NOV 2017

CITY OF HOBART
RESPONDING TO CLIMATE CHANGE

BACKGROUND PAPER

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2017

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PURPOSE OF THIS BACKGROUND PAPER

This background paper forms part of the City of Hobart's review of its climate change strategy. It provides information to guide understanding and awareness of the impacts of climate change and potential adaptation actions.

This paper has been developed to promote discussion and does not provide a comprehensive overview of all the City's climate actions.

The complementary background paper Managing Hobart's Carbon Footprint provides further information focused on Hobart's carbon profile, local energy use and greenhouse house gas emissions, examples of City of Hobart and community actions, and priority areas for future action.

Both papers are available through the website hobartcity.com.au

HOW TO MAKE A SUBMISSION

The City of Hobart is seeking feedback to develop an updated climate change strategy. To prepare sound solutions it will take contributions from individuals, businesses, the broader community and different levels of government. This is why we need your help; to make sure we are on the right track.

Your submission to the draft climate change strategy can be as long or short as you want. You can answer the questions in these background papers or just write about what you think is important. You can email through your feedback or complete the online survey available at the Your Say City of Hobart website until
5 March 2018.

Online

yoursay.hobarcity.com.au

Email

coh@hobartcity.com.au
Climate strategy in the subject line.

Post

Climate Change Strategy

City of Hobart

GPO Box 503

Hobart TAS 7001

Submissions should be lodged by 5 March 2018.

Image credit: Alastair Bett, City of Hobart

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KEY ISSUES

- The world is taking action to limit global warming to below 2 °C. While it is a global issue, the solutions are local.
- All weather, including extreme weather events, is being influenced by climate change.
- Extreme weather events are putting pressure on our local economies, health systems, built and urban infrastructure, ecosystems and food production systems. Climate change will have a long-term impact on our communities.
- Individuals, communities, businesses and governments all have a role to play in responding to climate change.
- Local governments have a role around informing the community and managing its assets and services.
- Hobart has highly valued and unique natural and built environments. To protect these requires adaptation actions now.
- The City of Hobart works with other local governments, networks and stakeholders. It has led a range of 'adaptation actions', including the development of an adaptation policy and an adaptation action plan that was replicated across all Tasmanian local governments.
- The City of Hobart is
  - working with communities in areas vulnerable to climate impacts such as sea level rise and storm surge at Marieville Esplanade, Long Beach and Nutgrove foreshores
  - reducing bushfire hazard across bushland areas
  - improving Hobart's resilience and sustainability through improved transport and waste management.
- The City of Hobart influences community adaptation by working towards:
  - a low emissions future—increased renewable energy generation, low carbon transport, energy efficient buildings, zero waste to landfill
  - a healthy and robust built and natural environment
  - people being connected, empowered and feeling part of the community
  - well-informed decision-making at all levels.
- The City of Hobart is seeking feedback on what actions—for the community and the City—are priorities for the next critical decade.

INTRODUCTION

There is an expansive and growing body of scientific evidence that the global climate has changed, and will continue to change over the coming century.

Climate change modelling undertaken in Tasmania shows that Hobart faces greater risks and challenges from more frequent bushfires, extended heatwaves, heavier rainfall, sea level rise and storm tide events.

The City of Hobart recognises that local governments have a key role in working with communities, to prepare for and manage climate change impacts. Local governments have local knowledge and experience, understanding of community needs and vulnerabilities, and has a key role in shaping our urban landscapes and responding to emergencies.

Around the world, cities like Hobart are leading the way on climate action. In 1999, the City of Hobart was the first Tasmanian local government to formally commit to and take action on climate change. It has a program in place that has seen it both reduce greenhouse gas emissions and energy usage as well as preparing Hobart to respond to climate risks.

The City of Hobart has a commitment to see the capital evolve into a strong, vibrant, resilient and sustainable city through the provision of local government services and infrastructure.

The Capital City Strategic Plan 2015–2025, the City's key document to guiding development and delivery of our assets, programs and services, identifies the need for increased resilience to climate change. Reviewing and updating our climate strategy therefore presents an opportunity to make sure that we have in place actions that continue to decrease our carbon footprint and assist in responding to climate change impacts (Strategic Objective 3.1).

The City of Hobart, through a range of programs, provides resources to build climate resilience. The City offers grants for climate and energy-saving projects, provides climate change information, and encourages behaviour change.

The City of Hobart works closely with the following organisations to deliver adaptation projects:

- Southern Tasmanian Regional Councils Authority
- southern Tasmanian local governments
- Tasmanian Government, particularly with the Tasmanian Climate Change Office
- Local Government Association of Tasmania.

WHY ARE LOCAL GOVERNMENTS TAKING CLIMATE ACTION?

Local governments are the closest level of government to communities and has a responsibility under the Local Government Act 1993 to provide for the health, safety and welfare of the community. This role includes taking action on climate change.

The Australian Local Government Association, the peak body representing local governments, identifies climate change as one of the top five priorities to act on. It states that effective mitigation of greenhouse gas emissions and adaptation to the impacts of climate change will transform the Australian economy, environment and society.[1]

The case for climate action is also made by the Southern Tasmanian Councils Authority which recognises that "in managing and preparing for climate change impacts, local governments are best positioned to work with communities due to their:

- responsibility to support and assist local communities
- local knowledge and experience
- understanding of community needs and vulnerabilities
- role in preparing for, supporting respondes to and recovering from emergencies
- role in infrastructure design, construction and maintenance
- role in review and update of planning schemes (in relation to identified local impacts and threats)
- ability to effectively disseminate information and provide support to the community."[2]

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1 Australian Local Government Association, 'Climate Change', viewed 27 July 2017, <http://alga.asn.au/?ID=210>.

2 Southern Tasmanian Councils Authority, Regional Councils Climate Change Adaptation Strategy, Southern Tasmania 2013–2017, 2013, p. 7.

CITY OF HOBART'S PRINCIPLE-BASED APPROACH

Building on its existing leadership role, and highlighting the role of local government in responding to climate change, the City of Hobart recognises that:

- climate change is a global issue requiring local solutions
- climate change action is a shared responsibility between local, state and federal governments, communities and the private sector
- local government has an important role in educating communities at the municipal and regional level on climate change as a risk, and options for adaptation and mitigation
- local government must prepare for and manage the impacts of climate change on its assets and services and work to reduce its emissions and energy use
- early climate change adaptation and mitigation action is more cost effective than delayed action
- in many instances, mitigation actions like renewable energy and energy efficient lights can help bring down overall running costs
- collaboration and cooperation on climate change adaptation and mitigation actions by local government provides more effective use of resources.

The City of Hobart is guided in how it responds to climate change by the following principles, which are to:

- administer relevant Tasmanian and/or Australian legislation to promote climate action, including the application of relevant codes, such as the Building Code of Australia
- provide leadership and collaborate across local governments and with the Tasmanian Government to act on climate change
- manage risks and impacts, and consider opportunities, to assets it owns and manages and services it provides
- ensure policies and regulations under its jurisdiction incorporate climate change considerations and are consistent with Tasmanian and Australian government approaches to adaptation and mitigation
- facilitate resilience building and adaptive capacity in the local community by providing information on local climate change risks and mitigation
- work in partnership with the community, local non-government organisations, businesses and other key stakeholders to implement adaptation and mitigation initiativescontribute appropriate resources to prepare, prevent, respond and recover from detrimental climatic impacts and to reduce greenhouse gas emissions.

What is adaptation?

Adaptation is the action taken to respond to a changing climate and its impacts. It applies to the economy, community and environment. Examples of adaptation include the construction of sea walls to protect property from stronger storm surges in coastal areas through to increasing the frequency of prescribed burning to reduce fire risk.[3]

[3] Organisation for Economic Cooperation and Development, Key Adaptation Concepts and Terms, Paris, 7 March 2006, p. 5.

