Road floods (between Gardenvale station and North Bright Stain) - A lot of flooding in northern end of Bayside - Swimming not possible at local beaches due to pollution after floods
<p>Average Rainfall</p> 	<ul style="list-style-type: none"> - Food security - Higher food prices - Lake at Landcox Park dried up through drought for years. It looked terrible. The ducks had no lake! - Drought at Trey Bit Reserve - Drought impacting school and golf courses - Reduction in froglet numbers near the Sandringham Golf Links and Royal Melbourne Golf Club. - Impacts to buildings and footpaths as a result of drought (i.e. drying and shifting soils) - Tree loss
<p>Extreme Wind</p> 	<ul style="list-style-type: none"> - Risk to life - Damage to large old trees - Property damage - Need to be prepared for extreme weather events
<p>Bushfire</p> 	<ul style="list-style-type: none"> - Increased risk due to drying vegetation
<p>Other comments</p>	<ul style="list-style-type: none"> - The specific impact on Bayside is likely to be marginal. Bayside is fairly insulated as a community - Influx of climate refugees from overseas - Large elderly population

Action or Idea	To be led by Council or the Community
One thing BCCAG has lobbied for is an Eco timing Centre where residents can go to learn about all relevant issues. A cheaper option could be a caravan which could be taken to various locations.	Both together
Expansion of tip facilities	Council (with input from our group and no doubt others)
Problems at Windsor Station seem to have been with maintenance. Perhaps a better or more rigorous maintenance program is needed.	Council
Collection of water for use in sporting grounds and for tree watering etc	Council and relevant community sport groups etc
Introducing standard planning measures like provision of shade and use of heat/cold appropriate columns in paint etc.	
Encourage energy efficiency when granting planning permits for building/innovation (council buildings too)	Council with architectural etc input (and energy efficiency experts)
Better facilities for bike users eg not a good setup when taking a bike to shopping strips. Encouraging bike use will relieve pressure on roads as population increases. School bike programs	Work with schools and other local groups.
Work with other councils to lobby for wider action, learn from each other and not having to reinvent the wheel	
Reducing short trip, one car. Have teams of delivered (bikes/electric cars), local buses	Council?
Fruit trees on nature strip	Council
Warn people living in flood prone areas. How to get help in emergency/plan trees. Plan resources	Council
Leadership to help people adapt at low cost. Community experts on tap	Commercial/council
Clear advice on what people can do	Commercial/council
Floods and erosion on Beach Road and on beaches	
Train tracks buckling	
Degradation of parks and wildlife	
Increased risk of fire	
Increased power cuts from peak load	
Drainage system inadequate resulting in local flooding issues	
Facility for electric vehicles	
More facilities to encourage bike riding	
Waste Management/reduction	
Alternative energy hub eg. Setup a solar and/or wind mini power station for bayside	
Change building planning process to fast track sustainable changes/improvements to building/homes	
Provide rate discount for those including sustainable features in their homes	
Educate local households and businesses with free talks/help to change	
Let people take hard rubbish from road as it helps reduce landfill and is a form of recycling	
BBN input	
Train line flooding – improve drainage or raise rail lines Identify water path and engineer method of diversion or storage	
Cliff erosion – stabilize cliffs - Improve drainage	
Tree and shrub protection – more mulching	
Water storage – capture storm water run off	
Sun shelter – provide sun shades for people in streets	
Survey in Sandringham of ideas – newspaper/council brochure	
Encourage community action – plant fruit trees in street nature strips rather than paper barks with their hungry, destructive roots. Community vegetable plantings to share	
Register of elderly or frail – transport to colled centre – eg town hall if weather too hot “communal bus” Local bus service to shops or other services for people without own transport on extremely hot days.	
Mail deliveries on hot days – health risk to postman Street lighting – low energy gloves. Establish/negotiate a better arrangement with power companies.	
People trained to specifically deal with impacts of heat wave at designated centres. Public education – drink alot of water. Keep cool with wet clothes.	
Consider composting toilets. Facilities for recycling CFL and more difficult items. Not just at council chambers. Also for toxic or environmentally hazardous liquids. Also for fabrics – shouldn't go in landfill.	
Bulk purchase of for example to enable residents to install double glazed window, better insulation Council to provide more advice about building modifications.	
Waste of storm water – runs into bay.	
Expedite and/or encourage of preapproved house designs with environmentally friendly features. Eg. Bladder tanks, wide eaves (mandate?)	
Monitor local flood events, local rainfall patters are some areas becoming more prone to events?	Council
Light coloured roofs to be favoured	
Maintain /clean street drains better Cost potential impact of Climate Change and sea level rise to weigh against cost of reducing emissions	
Oblige public buildings eg. Clubs to save water, off roofs and solar collectors, sky lights etc	
Wiring in streets underground to save street trees (shade, birds etc) – reduce urban heat island	
Be cautious about early introduction of LED street lighting is the technology mature? Are there water tight lifetime guarantees?	
Scheme to monitor and assist neighbours in extreme events	Joint
Council to raise community awareness about scale and impacts of climate change and encourage participation of prevention of climate change.	
Flooding High tide flooding of coastling Blocked railines Flooding of beach road	

Action or Idea	To be led by Council or the Community
Beaches washed away or covered Influx of climate refugees from O/S Bayside has any elderly residents who are at increased risk of heat extremes	
Upgrade housing insulation to adapt to increased heat – improve building regulations Increased installation of home water tanks Improved drainage Measures taken to increase independence from national energy at municipal, business and domestic levels	
Backup power supply to municipal buildings	
Bolster sea wall defences in vulnerable areas along the coast.	
Build a specific strategy to preserve trees	
Reduce reliance on imported energy and water and decentralise energy production by supporting services grid, insulation, solar and other initiatives.	
“Adapt a plant or tree” in a nearby park. Invite a nearby resident to look after a single tree	
Educate the next generation by example	
Create a record of how climate change is affecting local environment/infrastructure (to create community and council awareness)	Council with input from community
Improve public transport	Council
More energy efficient buildings – new/existing	Council and community
Elderly - systems to safeguard elderly during heatwaves.	Council and community
More efficient street lighting in bayside	Council
Community vegetable garden on Council land	Council and community
More sustainable lifestyle – educate/lead	Council and community
Stormwater harvesting in extreme events (potable as well, domestic use)	Council
Awareness of increase of pollutants in Bay during events	Council
Extreme weather event communications process	Council
Backup power supply in case of infrastructure collapse. Especially essential services eg Sandringham Hospital e.g renewable energy backup	Council
Understanding of floods on sewers, and environmental risks	Council/community
Setup environmental saving Institute – self insuring notions (bulk buying environmental services)	Council
Perhaps local council environmental bonds	Council
Continuous disclosure of targets and meeting goals	Council
Design and building standards update	Council
Include greenhouse based accounts	Council
Direct council funds to invest in sustainable enterprises/funds	Council
Tariffs, processes to support environmental building design	Council
Communicate strategy in central pages of header	Council
Development of a neighbourhood network (small, local eg. Neighbourhood watch) to check at risk/vulnerable people. Facilitate, establish guidelines	Council
Raise awareness - major in community to engage ‘community’ increase knowledge re potential/probable effects of climate change	Council
Improve drainage	Council
Check all local Bayside infrastructure/vegetation etc that will be likely be impacted by increased storm temperature etc	Council
Increase food security options i.e open space for community vegetable plots (in view of increased density, multi developments) fruit trees/gardens allowed as street plantings ? Suited to some neighbourhoods but worth trialling.	Council
Council to attempt more planning department – conditions/controls to prevent multi level buildings eg 220 Bay fiasco!	Council
Sustainable conditions e.g no halogens etc	

Appendix B

Bayside City Council Climate Change Risk Profile and Risk Tables

Appendix B Bayside City Council Climate Change Risk Profile and Risk Tables

Climate Change Risk Profile

This Appendix illustrates a detailed visual analysis of climate change risks to each of the Bayside City Council's divisions and the Council's complete climate change risk register.

