

Climate Change Impacts and Adaptation Plan

Preparing for a changed climate

May 2011

Acknowledgements

The Climate Change Impacts and Adaptation Plan was developed by Frankston City Council's Climate Change Taskforce.

The following are thanked for their contribution in the development of this Plan:

Frankston City Mayor and Councillors

Frankston City's Climate Change Taskforce (in alphabetical order):

Kevin Alexander	Foreshore Coordinator
Jacquie Anderton	Recreation Development Coordinator
Libby Anthony	Environment Manager
Jeff Best	Ambassador Programs Coordinator
Lyle Clauscen	Environmental Health Coordinator
Liz Daley	Community Development Manager
Mandy Gatliff	Family and Youth Services Manager
Peter Harrison	Aged Services Manager
Graham Hayden	Physical Services Manager
Jane Homewood	General Manager, Development
Aida Horvath	Planning and Policy Coordinator
Chris Innes	Risk Coordinator
Meghan Kelly	Strategic Planner
Melissa King	Community Safety Coordinator
Ken Poulier	Traffic and Drainage Coordinator
Robert Powell	Business Development Officer
Kathryn Renwick	Planning and Policy Officer
Prue Robertson	Climate Change Officer
Kate Somerville	Senior Policy Officer
Rod Tanner	Waste Services Contract Manager
Karen Taranto	Planning and Policy Officer
Rachel Weaver	Resource Efficiency Coordinator

For further information, please contact:

Frankston City Council
Environment Department
PO Box 490
Frankston, Victoria 3199
Phone: 9784 1747
environment@frankston.vic.gov.au

Copyright © Frankston City Council 2011

This document is subject to copyright and shall not be reproduced without the approval of Frankston City Council, except that material may be copied for non-commercial purposes without permission from the publisher. This document remains the property of Frankston City Council and it may only be used for the purpose intended for this project.

Disclaimer

While the author, publishers and others responsible for this publication have taken all appropriate care to ensure the accuracy of its contents, no liability is accepted for any loss or damage arising from or incurred as a result on any reliance on the information provided in this publication.

Contents

Acknowledgements.....	2
Contents.....	3
Executive Summary	4
1. Background.....	8
1.1 Climate Change Predictions and Modelling of Impacts	8
1.2 Strategic Framework	9
1.3 Why is a Climate Change Impacts and Adaptation Plan needed?.....	12
1.4 What is already being done in relation to Adaptation?	13
2. Impacts and risks of climate change	16
2.0 Impacts of Climate Change.....	16
2.1 Limitation of data	19
2.2 New information on sea level rise – Future Coasts Program.....	19
2.3 Risks	19
2.4 Case studies of existing adaptation actions.....	21
3. Implications for Council.....	23
3.0 Broad functions and potential impacts of climate change on areas of responsibility	23
4. Implications for Community.....	27
4.0 Community Vision	27
4.1 Communicating Climate Change.....	27
4.2 Who is at risk?	27
4.3 Impacts of Climate Change on Community Wellbeing.....	28
4.4 Engagement with the community	29
4.5 Level of preparedness	32
5. Adaptation Plan	33
6. Community Consultation Plan	42
7. Appendices.....	48



Executive Summary

Background

Climate change has potential to adversely affect our environment, community and economy. Even if global greenhouse gas emissions were to be sharply curbed, the scientific consensus is that the impacts of climate change will still be felt.

Research conducted with CSIRO show that Frankston City is significantly exposed to climate extremes and natural hazards such as storm surges and coastal inundation, floods, bushfires and extreme temperatures. As a result of climate change these hazards are projected to increase in frequency and severity.

Frankston City Council, as part of the Western Port Greenhouse Alliance (now South East Councils Climate Change Alliance Incorporated: SECCCA), contributed to the development of the following two reports: *Impacts of Climate Change on Settlements in the Western Port Region: People Property and Places* and *Climate Change Risks and Adaptation*. Following the public release of the reports, Council established an internal Climate Change Taskforce to guide the development of a *Climate Change Impacts and Adaptation Plan*.

This Plan aims to provide a framework and guide to:

1. Facilitate action by Council in its operations and services to prepare for the impacts of climate change.
2. Provide information and assistance to the community to reduce their vulnerability and facilitate an adaptive response to climate change impacts.

Risk Assessment

In the development of the *Climate Change Risks and Adaptation Report* a risk assessment was conducted to identify risks posed or exacerbated by climate change. Risks were assessed over three time frames current to 2015; mid term to 2030 and long term to 2070. These risks were revised internally and assessed against any existing controls or measures in place to determine how climate ready Council is.

From the risk assessment, fifty risks were identified - twenty seven relating to Council and twenty two relating to the community or other agencies. Major risks were identified for drainage and infrastructure, parks and leisure, planning, community safety and aged services.

Adaptation Planning

Adaptation planning with relevant Departments aimed to address priority risks to Council and consider potential gaps. The implications of climate change for specific Departments were assessed through internal consultation, presentations to the Taskforce and a literature review. Some actions that addressed climate change risks are already underway such as the recycled water scheme, changeover to warm season grasses in sporting grounds and completing a Heat Wave Action Plan for Aged Services direct care workers.

Projected Climate Change Impacts for Frankston City

Climate variable	Indicative change	
	2030	2070
Temperature		
Average annual temperature	↑ 0.5-1.3°C	↑ 1-3.5°C
Days per yr > 30 °C (20 current)	↑ 3-6	↑ 6-25
Days per yr > 40 °C (0 current)	↑ 1 - 2	↑ 2 - 5
Average rainfall	2030	2070
Average annual	↓ 0-8 %	↓ 0-23 %
Catchment stream flows	↓ 25 %	↓ >50 %
Droughts	↑ frequency & severity	
Extreme rainfall	2030	2070
2 hour	↑ 15 %	↑ 37 %
12 hour	↑ 4 %	↑ 26 %
24 hour	↓ 2 %	↑ 24 %
72 hour	↓ 16 %	↑ 20 %
Maximum flood heights	↑	↑
Flood return intervals (ARI)	↓ flash ↔ riverine	↓ flash ↓ riverine
Sea level rise / storm surge	2030	2070
Sea level rise	↑ 0.17 m	↑ 0.49 m
Storm tide – max. height, 1:100 year ARI (current 1.16m)	1.37 m	1.80 m
Storm surge – change to 1:100 year ARI	↓ to 1:40 - 1:6	↓ to 1:20 - 1:1
Inundation area (1:100 year storm surge)	under review	under review
Fire weather	2030	2050
No. of very high and extreme forest fire risk days (~ 12 days current)	↑ 1 - 2	↑ 5 - 7
No. of very high and extreme grass fire risk days (~ 95 days current)	↑ 7 - 15	↑ 9 - 30

Source: Impacts of Climate Change on Settlements in the Western Port Region – People, Property and Places, June 2008. Available online: www.seccca.org.au



Next Steps

To effectively prepare for a changed climate, recommended next steps coming out of the Adaptation Action Plan are listed under the seven key themes, (See Part 5 for full details).

1. Safeguarding community health and safety

Heatwave Planning - especially essential services for aged residents

Shade from the sun - incorporating refuges from extreme weather in building design

Keeping insects at bay - surveying insect populations, minimising breeding sites and developing alert systems

Promoting safer food production and storage for local business

Preparing for fire weather

Continue supporting community gardens and the Frankston Food Access Network

2. Managing our assets

Working with Melbourne Water to upgrade and remediate major drains

Monitoring, maintaining and upgrading our drainage system

Incorporating Ecological Sustainable Design in new building planning and design

3. Protecting our natural environment

Improving the quality and connectivity of our natural ecosystems

Protecting coastal vegetation and dunes

Cooperating with Melbourne Water for a healthy Seaford Wetlands

Extending bio-linkages within the Municipality

4. Keep on playing

Continue changing over sports grounds to warm season grasses

Investigating more alternative water sources for watering sports grounds

Implement irrigation audit recommendations to reduce pressure on grounds

Managing ground hardness and wetness

5. Using our water responsibly

Integrating water sensitive urban design into new developments

Developing an Integrated Water Management Plan for the City

Continue investigating possibilities for more alternative water sources

6. Planning for our future

Use the Planning Scheme to guide appropriate urban expansion encouraging open space and on-site water retention.

Working with the State Government to explore future coastal risks

Encouraging Water Sensitive Urban Design in new development

7. Ensuring Corporate continuity

Supporting Frankston City's local economy

Ensuring climate change impacts are considered in Council's strategies and risk register

Community Consultation

The impacts of climate change are already occurring. These will affect every individual, but we are in it together - Council and community. There are three key stages of community consultation briefly outlined below.

Stage 1.) Pre-Consultation Outcomes

Stage 1 has been completed. The Climate Change Community Workshop Evaluation Report summarises the outcomes of the workshop held on May 14th 2010 at Mahogany Neighbourhood Centre in Frankston North. It also includes the results to a series of climate change-related questions which helped form Part 4 of this Plan.

Stage 2.) Community consultation

A series of targeted community consultation activities were held to gain feedback on the Plan:

- Promotion on Council's website
- Article in Frankston City News
- Creative Conversation on Climate Change in February 2011 (70 participants);
- Copies of the draft Plan available from Council's Customer Service Centres and Libraries (over 50 copies distributed)
- Advertisements in both Local Newspapers
- Visual display cabinet at Frankston Library with copies of the draft Plan and information about climate change made available
- Environmental Sustainability Survey - questions pertaining to climate change (1,112 respondents)
- Presentations were given to and feedback sought from Council Committees and Networks
- Feedback was sought from: Environmental Friends Groups and Community Groups
- 35 residents expressed interest in being involved in the development of the Plan
- 1,500 residents on the Environment Department's Community Database
- 40 relevant agencies and organisations
- 6 Community Centres / Neighbourhood Houses
- Frankston Business Chamber and 2,300 local businesses
- Conversation with Community Kitchen members at Mahogany Neighbourhood Centre, and
- Internal staff awareness raising and invitations to provide input.

Stage 3.) Community Education

Further community education will take place following the adoption of the *Climate Change Impacts and Adaptation Plan*. These activities are detailed in the Consultation Plan and aim to develop further educational resources on the impacts of climate change and build community resilience in the long-term.



1. Background

Climate change has potential to adversely affect our environment, community and economy. All levels of government have responded in some way to the threat, but much more work is yet to be done. Part 1 of this Plan introduces climate change, Council's strategic direction and action taken to date - outlining the need to start planning for climate change.

1.1 Climate Change Predictions and Modelling of Impacts

The growing scientific consensus is that climate change is largely the result of emissions of carbon dioxide and other greenhouse gases from human activities including industrial processes, agriculture, fossil fuel combustion, and changes in land use, such as deforestation. Unless decisive action is taken, projections of future warming suggest a global increase of 1.1°C to 6.4°C by 2100 compared to 1980-1999 temperatures (Intergovernmental Panel on Climate Change (IPCC)). In addition to warming, increases in sea level and changes in rainfall, including more frequent floods and droughts, are likely. These changes, over time, are referred to broadly as "climate change".

Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.

IPCC Fourth Assessment Report (2007)

Amongst other things, the IPCC Fourth Assessment, 2007 finds:

- Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.
- A global assessment of data obtained since 1970 has shown that it is likely that anthropogenic warming has had a discernable influence on many physical and biological systems.
- Continued emission of greenhouse gases at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century.
- Anthropogenic warming and sea-level rise would continue for centuries owing to the time scales associated with climate processes and feedbacks, even if greenhouse gas concentrations were to be stabilised.

Given these findings, the IPCC (4) concluded that:

Adaptation will be necessary to address impacts resulting from the warming which is already unavoidable due to past emissions.

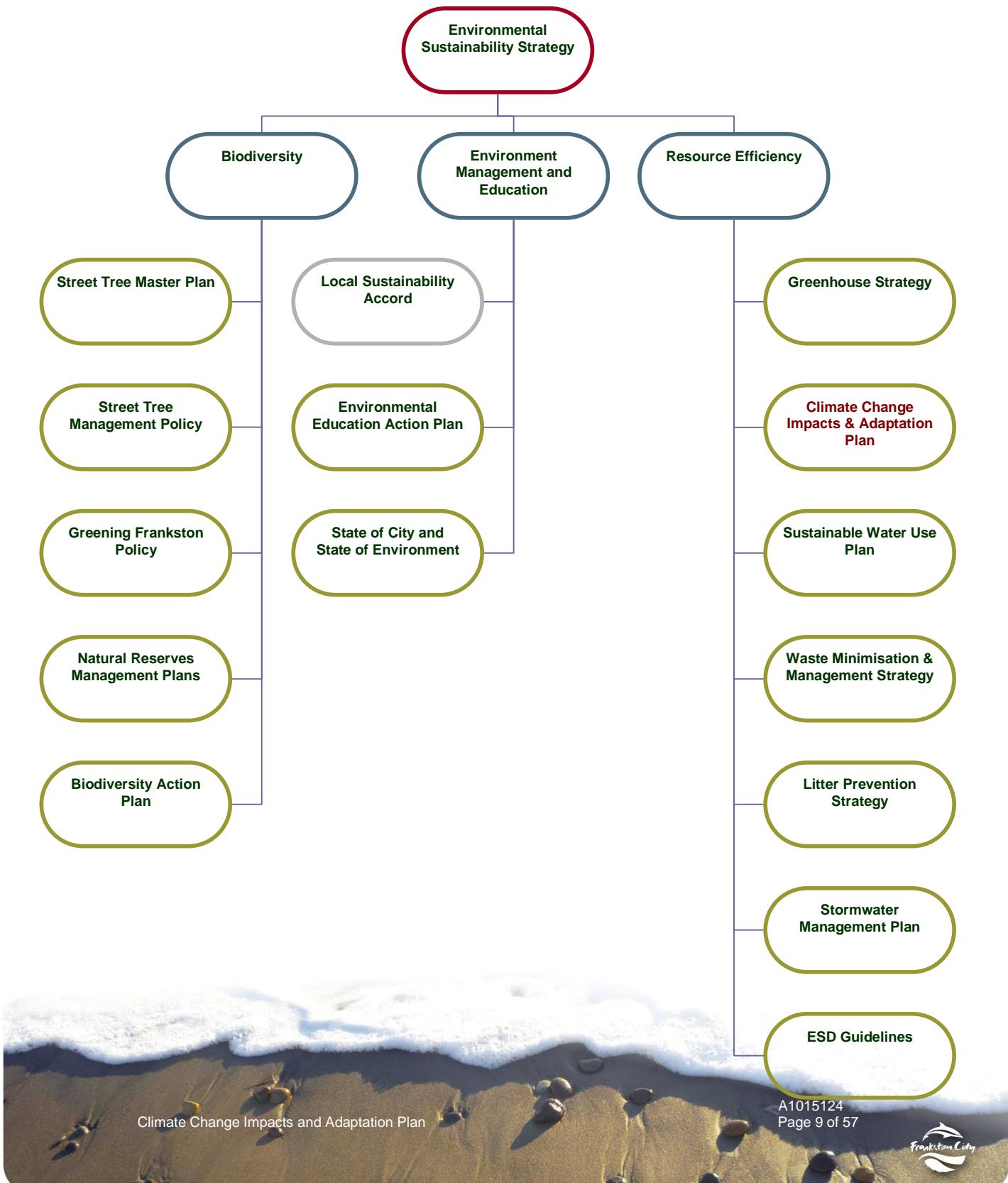
It also stated that:

A wide array of adaptation options is available, but more extensive adaptation than is currently occurring is required to reduce vulnerability to future climate change.