WE ALL HAVE A ROLE TO PLAY

Adaptation requires local, regional and national scale action, meaning that individuals, the community, businesses and government all have an important role to play.

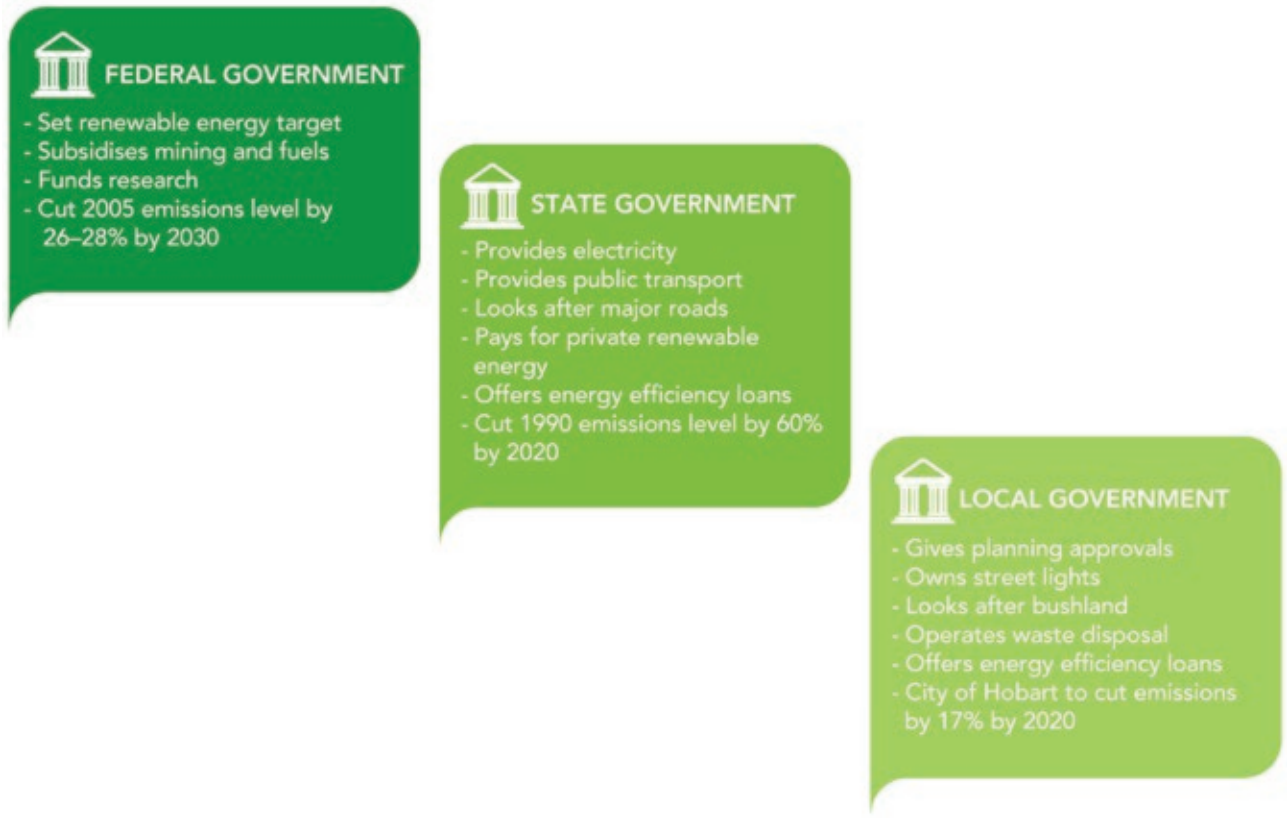
Individuals, the community and businesses have responsibility for the management of climate change risks in the same way that they are responsible for the management of other private risks, whether for property, assets or individual wellbeing.

Local governments are established by the Tasmanian Government to deliver legislation at a local level. It is the sphere of government closest to the community and is responsible for the delivery of a wide range of services and management and protection of assets that will be affected by climate change. As well as preparing for and managing climate impacts on assets and services, local governments also have a significant role to inform and educate communities to help them understand and respond to climate change impacts.

The state and federal governments are responsible for the regulations and policy settings that guide the broader response to climate change. A key role is the research, coordination and dissemination of scientific information on climate change impacts to local governments, the community and private sectors, enabling informed decisions to be made about the management of and adaptation to climate change impacts.

At times, the roles and responsibilities of the three spheres of government will be separate, such as the direct response of individual local governments to local climate impacts on their assets or services. Or in the case of the Australian Government, the development of national policy settings that guide the response of other levels of government and the business sector. For government, the roles and responsibilities will intersect and be shared with multiple agencies. This is the case for management of bushfires and floods, or in the development of guidelines and codes to minimise and adapt to climate change risks and vulnerabilities.[4]

Figure 1: Climate change adaptation roles and responsibilities



[4] Southern Tasmanian Councils Authority, Regional Councils Climate Change Strategy, Southern Tasmania 2013–2017, p. 10.

PART 1

WHAT THE EXPERTS SAY: CLIMATE CHANGE IMPACTS AND HAZARDS

This section provides a summary of the climate change impacts and hazards for Hobart.

CLIMATE CHANGE IS HERE

There is overwhelming scientific evidence that the earth is warming and that increased concentrations of greenhouse gases caused by human activity are contributing to our changing climate.

While climate change is a global phenomenon, its impacts are felt at the local level as changes to our weather conditions and patterns. Already in 2017, Australia has experienced the warmest winter on record and more than 260 heat and low rainfall records have been broken.[5] Hobart received only 12% of its average rainfall in June[6] and has above normal bushfire potential for the 2017–18 summer.[7]

Hobart and climate change

Understanding how the climate is changing at the local level is important to enable the City of Hobart and the broader community to prepare and respond. Tasmania is fortunate to have some of the most detailed climate modelling conducted in Australia, which has been undertaken by the Antarctic Climate Ecosystems Cooperative Research Centre based in Hobart. Its Climate Futures for Tasmania project provides a sound knowledge base for identifying climate-related risks at a local level that can be used to inform decision-making by local governments, business and industry.

The City has adopted a climate change adaptation policy that uses the Climate Futures for Tasmania projections for Hobart at 30 year intervals up to 2100. This information on how Hobart's climate is changing and why this is important for decision-making can be found at:

hobartcity.com.au/City-services/Environment/Climate-and-energy/Climate-change-in-Southern-Tasmania.

How is the climate changing?

Hobart has a temperate, maritime climate with relatively mild winters. Long-term average temperatures have risen in the decades since the 1950s, at a rate of up to 0.1 °C per decade.

Despite covering a small geographic area, Hobart experiences a marked rainfall gradient in average annual rainfall from about 1100 mm on the slopes of Mt Wellington to 615 mm in the city. There has been a decline in average annual rainfall since the mid 1970s, and this decline has been strongest in autumn.

A summary of the key projected changes to Hobart's climate is provided in Table 1. Further description is provided below.

Note: Projected changes are relative to the baseline period (1961–1990) and are based on a high emissions scenario (A2 emissions scenario).

5 Climate Council, Hot and Dry—Australia's Weird Winter, 2017, p. 1

6 ibid, p. 7.

7 ibid, p. 10.