Whole of Organisation

10 risks were identified that are considered to impact all four Council divisions. The majority of these risks relate to disruptions to Council services. At 2030, three risks were rated extreme and four risks were rated high. At 2070, six risks were rated extreme and two risks were rated high. The extreme risks at 2030 were:

- increased disruption to Council services from extreme events, including reduced predictability in the demand for Council clean up services
- need to relocate community infrastructure and services along the foreshore
- Increase in capital costs to maintain service standards during extreme weather events.

Figure 10 summarises the change in the profile of risks impacting the Whole of Organisation between 2030 and 2070.

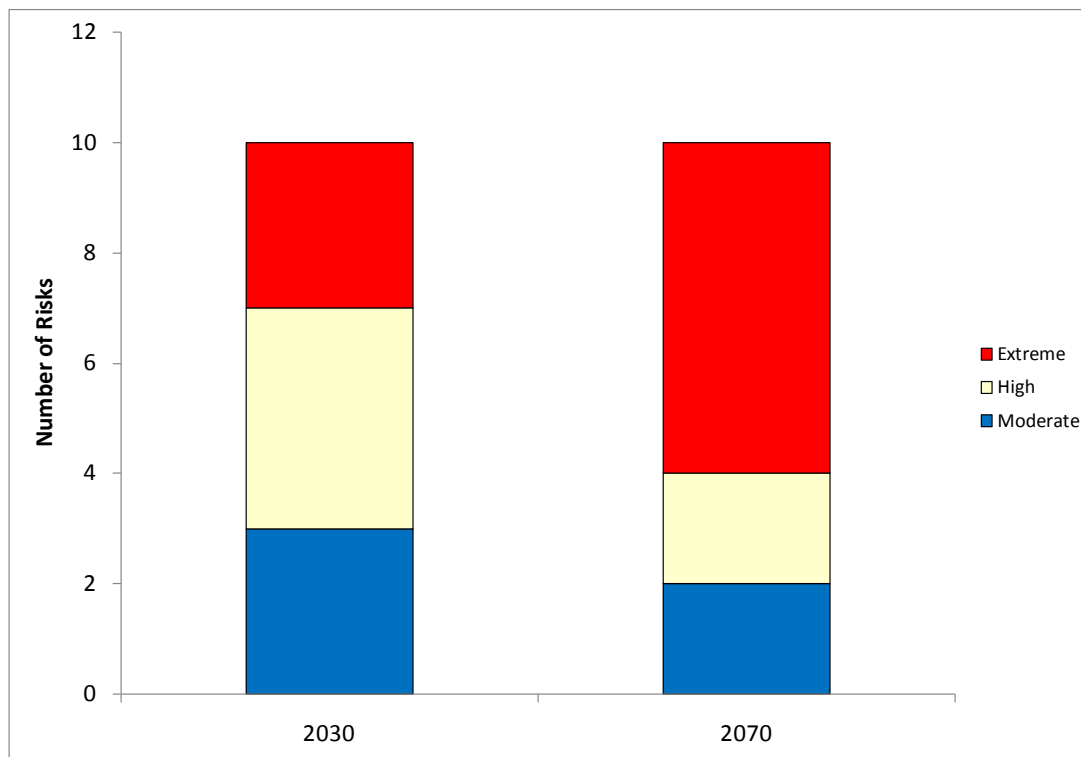


Figure 10: Bayside City Council's climate change risk profile for risks impacting Whole of Organisation at 2030 and 2070.

In considering the climate drivers, Heat and Urban Fires (40%) and Storms (30%) account for the majority of the risks impacting all divisions. Within the Heat and Urban Fires theme, three of the four risks solely relate to impacts of extreme heat rather than fire.

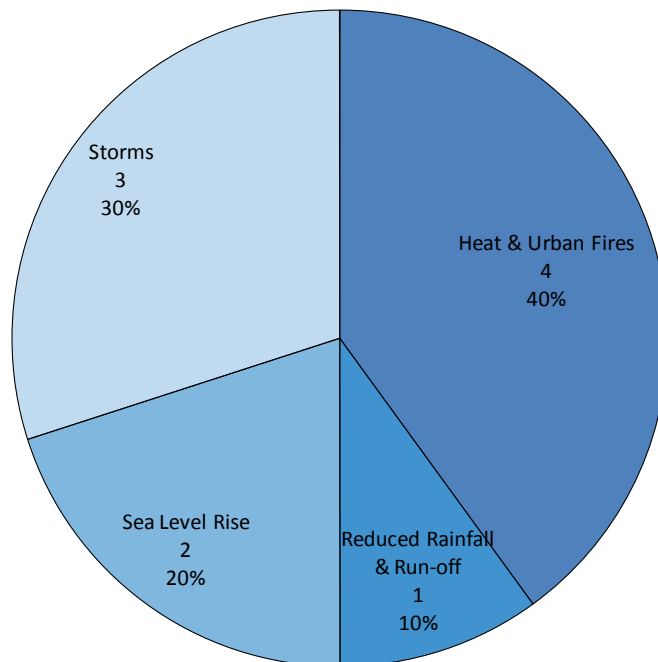


Figure 11: Risks impacting Whole of Organisation split by contributing climate drivers for 2030 (number of risks and percentage (%) of risks to the division).

The complete list of risks impacting Whole of Organisation is provided in Table 20.

Table 20: Bayside City Council climate change risks impacting Whole of Organisation.

Risk	Theme	Climate Driver*	2030 Risk Rating	2070 Risk Rating
Need to relocate community infrastructure and services along the foreshore	Service Disruption	SLR	Extreme	Extreme
Increased disruption to Council services from extreme events, including reduced predictability in the demand for Council clean up services	Service Disruption	ST	Extreme	Extreme
Increase in capital costs to maintain service standards (e.g. investment in alternative water supplies, adapting assets)	Financial Impacts	RR	Extreme	Extreme
Extreme heat leading to disruption of Council's ability to deliver services due to safety risks or OH&S requirements	Service Disruption	H	High	Extreme
Increase in frequency of power outages due to increased energy demand causing disruptions to Council service delivery	Service Disruption	H	High	Extreme
Requirement to release council staff to carry out emergency response and recovery activities	Service Disruption	ST	High	Extreme
Disruption of power to data centre leading to data loss or service interruption	Service Disruption	H	High	High
Inability of staff to get to or undertake work due to disruptions to transport linkages from flooding, inundation or asset failure	Service Disruption	SLR	Moderate	High
Increased temperature impacting comfort of occupiers and leading to reductions in productivity (or usability of buildings)	Service Disruption	H	Moderate	Moderate
Disruption to the ability of emergency services to respond during extreme events	Service Disruption	ST	Moderate	Moderate

*Climate Drivers: H = Heat and urban fires, RR = Reduced average rainfall and run off, SLR = Sea level rise and storm surge, ST = Storms (extreme wind and extreme rainfall)

Corporate Services

Eight risks were identified for the Corporate Services division. The majority of these risks relate to financial impacts to Council, both in terms of increased costs and reductions in revenue. At 2030, three risks were rated extreme and two risks were rated high. At 2070, four risks were rated extreme and two risks were rated high. The extreme risks at 2030 were the following:

- Increased costs to Council due to policy changes increasing utility costs combined with increased need for cooling.
- Community outrage and reputational impacts to Council such as flood damage to private property and belief that Council should provide greater protection
- Potential liability issues for Council if land uses are approved in areas at future risk of flooding.