It is an expectation that revisions to climate change modelling by the IPCC and other scientific bodies will further confirm the trends and show accelerated time lines required for action. The recent State of the Climate Report released by CSIRO and the Bureau of Meteorology in March 2010 reiterates the climate change trends being observed and their implications for the future.

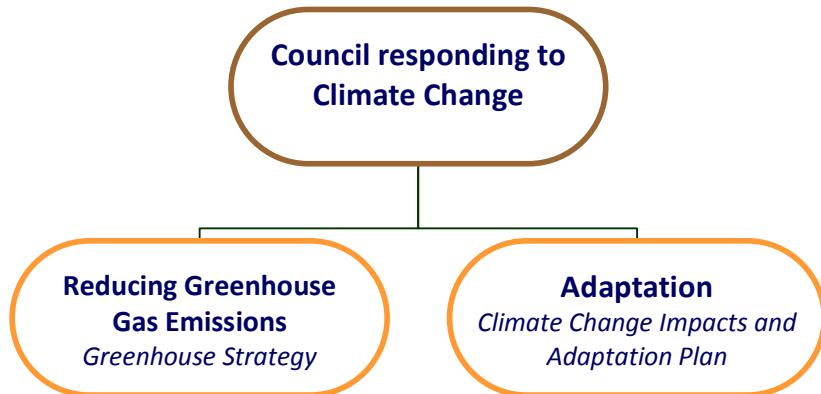
1.2 Strategic Framework

This Climate Change Impacts and Adaptation Plan comes under Council's Frankston 2025 Vision, Council Plan, Municipal Strategic Statement and Environmental Sustainability Policy, which states policy directive for Council to demonstrate leadership and achieve best practice in Environmental Sustainability.



Strategic direction on Climate Change

Frankston City Council is addressing climate change in two ways:



Reducing Greenhouse Gas Emissions

Frankston City Council is committed to reducing its greenhouse gas emissions, saving energy and transitioning to sustainable energy sources. Frankston City's Greenhouse Strategy was prepared in 1999 to address local government's role in creating and sustaining local solutions to greenhouse problems. The Greenhouse Strategy provides a strategic approach to greenhouse gas reduction and focuses on both community and corporate (Council) measures. Whilst Frankston City's Greenhouse Strategy will be reviewed in 2010/2011 as a Carbon Neutral Action Plan, Council continues to implement a range of greenhouse and energy saving strategies.

These include:

- Improving the energy efficiency of Council buildings, street lighting and equipment
- Installing renewable energy options including solar hot water heaters and solar electricity panels (photovoltaics) on several buildings
- Converting 6 cylinder to 4 cylinder vehicles and purchasing LPG and Hybrid vehicles
- Flaring methane from a cell of the McClelland Road former tip
- Reducing corporate waste to landfill and increasing recycling
- Offsetting emissions by planting trees
- Offsetting electricity consumption with GreenPower purchases
- Increasing recycling and sustainable procurement through the ECO-Buy program
- Educating staff and encouraging positive environmental behavioural change (such as Council's Green Team)
- Providing advice, education and support for community greenhouse programs
- Working regionally with other local governments through the South East Councils Climate Change Alliance (SECCA)
- Development of a Carbon Neutral Action Plan



Adapting to Climate Change

Frankston City Council is one of eight member councils of the South East Councils Climate Change Alliance Incorporated (SECCCA), formerly Western Port Greenhouse Alliance, researching the impacts and responding to climate change. In 2008, SECCCA completed the Impacts of Climate Change on Settlements in the Western Port Region project. This project, in which Frankston City Council was a participant, recommended that a process of assessing impacts and risks is vital to the success of local government climate change adaptation programs.

In response to the *People, Places and Property*¹ document; Council has moved towards developing and implementing strategies to minimise and respond to the impacts of climate change, including:

- Establishment of a Climate Change Taskforce with an aim to guide the development of a *Climate Change Impacts and Adaptation Plan* for Frankston City. The Taskforce meets monthly and comprises of internal staff representatives from a broad cross section of Council.
- As a component of research undertaken for the report: *Impacts of Climate Change on Settlements in the Western Port Region: Climate Change Risks and Adaptation*²; Council conducted a Risk Assessment Workshop in 2008. The risk register that developed out of this workshop was reviewed at internal workshops with the Climate Change Taskforce.
- Council's Drought Response Plan and Recycled Water Scheme are adaptation actions.
- Under a SECCCA project: *Protecting the Western Port Community from the Impacts of Climate Change*, a Climate Change Communications Plan was developed to guide consultation actions.
- A Climate Change Community Workshop was held in May 2010 to gauge community concerns and priorities for the development of this Plan.
- A 'Creative Conversation on Climate Change' forum was held in February 2011 to share concerns and ideas on how community members can prepare for a changed climate.

¹ Marsden Jacob Associates, Net Balance Foundation, Broadleaf Capital International, CSIRO (2008). Impacts of Climate Change on Settlements in the Western Port Region: People, Property and Places. June 2008.

² Marsden Jacob Associates, Net Balance Foundation, Broadleaf Capital International, CSIRO (2008). Impacts of Climate Change on Settlements in the Western Port Region: Climate Change Risks and Adaptation. October 2008.

1.3 Why is a Climate Change Impacts and Adaptation Plan needed?

Every aspect of community life and local government function that is impacted by weather could potentially be affected by climate change. Many changes are already being felt across Australia with scientific consensus warning of increasing temperatures, sea level rise, changing rainfall patterns and more frequent and extreme weather events. Due to the lag time in the climatic system, even with severe reductions in greenhouse gas emissions, climate change impacts will be felt.

Adaptation is preparing for the unavoidable impacts of climate change. This means undertaking actions in response to actual or projected impacts of climate change which leads to a reduction in the risks or realisation of potential benefits. Evidence shows acting sooner rather than later will pose fewer challenges and be more cost effective.³

While climate change impacts will be felt regionally, nationally and globally, Frankston City has its own climate-related vulnerabilities and priorities to be addressed.

This Plan aims to provide a framework and guide to:

- **Facilitate action by Council in its operations and services to prepare for the impacts of climate change.**
- **Provide information and assistance to the community to reduce their vulnerability and facilitate an adaptive response to climate change impacts.**

Some of the potential impacts of climate change are now routinely considered in Council planning and operational decisions. Reviewing, refining or augmenting Council strategies and plans may be the best approach to move towards adaptation, identifying larger and longer term needs and integrating these into long term planning and risk management.

Adaptation to climate change should be built into normal planning and risk management activities of both Council and the community. This Plan will address Council's core operations and services and set out a framework that can be translated into an agreed program of action. Reviewed and updated in line with the Council Plan; this Plan ensures that Council has a commitment in place to regularly reassess risks and adaptation actions over time. Key themes relating climate change impacts and functions across Council are identified below:

Key Themes

- Safeguard community health and safety
- Manage our assets
- Planning for our future
- Protect our natural environment
- Keep on playing
- Using our water responsibly
- Ensuring corporate continuity

³ Source: Federal Government (2007) Climate Change Adaptation Actions for Local Government. Available online: www.climatechange.gov.au/en/what-you-can-do/community/local-government.aspx

1.4 What is already being done in relation to Adaptation?

All three levels of government in Australia have an important role to play. Collaboration across levels of government and between different agencies is essential to a successful response to climate change.

1.4.1 Federal Government

The Federal Government has sought to address climate change through a number of planning policy initiatives.

Major risk assessments are being prepared in vulnerable areas such as biodiversity, infrastructure and human settlements. This includes a *National Coastal Risk Assessment* to investigate the impacts of storm surges and sea level rise on coastal communities. *Water for our Future* focuses upon four national priorities: taking action on climate change, using water wisely, securing our water supplies, and supporting healthy rivers and wetlands. *Farming for our Future* is an initiative for primary producers to mitigate their emissions and adapt to climate change; and *Caring for our Coasts* is helping coastal communities prepare for the changes climate change will bring.

The Federal Department of Climate Change and the Victorian State Government Department of Sustainability and Environment (DSE) provided funding to SECCA to complete the People, Places and Property Report. Research from this report has formed part of the Federal Government's '*Climate Change Risks to Australia's Coast - A first pass national assessment*'.

Sea level rise visualisation tools and maps have been developed by the Federal Government to identify potential risk areas. With the release of these tools, Council will play a role in responding to community concerns about the impacts of sea level rise.

1.4.2 State Government

The Victorian State Government has undertaken a number of initiatives to develop and implement Victoria's adaptation responses to climate change⁴. The Council of Australian Governments (COAG) requested the development of a National Adaptation Framework as part of its Plan of Collaborative Action on Climate Change, published in April 2007. It outlines the Framework for collaboration between the Commonwealth government and State governments.

At the 2006 state election, the Victorian Government gave a commitment to introduce a Climate Change Bill to ensure that actions taken on climate change are backed by legislation and protected under Victorian law.

Relevant Policy and program initiatives include:

⁴ More information on the Victorian Government climate change actions is available online: www.climatechange.vic.gov.au/index.html

- The White Paper on Land and Biodiversity – which will improve the resilience of our ecosystems through better management of crown and private land.
- Future Farming Strategy – meeting the challenges and opportunities of the future by improving productivity, competitiveness and sustainability of farm businesses.
- Victorian Coastal Strategy – guiding how government will address climate change along the coast.
- Future Coasts program – assessing the physical vulnerability of Victoria's coast to climate change.
- Climate Communities – promote voluntary action through grants on climate change on a community level.
- Victorian Local Sustainability Accord and the Solar Hubs Program.

The role of the State Government is policy development for Victoria, implementation and program delivery of actions coming from the Climate Change White Paper; especially in helping communities adapt to the unavoidable impacts of climate change.

This also includes providing support for major infrastructure and funding project development.

The Victorian Government has released a Climate Change White Paper (July 2010) which outlines ten new actions to reduce our emissions; capitalise on new jobs, new technologies and new markets; and adapt to a changing climate. Submissions to the Green Paper fed into the State Government's White Paper with a final position that includes new investment, policies and actions on climate change.

To investigate how land use planning and development controls can best support the management of coastal impacts of climate

change, a Coastal Climate Change Advisory Committee was charged with the development of an Issues and Options Paper in February 2010. Frankston City Council with community input provided a submission to the Committee to feed into the final recommendations for the Minister for Planning.

1.4.3 Local Government

Local government associations such as the International Council for Local Environmental Initiatives 'Cities for Climate Protection' program, the Municipal Association of Victoria and the Victorian Local Government Association are working collaboratively with collections of councils on aspects of climate change.

Six key local government functions and responsibilities which will be impacted by climate change have been identified in the Federal Government's report on *Climate Change Adaptation Actions for Local Government*. These include: property and infrastructure services, provision of recreational facilities, support of health and community services, planning and development approvals, natural resource management and water and sewerage services. These local functions of councils will all be affected by climate change in some way and will require adaptation planning.

To facilitate action on a regional level, cooperative local government alliances⁵ have formed to focus on greenhouse and adaptation action. SECCCA is an example of such an alliance.

⁵ Victorian Regional Greenhouse Alliances include Central Victoria Greenhouse Alliance, North East Greenhouse Alliance, South West Sustainability Partnership, South East Councils Climate Change Alliance Incorporated (SECCCA) (formerly Western Port Greenhouse Alliance) and Western Alliance for Greenhouse Action. New partnerships are forming in other parts of metropolitan Melbourne, Geelong region, and Goulburn region.

Case Study: Wellington Shire Council – Sea level rise in the Honeysuckles

Wellington Shire Council has mandated the preparation of a Climate Change (Sea Level Rise) Management Response Plan for planning permits for new dwellings in the Honeysuckles.

This requires the applicant/land owner development to commit to managing the risks of climate change and sea level rise including safety and risk to life, damage to property and services, pollution and access.

Source: www.wellington.vic.gov.au

1.4.4 Service Providers

Local adaptation to the impacts of climate change is the responsibility of a range of decision-making authorities. The involvement of a wide range of agencies and other organisations is likely to be critical in assessing and implementing responses. Relevant stakeholders include national and state government departments and agencies, utilities, other regional agencies and adjoining local councils⁶.

Key Partners include:	Federal State SECCA SECCA council members Friends Groups Country Fire Authority (CFA) State Emergency Service (SES) Coast Guard Melbourne Water South East Water Red Cross	Environment Protection Agency Peninsula Health Network Brotherhood of St Laurence Eastern Treatment Plant Melbourne Water Vic Roads Transurban Victoria Police Emergency Services Metropolitan Ambulance and Fire Services
-----------------------	--	---

1.4.5. Emergency Services

The roles and relationships with emergency services in times of a natural disaster that may or may not be related to climate change are governed by Frankston City Council's Municipal Emergency Management Plan⁷ (MEMP). The MEMP addresses how to prevent, respond to and recover from, emergencies within the municipality and uses an all hazards approach.