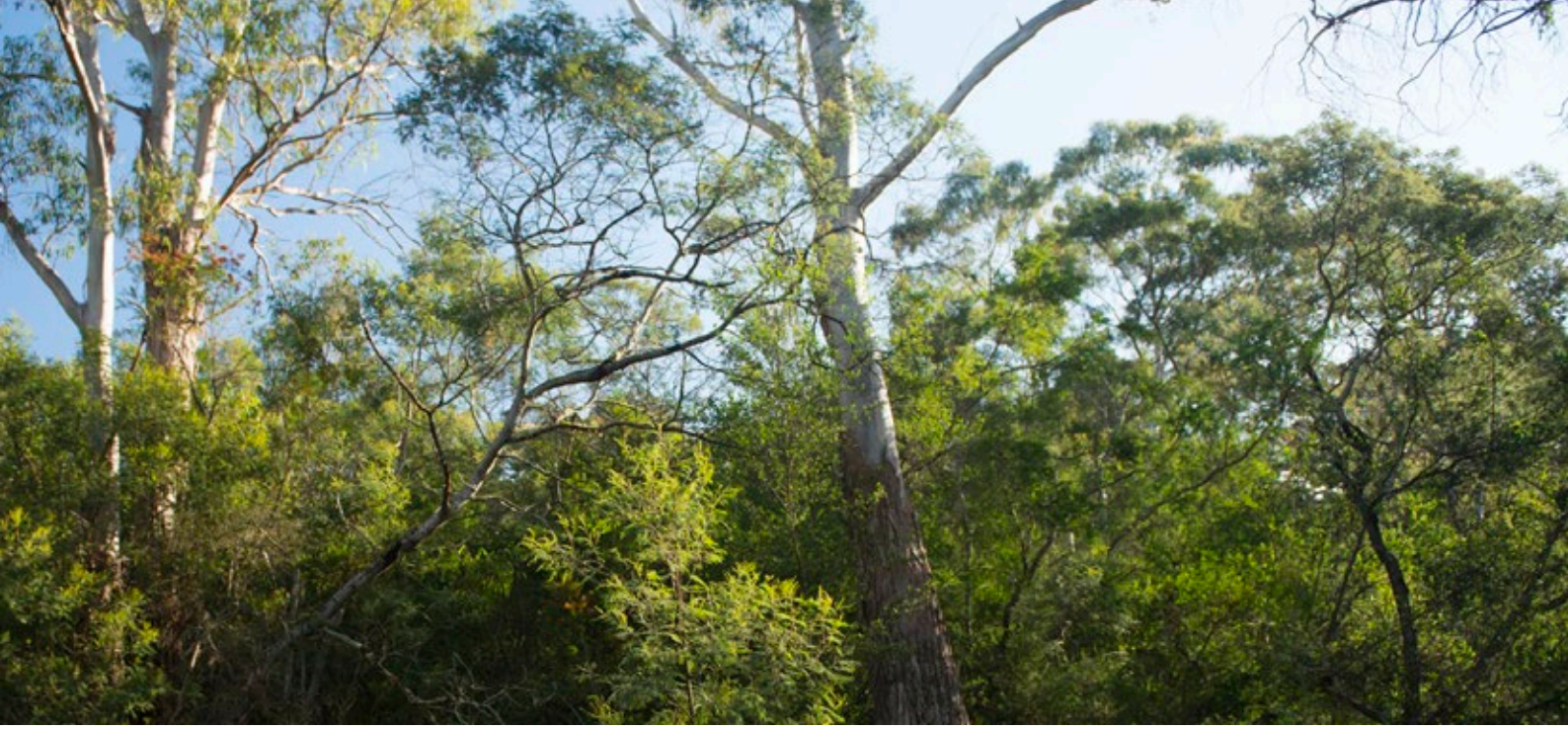


Table 1: Hobart climate change impacts by 2100 based on a high emissions scenario

Source: Southern Tasmanian Councils Authority, Hobart City Council Climate Change Snapshot, 2012.

Climate Change Variable	Change	Relative change
Temperature (annual average)	+2.6 to 3.3 °C	
Summer days (>25°C)	+22 days	+120%
Warm spells (days)	2–6 days longer	+50–150%
Hottest day of the year	+3 °C	
Frost risk days/year	-9 days	-90%
Rainfall (annual average)	Increase in all seasons	
Rainfall (wettest day of the year)		+25%
Rainfall extreme (ARI-200)	+30–40 mm	+30–40%
Evaporation		+19%
Run-off	Increase in all seasons	
Coastal inundation	100-year event becomes a 2- to 6-year event	

Key climate change risks identified for the Hobart municipal area (by 2100) include the following:

- the temperature of very hot days to increase by up to 3 °C
- extended heatwaves and more extreme temperatures are likely to enhance the occurrence and intensity of bushfires
- rainfall trending towards heavier downfalls interspersed by longer dry periods
- inundation along the Derwent Estuary coastline to increase
- the current 100-year storm tide event (0.9 to 1.4 m above average sea level) may become a 50-year event by 2030, and a 2- to 6-year event by 2090.[8]

[8] Hobart City Council, Corporate Climate Change Adaptation Plan 2013–2016, 2012, p. 26.

TEMPERATURE

Hobart will become warmer as the climate changes over the coming century (Figure 2). The average temperature will increase by 1.5 °C by mid-century, and by 2.5 °C towards the end of the century.

What is a heatwave?

A heatwave is a prolonged period of excessive heat, which results from a certain combination of temperature, humidity, air movement and duration.

Heat kills more people in Australia than all other natural disasters combined. Since 1990 at least 4500 Australians have died from heatwaves.[9] Heatwaves also cause damage to ecosystems, agriculture and infrastructure.

While Hobart may not experience the 'heatwaves' of other parts of Australia, we are still vulnerable to spikes in our local temperatures. This is because we are acclimatised to lower temperatures and when we experience temperatures outside of this we do not have the necessary physical and behavioural responses to manage.

The temperature of very hot days is likely to increase by nearly 3 °C by the end of the century, and about half that by mid-century. Warm spells (days in a row where temperatures are in the top 5%) currently last around five days and may increase by up to three to six days (Figure 3).

[9] Australian Broadcasting Corporation Science, 25 November 2014, 'Killer heat waves', viewed 2 August 2017, <http://www.abc.net.au/science/articles/2014/11/25/4135556.htm>.

Figure 2: Increasing annual mean temperatures

Source: Bureau of Meteorology, 2017. For use under the Creative Commons Attribution Licence, http://www.bom.gov.au/climate/change/#tabs=Tracker&tracker=trend-maps