Figure 12 summarises the change in the risk profile for the Corporate Services Division between 2030 and 2070.

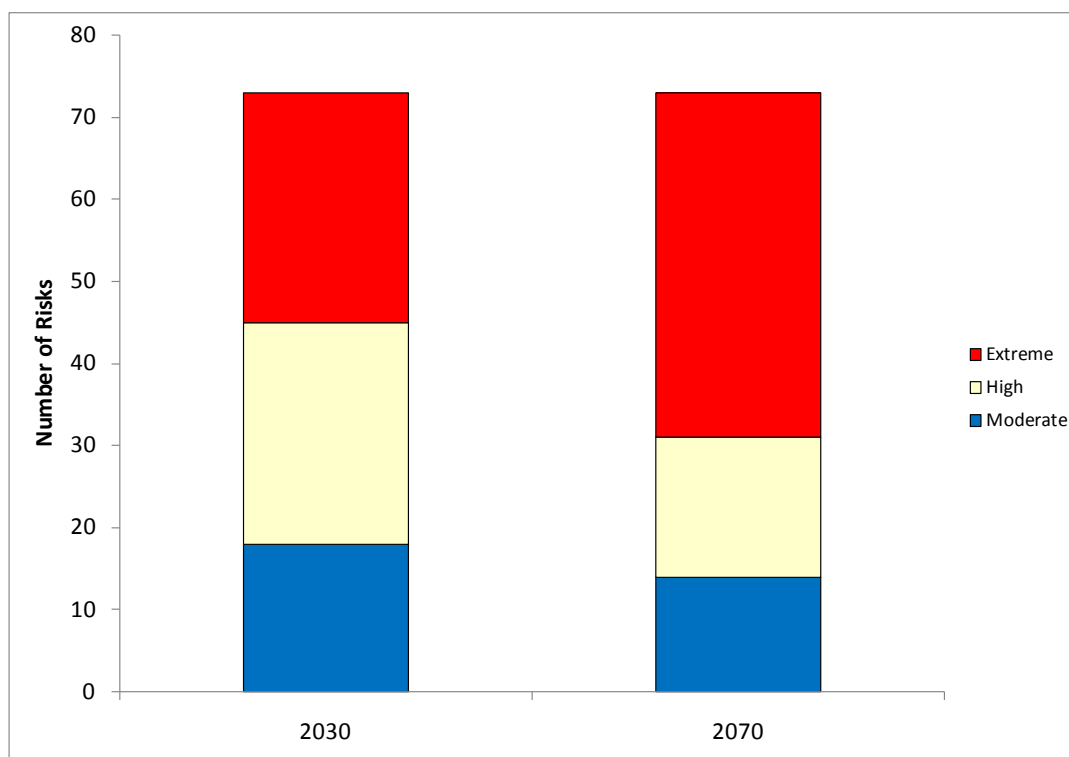


Figure 12: Bayside City Council's climate change risk profile for risks impacting Corporate Services at 2030 and 2070.

In considering the climate drivers, Storms (50%) and Sea Level Rise and Storm Surge (38%) account for the majority of the risks impacting the Corporate Services division (as illustrated in Figure 13). There were no risks identified as a result of Reduced Rainfall and Runoff for this division.

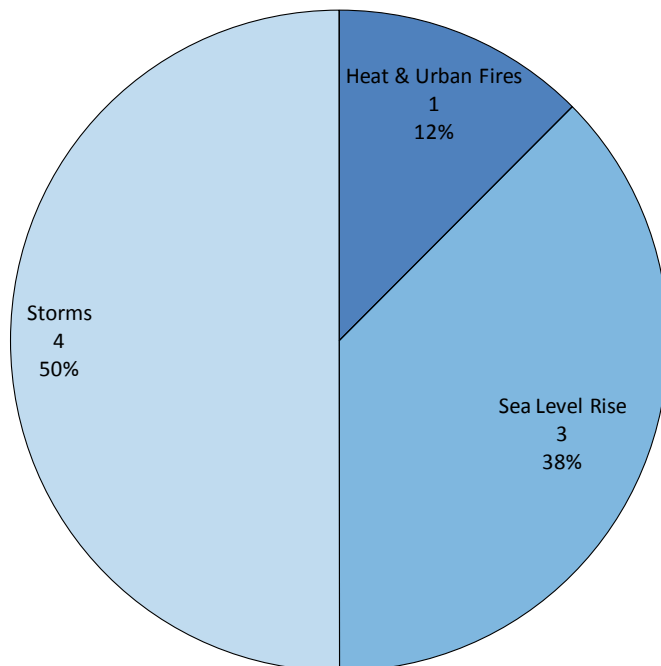


Figure 13: Risks impacting Bayside City Council's Corporate Services division split by contributing climate drivers by 2030 (number of risks and percentage (%) of risks to the division).

The complete list of risks impacting Council's Corporate Services division is provided in Table 21.

Table 21: Climate change risks impacting Bayside City Council's Corporate Services division.

Risk	Theme	Climate Variable*	2030 Risk Rating	2070 Risk Rating
Increased costs to Council due to policy changes and increasing utility costs combined with increased need for cooling	Financial Impacts	H	Extreme	Extreme
Reduction in Council revenue opportunities from land leased to foreshore clubs and businesses as a result of erosion and inundation	Financial Impacts	SLR	High	Extreme
Increased need to provide contingency funding for repair and replacement of assets due to increased damage and reduced lifespan of assets	Financial Impacts	ST	High	Extreme
Community outrage and reputational impacts to Council such as flood damage to private property and belief that Council should provide greater protection	Community Discontent	ST	Extreme	High
Potential liability issues for Council if land uses are approved in areas at future risk of flooding	Liability	ST	Extreme	High
Increase in insurance premiums and exposure leading to increased budget requirements	Financial Impacts	ST	Moderate	Extreme
Reduction in community confidence, especially in relation to property values	Community Discontent	SLR	Moderate	Moderate
Sewer overflow during extreme events causing potential health risks and pollution	Health Risks	SLR	Moderate	Moderate

*Climate Drivers: H = Heat and urban fires, RR = Reduced average rainfall and run off, SLR = Sea level rise and storm surge, ST = Storms (extreme wind and extreme rainfall)

Community Services

16 risks were identified for the Community Services division. It is noted that responsibility for some of these risks (e.g. building improvements and emergency management) rests with other divisions that have operational responsibility. This has been addressed in the development of relevant actions. The majority of these risks relate to increasing demands on Council services (six risks) and health risks (five risks). The Community Services risk profile changed marginally from 2030 to 2070. At 2030, four risks were rated extreme and four risks were rated high. At 2070, four risks were rated extreme and five risks were rated high.

- direct and indirect effects of extreme weather events (e.g. power loss) on the health of vulnerable members of society
- increased demand for sheltered and/or air conditioned spaces
- increased demand for emergency relief response increasing Council service costs
- increased demand on the Municipal Recovery Manager's role, potentially drawing them away from other services.

Figure 14 summarises the change in the risk profile for the Community Services division between 2030 and 2070.