The plan is developed by the Municipal Emergency Management Planning Committee (MEMPC) comprising representatives from Council, Victoria Police, CFA, SES, Red Cross, Coastguard, DHS and other support and relief agencies. It maps out how, as a community, we can cope with hazards and emergencies. The plan recognises the inevitability of economic and social effects of emergencies including loss of life, destruction of property and dislocation of individuals and communities.

Frankston City Council has responsibility for management of municipal resources and the co-ordination of community support to counter the effects of an emergency.

⁶ WPGA, 2008

⁷ The Municipal Emergency Management Plan is available online:
www.frankston.vic.gov.au/About_Frankston_City/Municipal_Emergency_Management_Plan/index.aspx

2. Impacts and risks of climate change

In the last decade, there has been a noticeable increase in the intensity and frequency of extreme weather events both locally and abroad. Devastating bushfires, severe heatwaves, storms and floods and the continuation of drought have all been experienced. These events have impacts on infrastructure, economies, environments, health systems and emergency services. Even more importantly, these events affect individuals and groups within our community.

This part of the Plan provides information on the projected impacts and risks specific to Frankston City. There are five key impacts predicted to affect Frankston City and its communities which Council wants to consider in its planning and decision making, listed below.

2.0 Impacts of Climate Change

- ↑ Sea level rise/ storm surge
- ↑ Intense rainfall and inland flooding
- ↑ Fire weather conditions
- ↑ Changes to average and extreme temperatures
- ↓ Changes to average rainfall

A more detailed overview of the climate change impacts on Frankston City are included in the table in Appendix 1.

Sea level rise/ Storm Surge

Frankston City is bounded by Port Phillip Bay in the west with approximately 10km of coastline. Inundation from sea-level rise, particularly in conjunction with extreme tide and storm events⁸, is a risk for a significant portion of coastal land areas. Storm surges that were seen in July 2008 and April 2009 that battered Frankston and Seaford foreshores are examples of these events in recent history.

Frankston City has an estimated number of 1,500 to 3,100 existing residential buildings at risk of inundation from a sea level rise of 1.1 metres and 1-in-100 year storm tide⁹.

Frankston waterfront and Seaford foreshore are highly valued by the community and attract many visitors every year. Storm surge and sea level rise pose a threat to the beaches increasing the possibility of erosion. Ensuring that natural vegetation and dune systems are protected and enhanced will provide a natural sea defense along the coastline.

Different types of coastal frontage may be more or less vulnerable to inundation and erosion than others. For example, those beaches such as Seaford with primary and secondary sand dunes still intact have buffers for storms, but those without are

⁸ The WPGA, 2008 report uses sea-level rise scenarios of up to 0.17 metres for 2030 and up to 0.49 metres for 2070, which were combined with wind speed change scenarios to calculate 1-in-100 year storm surge height. This is likely to be an underestimate as climate change science findings suggest a sea-level rise of a metre or more out to 2100 is plausible.

⁹ According to the Federal Government's Climate Change Risks to Australia's Coast available online: www.climatechange.gov.au/publications/coastline/climate-change-risks-to-australias-coasts.aspx

vulnerable to inland recession of beaches allowing storm surge to reach further inland.

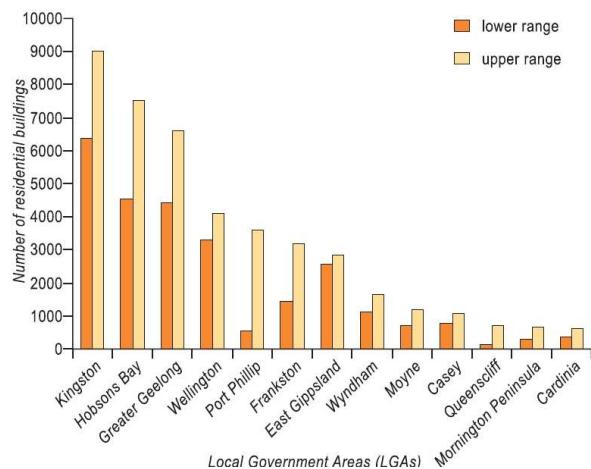


Figure 1: Estimated number of existing residential buildings in Victoria at risk of inundation from sea level rise of 1.1 metres and 1-in-100 year storm tide with lower range (0.4m mean sea level rise) and upper range (1.2m mean sea level rise). Source: 'Climate Change Risks to Australia's Coast - A first pass national assessment'. www.climatechange.gov.au/publications/coastline/climate-change-risks-to-australias-coasts.aspx

Intense Rainfall and Inland Flooding

Extreme rainfall events in Frankston City are projected to increase, with extreme rainfall over a two hour period increasing by 15% by 2030 and increasing by 37% in 2070¹⁰. Frankston City is vulnerable due to the creek systems, which form such an important part of taking stormwater to the Bay.

Infrastructure in Frankston City at risk from flooding includes an estimated 148 kilometres (km) of road, 8km of rail, 26 bridges and a large number of residential properties. Water, sewer and drainage infrastructure in Frankston City is subject to flooding with a total of 98.5km of drainage pipes, 99.3km of water infrastructure, 10 sewer pump stations and 2,221 pits located in exposed areas. Further study is required to make allowance for localised low points, blind depression areas and vulnerable valley floors.

With predictions of heavy rainfall over short periods of time, hard surfaces such as roads and buildings can increase urban flooding and runoff. Stormwater management infrastructure need to be updated to protect low lying areas. Outlets into Kananook Creek need to be upgraded as existing drainage may not cope with future sea level rise and intense rainfall.

Fire Weather Conditions

Climate change is likely to increase the frequency and severity of bushfires in Australia with climate and fire weather projections indicating that fire risk in bushfire prone areas of the Western Port region is likely to increase in the future.

¹⁰ Source for data is the CSIRO, Marsden Jacobs WPGA, 2008 *People, Property and Places* unless otherwise stated.

Frankston City has approximately 35.5 square kilometres of bushfire prone lands. A large proportion of housing stock (84%) in Frankston City was constructed prior to the implementation of current national guidelines for Building in Bushfire-Prone Areas.

Council currently under its Fire Management Plan and Municipal Emergency Management Plan undertakes annual fire inspections on risk properties and vacant lands. Actions coming from the Fire Management Plan, individual Reserve Management Plans and designated Wildfire Management Overlays in the Planning Scheme help to reduce the risk.

Changes to Average and Extreme temperatures

Rising average temperatures and more frequent extreme temperature days have the potential to contribute to a variety of impacts including heat-related illness and mortality. Sixteen people, largely elderly, were admitted to Frankston Hospital and six to Rosebud Hospital from heat-related stresses during the heatwave of February 2009, which saw three successive days of temperatures above 43 degrees Celsius for the first time in recorded history¹¹. In Frankston City, average annual temperatures are projected to increase by 0.5 to 1.3 °C by 2030 and between 1 to 3.5 °C by 2070¹². Dependent on global action on reducing greenhouse gas emissions, there are projections of temperature rise of 4.5 degrees Celsius to 6 degrees Celsius by 2100.

A large proportion of housing stock (73%) in Frankston City was constructed prior to the implementation of any national energy efficient insulation standard¹³. With rising temperatures, managing comfort levels and energy use in residential, retail and industrial buildings is essential to reduce heat-related illness, mortality and energy poverty.

Present increases in summer peak energy demand are nearing capacity on many parts of the electricity grid. Without effective demand management strategies the growing demand could necessitate further augmentation of capacity of both generation and local distribution networks. 'Smart Meters' or real time electricity pricing that will be introduced in the coming years may benefit or disadvantage local households, for example, by helping householders manage their energy use, but possibly time of use tariffs resulting in increasing energy bills.

Extreme temperatures can contribute to the degradation of asphalt, jointed concrete roads and road foundations. Frankston City has a total length of 1,089.7km of roads and with a significant proportion of Council budgets currently devoted to road construction and maintenance (5 to 13%), marginal increases in degradation and maintenance costs could have significant financial implications.

Changes to Average Rainfall

While we have experienced heavy rainfall in the last twelve months, the average rainfall in the Western Port region is projected to decline by up to 8% in 2030 and

¹¹ Minister for Climate Change and Energy Efficiency Mr Greg Combet: www.climatechange.gov.au

¹² Source for data is the CSIRO, Marsden Jacobs WPGA, 2008 *People, Property and Places* unless otherwise stated.

¹³ Frankston City has 23% of its housing stock built between 1992-2004 where standards mandated new homes built to be insulated and only 4% built post 2004 with the Nationwide House Energy Rating Scheme (NatHERS) 5 Star rating.

23% by 2070. Drought frequency and intensity is projected to increase. Dependent on the supply and demand scenarios for Greater Melbourne, the possible continuation of a drying trend may affect drinking water availability and quality leading to potential water shortages.

A drying trend across the Western Port region is likely to have a number of impacts on waterways and wetlands health, both food and ornamental (exotic and indigenous) gardens, sporting fields, streetscapes and infrastructure.

2.1 Limitation of data

Scientific research into climate change impacts is evolving, which means that data quality and availability frequently change. This Plan uses the research conducted by SECCCA and CSIRO as a basis for Frankston City specific data. This is and will continue to be complemented by advances in knowledge from State and Federal agencies such as DSE's Future Coasts¹⁴ program and the CSIRO and Bureau of Meteorology's State of the Climate Report¹⁵. It is expected revisions to climate change modelling will further confirm the trends and show accelerated timelines required for action - sooner rather than later. The risk that scientific projections are conservative and do not accurately account for concurrent weather events could result in unforeseen consequences.

2.2 New information on sea level rise – Future Coasts Program

High resolution digital elevation modelling of the coast, under the Future Coasts program, would enable broad scale quantitative assessment of the potential impacts of sea level rise and identification of appropriate response strategies.

2.3 Risks

An Impact and Adaptation risk identification and assessment process was conducted by Frankston City Council in October 2008 to determine what risks and hazards may arise over time. The risk assessment methodology is included in Appendix 2. This was revised by the Climate Change Taskforce in February 2010 with new risks identified. The risks that are the direct responsibility of Council have formed the basis of the adaptation plan.

2.3.1 Risk Assessment Priorities

Fifty risks have been identified considering six climate change impacts (coastal inundation, inland flooding, bushfire, air temperature, water and concurrent trends). Below is a table of the high and extreme risks that have been identified for the short (2015), medium (2030) and long (2070)¹⁶, for full risk assessment see appendix 4.

Impact	Risk #	Risk	2015	2030	2070
Coastal inundation	1.02	Flooding Kananook Creek	Medium	High	Extreme

¹⁴ Information on the Future Coasts program is available online: www.climatechange.vic.gov.au

¹⁵ State of the Climate Report is available online: www.csiro.au/resources/State-of-the-Climate.html

¹⁶ Broadleaf Capital and Marsden Jacob Associates (2008). Frankston City Council Risk Assessment Workshop Report.

Impact	Risk #	Risk	2015	2030	2070
	2.01	Sub catchments inundation – Seaford and Frankston	High	High	Extreme
Inland Flooding	2.07	Flood prone areas left uncontrolled from responsibilities insufficiently delineated	High	Extreme	Extreme
	2.06	Drainage system overwhelmed	Medium	High	Extreme
	3.03	More frequent fires	High	High	Extreme
Air temperature	4.17	Reduced water availability	High	High	High
	4.05	Degradation of sports fields	High	High	High
	4.01	Increased visitation during warm weather	Medium	High	High
	4.03	Increased anti social behaviour	Medium	High	High
	4.11	Loss of biodiversity	Medium	High	High
	4.14	Difficulty establishing new vegetation	Medium	High	High
	4.18	Declining attendance at public events	Medium	High	High
	4.04	Health risk to community	Low	High	Extreme
	5.01	Degradation of Seaford Wetlands	Medium	High	High
	5.02	Water table falling	Medium	High	High
	5.03	Decreased stream flows	Medium	High	High

Table 1: Impacts and risks scaled over three time frames, Frankston City

Over time the seriousness of the risk can rise in significance as the impacts of climate change are felt more strongly. The most serious areas of emergent risk are health risks from higher ambient temperatures, coastal inundation and inland flooding especially in relation to Kananook Creek, the Eastern Treatment Plant and storm water drainage systems; as well as increasing costs of water associated with changes to average rainfall.

2.3.2 Re-scaling of risks

Risks must be reassessed for appropriateness over time as trends in how future climate change will affect the incidence and severity of disasters are poorly understood. These risks will be rescaled when the plan is reviewed in 2013.

2.4 Case studies of existing adaptation actions

Actions to address the impacts of climate change such as drought proofing sporting grounds have already been undertaken by Frankston City Council, however, not under the umbrella of 'climate change' adaptation. Key projects are detailed below; whether these are sufficient to control the risk has been assessed in Part 5.

Recycled water flows to Frankston City



Council provides and maintains high quality recreation and sporting reserves for its community. Due to extreme droughts, Council proposed extending the recycled water pipeline from the South Eastern Outfall to bring much needed recycled water to three of Council's sporting reserves; thereby reducing demand for drinking water supplies and enabling sport activities to continue during the drought.

Now known as the Ballam Recycled Water Scheme, the project increases the supply of Class C recycled water

through an additional water supply system to Ballam Park, Jubilee Park and Lloyd Park.

The Scheme will provide greater security of water supply to 12 sporting ovals within regional and district level reserves, benefiting 20 major sporting clubs as well as approximately 150,000 recreational users from the broader south east Melbourne region.

Community Gardens – Groundswell and Pines Patch



A partnership between Council and a local community group started the Groundswell Community Garden in 2006 as part of a food security program. Located in Frankston next to a preschool, playgroup and scout hall, it prides itself on building fences, plot edges and garden furniture using recycled materials.

Pines Patch Community Garden started in late 2003, and is located in Frankston North beside a community centre. It maintains a library of tools so

that new members do not need to purchase their own set. This demonstrates the benefits of sharing to reduce resource consumption.

Both community gardens have installed water tanks to be self-sufficient with water supply.



Changing Grasses – Drought Response Plan



Under Council's Drought Response Plan many initiatives have been implemented to ensure that sporting grounds and open space within the City survive drought conditions. This includes changing from cool to warm season grasses on 23 sports grounds and 9 holes at the golf course; and 18 other grounds have a percentage changed. Audits on irrigation systems have investigated the effectiveness of current systems and possibility of subsurface irrigation. Incorporating water-absorption products into ground reconstructions and applying aeration techniques have also helped relieve some pressure on the grounds.