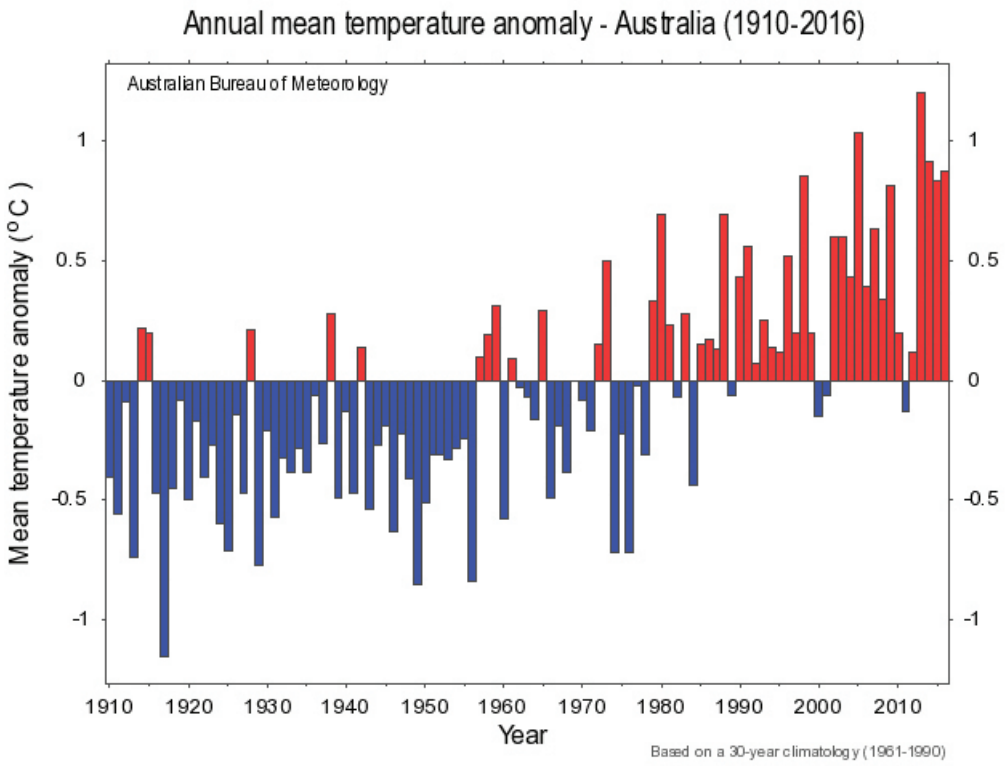
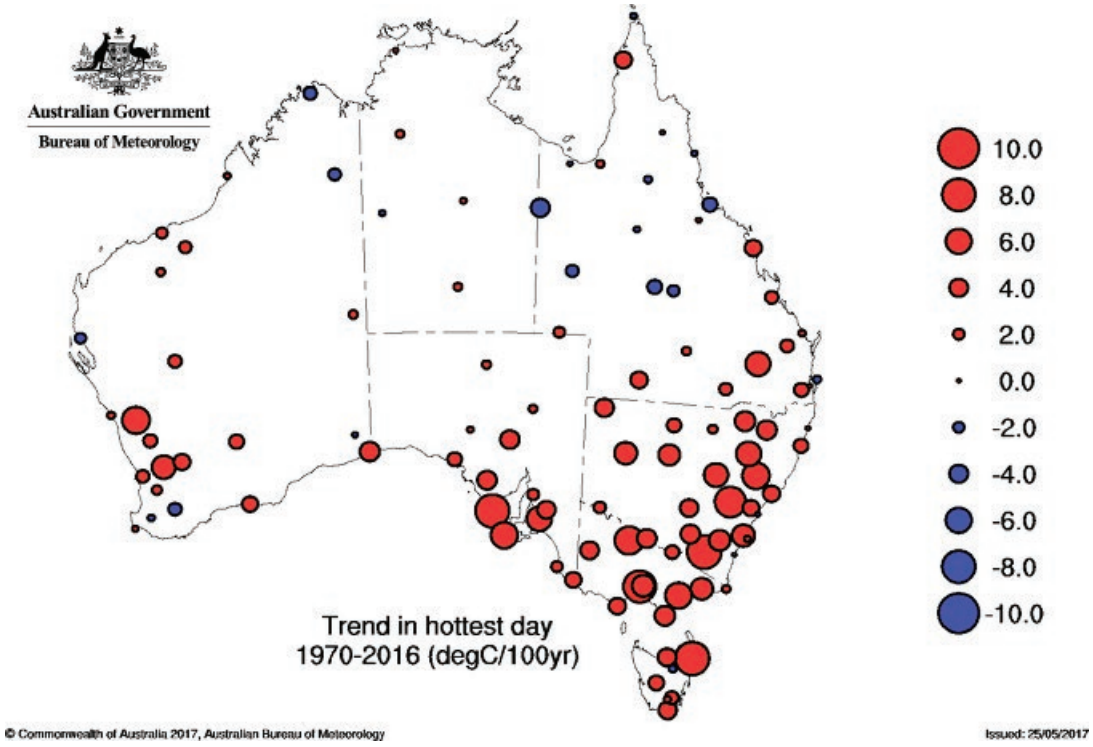


Figure 3: Hottest day trends

Source: Bureau of Meteorology, 2017. For use under the Creative Commons Attribution License, http://www.bom.gov.au/climate/change/#tabs=Tracker&tracker=trend-maps



Who does what?

Responsibility for preparing for, responding to and recovering from extreme heat is shared. For example:

- The Tasmanian Government provides public health alerts for extreme heat and information on how to avoid and manage heat stress.
- Local governments provide information on suitable actions and behaviours for heatwaves and provides a safe work environment for its workforce, in particular those who work outdoors.
- Individuals can inform themselves about recognising heatwaves and appropriate actions, such as drinking extra water and seeking out shaded areas to avoid heat stress.

RAINFALL AND FLOODING

There has been a reduction in total annual rainfall in Tasmania and a change in year-to-year rainfall variability since 1975 (Figure 4). In Hobart, climate change will result in an increase in summer and autumn rainfall and a decline in winter and spring rainfall, which should be apparent from around 2025 onward.

Extreme rainfall events are expected to increase in intensity in Australia. The warmer atmosphere will hold about 7 per cent more moisture than previously. This will increase the risk of heavy downpours.[10]

In Hobart, high daily run-off events are likely to increase, including those that may lead to erosion or flooding. Rainfall volume in a 200-year average recurrence interval will increase by up to 30–40 per cent. [11]

Who does what?

Responsibility for preparing for, responding to and recovering from rainfall-induced flooding is shared.

For example:

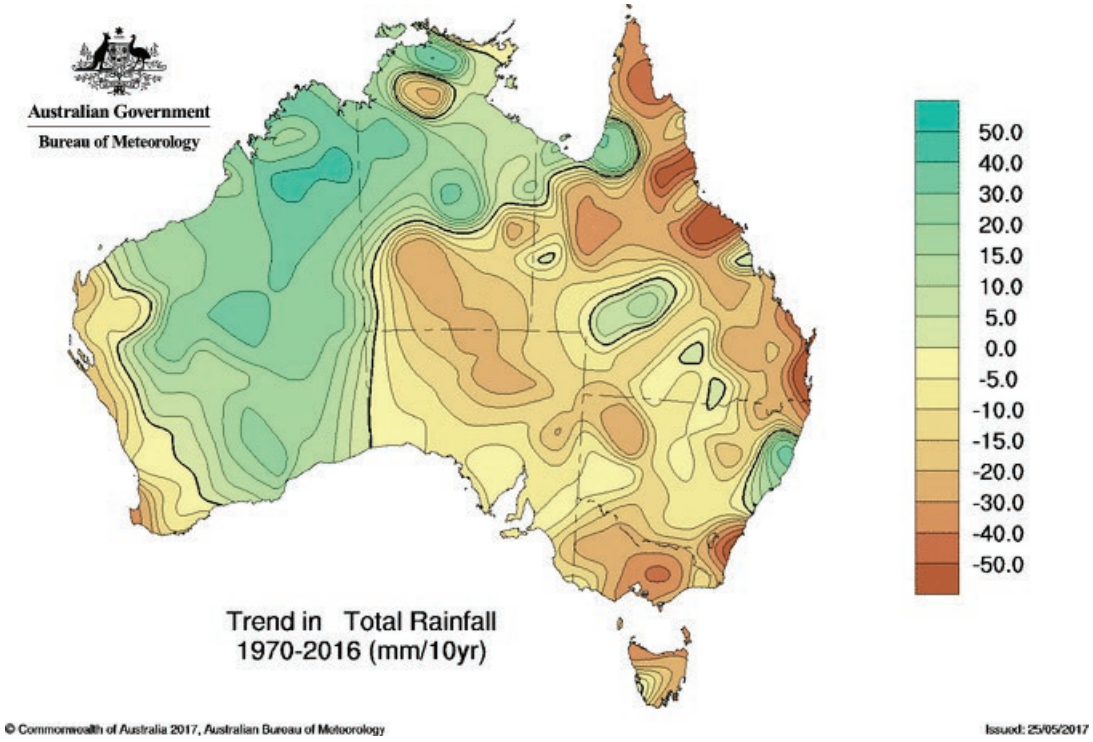
- the Tasmanian Government, through the State Emergency Service, provides essential support to communities during flooding and storm events.
- Local governments manage assets and open space areas to best reduce flooding hazard, maintains and manage stormwater assets and catchments, and through planning and development manages local flood risks and hazards.
- Individuals can assess whether their private property is vulnerable to flooding hazard and implement actions to reduce the impacts, such as ensuring vegetated buffers are maintained to minimise the potential for erosion and scouring, and stormwater drainage is not impeded.