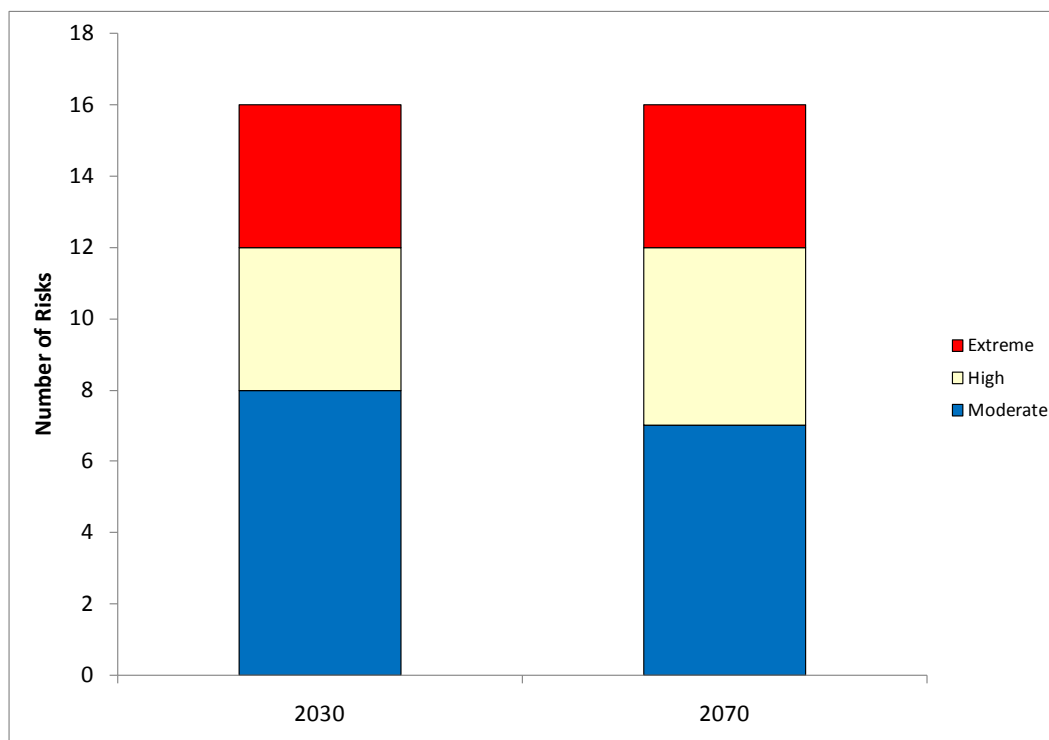


Figure 14: Bayside City Council's climate change risk profile for risks impacting Community Services at 2030 and 2070.

In considering the climate drivers, Heat and Urban Fires (37%) and Sea Level Rise and Storm Surge (31%) account for the majority of the risks impacting the Community Services division (as illustrated in Figure 15). Two of the seven risks in the Heat and Urban Fires category are related to fire as well as the impacts of extreme heat.

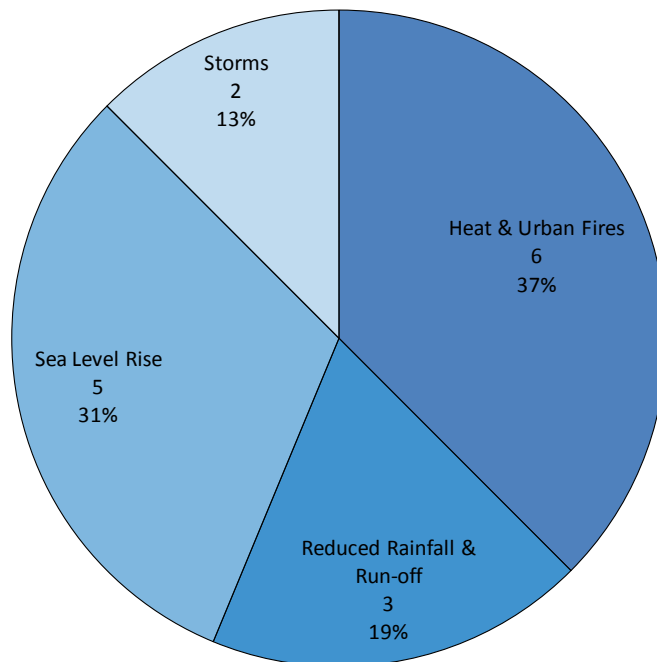


Figure 15: Risks impacting Bayside City Council's Community Services division split by contributing climate drivers by 2030 (number of risks and percentage (%) of risks to the division).

The complete list of risks impacting Council's Community Services division is provided in Table 22.

Table 22: Climate change risks impacting Bayside City Council's Community Services division.

Risk	Theme	Climate Variable*	2030 Risk Rating	2070 Risk Rating
Direct and indirect effects of extreme weather events (e.g. power loss) on the health of vulnerable members of society	Health Risks	H	Extreme	Extreme
Increased demand for sheltered and/or air conditioned spaces	Service Demand	H	Extreme	Extreme
Increased demand for emergency relief response increasing Council service costs	Service Demand	SLR	Extreme	Extreme
Increased demand on the Municipal Recovery Manager's role, potentially drawing them away from other services	Service Demand	ST	Extreme	Extreme
Potential impact on the use and management of recreation facilities, including the potential loss of usable beach areas due to sea level rise	Service Disruption	SLR	High	High
Impacts on social connections caused by reduced access to community resources, including sporting grounds	Health Risks	RR	High	High
Increased damage to and deterioration of homes, leading to more requests for home maintenance assistance	Service Demand	H	High	High
Increased need for outreach services, including youth counselling	Service Demand	H	High	High
Increased risk of water-borne diseases and demand for immunisation and environmental health services	Health Risks	RR	Moderate	High

Risk	Theme	Climate Variable*	2030 Risk Rating	2070 Risk Rating
Increase in the occurrence of algal blooms in water bodies negatively impacting biodiversity and public health	Biodiversity	H	Moderate	Moderate
Reduced 'Liveability' rating for Bayside	Community Discontent	SLR	Moderate	Moderate
Increased damage to and potential loss of historically and culturally significant sites such as Black Rock House, Kamesburgh and Billilla	Financial Impacts	SLR	Moderate	Moderate
Impacts to commercial activities and tourism in the region, potentially reducing Council revenues	Financial Impacts	SLR	Moderate	Moderate
Increase in health risks associated with food hygiene impacted by increase in high temperature days for meals on wheels style community services	Health Risks	H	Moderate	Moderate
Increased risk of injury on sports grounds leading to public liability issues	Health Risks	RR	Moderate	Moderate
Greater demand for customer services and web updates to inform the community in the lead up to, during and after extreme events	Service Demand	ST	Moderate	Moderate

*Climate Drivers: H = Heat and urban fires, RR = Reduced average rainfall and run off, SLR = Sea level rise and storm surge, ST = Storms (extreme wind and extreme rainfall)

Infrastructure Services

18 risks were identified for the Infrastructure Services division. The majority (eight risks) of these risks relate to property damage. At 2030, ten risks were rated extreme and seven risks were rated high. At 2070, thirteen risks were rated extreme and the remaining five risks were rated high. The extreme risks at 2030 are:

- financial impacts associated with upgrading the drainage system
- increase in coastal cliff erosion damaging infrastructure, including Beach Road, the Bay Trail and the Coastal Path
- damage to building foundations and other subterranean assets
- flood damage to building structures on the foreshore
- increase in damage to infrastructure including roads and buildings due to direct impacts of storm surge or inundation
- flooding damage to infrastructure and property, including homes, businesses, community facilities underground car parks, vehicles
- increase in build up of vegetation and litter in drainage systems leading to an increased risk of flooding
- flash flooding caused by reduced effectiveness of the municipality's drainage system arising from increased storm frequency and intensity and possible sea level rise
- potential increase in flooding due to back up of local drainage as the Elster Creek/Elwood Canal reaches capacity
- Insufficient water available for irrigation due to inadequate design of drainage and water capture systems.

Figure 16 summarises the change in the risk profile for the Infrastructure division between 2030 and 2070.