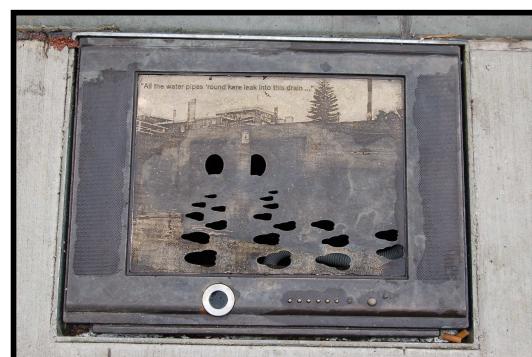
Beat the Heat – Aged Services

Summer in Australia is hot, and Frankston City is no exception. Each year we experience heatwaves. Council's Aged Services Department has put in place a Departmental Heatwave Plan to minimise the risks of impacts of climate events on the client population, workforce and operations. Phone interviews have already taken place to further understand what clients know about extreme temperatures and whether they know what to do, who to call and how they can respond when heatwaves are on.



Water Sensitive Urban Design

Council has incorporated Water Sensitive Urban Design principles into the landscape and urban design practices in some parts of Frankston City. A good example is the Beach Street East shopping centre which also has an arts component to integrate the infrastructure improvement works and to deliver an educational/ informational message in a playful and intriguing way.



3. Implications for Council

Frankston City Council provides a wide range of services and infrastructure to some 123,000 residents, which is expected to grow to over 154,000 residents by 2026. Council is responsible for the effective management of over \$800 million of infrastructure assets across an area of 131 square kilometres, from Seaford Wetlands in the north, to Mt Eliza in the south and the Western Port Highway in the east. The western boundary of the City is made up of about 10 kilometres of coastline along Port Phillip Bay. The city has close to 600 pieces of open space that vary in size, function and ownership.

Local government has responsibilities across a wide range of areas that can influence climate change adaptation and the health and wellbeing of communities. This Part of the Plan identifies those risks particular to Council functions and Department responsibilities. Identifying these implications can help inform appropriate adaptation planning and for consideration in budgetary planning. The Adaptation Action Plan (Part 5 of the Plan) addresses key risks relating to these areas of functions and responsibilities.

3.0 Broad functions and potential impacts of climate change on areas of responsibility

Seven key local government functions and responsibilities for the development of climate change adaptation actions¹⁷ have been identified:

3.0.1) Safeguarding our community's health and safety

Council plays a key role in delivering services to the community which span social support, public health activities and promotion, environmental health and management responses to emergencies.

- Pressure on **Aged Services** is likely to increase with an aging population and increased incidence of heat stress. Direct care workers providing services to this vulnerable group are also likely to be impacted during heatwave episodes.
- **Community Facilities** such as libraries and swimming pools are likely to be in increased demand as they potentially could be used as refuges.
- **Family and youth services** are likely to be affected in the long term by climate-change related diseases increasing demand for maternal and child health, immunisation requirements and impacts to child care
- **Environmental Health services** are likely to be in more demand as there is a potential increase in geographical range and seasonality of vector-borne diseases and the possibility for an expansion of receptive zones. Higher temperatures are likely to increase the incidence of food and water-borne diseases as well as heat exposure.



¹⁷ Australian Government, Department of Environment and Water Resources: *Climate Change Adaptations for Local Government*, 2007.

- **Community safety and compliance** services are likely to be impacted from increased levels of anti-social behaviour as temperatures rise and more people seek refuge from the heat in public areas. Community perceptions of safety levels are likely to be influenced by extended fire danger periods.
- **Emergency/bushfire management** is likely to be impacted from increased emergency response and recovery operations and increased pressure to remove vegetation from public lands. Higher work demand and occupational health and safety risks for Rangers are also likely. As well as increased emergency and recovery operations that diverts staff and resources.

3.0.2) Managing our assets

Council is responsible for the effective management of over \$800 million of assets; climate change can have significant implications for infrastructure and asset life as well as ramifications for the community such as:

- **Road/pavement construction and maintenance** can be impacted by rainfall, inundation, changes in average temperature.
- **Drainage** is a serious issue to consider with the future projections of sea level rise and more intense storm events. The drainage system relies on outfall into Kananook Creek so changes could place increased pressure on the pipes causing back-up and potential inundation of low-lying areas.
- **Buildings** can be impacted with higher rates of building deterioration and associated costs for maintenance, heating and cooling.
- **Coastal infrastructure** can be impacted with increased tourism and use of public amenities by people heading to Frankston or Seaford Beach to 'beat the heat'. There would be increased costs associated with operation and maintenance costs of public amenities/recreational sites due to storm damage and inundation; and costs associated with community safety initiatives around coastal infrastructure.
- Demand for **Waste collection services** can be impacted from hot weather with increased complaints of odour and considerations of disease, pest and cost implications. Increased demand for disposal of green waste from fire management on properties is also likely.



3.0.3) Protecting our natural environment

All natural systems are vulnerable to the impacts of climate change; Council manages over 55 natural reserves and approximately 450 parks. Climate change impacts are likely to place additional stress on remaining wildlife and habitat.



Climate Change Impacts and Adaptation Plan



- **Coastal management** is likely to be impacted from sea level rise and coastal erosion with potential loss of beach width and public space in coastal areas.
- **Biodiversity** is likely to be influenced from shifts in distribution of plant and animal species as well as increased risk of species extinction from reduced resilience to stress.

3.0.4) Keep on playing

Council is responsible for the construction, management and maintenance of council-owned community and recreational facilities including parks, sporting grounds and stadiums, public golf courses, swimming pools, sport centres and community centres. These all can be impacted in some way by climate change including:

- The **provision and use of recreational facilities** can be impacted from reduced water for irrigation of sports grounds and open space potentially causing the closure of ovals and swimming pools. As well as the risk of increased health risks and changes in demand for recreational facilities.
- The **maintenance of recreational facilities** is likely to increase as demand and population does.

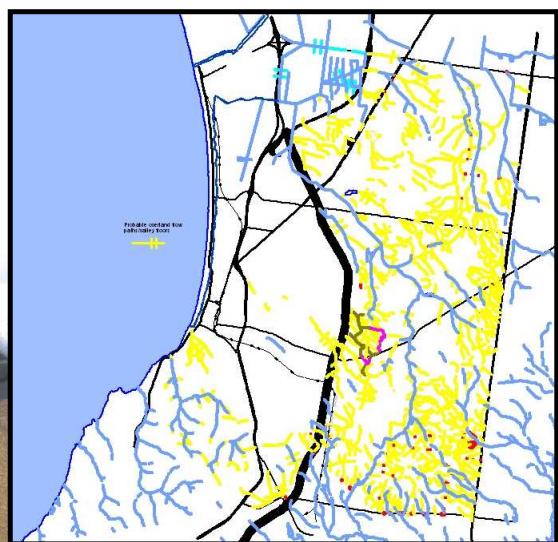
3.0.5) Using our water responsibly

- **Water supply** essential for Council functions is likely to decrease in availability from changes to average rainfall. Changes in intensity are likely to increase potential for water contamination, blockages and other complications to the drainage system. Council is part of the development of the Integrated Water Management Strategy for the South East Region of Melbourne; as well as developing an Integrated Water Management Plan specifically for Frankston City.
- **Urban Planning and Design** will increasingly need to integrate Water Sensitive Urban Design (WSUD) into new developments to protect natural systems and reduce runoff and peak flows.



3.0.6) Planning for our future

While local government decision making with regards to planning and development is steered by State Government policy and legislation; local government prepare a range of legally binding statutory planning instruments such as the Planning Scheme, codes and regulations. This provides an opportunity for Council to incorporate actions that may act as a mechanism for local climate change adaptation.

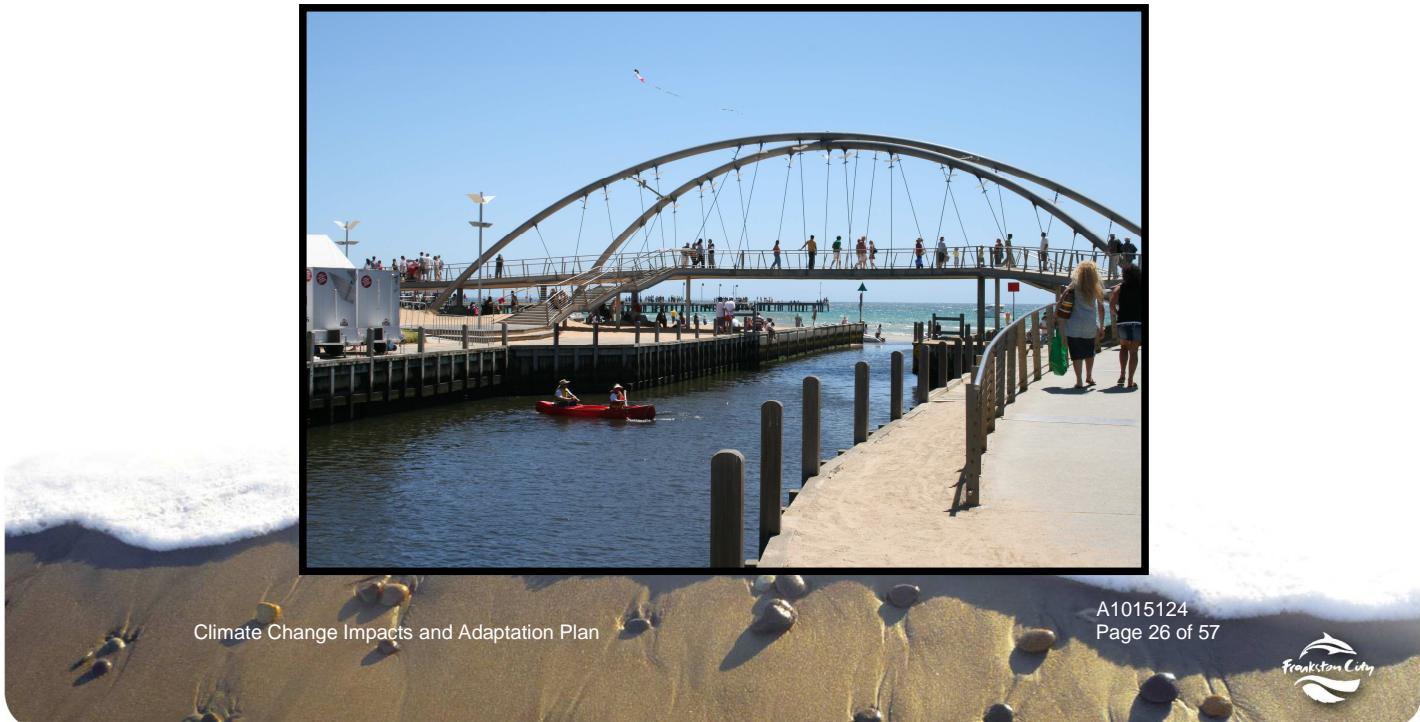


- **Planning and development** will be impacted from changes to Planning Overlays with potential introductions of coastal hazard overlays from the risk of sea level rise. Increasing pressure for more sustainable building design may result in mandating ecological sustainable design and higher building standards.
- **Strategic planning** will be affected by the distribution of climate change impacts across the Municipality, possibly resulting in urban expansion in some areas inappropriate.

3.0.7) Ensuring Corporate continuity

Climate change is likely to have unforeseen impacts on Council's Policies, Plans and Strategies with a range of risks to be considered in risk management and business continuity.

- **Greater demand for Council services** will be required to help respond and recover from emergency events.
- **Economic Development** in Frankston City is likely to be influenced by manufacturing costs; but potential opportunities arise from being a coastal city.
- **Marketing and tourism** is likely to be impacted positively and negatively with unknown impacts from higher average temperatures and tourism levels.
- **Community Events and outdoor activities** organised to increase community connectedness are likely to be impacted from changes to the climate and increased frequency of extreme weather events.
- **Business continuity and risk management** is likely to be impacted by rising costs of insurance policies and increased need for proactive risk management.
- **Information Services** may have increased demand to provide IT support services such as Geographical Information Systems (GIS) and mobile computing applications to locate vulnerable areas such as drains and septic tanks.



4. Implications for Community

Local government is well placed to address local climate change impacts and to build community capacity to respond and adapt to climate change. In combination with broader State and Federal Government education campaigns, Council has a key role in facilitating local climate change initiatives, customising responses to suit local circumstances and engaging communities in discussion about the potential local impacts of climate change. In Part 4 attention is given to setting communication directions; understanding who is at risk and why; and determining what levels of preparedness is required to reduce the extent of vulnerability.

4.0 Community Vision

Frankston City Council has a commitment to the Frankston 2025 Community Vision with strategic objectives relevant to this Plan:

Strategic Objective 2: Connected Community in a Proud and Safe City

- Key Strategy 2.1 “Work with communities to enable their strength, safety, liveability and resilience”;

Strategic Objective 5: Clean and Green for our Future

- Key Strategy 5.1 “Provide community education and encourage participation in environmental programs to increase the uptake of environmentally sustainable practices.”

Council's Municipal Public Health and Wellbeing Plan 2009 - 2013 is a statutory plan focusing on the four environments for health: the *Natural*, the *Built*, the *Economic* and the *Social*. The development of community resilience in the face of social, economic or environmental changes which may impact on health and wellbeing is therefore explicit in the Plan. As climate change will have direct and indirect impacts upon community wellbeing and social equity; the Health and Wellbeing Plan, which is reviewed annually with significant community engagement, will play an important strategic role in addressing specific issues as they arise.

Communicating Climate Change

Communicating climate change to the community can be difficult with shifting debates and complex science. Part 4 of this Plan in combination with the Consultation Action Plan in Part 5 will be guided by the following aims:

- set the direction for communicating climate change to the community
- identify target groups within the community which may be particularly vulnerable to the impacts of climate change
- guide and prioritise communications and engagements that can assist the community to effectively prepare and respond to the impacts of climate change.