[10] Climate Council, Intense Rainfall and Flooding: The Influence of Climate Change, undated.

[11] Hobart City Council, Climate Change Snapshot, 2012, p. 2.

Figure 4: Rainfall trend 1970–2015

Source: Bureau of Meteorology, 2017. For use under the Creative Commons Attribution License, www.bom.gov.au/climate/change/#tabs=Tracker&tracker=trend-maps



BUSHFIRES

Hobart is on the frontline of increasing bushfire risk. Of all the natural disasters to impact the city, bushfire is the most likely and frequent.[12]

Due to changing temperature and rainfall patterns, climate change will result in a longer fire season with an earlier start. Places with high fire danger ratings are projected to get worse more rapidly.

Bushfires damage buildings, roads and other public infrastructure, adversely affect human health through poor air quality caused by smoke, and leave top soils exposed and vulnerable to erosion from loss of ground-cover vegetation.

Dunalley bushfire $100 million cost

The summer of 2012–13 was Tasmania's worst bushfire season in decades. The fire burnt around 25 000 hectares, with a perimeter of almost 310 kilometres. Ninety-three dwellings and 186 other buildings were destroyed, including Dunalley's school and police station.[13] The Insurance Council of Australia reported that 1797 claims valued losses at $80 million. In addition, the Tasmanian Farmers and Graziers Association estimated that approximately 662 kilometres of commercial fencing and 10 000 head of livestock, mainly sheep, were lost.[14]

Who does what?

Responsibility for preparing for, responding to and recovering from bushfires is shared.

For example:

- The Tasmanian Government operates the Tasmanian Fire Service, the peak organisation for fire-fighting that prepares for, combats and coordinates responses to bushfire.
- Local governments assist in the preparation for and recovery from bushfires, manages assets and open space areas to reduce bushfire hazard, and through planning and development ensures compliance with bushfire standards and development of bushfire management plans.
- Individuals are responsible for the preparation of bushfire action plans and ensuring that fire hazards, such as dry fuel or long grass on their properties, are minimised.

12 Hobart City Council, Bushfire Management Strategy 2014, p. 1.

13 Baines, R, 'Dunalley bushfires: Report finds most inquiry recommendations adopted', Australian Broadcasting Corporation, viewed 2 August 2017, <http://www.abc.net.au/news/2015-10-13/tasmanian-bushfire-report-finds-recommendations-adopted/6849576>, October 2015.

14 2013 Tasmanian Bushfires Inquiry, Volume 1, October 2013, p. 51.

RISING SEA LEVELS AND STORM TIDE EVENTS

At a global scale, sea level rise is caused by two main factors. First is increased atmospheric temperature that transfers to the oceans causing them to warm and expand. Second, is the melting of land-based glaciers and ice sheets. The majority of sea level rise over the past 100 years has been due to the first of these, which is also called 'thermal expansion'.

Globally, sea levels have risen by approximately 0.2 m since the late 1880s.[15] Planning allowances are for sea levels to rise by 0.2 m by mid-century, and by up to 0.8 m by 2100.

Sea level changes are also due to regional factors like the density of the ocean (which is dependent on temperature and salinity), changes in ocean currents and air–sea interactions (winds and fluxes of heat and freshwater between the oceans and the atmosphere).[16] For example, the recent sea level rise modelled for the Hobart municipal area by 2100 is 0.85 m, whereas for the Kingborough area it is 0.87 m and Glamorgan Spring Bay is 0.92 m.

Rising sea levels can threaten human physical safety and health, damage settlements and infrastructure in low-lying coastal areas, and erode sandy beaches.

Who does what?

Responsibility for preparing for, responding to and recovering from erosion and flooding from storm surges is shared.

For example:

- The Tasmanian Government sources data and models on sea level rise, delivered the Tasmanian Coastal Adaptation Pathways project in collaboration with local government and communities in areas of coastal hazard, and legislates the planning and policy framework for coastal development.
- Local governments work with communities to inform them of coastal hazards, construct and maintain seawalls, undertake works to protect assets from erosion and inundation, and support dune stablisation programs.
- Individuals can review whether their private property is vulnerable to coastal hazard through resources such as the Land Information System Tasmania and implement actions to reduce the impacts, such as ensuring vegetated buffers are maintained to minimise the potential for erosion and scouring.

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15 JA Church et al, 'Revisiting the Earth's sea-level and energy budgets from 1961 to 2008', Geophysical Research Letters, 38, L18601, 2011, doi:10.1029/2011GL048794.

16 KL McInnes, D Monselesan, J O'Grady, J Church and X Zhang, Sea-Level Rise and Allowances for Tasmania based on the IPCC AR5, 15 May 2016, p. 8.

PART 2
FUTURE PATHWAYS

This section describes how the City of Hobart, its community and businesses can respond to climate change. It considers the impacts that are likely to be faced across four key areas:

- disasters and emergency management
- human health and vulnerable communities
- settlements, infrastructure and industry sectors
- natural systems.

The City of Hobart is seeking feedback to help determine how to respond to climate change and therefore, the types of actions that can form part of its final Climate Change Strategy.

HAVE YOUR SAY

- How can the City of Hobart respond to climate change?
- What is required to build resilient communities, businesses and natural systems?
- What are the short- and long-term actions that the community or City of Hobart should undertake and why?
- Other comments and suggestions.

DISASTERS AND EMERGENCY MANAGEMENT

Emergency management and service providers help the community, businesses and the natural environment prepare, respond to and recover from natural hazards like bushfires and flooding. They are essential for a resilient community.

Experience shows that the most resilient communities are those that have strong social networks and communication lines, are prepared for potential hazards, and have response and recovery plans. Continued investment in emergency management and building a resilient community will be an essential response to climate change.

HAVE YOUR SAY

- How can the community and City of Hobart respond to an increase in emergencies due to climate change?
- What information is required to help manage the predicted increase in natural hazards as a result of climate change?
- How can communities increase their capacity to respond to and recover from emergencies?
- What further actions can be taken to reduce the risk of natural climate hazards?
- Other comments and suggestions.

Bushfire

Bushfire is considered to be the most significant natural hazard for southern Tasmania. Hobart is likely to experience an increase in the number of days with 'extreme' fire danger.

Fire danger ratings above extreme (to 'catastrophic') (Figure 5) have occurred six times in Tasmania over the past 90 years. Climate change impacts mean there is the potential for the number of catastrophic days to increase.[17] Fire seasons are expected to be longer and start earlier.[18]

Increasing the risk posed by fire is that Hobart's urban fringe has developed alongside bushland in the steep valleys and ridges of Mount Nelson, Knocklofty Reserve and the foothills of kunanyi/Mount Wellington. Most of these areas were developed at a time when planning controls did not require the same level of bushfire risk consideration in the design, construction and management of homes, subdivisions and infrastructure as is required now.

[17] Tasmania Fire Service, 'Fire Danger Rating & Alerts', viewed 2 August 2017, <http://www.fire.tas.gov.au/Show?pageId=colFireDanger>.

[18] City of Hobart, Hobart Climate Change Information for Decision Making, May 2016, p. 3.

While the City of Hobart maintains firebreaks and undertakes fuel reduction burns, in the future a bushfire may again burn through the edges of the city. While the risk of bushfire cannot be completely removed, with careful preparation and planning and the cooperation of the community, it can be reduced.

Figure 5: Fire danger ratings

Source: Tasmania Fire Service, www.fire.tas.gov.au/Show?pageId=colFireDanger

City of Hobart controlled burning

Controlled burning is a common approach for reducing bushfire risk. The City of Hobart has responsibility for managing over 4500 hectares of bushland. It conducts on average, eight controlled burns a year. Fire risk management requires specialised training and equipment, detailed planning, and an ongoing commitment to continue the work once begun. Ensuring that smoke produced during a prescribed burn causes as little impact as possible is an increasingly large and difficult part of fire risk management.