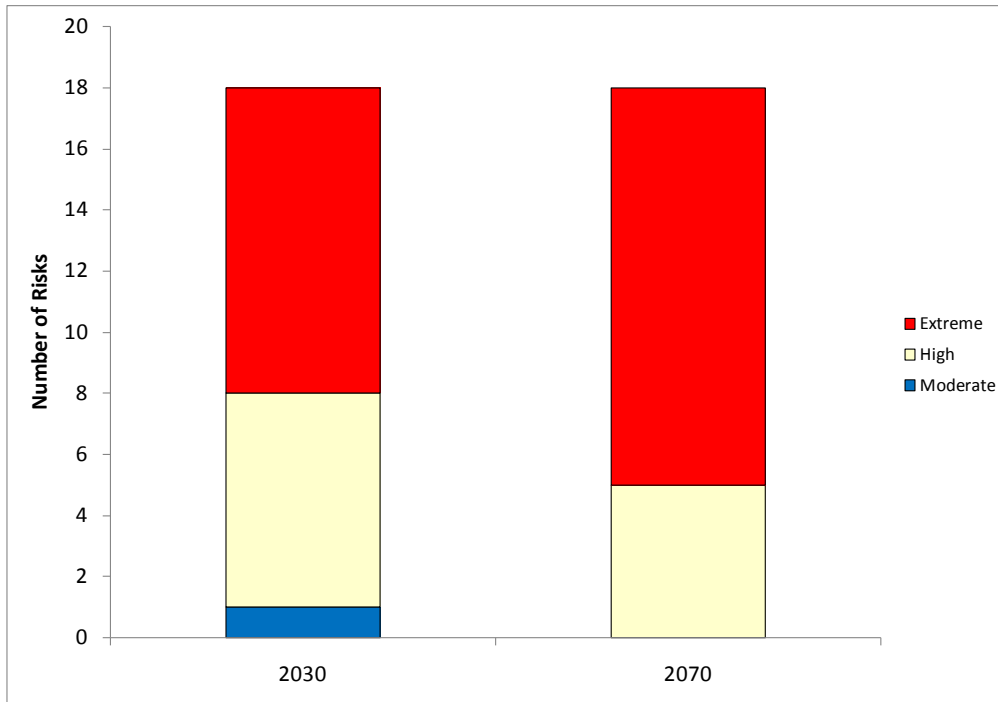


Figure 16: Bayside City Council's climate change risk profile for risks impacting the Infrastructure division at 2030 and 2070.

In considering the climate drivers, there is a near even split across the four climatic drivers, as illustrated in Figure 17.

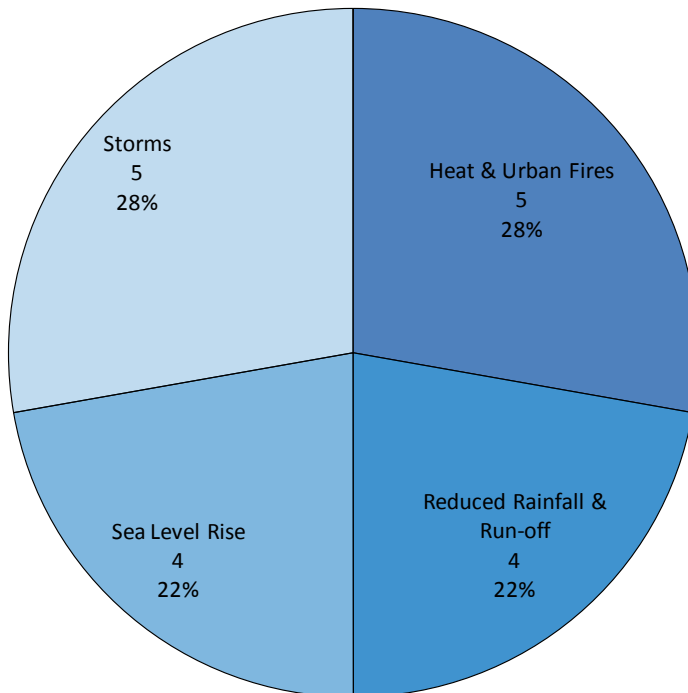


Figure 17: Risks impacting Bayside City Council's Infrastructure division split by contributing climate drivers by 2030 (number of risks and percentage (%) of risks to the division).

The complete list of risks impacting Infrastructure division is provided in Table 23.

Table 23: Climate change risks impacting Bayside City Council's Infrastructure division.

Risk	Theme	Climate Variable*	2030 Risk Rating	2070 Risk Rating
Financial impacts associated with upgrading the drainage system	Financial Impacts	ST	Extreme	Extreme
Increase in coastal cliff erosion damaging infrastructure including Beach Road, the Bay Trail and the Coastal Path	Erosion	SLR	Extreme	Extreme
Damage to building foundations and other subterranean assets	Property Damage	RR	Extreme	Extreme
Flood damage to building structures on the foreshore	Property Damage	SLR	Extreme	Extreme
Increase in damage to infrastructure including roads and buildings due to direct impacts of storm surge or inundation	Property Damage	SLR	Extreme	Extreme
Flooding damage to infrastructure and property, including homes, businesses, community facilities underground car parks, vehicles	Property Damage	ST	Extreme	Extreme
Increase in build up of vegetation and litter in drainage systems leading to an increased risk of flooding	Drainage	RR	Extreme	Extreme
Flash flooding caused by reduced effectiveness of the municipality's drainage system arising from increased storm frequency and intensity and possible sea level rise	Drainage	SLR	Extreme	Extreme
Potential increase in flooding due to back up of local drainage as the Elster Creek/Elwood Canal reaches capacity	Drainage	ST	Extreme	Extreme
Insufficient water available for irrigation due to inadequate design of drainage and water capture systems	Open Space	RR	Extreme	Extreme
Damage to roads, footpaths and drainage infrastructure	Financial Impacts	ST	High	Extreme
Damage to infrastructure and buildings in areas vulnerable to landslip and erosion	Erosion	ST	High	Extreme
Decrease in the longevity of exterior materials of buildings and other infrastructure, leading to increased maintenance and replacement costs	Property Damage	H	High	Extreme
Increase in the rate of melting spray seals on roads surfaces	Property Damage	H	High	High
Increase in the occurrence of lifting footpath panels impacting safety and disability access	Property Damage	H	High	High
Increase in the cost of maintaining infrastructure as materials need to be replaced more often or with more resilient materials	Property Damage	H	High	High
Increase in the frequency of root intrusion into the drainage system	Drainage	RR	High	High
Increased maintenance costs associated with more of the community using foreshore facilities due to warmer weather	Financial Impacts	H	Moderate	High

*Climate Drivers: H = Heat and urban fires, RR = Reduced average rainfall and run off, SLR = Sea level rise and storm surge, ST = Storms (extreme wind and extreme rainfall)

City Strategy

21 risks were identified for the City Strategy division. The majority (8 risks) of these risks relate to health impacts. At 2030, eight risks were rated extreme and ten risks were rated high. At 2070, fifteen risks were rated extreme and three risks were rated high. The extreme risks at 2030 were:

- reduction in the resilience and value of natural areas and 'ecosystem function' as a result of heat stress, reduced rainfall and increases in range and occurrence of pest species
- reduced biodiversity and amenity values due to storm surge impacts and inundation
- increased capital costs for alternative water supplies to maintain public open space
- higher concentrations of accumulated pollutants being flushed into beaches and other public open spaces leading to restricted access or health risks
- Increased liabilities associated with building approvals such as inadequate design of buildings for flooding or extreme temperature
- Potential for increased risk to privately owned coastal property due to sea level rise and storm surges placing increased pressures and demands on the planning scheme
- Potential for increased exposure to liability from future development activity as a result of a lack of policy direction, coastal vulnerability assessments and regulatory controls for responding to sea level rise
- reduction in usable open space due to temporary or permanent inundation.