4.1 Who is at risk?

Identifying vulnerability to climate change considers how susceptible people and communities are to the adverse impacts of climate change. The following table

identifies examples of types of communities that could potentially be amongst the most vulnerable to climate change:

General Frankston City Community	The Frankston City Community includes all residents, ratepayers, landowners and members of the general public including individuals, groups, visitors, organisations, government and business.
Vulnerable Groups	<ul style="list-style-type: none"> • People living on low income (19.5% from ABS, 2006) • Residents with a disability and mental health issues. • Elderly residents (over the age of 65) • Infants, children (less than 5 years of age) and lactating women. • Indigenous communities • Single parents and unemployed people • Newly arrived migrants and refugees • People requiring frequent medical services
Frankston City Communities by specific locations	<ul style="list-style-type: none"> • Residents and businesses in coastal and low lying areas • Near the coast • Along Kananook Creek • Surrounding Seaford Wetlands • Areas susceptible to flooding • Central Activity District • Areas with a wildfire management overlay

How equipped communities are to respond depends upon indicators of community vulnerability/resilience to climate-related impacts such as: food security, access to arable land and water, social capital, disposable income levels, health, age, gender, exposure to violence, crime rates, education levels, access to health, social and emergency service rates and types of volunteerism¹⁸.

4.2 Impacts of Climate Change on Community Wellbeing

Some of the possible impacts from the 'Liveable and Just' Toolkit are summarised below, a full detailed table is included in Appendix 3.

- Physical health: heat, extreme weather, air pollution, allergies, vector-borne diseases, water-borne diseases
- Mental health: direct mental health impacts, impacts on key determinants of mental health, emotional distress
- Access to food, water, housing, energy and transport
- Employment and financial security
- Access to health, community and emergency services
- Social cohesion, cultural identity and community participation
- High oil vulnerability (see box)

Frankston City has an extremely high Oil Vulnerability Index score of 21, compared to Melbourne with a score of 4; which is calculated using the *Oil Vulnerability Index*, derived from a combination of three variables: average taxable income, fuel use and the percentage of non-automobile weekly travel. This shows a clear pattern in the distribution of vulnerability with an increase with distance from the CBD. This vulnerability will be compacted with high population growth projected for outer suburbs such as Frankston.

Source: Institute for Sensible Transport, 2009.

¹⁸ The Liveable and Just project is an initiative of the Victorian Local Governance Association in partnership with the Brotherhood of St Laurence and the Department of Sustainability and Environment and prepared by the McCaughey Centre. The Toolkit is available online: www.vlga.org.au/Resources/Liveable_Just_Toolkit.aspx

4.3 Engagement with the community

As part of Council's pre-consultation on climate change, a workshop was held in May, 2010. The results¹⁹ of this workshop clearly showed that there was concern for rising sea levels, increased fire prevalence and changes to temperature, rainfall and storm intensity. Community members voiced serious concerns for the loss of biodiversity, potential impacts of flooding and inundation, a need for appropriate land-use planning and the cost of adaptation. Broader issues of retaining the quality of life for humans and flora and fauna as well as ensuring generational equity were also raised.



4.3.1 Community Awareness

Community participants clearly demonstrated their concern for climate change impacts as **96%** of participants thought rainfall and drought would affect them; **85%** of participants thought storms and floods would affect them; **70%** thought fire risk weather would affect them; **92%** of participants thought extreme weather would affect them and **69%** of participants thought rising sea levels would affect them.

"I am concerned about the future liveability of this area".

Workshop participant

4.3.2 Role of the Individual and Community

Adaptation to climate change means that on an **individual** level we will all have to find different ways to do things. Participants outlined some ideas on how they as individuals could effectively prepare and respond to climate change. These actions predominantly related to education and information provision with participants specifying ways to inform themselves and their neighbours on the risk of climate change and emergency response procedures.

"I am learning about climate change but also its impact on our own community - it's very close to home".

Workshop participant

Advocacy also rated higher with participants identifying stronger needs for community groups and networks to advocate for stronger response and consistency by Government. Also emphasised was ways to make 'climate friendly homes', how to encourage sustainable transport choices, support renewable energy and increase consumer awareness.

4.3.3 Role of the Government

Government has a key role to play to support communities in building strengths, skills and strategies to deal with climate change. Participants suggested ways that Government on all levels could act to prepare for climate change. These included incentives for energy efficiency such as rebates, encouraging efficient use of resources such as rainwater tanks in natural reserves and building retrofits. Guidance on 'future proof' land use planning and ESD building design were also emphasised along with hard infrastructure options of sea walls and covered walk-ways. Integration of policies related to health, population levels, sustainable transport and food security were also identified as important directions to take.

"A real concern of mine is to see governments taking steps to deal with the consequences of climate change".

Workshop participant

¹⁹ Climate Change Community Workshop Evaluation (Obbie ref.: A825795).

Key Messages

Generic key messages that have been developed to assist the community to prepare and respond to the impacts of climate change are presented in the table below. These messages will be reinforced to the general Frankston City community in all communication and engagement activities through Council.

Key messages about climate change
<ul style="list-style-type: none">○ The impacts of climate change are already occurring. These will affect every individual, but we are in it together - Council and community.
<ul style="list-style-type: none">○ Frankston City will experience the impacts of climate change with the increase in the frequency and severity of extreme weather events; this includes long-term changes to average and extreme temperatures, changes to average rainfall, sea level rise and storm surge, intense rainfall and inland flooding as well as increased risk from fire weather conditions.
<ul style="list-style-type: none">○ Managing the risk of climate change has two components: Firstly we can reduce the amount of greenhouse gases we put into the atmosphere. And secondly, we can adapt to the change in climate that has occurred and the changes to the climate into the future. <p>Adaptation is modifying the way we behave and do things, in order to be more appropriate for the future climate.</p>
<ul style="list-style-type: none">○ The Frankston community will need to prepare and respond to the impacts of climate change together.
Key messages for Council's role in dealing with climate change
<ul style="list-style-type: none">○ Frankston City Council is working with State and Federal governments and the community to assist with the preparation and response to the impacts of climate change.
<ul style="list-style-type: none">○ By understanding the impacts of climate change, Council can help to provide advice and information for community members to be proactive in adapting to the impacts of climate change.
<ul style="list-style-type: none">○ Frankston City Council is working with the South East Councils Climate Change Alliance (SECCCA), State and Federal Governments and other Agencies to remain up-to-date with the latest climate science research, trends and policy directions.
Key messages for community's role in dealing with climate change
<ul style="list-style-type: none">○ We all can do our bit as individuals to alleviate the impacts of climate changes in our homes and workplaces. Together we need to foster an attitude of looking out for each other and not being afraid to ask for help.
<ul style="list-style-type: none">○ If community members are unable to prepare and respond to the impacts of climate change, a network of family, friends and neighbours should be in place to assist when required.
<ul style="list-style-type: none">○ Community members should be aware of any family, friends or neighbours that are unable to prepare and respond to the impacts of climate change and render assistance when required.



Communication Channels

There is a number of existing communication channels that can be built on and new areas of engagement have been identified to achieve effective communication of climate change to communities within Frankston City.

General principles for communicating with target groups:

- Use simple and appropriate language and provide clear information
- Create practical incentives for actions
- Use existing networks and trusted sources of information or service provision
- Acknowledge and understand the context and profiles of different communities

Existing community communication and engagement methods	Potential new or emerging areas of community engagement/support
<ul style="list-style-type: none">• Website• Frankston City News• Council newsletters• Local newspapers• SECCCA programs• Economic development services• Customer service• Telephone on-hold message• Newsletters• Direct mail outs• Statutory notices and advertisements• Planning notices and requests for submissions/objections• Focus groups, forums and community workshops• Annual survey• Public Meetings• Input from Advisory Committees or Reference Groups• Community Grants• Public exhibition• Festivals and events• Contact with Councillors and Ward Meetings• Council Meetings• Council Staff• Environment Department Services• Environmental Teachers Network• Schools	<ul style="list-style-type: none">• Community Gardens• Composting/Worm Farming Workshops• Men's Sheds• Transition Town movements• Community-based social marketing programs for behaviour change• Community Development's Local Area Plans• Council's Environmental Education Actions• Build partnership with Brotherhood of St Lawrence, utilising their teleconference link-ups to their clients• Neighbourhood Houses and Community Centres• Children Centres• Urban reforestation: productive tree plantings• Local community investment mechanisms• Environmental Film Screening• Recycled fashion shows and swap-meets• Home chicken husbandry• Share-hood communities• Radio segment• Eco-living demonstration centres• Rebates and incentive programs• Climate Communities Grant program• Frankston Vegie Growers Network²⁰• Interest groups coming from Local Area Planning Workshops

Current Barriers

A preliminary assessment identified a number of possible barriers to effectively communicating climate change messages and for the community to effectively

²⁰ <http://vegiegrowersnetwork.wordpress.com>

receive and respond to the messages. Further research will need to be undertaken and these learnings feed back into new communication measures.

- **Lack of access to credible and reliable information** and knowledge about climate change trends and issues on a local level.
- **Mixed messages** in the public domain and internal to Frankston City Council about the existence and importance of climate change impacts.
- **Concern on Government inaction** with politics, decision making and lack of communication between the three tiers of Government
- **Difficulties in communicating complex science** and future climate modelling with challenges distinguishing between short-term climate variability and longer-term climate change.
- **Disempowerment** from the belief that it is too late to influence the trajectory of climate change.
- **Inability for community to access enabling factors to support lifestyle change** due to cost, time restraints, confusion, convenience, viability or structural systems.

4.4 Level of Preparedness

Council is strategically working for a connected *community in a proud and safe city: working with communities to enable their strength, safety, liveability and resilience*. With the increasing pressures of climate change, these outcomes need to be realised. We need to raise awareness around climate change and support a community led process to build resilience and community preparedness.

Networks need to be established and/or strengthened between local government and community in addressing climate change to champion key messages. Engagement with groups that look at all the key areas of life such as food, energy, transport, health, local economy, sustainable livelihoods is also very important. Characteristics of a resilient community include building a strong and diverse local economy; extending social capital and increasing communications and community connectedness. A change to a green job economy is projected to increase jobs in the South East region by 13%, which means 15,860 extra jobs²¹. Broad social networks need to be strengthened with a strong sense of community pride and optimism for a shared vision for the future.

We are in it together; already steps have been made to build community resilience-community gardens, food access networks, Community Kitchens and enormous support for local area planning and strong Environmental Friends Groups- the groundwork is there to build on. Preparing and responding to climate change may also bring enormous opportunity to build community, shared resources and networks to connect.

Food Security

Local research showed food insecurity to be a problem for a significant proportion of the community, due to cost, transport limitations and distance to fresh produce outlets. Only 12.6% of respondents were able to access fresh fruit and vegetables within 500m of their home (a standard measure of satisfactory access). The proportion of people who reported going without food within the previous six months due to lack of money was 12.3% (compared with the Victorian average of 6%), while lack of transport was cited by 7.2% of respondents as the cause (Doyle & Keleher, 2006). The potential for reduced potable water supply stemming from climate change, combined with increased water demand due to population growth and other trends, has significant social and economic implications for Frankston City residents.

²¹ Australian Conservation Foundation, 2010. Clean Energy Jobs. Available online: www.acfonline.org.au/default.asp?section_id=267

5. Adaptation Plan

This section includes the action plan to identify appropriate adaptation actions to respond to the remaining risks identified. Actions in this Adaptation Plan have been determined through rescaling the climate change risk assessment (Appendix 4) by investigating what controls are in place to mitigate the risk and determining their adequacy²². Risks that had inadequate or no controls in place were then evaluated and appropriate actions included in the Adaptation Plan. Those risks that were low or had adequate controls in place will be monitored and reassessed over time.

How to use this Adaptation Plan

Adaptation Actions are listed under seven key themes and are linked to specific risks. They are prioritised under three categories: high, medium or low relating to the level of risk and controls in place to manage the risk. As planning for climate change is long term, the associated time frame is included as either 2015 (short-term); 2030 (mid-term) or 2070 (long-term). The action is then listed with a responsible division/department/service unit with any key internal and/or external stakeholders listed. The budget estimations have been divided into three categories: minor (less than \$20,000), moderate (between \$20,000 and \$100,000) and significant (greater than \$100,000). These budget estimations only take into account the cost of the stated adaptation action not actions coming from those.

Key theme 1: Safeguarding our community's health and safety

Risks

- 4.04 Increased temperatures poses a health risk to the community
- 4.06 Increased temperatures can increase risks of insect infestation
- 2.10 Inland flooding may impact old landfill sites and septic tanks and cause contamination.

Priority	Time frame	Adaptation Action	Risk	Responsible Division > Department	Budget Estimation	Internal stakeholders	External stakeholders
High	2015	A1.0 Develop a Green Wedge Management Plan as per Council's Economic Development Strategy, Action 10, to identify and implement projects which assist our community and deliver fresh food security.	4.04	Economic Development	Minor		Frankston Environmental Friends Groups
Medium	2015	A1.1 Complete Extreme Heat Plan.	4.04	Development>Community	Significant	Assets>Physical	Victorian Department of

²² Assessment of key controls and their adequacy (Obbie ref.: A883605)

				Safety> Environmental Health		Services> Emergency Services Officer Organisational Development	Health
Medium	2015	A1.2 Ensure new Council developments have budget provisions for sufficient shade (natural or built) and embedded ESD design when developing new or retrofitting existing urban or recreational facilities and along the foreshore.	4.04	Development> Urban Strategy	Significant	Assets> Major Projects	Foreshore Advisory Committee
Medium	2015	A1.3 Develop alert systems for the possibility of vector-borne disease outbreaks to be developed with advice from State and Federal health agencies.	4.06	Development> Community Safety> Environmental Health	Minor	Corporate> Marketing	Melbourne Water Environmental Protection Authority
Medium	2030	A1.4 Engage in public health education activities for safer food production and storage processes for local business and communities, such as food handling guides and investigate funding opportunities for resources to run interactive public health workshops.	4.06	Development> Community Safety> Environmental Health	Minor	Corporate> Marketing	EPA Victorian Department of Health
Medium	2015	A1.5 Oversee heat risk of clients in Home and Community Care (HACC) service area with provision of more case management and communication services.	4.04	Communities> Aged Services	Medium		Victorian Department of Health
Medium	2030	A1.6 Integrate emergency management into relevant staff work plans to allow for time and resources to respond to and recover from an emergency event.	4.04	Managers where applicable			
Low	2030	A1.7 Monitor landfill sites over time for risk of inland flooding.	2.10	Assets> Physical Services	Minor	Corporate> Information Services (IS)	Environmental Protection Authority
Low	2030	A1.8 Monitor residential septic tanks for risk of inland flooding in low lying areas over time.	2.10	Environmental Health	Minor	IS	EPA

Key theme 2: Managing our Assets

Risks

- 1.02** Coastal inundation can increase the risk of the flooding of Kananook Creek.
- 1.03** Coastal inundation can increase the risk of flooding of the Central Activity District (CAD).
- 2.06** Inland flooding can increase the risk of overwhelming the drainage system.
- 2.07** Inland flooding from flood prone areas left uncontrolled from responsibilities insufficiently delineated.
- 2.08** Inland Flooding can increase the risk of property being affected by flooding.
- 5.04** Changes in average rainfall can increase the risk of blockage and damage to the drainage system.
- 4.07** Changes in average rainfall and temperature can increase the risk of complaints regarding increased airborne dust.