Heatwave

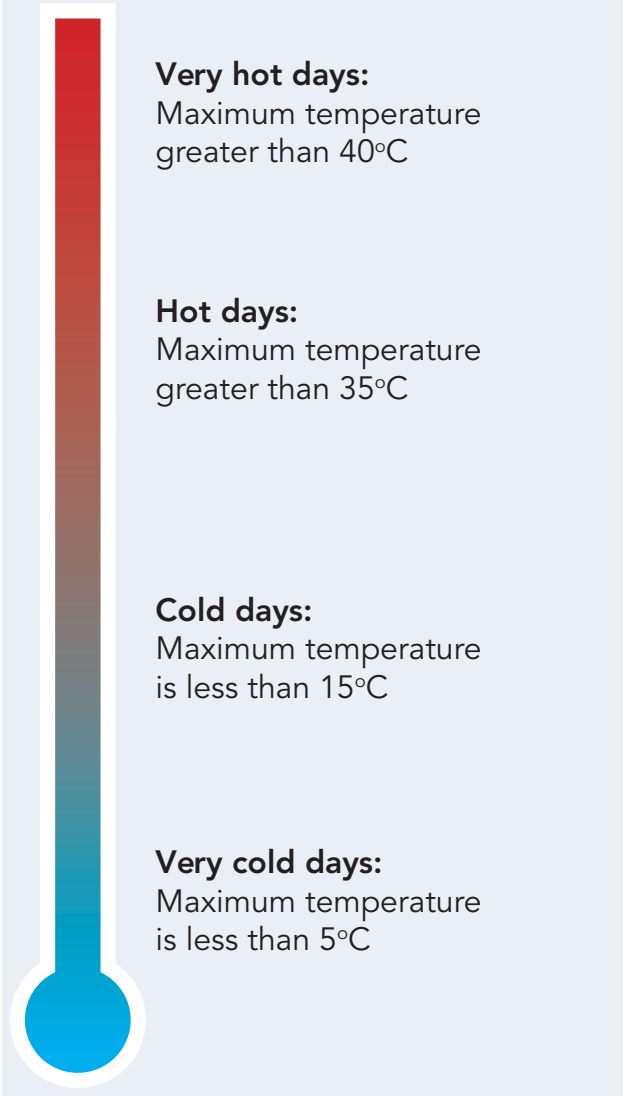
Climate change is already increasing the intensity and frequency of heatwaves in Australia. Heatwaves are becoming hotter, lasting longer and occurring more often.[19] Warmer days and nights will become more common and days of extreme heat will become more likely. 'Warm spells' (days in a row where temperatures are in their top 5%) currently last around four days in Hobart and will increase by up to six days. [20]

[19] Climate Council, Heatwaves: Hotter, Longer, More Often, 2014, p. 3

[20] City of Hobart, Hobart Climate Change Information for Decision Making, May 2016, p. 2.

Figure 6: Australian temperature extremes

Source: Bureau of Meteorology, 'About the climate extremes analyses', <www.bom.gov.au/climate/change/about/extremes.shtml>



Other natural Hazards

Other natural climate hazards that impact the region include flooding from intense rainfall, and coastal erosion and inundation. Inundation along the Derwent Estuary frontage will increase. The current 100-year storm tide event is around 0.9 to 1.4 m above average sea level. Allowing for sea level rise (0.82 m), the current 100-year coastal inundation event may become a 50-year event by 2030, and a 2- to 6-year event by 2090.[21]

Under climate change, natural hazards are increasing and intensifying. While there is capacity to respond to and recover from a single event, it may not be possible to respond to multiple cascading events because of resource and capacity constraints. For example, it has already been shown in Tasmania that flooding events followed closely by bushfires stretch available resources.

What can be done to prepare for emergencies?

The community, businesses and home owners can become better prepared for emergencies by:

1. Preparing an emergency kit with supplies for a couple of days.
2. Writing a plan, with contact numbers of local community members.
3. Hosting a 'get-to-know-you' street party.
4. Making sure you are aware of how to access the best sources of up-to-date emergency information.

[21] Hobart City Council, Climate Change Snapshot, 2012, p. 1.

HUMAN HEALTH AND VULNERABLE COMMUNITIES

There are a range of quality health services available in Hobart. Access to immunisation, clinical and mental health care and aged care services are important for vulnerable members of the community. One-third of the local population is either aged under 15 or over 65, and are at higher risk of suffering from respiratory illnesses from pollen attacks and poorly constructed housing.

Continuing to collaborate in the provision of heath care services to promote community and individual health and wellbeing will become increasingly important in the face of climate change.

Climate change poses a number of threats, from increased incidence of natural disasters such as bushfires and heatwaves, through to longer and more extreme pollen seasons.[22] Climate change is likely to lead to increases in certain types of air pollutants and airborne allergens like pollen and mould spores. These types of environmental conditions can create poor air quality and have major health impacts. This has implications for people who suffer from respiratory illnesses such as asthma, hay fever and lung cancer.

People in the community who are vulnerable to these environmental hazards need to know how to avoid these increasingly common conditions. This will enable them to better manage their symptoms and improve their quality of life.

HAVE YOUR SAY

- How can the community and City of Hobart respond to climate change induced health impacts?
- What information could help to better manage climate impacts on the health of individuals and the broader community?
- What actions could be taken to reduce risks to people's health and our vulnerable communities?
- How can the capacity and flexibility of the community be improved to help adapt to future health challenges?
- Other comments and suggestions

What can be done to prepare for hotter weather?

The community, businesses and home owners can become better prepared for hotter weather by:

1. seeking information about extreme heat forecasts
2. volunteering as part of a local community network to provide services in case of emergencies
3. knowing neighbours and checking in on them in the case of an emergency
4. pruning or mowing property vegetation before it creates a pollen or seed problem
5. supporting local food delivery so the elderly do not have to go out in heatwaves
6. promoting healthy indoor environments and climate resilient housing by raising awareness.

[22] Department of Health and Human Services, personal communications, July 2017.

AirRater app

Members of the community can help improve their health by seeking and acting on better information. AirRater is a free smartphone app that allows users to keep track of their health symptoms, such as sneezing, itchy eyes or shortness of breath, which are commonly caused by environmental triggers. AirRater also monitors smoke, temperature and pollen levels around the state, and matches user's symptoms with the levels of these hazards.

AirRater can help users work out if they are sensitive to smoke, temperature or a range of different pollens, and if certain conditions trigger symptoms. This allows users to avoid these situations to reduce their symptoms and manage their health.

AirRater has been available since October 2015, and to date has over 3500 users across Tasmania. It was developed through a collaboration of researchers from the University of Tasmania, Environment Protection Authority Tasmania, Commonwealth Scientific and Industrial Research Organisation and Australian National University. For more information and to download the app, visit www.airrater.org

Warmer winters in Tasmania may lead to fewer cold-related illnesses, however, this may be offset by an increase in high temperature days where heat exhaustion extends further south.

Members of the community vulnerable to the impacts of climate change also include people in low socio-economic or geographically isolated areas, who experience poor health or are disabled, and people who live in particular risk-zone areas such as some coastal areas.

Increasingly, warmer temperatures present a health risk to individuals who are most vulnerable to heat illness, including the elderly, the very young, those with pre-existing medical conditions and outdoor workers.

Supporting communities to adapt to rising temperatures

Since 2013, the Tasmanian Government's Public Health Services has provided information to increase awareness of the health risk of higher temperatures. Fact sheets, brochures and posters provide information on how to prepare for extreme heat, being active in the heat, safe food handling and caring for pets and wildlife. A heat health toolkit for residential aged care facilities is also available.

This information can be downloaded from dhhs.tas.gov.au/publichealth/alerts/standing_health_alerts/extreme_heat

Public Health Services also operates an extreme heat emergency management plan, which when triggered, activates a range of preparation and response activities across all emergency services. This means these services are well-prepared for extreme heat days when they arrive.