Figure 18 summarises the change in the risk profile for the City Strategy division between 2030 and 2070.

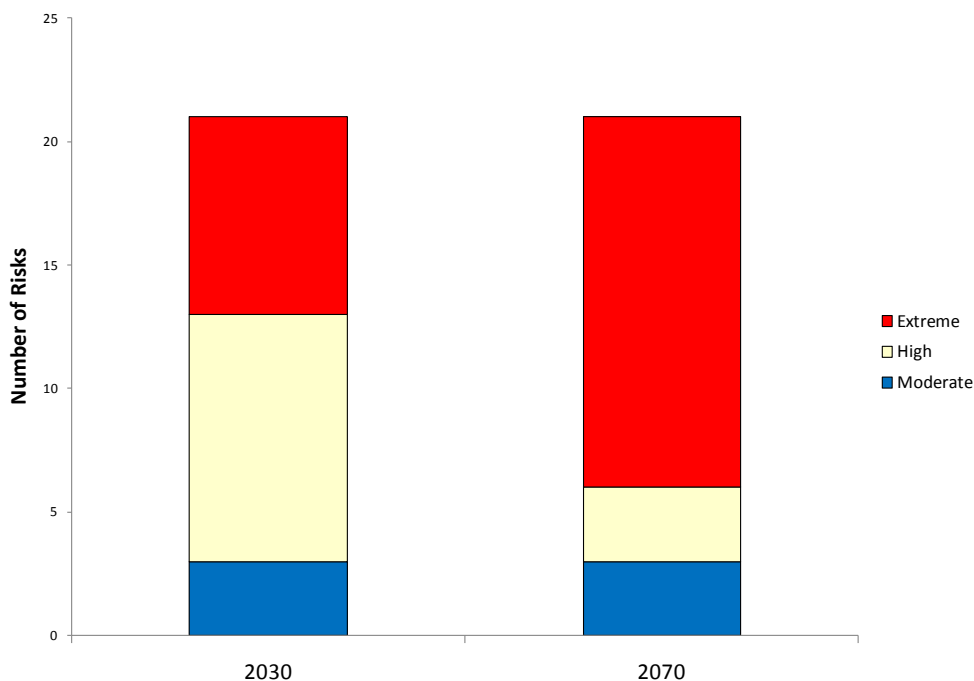


Figure 18: Bayside City Council's climate change risk profile for risks impacting City Strategy division at 2030 and 2070.

In considering the climate drivers, there is a near even split across the four climatic drivers, as illustrated in Figure 19.

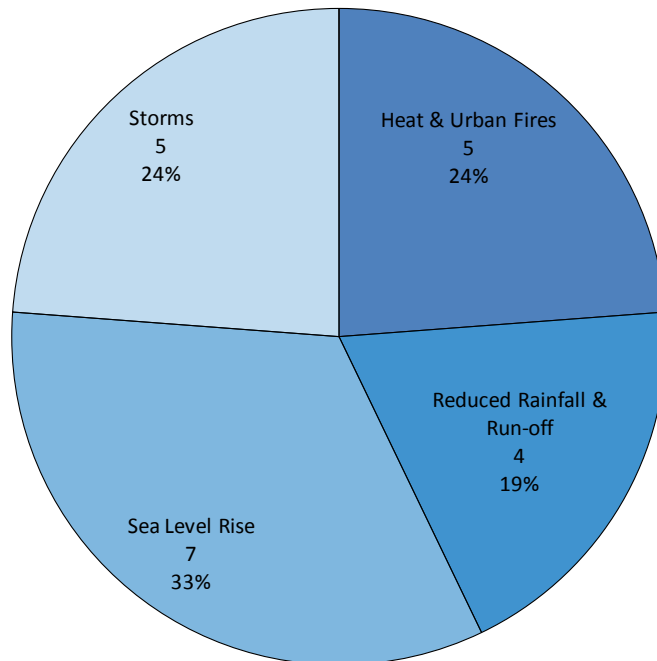


Figure 19: Risks impacting Bayside City Council's City Strategy division split by contributing climate drivers by 2030 (number of risks and percentage (%) of risks to the division).

The complete list of risks impacting Council's City Strategy division is provided in Table 24.

Table 24: Climate change risks impacting Bayside City Council's City Strategy division.

Risk	Theme	Climate Variable*	2030 Risk Rating	2070 Risk Rating
Reduction in the resilience and value of natural areas and 'ecosystem function' as a result of heat stress, reduced rainfall and increases in range and occurrence of pest species	Biodiversity	H	Extreme	Extreme
Reduced biodiversity and amenity values due to storm surge impacts and inundation	Biodiversity	SLR	Extreme	Extreme
Increased capital costs for alternative water supplies to maintain public open space	Financial Impacts	RR	Extreme	Extreme
Higher concentrations of accumulated pollutants being flushed into beaches and other public open spaces leading to restricted access or health risks	Health Risks	ST	Extreme	Extreme
Potential for increased risk to privately owned coastal property due to sea level rise and storm surges placing increased pressures and demands on the planning scheme	Property Damage	H	Extreme	Extreme
Increased liabilities associated with building approvals such as inadequate design of buildings for flooding or extreme temperature	Property Damage	ST	Extreme	Extreme
Reduction in usable open space due to temporary or permanent inundation	Open Space	SLR	Extreme	Extreme
Increased cost of maintenance of public green spaces, golf courses, parks and playing fields	Financial Impacts	RR	High	Extreme
Increased costs to Council related to early asset renewal from accelerated degradation of assets	Financial Impacts	ST	High	Extreme

Risk	Theme	Climate Variable*	2030 Risk Rating	2070 Risk Rating
Increased risk of heat stress as a result of buildings that are inadequately designed for vulnerable groups, including the elderly, sick or young	Health Risks	H	High	Extreme
Reduction in the availability and quality of water supply	Health Risks	RR	High	Extreme
Increased coastal erosion due to runoff from storm events	Erosion	ST	High	Extreme
Potential for increased exposure to liability from future development or activity as a result of a lack of policy direction, coastal vulnerability assessments and regulatory controls for responding to sea level rise	Liability	SLR	High	Extreme
Reduced effectiveness of drainage assets and wetlands due to loss of water retention or removal capacity due to rising ground water level or sea level rise	Drainage	SLR	High	Extreme
Loss of amenity and restricted coastal access due to failure of coastal defences and erosion of coastal open space due to sea level rise and increased storm surge events	Open Space	SLR	High	Extreme
Extreme heat causing an increase in public health risk due to lack of shade in public areas	Health Risks	H	High	High
Increased occurrence of heat stress for community due to extreme heat combined with loss of canopy trees from residential development	Health Risks	H	High	High
Increased risk of injury to Council staff or the public due to storm surge events	Health Risks	SLR	High	High
Increase in the occurrence of stressed trees leading to potential debris hazard during storm events	Health Risks	RR	Moderate	Moderate
Increased risk to cyclists or pedestrians resulting from inadequate road design to address flooding impacts	Health Risks	ST	Moderate	Moderate
Increased frequency of urban fires on foreshore and in golf course zones leading to public health risk or property damage	Property Damage	H	Moderate	Moderate

*Climate Drivers: H = Heat and urban fires, RR = Reduced average rainfall and run off, SLR = Sea level rise and storm surge, ST = Storms (extreme wind and extreme rainfall)

Climate Change Risk Tables

All Bayside City Council Extreme Rated Summary Risks for 2030

Whole of Organisation	R1	Increase in capital costs to maintain service standards during extreme weather events
	R2	Need to relocate community infrastructure and services along foreshore
	R3	Increased disruption to Council services from extreme events including reduced predictability in the demand for Council clean up services