Priority	Time frame	Action	Risk	Responsible Division > Department	Budget Estimation	Internal stakeholders	External stakeholders
High	2015	A2.0 To reduce the risk of property being affected by flooding undertake localised hydrological and flood modelling studies of the Municipality, implement the recommendations, which may include investigating the building of additional retarding basins to reduce flood events in flood prone areas. On completion, reassess the risks.	1.02	Assets> Infrastructure	Significant	Development> Planning	Melbourne Water Department of Planning and Community Development (DPCD)
High	2015	A2.1 Complete the Seaford Pilot Drainage Study and implement the recommendations to reduce the risk of flooding of Kananook Creek.	1.02	Assets> Infrastructure	Significant		Melbourne Water
High	2015	A2.2 Advocate to Melbourne Water to continue implementing long-term plans and remediation actions on the drainage system to reduce the risk of the drainage system being overwhelmed.	1.02	Assets> Infrastructure	Minor	Councillors	Melbourne Water
High	2030	A2.3 Review strategies to protect low lying areas from sea level rise such as retrofitting existing or developing new retarding basins.	2.06	Assets> Infrastructure	Significant	Development> Planning	Melbourne Water
High	2015	A2.4 Ensure that the drainage system is well maintained and vulnerable spots and easements regularly inspected to reduce the risk of inland flooding.	2.06	Assets> Physical Services	Medium	Assets> Infrastructure	Melbourne Water

High	2015	A2.5 Develop urban drainage management plans that optimise active storage capacity to alleviate flood peaks.	2.06	Assets> Infrastructure	Medium		Melbourne Water
High	2015	A2.6 Link urban based drainage system to catchment based flood management to reduce the risk of inland flooding.	2.06	Assets> Infrastructure	Significant		
High	2015	A2.7 Finalise 60 Hectare (ha.) negotiations with Melbourne Water for delineation of drainage responsibilities. This gives Council responsibility for drains with outfall grades sized smaller than 60 ha, Melbourne Water will take responsibility for outfall grades sized greater than 60 ha.	2.07	Assets> Infrastructure	Minor		Melbourne Water
High	2015	A2.8 Develop a current and historic database of properties with on-site water retention systems.	2.08	Assets> Infrastructure	Minor	Corporate> Information Services	
High	2015	A2.9 Increase community and body corporate awareness of responsibility for maintaining on-site water retention systems.	2.08	Assets> Infrastructure	Minor	Corporate> Marketing	
High	2015	A2.10 Encourage the minimisation of hard surfaces and retention of open space in new development.	2.08	Development> Planning	Minor	Assets> Infrastructure	
High	2015	A2.11 Advocate to Melbourne Water and the State Government for the removal of silt from Kananook Creek to improve drainage, as per Kananook Creek Corridor Management Plan.	1.02	Assets> Infrastructure	Minor	Councillors	
High	2015	A2.12 Investigate the design life and sea loading of the Frankston Bridge in relation to increased frequency of storm surges.	1.02	Assets> Infrastructure	Minor	Records	
Medium	2015	A2.13 Investigate the possibility of a third pass assessment with councils in the South East Councils Climate Change Alliance and the Association of Bayside Municipalities.	1.02 1.03	Development> Environment	Minor		ABM SECCA
Medium	2015	A2.14 Investigate the feasibility of decreasing the percentage of allowed hard surfaces to build into a Local Policy.	2.08	Development> Planning	Moderate	Assets> Infrastructure	
Medium	2015	A2.15 Develop education campaigns advocating for community members to undertake preventative practices prior to storm events such as clearing gutters and drains.	5.04	Assets> Infrastructure	Minor	Corporate> Marketing	
Low	2030	A2.16 Ensure emergency procedures and equipment are up-to-date and available to CAD business	1.03	Assets> Infrastructure	Minor	Business Development	MEMPC

Key theme 3: Protecting our natural environment

Risks:

- 1.04** Coastal inundation can cause a loss of beaches and foreshore reserves
- 3.02** Increased fire weather can increase the community perception of bushfire risk rising
- 4.11** Increased temperatures and concurrent trends will increase the risk of loss of biodiversity.
- 5.01** Changes to average rainfall can cause the degradation of Seaford Wetlands.

Priority	Timing	Action	Risk	Responsible Division > Department	Budget Estimation	Internal stakeholders	External stakeholders
High	2015	A3.0 Improve ecosystem resilience by maintaining and enhancing the quality of ecosystems by increasing connectivity between natural areas.	4.11	Development> Environment	Moderate	Natural Reserves	Parks Victoria
High	2015	A3.1 Protect foreshore vegetation and coastal dune systems in Frankston and Seaford to reduce the risk of coastal inundation. Where foreshore residences are adjacent to Crown Land, encourage the sharing of access across the sand dunes to prevent erosion issues that will be exacerbated by increased storm surges.	1.04	Assets> Parks and Leisure	Moderate	Development> Environment	Frankston City Environmental Friends Groups
High	2015	A3.2 Develop a Biodiversity Action Plan to identify measures for the monitoring of biodiversity and impacts of climate change on the natural environment.	4.11	Development> Environment	Minor	Assets> Parks and Leisure	
High	2015	A3.3 Investigate direct intervention in ecosystem transition with the inclusion of plant species that may be suited to changes in temperatures and rainfall.	4.11	Development> Environment	Minor	Assets> Parks and Leisure	
Medium	2015	A3.4 Conduct fire awareness sessions and educate the public on fire risk and property preparedness in association with the State Government and CFA.	3.02	Development> Community Safety	Minor	Marketing Natural Reserves	Municipal Fire Management Planning Committee
Medium	2070	A3.5 In collaboration with other stakeholders investigate the possibility of securing a water supply to wetlands.	5.01	Assets> Parks and Leisure	Minor	Development> Environment	Melbourne Water

Key theme 4: Keep on playing

Risks:

4.05 Changes to average rainfall and temperature will increase the risk of degradation to sports grounds.

4.06 Changes to average rainfall and temperature resulting in community dissatisfaction due to inability to use open space and reduced experiences.

Priority	Timing	Action	Risk	Responsible Division > Department	Budget Estimation	Internal stakeholders	External stakeholders
High	2015	A4.0 Implement Management Plan for other non-irrigated sports grounds to ensure ongoing availability for sport seasons in times of low rainfall and high temperatures.	4.05	Assets> Parks and Leisure Services	Moderate (\$24K/yr)		Clubs
High	2015	A4.1 Implement recommendations from irrigation audits to counter the impact from changes to average rainfall and temperature.	4.05	Assets> Parks and Leisure Services	Significant (\$388K)		Clubs
Medium	2015	A4.2 Continue to investigate opportunities to extend the Recycled Water Pipeline to Council properties and high-end community water users.	4.05	Assets> Infrastructure	Moderate		
Medium	2070	A4.3 Include climate change impacts in the revision of the Sports Development Plan to determine future adaptation requirements (such as more indoor facilities, diversity of sports to reduce reliance on irrigated ovals, risk procedures and heat contingency planning).	4.06	Assets> Parks and Leisure Services	Minor		
Medium	2015	A4.4 Continue to implement the Municipal Drought Response Plan to drought proof Council's reserves and open spaces.	4.05	Assets> Parks and Leisure Services	Significant (\$150K/yr)		Clubs

Key theme 5: Using our water responsibly

Risks:

4.17 Changes to average temperature and rainfall will reduce water availability.

Priority	Timing	Action	Risk	Responsible Division > Department	Budget Estimation	Internal stakeholders	External stakeholders
High	2015	A5.0 Include ESD Design measures, especially water sensitive design features in all Council facilities.	4.17	Assets> Major Projects Development> Urban Strategy	Significant	Development> Environment Assets> Infrastructure	
High	2015	A5.1 Develop an Integrated Water Management Plan that addresses climate change considerations and incorporates strategies for water sensitive design and development.	4.17	Development> Environment	Minor	Assets> Infrastructure and Physical Services Development> Urban Strategy and Planning	Melbourne Water South East Water
High	2015	A5.2 Implement stormwater harvesting for Council facilities and open space.	4.17	Development> Environment	Moderate	Assets> Infrastructure	
High	2015	A5.3 Investigate undertaking research with Monash University on the feasibility and safety of injection of Class A Recycled Water into the Aquifers.	4.17	Assets> Infrastructure			Melbourne Water South East Water
High	2015	A5.4 Progress the investigation of Monterey and Robinsons Road Recycled Water Pipeline with costings provided to Council and to seek funding contributions from State and Federal Government and from private benefactors of the scheme.	4.17	Assets> Infrastructure			Melbourne Water South East

							Water
Medium	2015	A5.5 In the installation of rainwater tanks investigate mandating a high storage capacity to cater for shorter more intense periods of rainfall.	4.17	Development>Environment	Moderate	Assets>Infrastructure	
Medium	2015	A5.6 Provide environmental education programs and investigate incentives to encourage community water conservation.	4.17	Development>Environment	Moderate		South East Water



Key theme 6: Planning for our future

Risks:

- 1.08 Exposure to legal liability for Council's function as the Planning Authority and issue of building permits
 7.01 Future climate change increases the risk that planning decisions made now prove to have been incorrect.

Priority	Timing	Action	Risk	Responsible Division > Department	Budget Estimation	Internal stakeholders	External stakeholders
High	2015	A6.0 Monitor developments in key projects such as the Future Coasts Program to inform future land use planning in vulnerable areas.	1.08	Development>Planning	Minor	Development>Environment	Department of Sustainability and Environment (DSE)
High	2015	A6.1 Continue to include Water Sensitive Urban Design in the plan making and development assessment stages of the planning process.	7.01	Assets>Infrastructure Development>Planning	Nil	Development>Environment	Home owners Melbourne Water Department of Planning and Community Development (DPCD) DSE
High	2015	A6.2 Council seek the Association of Bayside Municipalities request an urgent meeting with the Minister of Planning to advocate for protection of properties likely to be affected by sea level rise and to protect Councils from potential liability as a result of planning decisions on land that may be subject to inundation as a result of Climate Change.	1.08	Development>Planning	Nil	Development>Planning	DPCD
High	2015	A6.3 Following the release of the Victorian Coastal Climate Change Hazard Guidelines and results of the Victorian Government's Future Coast project, consider including relevant	1.08	Development>Planning	Minor		

		data in the future review of the Frankston City Council Municipal Strategic Statement.					
Medium	2015	A6.4 Promote Council's <i>ESD Design Guide for Buildings</i> to the community and encourage climate friendly building design in new developments.	7.01	Development>Planning Assets>Infrastructure	Moderate	Development>Environment	Land owners DPCD DSE Building Commission
Medium	2015	A6.5 Investigate whether additional controls for future management / building techniques for underground car parks are warranted	7.01	Development>Planning	Minor		DPCD
Medium	2015	A6.6 Investigate permit conditions to be applied in identified flood prone areas to reduce the risk of property damage.	1.08	Development>Planning	Minor		DPCD

Key theme 7: Ensuring Corporate Continuity

Risks:

- 4.02** Increased air temperature can increase occupational health and safety risks to outdoor staff.
- 6.02** Concurrent trends can increase the risks of shortage of personnel to deliver community services.
- 6.05** Peak Oil
- 7.01** From other impacts Council decisions made now may prove to be incorrect

Priority	Timing	Action	Risk	Responsible Division > Department	Budget Estimation	Internal stakeholders	External stakeholders
High	2015	7.0 General Managers will be responsible for the divisional delivery of the Adaptation Actions and for inclusion into their Manager's Performance Plans.	-	All	Minor		
High	2015	7.1 Continue to integrate climate change risks into Councils Corporate Risk Register Reassess risks and update the risk register on the impacts of climate change with the review of the Plan.	7.01	Corporate> Governance	Minor	Corporate> Organisational Development	
High	2015	7.2 Use priorities in this Plan to inform budget bids for climate change adaptation.	7.01	Climate Change Taskforce	Minor		
Medium	2015	7.3 Link climate change adaptation actions on Council's reporting system Interplan.	6.02	Corporate> Governance	Minor	Corporate> Organisational Development	
Medium	2015	7.4 Assess Council's current strategies and plans with consideration of climate change impacts.	6.02	Corporate> Governance	Minor		
Medium	2030	7.5 Maintain effective communication and consultation across Council to ensure Council is kept abreast with developments in climate science and local impacts.	7.01	Development> Environment	Minor	Corporate> Organisational Development	
Medium	2015	7.6 Increase regional collaboration and advocacy with the South East Councils Climate Change Alliance (SECCCA).		Development> Environment	Minor		

6. Community Consultation Plan

The Consultation Plan outlines the specific actions identified within each of the communication channels. It is important to note that this plan will continue to be updated as actions are rolled out and new information or techniques become available.