With climate change, the threat of extreme weather events and hazards are likely to increase in frequency, severity, duration and across a greater area.

SETTLEMENTS, INFRASTRUCTURE AND INDUSTRY

Hobart has internationally recognised and admired cultural and built heritage. The community and economy is supported by a range of services underpinned by communications, energy, water and wastewater infrastructure.

Under climate change, resources need to be managed to ensure that the infrastructure provided can respond to:

- the demands from a growing population
- emerging technology changes such as electric vehicles
- the needs of innovative local industries
- greater renewable energy capabilities
- hanges in the transport system that get people to their destination in a more streamlined way
- ensuring access for everyone, including people with disabilities.

Adaptation actions for settlements, infrastructure and industry need to focus on low emission solutions to avoid contributing to further climate change impacts.

HAVE YOUR SAY

- How can the community and City of Hobart respond to the impacts of climate change on infrastructure?
- What information is required to better plan for the projected impacts of climate change on settlements, infrastructure and industry?
- How can communities and industry increase their capacity to respond to a changing climate?
- What actions can be taken to reduce the risk of climate hazards on settlements, infrastructure and industry?
- Other comments and suggestions.

Transport

Roads damaged due to flooding or extreme hot days causing bitumen damage can delay traffic and reduce economic productivity. We need alternative ways of navigating the city if this occurs. We need to encourage and foster smarter ways of delivering people to their destinations, either by ferry, organised tours or by efficient public transport services.

Energy

The community relies on energy to meet basic needs and in some cases medical equipment is required to be kept on all the time. However, providing energy security will be more difficult with greater pressures on the system, such as extreme heat or bushfires causing disruptions to supply.

A diverse range of low emission, local renewable energy options can help to boost supply when one element is not working as well, or when there are outages in different parts of the network. An example is if there is a storm with strong winds, wind turbines are shut down and hydropower is used instead.

Public place infrastructure

The frequency and intensity of extreme storms is likely to increase. At the same time, sea levels are rising. This creates more likely situations of flooding and coastal inundation. Low lying settlements will be particularly vulnerable to the impacts of climate change from coastal erosion and storm surges. While coastal assets are protected in some areas, in others it will become too hard or too costly to continually repair the damage.

Marieville Esplanade and Nutgrove Beach

Marieville Esplanade, Nutgrove Beach and Long Beach are identified as being vulnerable to the impacts of storm tide inundation and coastal erosion. Managing coastal risks is a shared responsibility between the community and government. To assist with managing this risk, the City of Hobart has shared information about potential storm tide inundation and coastal erosion impacts with the local communities and explored potential ways to adapt.

The City of Hobart has also for many years upgraded coastal infrastructure at Long Beach, Cornelian Bay and Nutgrove Beach that protect assets such as parklands and recreational spaces. This has involved building structures to reduce the risk of erosion that are appropriate to the area and do not have flow-on negative impacts further down the beach.

Social networks

Our community relies on valuable social structures. Local community centres and open spaces, markets, meet-and-greets, cultural events and social networks all work to connect people and establish a sense of community. Further strengthening these networks will reinforce Hobart's reputation as a resilient, welcoming and connected place.

Protecting cultural heritage

Climate change may have adverse consequences for places of past human settlements and current cultural importance, such as significant Aboriginal and historic colonial sites.

Managing and protecting sites of Indigenous cultural significance

Over a period of at least 35 000 years, Aboriginal people have lived in the area now occupied by Hobart—leaving behind cultural material including stone tools, middens and other artefacts, as well as influencing the animal, plant and fire ecology of the region.[23]

Hobart is situated in the territory of the Mouheneenner people and the area is known as Nibberloonnee or Linghe. The Mouheneenner had a summer camp at Little Sandy Bay called Krewer. kunanyi (Mount Wellington) was a major spiritual place.[24]

The City of Hobart recognises the strong link between Tasmania's Aboriginal people and Hobart's bushland values by using inclusive management practices. Protection of cultural landscapes such as native grasslands is equally important as protection of cultural artefacts.

Historic heritage in Tasmania is that part of the cultural heritage that derives from non-Aboriginal history. The types of historic heritage that might be expected in Hobart, apart from its wide array of European settlement, include convict and early settlement buildings, significant trees, timber and maritime industry artefacts, and places associated with identifying events or people.

The vulnerability of built heritage to climate change is dependent on factors such as the location, age, design and construction method. Impacts on heritage assets range from storm to fire damage. These forces can mean expensive upgrades, which if delayed could lead to the demise of Hobart's high value heritage.

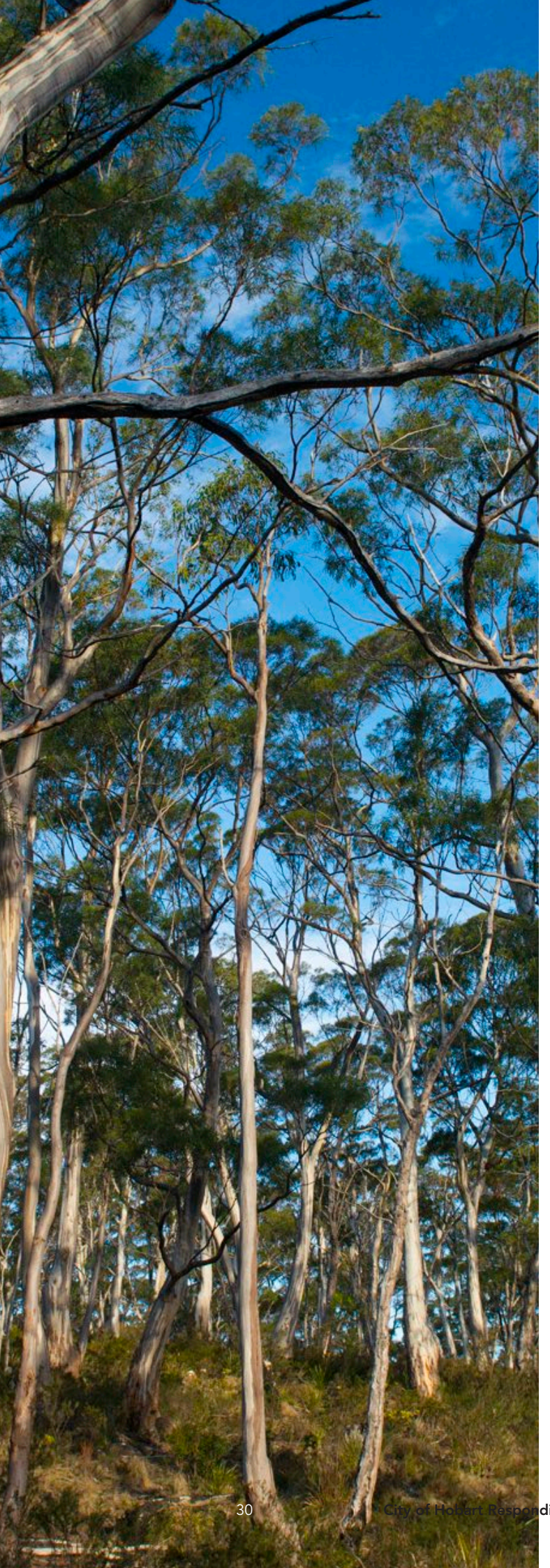
[23] Hobart City Council, Bushland Management Strategy 2007–2017, 2008.

[24] Hobart City Council, Aboriginal Strategy 2002, 2002.

What can be done to prepare for climate change impacts on settlements, infrastructure and industry?

The community, businesses and home owners can become better prepared for impacts on private and public infrastructure by:

1. Keeping up to date with information about pending emergency events, such as bushfire, intense rainfall, and storm surge on the coast.
2. Developing preparation and response plans for emergencies.
3. Discussing the sequence of responses that will be required for long-term adaptation of key infrastructure.
4. Prioritising assets for protection that are most vulnerable to climate change impacts.