City Strategy	R4	Reduction in the resilience and value of natural areas and 'ecosystem function'. Risk associated with loss of vegetation due to heat stress and reduced rainfall as well as an increase in range and occurrence of pest species.
	R5	Reduced biodiversity and amenity values due to storm surge impacts and inundation
	R6	Increased capital costs for alternative water supplies to maintain public open space
	R7	Higher concentrations of accumulated pollutants being flushed into beaches and other public open spaces leading to restricted access or health risks
	R8	Reduction in usable open space due to temporary or permanent inundation
	R9	Increased liabilities associated with building approvals such as inadequate design of buildings for flooding or extreme temperature
	R10	Potential for increased exposure to liability from future development activity as a result of a lack of policy direction, coastal vulnerability assessments and regulatory controls for responding to sea level rise
	R11	Potential for increased risk to privately owned coastal property due to sea level rise and storm surges placing increased pressures and demands on the planning scheme

Community Services	R12	Direct and indirect effects of extreme weather events (e.g. power loss) on the health of vulnerable members of society
	R13	Increased demand for sheltered and/or air conditioned spaces
	R14	Increased demand for emergency relief response increasing Council service costs
	R15	Increased demand on the Municipal Recovery Manager's role, potentially drawing them away from other services

Corporate Service	R16	Increased costs to Council due to policy changes increasing utility costs combined with increased need for cooling.
	R17	Community outrage and reputational impacts to Council such as flood damage to private property and belief that Council should provide greater protection
	R18	Potential liability issues for Council if land uses are approved in areas at future risk of flooding

Infrastructure	R19	Increase in build up of vegetation and litter in drainage systems leading to an increased risk of flooding
	R20	Flash flooding caused by reduced effectiveness of the municipality's drainage system arising from increased storm frequency and intensity and possible sea level rise
	R21	Potential increase in flooding due to back up of local drainage as the Elster Creek/Elwood Canal reaches capacity
	R22	Increase in coastal cliff erosion damaging infrastructure including Beach Road, the Bay Trail and the Coastal Path
	R23	Financial impacts associated with upgrading the drainage system
	R24	Insufficient water available for irrigation due to inadequate design of drainage and water capture systems
	R25	Damage to building foundations and other subterranean assets such as underground car parks and basements
	R26	Flood damage to building structures on the foreshore
	R27	Increase in damage to infrastructure including roads and buildings due to direct impacts of storm surge or inundation
	R28	Flooding damage to infrastructure and property, including homes, businesses, community facilities underground car parks, vehicles

THEME	Division	Climate Variable	Risk	Existing Controls	Principal Consequence Category	Likelihood (2030)	Consequence (2030)	Risk Rating (2030)	Likelihood (2070)	Consequence (2070)	Risk Rating (2070)
Financial Impacts	Whole of Organisation	RR	Increase in capital costs to maintain service standards during extreme weather events		Financial	Likely	Major	Extreme	Almost Certain	Catastrophic	Extreme
Service Disruption	Whole of Organisation	SLR	Need to relocate community infrastructure and services along foreshore	Asset Management Plan, Housing Strategy	Financial	Likely	Major	Extreme	Almost Certain	Major	Extreme
Service Disruption	Whole of Organisation	ST	Increased disruption to Council services from extreme events including reduced predictability in the demand for Council clean up services		Financial	Almost Certain	Major	Extreme	Almost Certain	Major	Extreme
Service Disruption	Whole of Organisation	H	Extreme heat leading to disruption of Council's ability to deliver services due to safety risks or OH&S		Service Interruption	Likely	Moderate	High	Almost Certain	Moderate	Extreme
Service Disruption	Whole of Organisation	H	Increase in frequency of power outages due to increased energy demand causing disruptions to Council service delivery		Service Interruption	Likely	Moderate	High	Almost Certain	Moderate	Extreme
Service Disruption	Whole of Organisation	ST	Requirement to release council staff to carry out emergency response and recovery activities		Service Interruption	Likely	Moderate	High	Almost Certain	Moderate	Extreme
Service Disruption	Whole of Organisation	H	Disruption of power to data centre leading to data loss or service interruption		Service Interruption	Possible	Major	High	Possible	Major	High
Service Disruption	Whole of Organisation	SLR	Inability of staff to get to or undertake work due to disruptions to transport linkages from flooding, inundation or asset failure	Improved processes allowing people to work from	Service Interruption	Possible	Moderate	Moderate	Likely	Moderate	High
Service Disruption	Whole of Organisation	H	Increased temperature impacting comfort of occupiers and leading to reductions in productivity (or usability of buildings)		Human Resources / OH&S	Almost Certain	Insignificant	Moderate	Likely	Minor	Moderate
Service Disruption	Whole of Organisation	ST	Disruption to the ability of emergency services to respond during extreme events		Service Interruption	Possible	Moderate	Moderate	Possible	Moderate	Moderate
Biodiversity	City Strategy	H	Reduction in the resilience and value of natural areas and 'ecosystem function'. Risk associated with loss of vegetation due to heat stress and reduced rainfall as well as an increase in range and occurrence of pest species.	Plant trees and other vegetation. Pest species control program	Environmental	Likely	Major	Extreme	Almost Certain	Major	Extreme
Biodiversity	City Strategy	SLR	Reduced biodiversity and amenity values due to storm surge impacts and inundation		Environmental	Likely	Major	Extreme	Likely	Major	Extreme
Financial Impacts	City Strategy	RR	Increased capital costs for alternative water supplies to maintain public open space		Financial	Likely	Major	Extreme	Almost Certain	Major	Extreme
Health Risks	City Strategy	ST	Higher concentrations of accumulated pollutants being flushed into beaches and other public open spaces leading to restricted access or health risks		Performance & Image	Likely	Major	Extreme	Likely	Major	Extreme
Open Space	City Strategy	SLR	Reduction in usable open space due to temporary or permanent inundation		Performance & Image	Likely	Major	Extreme	Almost Certain	Major	Extreme
Property Damage	City Strategy	ST	Increased liabilities associated with building approvals such as inadequate design of buildings for flooding or extreme temperature		Performance & Image	Almost Certain	Moderate	Extreme	Almost Certain	Moderate	Extreme
Drainage	City Strategy	SLR	Reduced effectiveness of drainage assets and wetlands due to loss of water retention or removal capacity due to rising ground water level or sea level rise	No local flood overlay	Financial	Likely	Moderate	High	Almost Certain	Moderate	Extreme
Erosion	City Strategy	ST	Increased coastal erosion due to runoff from storm		Environmental	Possible	Major	High	Likely	Major	Extreme
Financial Impacts	City Strategy	RR	Increased cost of maintenance of public green spaces, golf courses, parks and playing fields	Open space contributions, developing draft DCP	Financial	Likely	Moderate	High	Almost Certain	Moderate	Extreme
Financial Impacts	City Strategy	ST	Increased costs to Council related to early asset renewal from accelerated degradation of assets		Financial	Likely	Moderate	High	Almost Certain	Moderate	Extreme