Action	Target Group/s	Communication Channels	Objectives	Timing	Lead Responsibility	Comments
Increasing awareness within Council						
Use CityNet to increase staff awareness of climate change impacts	Council staff	<input type="radio"/> Internal website	Increase awareness of climate change adaptation in Council.	Ongoing	Environment	
Invite a guest speaker to speak with staff on the impacts of climate change	Council staff	<input type="radio"/> Presentation	Increase awareness of climate change adaptation in Council.	TBD	Environment	
Researching Community Attitudes						
Community focus groups involving randomly selected individuals representing each of the suburbs in Frankston City. The focus group would use storytelling and shared experiences to determine community attitudes towards climate change adaptation including identification of the barriers and benefits.	<input type="radio"/> All groups (randomly selected)	<input type="radio"/> Phone calls to randomly select participants <input type="radio"/> Focus group facilitation <input type="radio"/> Follow-up phone calls	To determine: <ul style="list-style-type: none">• What residents already know about climate change?• What information do they require?• What are the barriers and benefits of adapting?	TBD	Environment	This approach could also be applied to business groups and community groups to gain a more representative sample.
Conduct a telephone survey of Home and Community Care Service (HACC) clients to determine level of knowledge on the symptoms and response to	<input type="radio"/> HACC clients	<input type="radio"/> Telephone	<input type="radio"/> To determine whether Aged who are HACC clients understand what the symptoms of heatwave and how	By June 2011	Aged Services	

Action		Target Group/s	Communication Channels	Objectives	Timing	Lead Responsibility	Comments
heatwave events				they should respond.			
1 Generic Climate Change Material							
1A	Develop generic climate change information for Frankston City Council.	<ul style="list-style-type: none"> <input type="radio"/> All groups 	<ul style="list-style-type: none"> <input type="radio"/> Frankston City Council website 	<ul style="list-style-type: none"> <input type="radio"/> Inform about what kinds of changes residents can expect from climate change and how they might be impacted in specific regions. 	By June 2011	Environment Marketing	This resource should contain information that is consistent with other Council's in the region.
1B	Develop an online resource (survival) kit for extreme weather events in Frankston City.	<ul style="list-style-type: none"> <input type="radio"/> All groups 	<ul style="list-style-type: none"> <input type="radio"/> Frankston City Council website 	<ul style="list-style-type: none"> <input type="radio"/> Inform about how residents can prepare, respond and recover from extreme weather events. 	Update when necessary	Community Development	This has been completed. Possible updating material over time.
1C	Identify and attend suitable Council events to attend and educate participants on the impacts of climate change.	<ul style="list-style-type: none"> <input type="radio"/> All groups 	<ul style="list-style-type: none"> <input type="radio"/> Forums <input type="radio"/> Events <input type="radio"/> Community Days 	<ul style="list-style-type: none"> <input type="radio"/> Inform of simple actions people can take to deal with heatwaves, bushfires, floods and storms. 	TBD	Environment, Community Development, Aged Care	This could be in combination with greenhouse gas mitigation activities.
1D	Build 'Future Stories' that are locally grounded and use local characters to support 'positive forward looking' about climate change	<ul style="list-style-type: none"> <input type="radio"/> All groups <input type="radio"/> Specific geographical locations 	<ul style="list-style-type: none"> <input type="radio"/> Local Area Planning forums 	To determine: What a desired future scenario would like and what changes are required from the present to get there	Dependent on Local Area Action Planning Pilot outcomes	Community Development Environment	
1E	Disseminate seasonal	<ul style="list-style-type: none"> <input type="radio"/> All groups 	<ul style="list-style-type: none"> <input type="radio"/> Customer 	Provide emergency	Ongoing	Community	

Action		Target Group/s	Communication Channels	Objectives	Timing	Lead Responsibility	Comments
	information in Frankston City News and in other communication material relating to potential emergency situations e.g. heat waves in summer and storms in autumn etc.		Service Centres	management information to guide community members to be prepared, respond and recover.		Development	
2	Increasing Temperature						
2A	Arrange training HACC staff to educate them on heatwave preparedness and response.	<ul style="list-style-type: none"> ○ HACC staff working with Elderly 	<ul style="list-style-type: none"> ○ Staff training ○ Performance review 	<ul style="list-style-type: none"> ○ To empower service based staff with the knowledge to help them help their clients deal with heatwaves and bushfire. 	2010/2011 and ongoing.	Aged Services	Guidelines and an Action Plan have been finalised.
2B	Implement actions from the Aged Services Heatwave Response Plan.	<ul style="list-style-type: none"> ○ Elderly ○ HACC staff working with Elderly 	<ul style="list-style-type: none"> ○ Email and phone reminders ○ Staff Meetings 	<ul style="list-style-type: none"> ○ To increase client and staff knowledge of self management during a heatwave ○ Ensure plant operations continue to work during a heatwave 	2010 ongoing	Aged Services	
2C	Distribute information to childcare, playgroups and schools about how to deal with heatwaves	<ul style="list-style-type: none"> ○ Children 	<ul style="list-style-type: none"> ○ State Government 'Heatwave' leaflet ○ Consultations 	<ul style="list-style-type: none"> ○ To ensure children are provided with adequate care during heatwaves 	TBD	Maternal and Child Health Services	
3	Flooding, Storms and Storm Surge						
3A	Make available Melbourne Water's 'Building in flood prone areas' on Council	<ul style="list-style-type: none"> ○ Community members in coastal and 	<ul style="list-style-type: none"> ○ Mapping ○ Letter notification 	<ul style="list-style-type: none"> ○ Inform community members of the risks and what they can 	2011	Melbourne Water	Drainage and Environment to liaise.

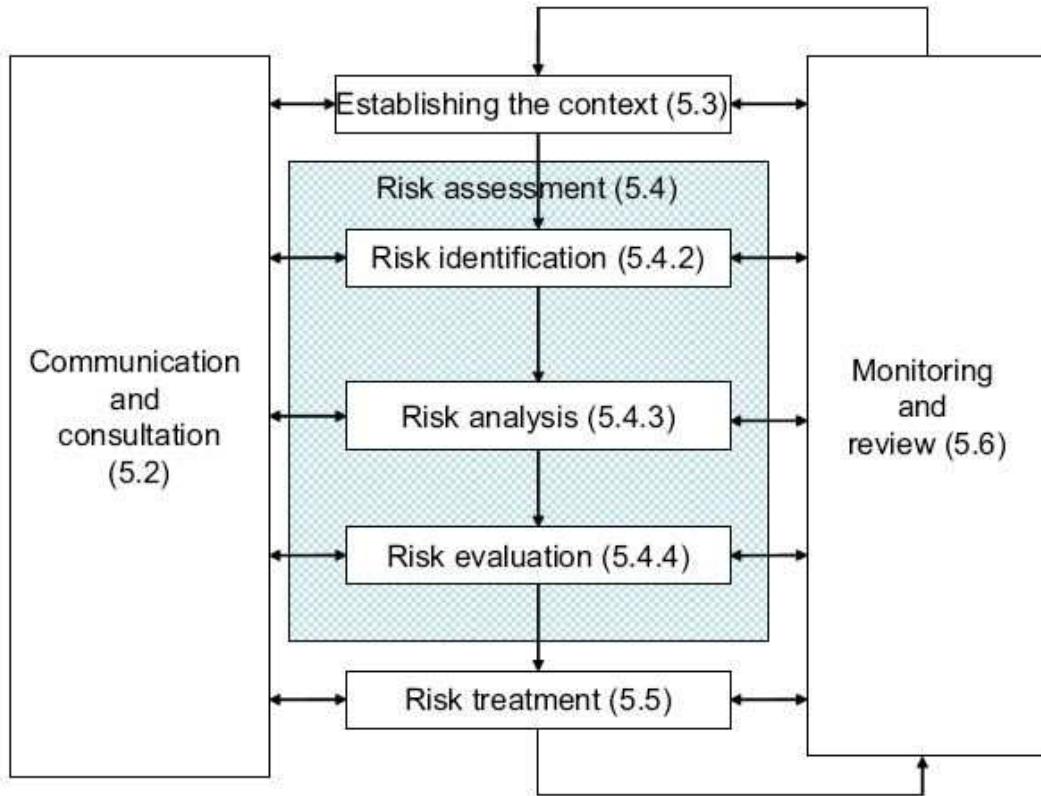
Action	Target Group/s	Communication Channels	Objectives	Timing	Lead Responsibility	Comments
	website.	low-lying areas	do to prepare, respond and recover from flooding and storm surge events.		Infrastructure	
3B	Work with business groups in Frankston City to determine an approach to educating businesses at risk of climate change impacts of how they can prepare and respond.	<ul style="list-style-type: none"> o Businesses 	<ul style="list-style-type: none"> o Seminars o Green business network <ul style="list-style-type: none"> o To develop an effective program to prepare businesses in Frankston City for climate change. 	2011/2012	Economic Development	This could be coupled with greenhouse mitigation activities.

Appendix 1 - Frankston City, Overview of Climate Change Impacts

Source: Impacts of Climate Change Settlements in the Western Port Region - People, Property and Places, Final Report June 2008 (A591911).

Climate variable	Indicative change*		Exposed people**	Exposed property and infrastructure**	Most sensitive locations	Economic and social impacts	Vulnerable sectors	Vulnerable groups
Temperature	2030 2070							
Average annual temperature	↑ 0.5-1.3°C	↑ 1-3.5°C						
Days per yr > 30 °C (20 current)	↑ 3-6	↑ 6-25	▪ entire population, especially 15,000 elderly	<ul style="list-style-type: none"> ▪ most roads ▪ most railways lines ▪ some building materials ▪ buildings or services that require cooling 	<ul style="list-style-type: none"> ▪ inland areas (particularly urban) ▪ areas with high concentrations of elderly and infants (esp. NW and SW corners) 	<ul style="list-style-type: none"> ▪ increased mortality and morbidity in vulnerable groups ▪ increased infrastructure maintenance costs ▪ disruptions to transport networks ▪ increased risk of food and water born disease outbreaks ▪ increased summer peak demand ▪ increased cooling costs 	<ul style="list-style-type: none"> ▪ transport ▪ construction ▪ local government services such as child care, environmental health 	<ul style="list-style-type: none"> ▪ elderly (15,000) ▪ Infants (7,000) ▪ residents in low quality housing (e.g. rental) or low income households
Days per yr > 40 °C (0 current)	↑ 1 - 2	↑ 2 - 5						
Average rainfall	2030 2070		▪ entire population	<ul style="list-style-type: none"> ▪ municipal parks and gardens ▪ playing fields ▪ water & wastewater infrastructure ▪ other infrastructure on clay soils 	<ul style="list-style-type: none"> ▪ greenfield development sites (possibly) ▪ high water requirement sites ▪ wetlands, heritage gardens and other reserves 	<ul style="list-style-type: none"> ▪ increased water prices ▪ increased reliance on non-traditional supply sources ▪ access to water for some activities (possibly) ▪ viability of some water dependent businesses and activities ▪ increased maintenance costs, some infrastructure 	<ul style="list-style-type: none"> ▪ nurseries, garden services, etc ▪ local government services such as parks, recreation ▪ water suppliers and retailers 	<ul style="list-style-type: none"> ▪ householders in new developments (possibly) ▪ low income households (possibly)
Average annual Catchment stream flows	↓ 0-8 %	↓ 0-23 %						
Droughts	↓ 25 % ↓ >50 %							
↑ frequency & severity								
Extreme rainfall	2030 2070							
2 hour	↑ 15 %	↑ 37 %	▪ up to 19,000 people	<ul style="list-style-type: none"> ▪ 5,700 residential properties ▪ 1,150 commercial properties ▪ 130 public properties - schools, emergency services, reserves ▪ water and drainage infrastructure ▪ 16 km of roads including Nepean Highway, 9 bridges 	<ul style="list-style-type: none"> ▪ most of central and northern coastal hinterland ▪ Frankston CBD ▪ Seaford wetlands and surrounds 	<ul style="list-style-type: none"> ▪ increased flood damage costs to residential and commercial buildings ▪ increased flood damage to public infrastructure, especially roads and bridges ▪ health impacts related to disruption to water and sewerage services ▪ stress, social disruption ▪ disruption to transport ▪ increased emergency services demand and costs 	<ul style="list-style-type: none"> ▪ residential ▪ commercial (Frankston CBD) ▪ water and wastewater ▪ local government ▪ emergency services 	<ul style="list-style-type: none"> ▪ low income households ▪ businesses and properties without adequate insurance ▪ properties not adequately prepared or maintained
12 hour	↑ 4 %	↑ 26 %						
24 hour	↓ 2 %	↑ 24 %						
72 hour	↓ 16 %	↑ 20 %						
Maximum flood heights	↑	↑						
Flood return intervals (ARI)	↓ flash ↔ riverine	↓ flash ↓ riverine						
Sea level rise / storm surge	2030 2070		▪ minimal number based on current modelling, however data may be too coarse to adequately capture Kananook Creek mouth	<ul style="list-style-type: none"> ▪ most beaches and foreshore reserves including Frankston and Seaford ▪ most boating facilities ▪ historical evidence suggests potentially many residences and commercial properties, as well as the Nepean Highway 	<ul style="list-style-type: none"> ▪ most of central and northern coastline ▪ Kananook Creek and surrounds, including potentially Frankston CBD and Seaford wetlands and surrounds ▪ Oliver's Hill (erosion, possibly) 	<ul style="list-style-type: none"> ▪ partial or (in worst case) complete loss of land values in affected areas ▪ major amenity impacts associated with damage to beaches and foreshore reserves ▪ impacts on businesses dependent on beach related tourism ▪ increased insurance costs or lack of access to insurance ▪ costs associated with beach and foreshore maintenance (e.g. beach renourishment) 	<ul style="list-style-type: none"> ▪ tourism ▪ recreation and boating ▪ local government 	<ul style="list-style-type: none"> ▪ no specific groups identified
Sea level rise	↑ 0.17 m	↑ 0.49 m						
Storm tide – max. height, 1:100 year ARI (current 1.16m)	1.37 m	1.80 m						
Storm surge – change to 1:100 year ARI	↓ to 1:40 - 1:6	↓ to 1:20 - 1:1						
Inundation area (1:100 year storm surge)	under review	under review						
Fire weather	2030 2050		▪ up to 14,000 people	<ul style="list-style-type: none"> ▪ 6,000 residential properties ▪ 66 businesses ▪ 160 public use areas including schools, medical facilities and numerous reserves ▪ 245 km of roads and 7 kms of rail 	<ul style="list-style-type: none"> ▪ central areas around Langwarrin southern boundary around Frankston South, Langwarrin South 	<ul style="list-style-type: none"> ▪ increased damage costs to residential properties ▪ health impacts including loss of life and air quality ▪ increased emergency services demand and costs ▪ stress, social disruption 	<ul style="list-style-type: none"> ▪ residential ▪ emergency services ▪ local government ▪ transport 	<ul style="list-style-type: none"> ▪ people living in older housing (in exposed areas) ▪ properties that have not been adequately prepared ▪ low income households
No. of very high and extreme forest fire risk days (~ 12 days current)	↑ 1 - 2	↑ 5 - 7						
No. of very high and extreme grass fire risk days (~ 95 days current)	↑ 7 - 15	↑ 9 - 30						