THEME	Division	Climate Variable	Risk	Existing Controls	Principal Consequence Category	Likelihood (2030)	Consequence (2030)	Risk Rating (2030)	Likelihood (2070)	Consequence (2070)	Risk Rating (2070)
Health Risks	City Strategy	H	Increased risk of heat stress as a result of buildings that are inadequately designed for vulnerable groups, including the elderly, sick or young	Existing policies such as ResCode, buildings over four storey	Performance & Image	Likely	Moderate	High	Almost Certain	Moderate	Extreme
Health Risks	City Strategy	RR	Reduction in the availability and quality of water supply	drought tolerant turf, water saving devices, Amendment	Service Interruption	Likely	Moderate	High	Almost Certain	Moderate	Extreme
Property Damage	City Strategy	SLR	Potential for increased risk to privately owned coastal property due to sea level rise and storm surges placing increased pressures and demands on the planning scheme		Performance & Image	Likely	Major	Extreme	Almost Certain	Major	Extreme
Liability	City Strategy	SLR	Potential for increased exposure to liability from future development activity as a result of a lack of policy direction, coastal vulnerability assessments and regulatory controls for responding to sea level rise	No local policy, Clause 15 of SPPF	Financial	Likely	Major	Extreme	Possible	Catastrophic	Extreme
Open Space	City Strategy	SLR	Loss of amenity and restricted coastal access due to failure of coastal defences and erosion of coastal open space due to sea level rise and increased storm surge events		Environmental	Unlikely	Catastrophic	High	Likely	Catastrophic	Extreme
Health Risks	City Strategy	H	Extreme heat causing an increase in public health risk due to lack of shade in public areas	Plant trees	Human Resources / OH&S	Almost Certain	Minor	High	Almost Certain	Minor	High
Health Risks	City Strategy	H	Increased occurrence of heat stress for community due to extreme heat combined with loss of canopy trees from residential development	VPOs, ResCode (schedule variation for site cover), local policy for maintaining tree canopy, local law (possible contradiction with Clause 52 provisions)	Performance & Image	Almost Certain	Minor	High	Almost Certain	Minor	High
Health Risks	City Strategy	SLR	Increased risk of injury to Council staff or the public due to storm surge events		Human Resources / OH&S	Possible	Major	High	Possible	Major	High
Health Risks	City Strategy	RR	Increase in the occurrence of stressed trees leading to potential debris hazard during storm events	VPOs, ResCode (schedule variation for site cover), local policy for maintaining tree canopy, local law (possible contradiction with Clause 52 provisions)	Human Resources / OH&S	Possible	Minor	Moderate	Likely	Minor	Moderate
Health Risks	City Strategy	ST	Increased risk to cyclists or pedestrians resulting from inadequate road design to address flooding impacts		Performance & Image	Possible	Moderate	Moderate	Possible	Moderate	Moderate
Property Damage	City Strategy	H	Increased frequency of urban fires on foreshore and in golf course zones leading to public health risk or property damage	MFB inspections, fire breaks and fuel	Environmental	Likely	Minor	Moderate	Likely	Minor	Moderate
Opportunity	City Strategy		Opportunity - Potential reduction in open space maintenance costs including mowing and pruning due to reduced growth								
Opportunity	City Strategy		Opportunity - Reduced sedimentation in pits and ponds								
Health Risks	Community Services	H	Direct and indirect effects of extreme weather events (e.g. power loss) on the health of vulnerable members of	Vulnerable client register	Performance & Image	Almost Certain	Moderate	Extreme	Almost Certain	Moderate	Extreme

THEME	Division	Climate Variable	Risk	Existing Controls	Principal Consequence Category	Likelihood (2030)	Consequence (2030)	Risk Rating (2030)	Likelihood (2070)	Consequence (2070)	Risk Rating (2070)
Service Demand	Community Services	H	Increased demand for sheltered and/or air conditioned spaces		Financial	Almost Certain	Moderate	Extreme	Almost Certain	Moderate	Extreme
Service Demand	Community Services	SLR	Increased demand for emergency relief response increasing Council service costs	MEMP and MERP in place	Financial	Almost Certain	Moderate	Extreme	Almost Certain	Moderate	Extreme
Service Demand	Community Services	ST	Increased demand on the Municipal Recovery Manager's role, potentially drawing them away from other services	Refer to Municipal Emergency Recovery Plan	Service Interruption	Almost Certain	Moderate	Extreme	Almost Certain	Moderate	Extreme
Health Risks	Community Services	RR	Impacts on social connections caused by reduced access to community resources, including sporting	Policy to control use	Performance & Image	Likely	Moderate	High	Likely	Moderate	High
Service Demand	Community Services	H	Increased damage to and deterioration of homes, leading to more requests for home maintenance		Financial	Likely	Moderate	High	Likely	Moderate	High
Service Demand	Community Services	H	Increased need for outreach services, including youth counselling		Financial	Likely	Moderate	High	Likely	Moderate	High
Service Disruption	Community Services	SLR	Potential impact on the use and management of recreation facilities, including the potential loss of usable beach areas due to sea level rise	Replenishment works, protective sea walls	Service Interruption	Likely	Moderate	High	Likely	Moderate	High
Health Risks	Community Services	RR	Increased risk of water-borne diseases and demand for immunisation and environmental health services	Immunisation program (which could expand)	Financial	Possible	Moderate	Moderate	Likely	Moderate	High
Biodiversity	Community Services	H	Increase in the occurrence of algal blooms in water bodies negatively impacting biodiversity and public	Public notification	Environmental	Possible	Minor	Moderate	Possible	Minor	Moderate
Community Discontent	Community Services	SLR	Reduced 'Liveability' rating for Bayside		Performance & Image	Possible	Minor	Moderate	Possible	Moderate	Moderate
Financial Impacts	Community Services	SLR	Increased damage to and potential loss of historically and culturally significant sites such as Black Rock House, Kamesburgh and Billilla	Mapping, maintain and renew	Performance & Image	Possible	Minor	Moderate	Possible	Moderate	Moderate
Financial Impacts	Community Services	SLR	Impacts to commercial activities and tourism in the region, potentially reducing Council revenues		Performance & Image	Possible	Minor	Moderate	Possible	Minor	Moderate
Health Risks	Community Services	H	Increase in health risks associated with food hygiene impacted by increase in high temperature days for meals on wheels style community services		Human Resources / OH&S	Possible	Minor	Moderate	Possible	Minor	Moderate
Health Risks	Community Services	RR	Increased risk of injury on sports grounds leading to public liability issues		Financial	Possible	Moderate	Moderate	Possible	Moderate	Moderate
Service Demand	Community Services	ST	Greater demand for customer services and web updates to inform the community in the lead up to, during and after extreme events	Currently provided. Customer services pool.	Financial	Likely	Minor	Moderate	Likely	Minor	Moderate
Opportunity	Community Services		Opportunity - Increase in the number of people attending libraries and other air-conditioned community services during hot days								
Opportunity	Community Services		Increase in employment opportunities for waste management suppliers, gardeners, builders and other maintenance professions.								
Financial Impacts	Corporate Services	H	Increased costs to Council due to policy changes increasing utility costs combined with increased need for cooling.		Financial	Almost Certain	Moderate	Extreme	Almost Certain	Moderate	Extreme
Financial Impacts	Corporate Services	SLR	Reduction in Council revenue opportunities from land leased to foreshore clubs and businesses as a result of erosion and inundation		Financial	Possible	Major	High	Likely	Major	Extreme
Financial Impacts	Corporate Services	ST	Increased need to provide contingency funding for repair and replacement of assets due to increased damage and reduced lifespan of assets		Financial	Likely	Moderate	High	Almost Certain	Moderate	Extreme
Community Discontent	Corporate Services	ST	Community outrage and reputational impacts to Council such as flood damage to private property and belief that Council should provide greater protection		Performance & Image	Likely	Major	Extreme	Almost Certain	Minor	High
Liability	Corporate Services	ST	Potential liability issues for Council if land uses are approved in areas at future risk of flooding		Financial	Likely	Major	Extreme	Possible	Major	High
Financial Impacts	Corporate Services	ST	Increase in insurance premiums and exposure leading to increased budget requirements		Financial	Likely	Minor	Moderate	Almost Certain	Moderate	Extreme