Appendix 2 – Risk Assessment Methodology



Risk Flowchart: ISO 3100



Appendix 3 – Climate change impacts on community wellbeing

Determinant of Community Wellbeing	Climate Change Impacts on wellbeing	Equity Concerns
Physical health	<p>Heat: Heat stress, cardio failure, increased exposure to UV, dis incentive to participating in physical exercise</p> <p>Extreme Weather: Injuries, fatalities</p> <p>Air pollution: Asthma, cardio diseases</p> <p>Allergies: Respiratory allergies, poison ivy</p> <p>Vector-borne diseases: Malaria, dengue fever, hantavirus, encephalitis, rift valley fever</p> <p>Water-borne diseases: Cholera, cryptosporidium, campylobacter, leptospirosis</p>	<p>Worse outcomes are likely for those already experiencing health challenges related to social status and conditions.</p> <p>Increased disadvantage to those living in areas most exposed to climate impacts.</p>
Mental health	<p>Direct mental health impacts to extreme weather events: Anxiety, post traumatic stress, depression, despair, shock.</p> <p>Impacts on key determinants of mental health including social exclusion, economic insecurity, violence and discrimination.</p> <p>Emotional distress arising from awareness of climate change as a global threat.</p>	<p>Existing social and health inequalities exacerbated.</p> <p>Increased disadvantage to those working in industry and living in areas most exposed to climate impacts.</p>
Access to food, water, housing, energy transport	<p>Implications of more extreme weather impacting security of access, quality, cost of food and water.</p> <p>Impact on housing with decreased property values in some areas, unaffordability in other areas, cost of modifications to improve energy efficiency and comfort.</p> <p>Impacts of increased demand and higher costs associated with transitioning to non-polluting sources, costs associated with pressure on supply systems during extreme weather, security of access.</p>	<p>Exacerbation of existing disadvantage e.g. patterns of food security, unaffordability of housing and utilities, transport disadvantage.</p> <p>People on low-incomes unable to afford costs of retrofitting homes to adapt to weather extremes or higher prices for essential services.</p>



Determinant of Community Wellbeing	Climate Change Impacts on wellbeing	Equity Concerns
	Access to different modes of transport, costs, comfort and reliability.	
Employment and financial security	<p>Impacts of industries vulnerable to climate change such as agriculture and tourism as well as opportunities posed from new 'green' economy.</p> <p>Access and affordability of insurance.</p>	<p>Increased disadvantage to those working in industry and living in areas most exposed to climate impacts.</p> <p>Exacerbation of existing disadvantage, e.g. those facing financial insecurity or barriers to employment.</p>
Access to health, community and emergency services	<p>Greater pressure on emergency and health services (e.g. ambulances and hospitals) to respond to floods, storms, bushfire and other extreme weather events as well as subsequent communication breakdowns and power blackouts.</p> <p>Increased demand for health and community services</p> <p>Increased pressure on local government (and other tiers of government) to protect public safety, respond to emergencies and respond to higher demand for health and social services.</p> <p>Increased reliance on volunteers and informal support networks.</p>	<p>Existing social and health inequalities exacerbated.</p> <p>Increased disadvantage to those living in areas most exposed to climate impacts.</p> <p>Those without informal support networks to cope with emergencies and extreme weather events particularly vulnerable.</p>
Social cohesion, cultural identity and community participation	<p>Social cohesion may be affected by temporary or permanent displacement of communities and being affected by increasing numbers of climate refugees and displaced people.</p> <p>Could have positive impacts of greater inter-dependence and cooperation within communities or negative with integration concerns for displaced people.</p> <p>Potential to disrupt community participation opportunities such as</p>	<p>Existing social and health inequalities exacerbated.</p> <p>Increased disadvantage to those living in areas most exposed to climate impacts.</p>



Determinant of Community Wellbeing	Climate Change Impacts on wellbeing	Equity Concerns
	outdoor sport, recreation and enjoyment of open space. Impacts include degradation or reduced access to parks and gardens and overcrowded beaches	
Oil vulnerability	- Using the <i>Oil Vulnerability Index</i> ²³ , derived from a combination of three variables: average taxable income, fuel use and the percentage of non-automobile weekly travel; Frankston City has an extremely high Oil Vulnerability Index score of 21, compared to Melbourne with a score of 4. This shows a clear pattern in the distribution of vulnerability with an increase with distance from the CBD. This vulnerability will be compounded with high population growth projected for outer suburbs such as Frankston.	Increased vulnerability in relation to transport.

Adapted from the Liveable and Just Toolkit²⁴ (2010) unless otherwise specified.

²³ Institute for Sensible Transport's report on *Oil Vulnerability in Melbourne* (November, 2009)

²⁴ The Liveable and Just project is an initiative of the Victorian Local Governance Association in partnership with the Brotherhood of St Laurence and the Department of Sustainability and Environment and prepared by the McCaughey Centre. The Toolkit is available online: www.vlga.org.au/Resources/Liveable_Just_Toolkit.aspx

Appendix 4 – Risk Assessment

The below risk assessment is an extract from the revised risk assessment. Extreme means it is almost certain to happen with major or catastrophic consequences; High means it is likely to happen with major or catastrophic consequences; Medium means almost certain to happen with minor consequences or unlikely to happen with major or catastrophic consequences; Low means rare likelihood with insignificant to major consequences.

Impact	Risk #	Risk	2015	2030	2070
Coastal inundation	1.01	Significant disruption to traffic, property damage and fatalities from the collapse of Olivers Hill	Low	Medium	Medium
	1.02	Significant disruption to traffic, property damage and loss of amenity from the flooding of Kananook Creek	Low	High	Extreme
	1.03	Flooding CAD	Medium	High	Extreme
	1.04	Inability to attract visitors to municipality and decrease in economic activity	Medium	High	High
	1.08	Exposure to legal liability for Council's function as the Planning Authority and issue of building permits			
	2.01	Sub catchments inundation – Seaford and Frankston	High	High	Extreme
Inland Flooding	2.07	Flood prone areas left uncontrolled from responsibilities insufficiently Delineated.	High	Extreme	Extreme
	2.06	Drainage system overwhelmed	Medium	High	Extreme
	2.08	Increased extent of property affected by flooding	High	High	Extreme
	2.10	Illness caused by exposure to contaminated substance from flooding of old landfill sites			
Bushfire	3.03	More frequent fires	High	High	Extreme
Air temperature	4.17	Reduced water availability	High	High	High
	4.05	Degradation of sports fields	High	High	High
	4.01	Increased visitation during warm weather	Medium	High	High
	4.03	Increased anti social behaviour	Medium	High	High
	4.11	Loss of biodiversity	Medium	High	High
	4.14	Difficulty establishing new vegetation	Medium	High	High



Impact	Risk #	Risk	2015	2030	2070
4.00	4.18	Declining attendance at public events	Medium	High	High
	4.04	Health risk to community	Low	High	Extreme
	4.02	OH&S exposure - heat stress/ sunburn / exposure to elements for outdoor employees	Low	Medium	High
	4.06	Increased pest species resulting in loss of biodiversity, increased cost of maintenance and increase in pesticides/ spraying	Medium	Medium	Medium
	4.07	Increase in airborne dust resulting in increase in complaints and increase in maintenance costs	Medium	Medium	Medium
	4.08	Increased cost of maintenance / increase in traffic accidents and or claims	Low	Low	Low
	4.10	Increased costs – maintenance; and refurbishments. Increase in personal injuries or property damage due to condition of assets resulting in claims and /or litigation	Low	Low	Low
	4.15	Community dissatisfaction due to inability to use open space and reduced experiences	Low	Low	Low
	5.01	Degradation of Seaford Wetlands	Medium	High	High
	5.02	Water table falling	Medium	High	High
Concurrent	5.03	Decreased stream flows	Medium	High	High
	5.04	Blockage and damage to drainage system from low flows.	Low	Medium	Medium
	5.05	Increasing water charges	Low	High	High
	6.01	Reduced mobility due to increasing fuel costs			
	6.02	Shortage of personnel to deliver services			
	6.03	Demand on child care centres			
	6.04	Unable to meet greenhouse gas targets			
	6.05	Peak Oil			
Other	7.01	Council decisions made now have proved to be incorrect			



References

- Australian Government Department of Climate Change and Energy Efficiency (2009). *Climate Change Risks to Australia's Coasts*. Available online: <http://www.climatechange.gov.au/publications/coastline/climate-change-risks-to-australias-coasts.aspx>
- Australian Government Department of Climate Change (2009). *Climate Change Adaptation Actions for Local Government*. Available online: <http://www.climatechange.gov.au/publications/local-govt/local-government.aspx>
- City of Boroondara (2009). *Preparing for climate change in the City of Boroondara: Summary Report*. Available online: <http://boroondara.vic.gov.au/our-city/environment/policies-strategies-plans/preparing-for-climate-change>
- City of Darebin (2009). *Climate Change and Peak Oil Adaptation Plan*. Available online: http://www.darebin.vic.gov.au/page/page.asp?Page_id=5462
- City of Melbourne (2008). *Draft Climate Change Adaptation Report: A Risk Assessment and Action Plan, Discussion Paper*. Maunsell/ AECOM. Available online: http://www.melbourne.vic.gov.au/Environment/WhatCouncilisDoing/Documents/climate_adaptation_draft_2008.pdf
- City of Port Phillip (2010). *Draft Climate Adaptation Plan: Climate Adept City*. Available online: [http://www.portphillip.vic.gov.au/default/DRAFT_CLIMATE_ADAPTATION_PLAN_web\(1\).pdf](http://www.portphillip.vic.gov.au/default/DRAFT_CLIMATE_ADAPTATION_PLAN_web(1).pdf)
- England, P. (2007) *Climate Change: What are local governments liable for?* Urban Research Program, Issues Paper 6, Brisbane: Griffith University.
- Frankston City Council (2008). *Impacts of Climate Change on Settlements in the Western Port Region: Risk Assessment Workshop Report*. Broadleaf Capital International Pty Ltd and Marsden Jacob Associates.
- Garnaut, R. (2008) *The Garnaut Climate Change Review: Final Report*. Available online: http://www.garnautreview.org.au/pdf/Garnaut_introSynopsis.pdf
- ICLEI (2008). *Local Government Climate Change Adaptation Toolkit*. Cities for Climate Protection Australia Adaptation Initiative. Available online: <http://www.iclei.org/index.php?id=adaptation-toolkit>
- Institute for Sensible Transport (2009). *Oil vulnerability in Melbourne*. Available online: <http://www.sensibletransport.org.au/project/oil-vulnerability-melbourne-research-project>
- Local Government Association of Queensland Inc. (2007). *Adapting to Climate Change: A Queensland Local Government Guide*. Available online: www.lgaq.asn.au
- Hennessy, K., B. Fitzharris, B.C. Bates, N. Harvey, S.M. Howden, L. Hughes, J. Salinger and R. Warrick, 2007: Australia and New Zealand. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group 11 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L.

Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 507-540.

Hornsby Shire Council (2009). *Climate Change Adaptation Strategic Plan*. Aurecom. Available online: http://www.lgsaplus.net.au/resources/documents/Climate_Change_Adaptation_Strategic_Plan - Council report copy - August Ordinary Meeting.pdf

Local Government Association of Queensland (2007). *Adapting to Climate Change: A Queensland Local Government Guide*, Brisbane: Local Government Association of Queensland.

Moloney, S., Horne, R., Fien, J. (2009) *Transitioning to low carbon communities- from behaviour change to systemic change: Lessons from Australia*. Energy Policy (2009), doi:10.1016/j.enpol.2009.06.058.

National Climate Change Adaptation Research Facility (2009). *Emergency Management and Climate Change: National Adaptation Research Plan*. Available online: <http://www.nccarf.edu.au/national-adaptation-research-plan-emergency-management>

University of Victoria- McCaughey Centre, VicHealth Centre for the Promotion of Mental Health and Community Wellbeing (2009). *Liveable and Just: Improving the capacity of local government to respond to climate change in ways which are healthy, just and sustainable*.

Victorian Government Department of Sustainability and Environment (2004). *Adapting to Climate Change: Enhancing Victoria's Capacity*. Available online: [http://www.climatechange.vic.gov.au/CA256F310024B628/0/7A9BB820201BC573CA2575C4000AF56C/\\$File/Adapting+to+climate+change+2004.pdf](http://www.climatechange.vic.gov.au/CA256F310024B628/0/7A9BB820201BC573CA2575C4000AF56C/$File/Adapting+to+climate+change+2004.pdf)

Victoria Government Department of Sustainability and Environment (2009). Green Paper- Adaptation: A new reality. Available online: <http://www.climatechange.vic.gov.au/Greenhouse/wcmn302.nsf/LinkView/F431CD29B8145851CA2575C00080C78CBBA69776518142B6CA2575C400224496>

Vale of White Horse (2007). *Vale of White Horse District Council Climate Change Strategy 2008-2010 and beyond*. Available online: http://www.whitehorsedc.gov.uk/Images/Climate%20Change%20Strategy_tcm4-5483.pdf

Victorian Local Governance Association (2010). *Liveable and Just Toolkit: A toolkit for local government to address the social and equity impacts of climate change*. Available online: http://www.vlga.org.au/Resources/Liveable_Just_Toolkit.aspx

Western Port Greenhouse Alliance (2008). *Impacts of Climate Change on Settlements in the Western Port Region: People, Property and Places*. CSIRO, Marsden Jacob Associates. Available online: <http://www.seccca.org.au/ppp.asp>

Western Port Greenhouse Alliance (2008). *Impacts of Climate Change on Settlements in the Western Port Region: Climate Change Risks and Adaptation*. Marsden Jacob Associates, the Regional Development Company Pty Ltd, CSIRO, Broadleaf. Available online: http://www.seccca.org.au/projects/Final_Risks_and_Adaptation.pdf



Climate Change Impacts and Adaptation Plan

Preparing for a changed climate