NATURAL SYSTEMS

Hobart's residents and visitors value and enjoy the natural environment. The city provides a unique experience with important conservation areas in close proximity to the urban setting. Residents are keen dog walkers and bike riders and explore many of the tracks and trails.

The natural systems of Hobart need to be protected and restored so that flora and fauna can flourish and so that they can continue to provide a range of functions for the community.

Climate change threatens Hobart's natural assets and is likely to lead to ecosystem changes, including local species extinction.

The community, along with the natural resources and primary industry sectors, will need to work cooperatively to sustain natural landscapes and seascapes. Priorities are providing adequate protection to critical conservation areas on land and in the sea, and focusing conservation efforts on species with the capacity to adapt.

HAVE YOUR SAY

- How can the community and City of Hobart help natural systems respond to climate change impacts?
- What information is required to better plan for the projected impacts of climate change on natural systems?
- How can communities and industry increase their capacity to help natural systems adapt to a changing climate?
- What on-ground actions can be taken to reduce the risk of climate hazards on natural systems?
- Other comments and suggestions.

Over 60% of the Hobart area is private and public bushland. No other Australian capital city has such a diverse altitudinal range and variety of native vegetation. Alpine heaths and 'string bogs' swathe the wild, rocky mountain pinnacle of Mt Wellington; eucalypt forests cloak the hillsides; towering Tasmanian blue gums shadow the rivulet corridors; and she-oak coastal forests and lowland native grasslands flank the estuarine foreshore.

The impacts of climate change are especially significant for the region's natural systems, and will place additional stress on biodiversity. Land-based species and ecosystems are vulnerable to climate change, including:

- impacts on soils, leading to changes in soil hydrology, organic carbon, salinity, erosion and sedimentation
- increasing temperatures and snow cover declines that will result in a decline in alpine and sub-alpine area
- ecosystems vulnerable to fire, such as temperate rainforests, which are likely to be placed under increased pressure from climate change
- native animals affected by changes to and loss of their habitats.

Tasmania's freshwater ecosystems are considered to be one of the most vulnerable to climate change. Water quantity and temperature change are key factors as well as the following risks:

- a potential reduction in the amount of suitable habitat available for aquatic species as a result of changed rainfall and run-off patterns
- increased bank erosion, loss of vegetation on banks, and increased sedimentation as a result of longer periods of dry weather, separated by heavier rain events
- increased threats from invasive species and erosion
- freshwater wetlands close to sea level are at risk of saltwater intrusion and the effects of storm surges.[25]

[25] Tasmanian Climate Change Office, Adapting to Climate Change in Tasmania: Issues Paper, October 2012.

City of Hobart and Bushland Management

The City of Hobart in partnership with the local community is working to retain, promote and enhance the unique character and values of Hobart's bushland for the long-term environmental, social and economic benefit of the community.[26]

The City established its Bushcare program in 1993 and currently supports 17 Bushcare groups across the city, from the Hobart's coastline to kunanyi/ Mount Wellington Park.

On average, 120 people volunteer for Bushcare each month. With additional field days and special events, Bushcare volunteers contribute over 3000 hours each year to regenerating local bushland and raising awareness of the issues in their local area.

Derwent Estuary Program

The Derwent Estuary Program is a regional partnership between the City of Hobart, other local governments of Greater Hobart, the Tasmanian Government, industry, and community-based groups to restore and promote the Derwent Estuary.

The Derwent Estuary Program has a strong interest in retaining environmental assets within the estuary that are improving water quality, which appears to be at risk from climate change. Key areas of concern in relation to climate change include:

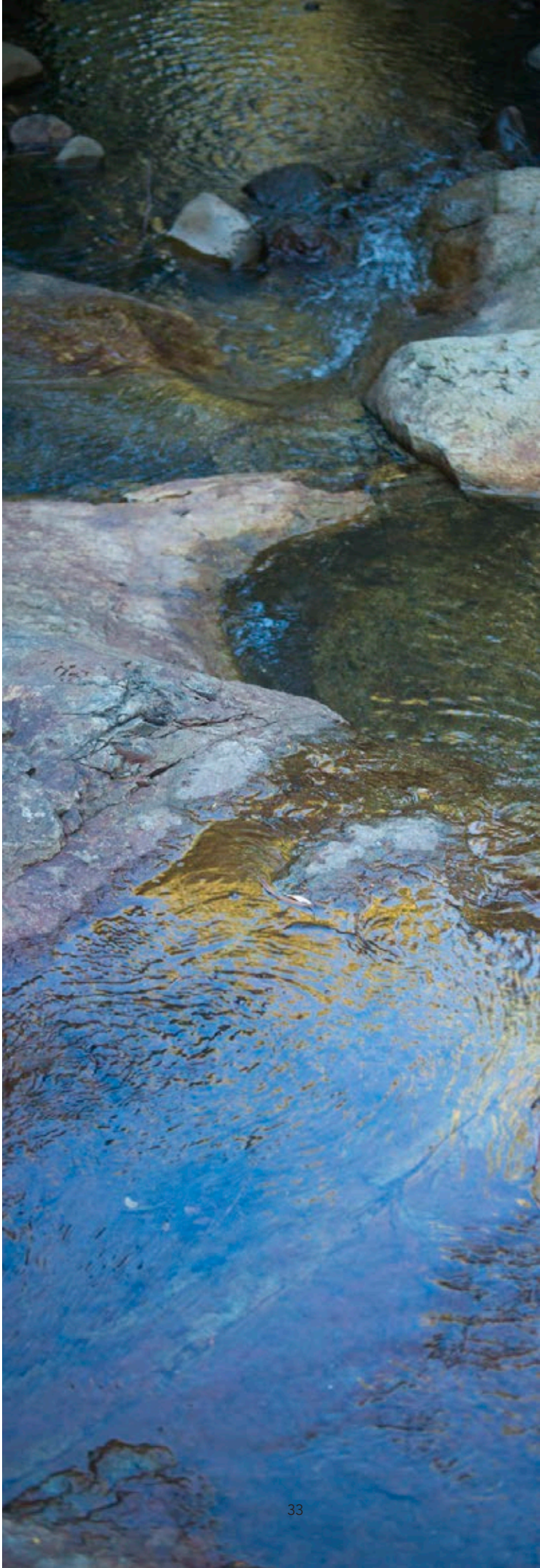
- sea level rise causing coastal squeeze and loss of tidal wetlands and saltmarshes. The program is advocating for planning consideration to be given to current vulnerable areas and habitat retreat corridors
- potential reduced River Derwent flows causing reduced dissolved oxygen at depth within the estuary. The program is encouraging research and information sharing to assist better understanding of the risk
- increased occurrence of intense rainfall events in Hobart's urban areas, causing stormwater management issues such as 'urban stream scour'. The program is promoting retention of natural watercourses and local government application of the State Stormwater Strategy.

[26] Hobart City Council, Bushland Management Strategy 2007–2017, 2008.

What can be done to prepare for climate change impacts on the natural environment?

The community, businesses and home owners can become better prepared for impacts on private and public infrastructure by:

1. joining local bushcare groups or wildlife rescue
2. building community preparedness by increasing understanding of how to help wildlife in bushfire emergencies
3. forming networks with other private landholders for increased communication on natural resource management strategies.

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FURTHER INFORMATION

Antarctic Climate and Ecosystems Cooperative Research Centre, 'Climate Futures for Tasmania', 2015. http://acecrc.org.au/climate-futures-for-tasmania/

Antarctic Climate and Ecosystems Cooperative Research Centre, Climate Futures for Tasmania, fact sheet: LiDAR Dataset, undated. http://www.dpac.tas.gov.au/__data/assets/pdf_file/0007/105001/CFT_Fact_Sheet_LiDAR_Dataset_FINAL_081118.pdf

Australian Government, National Climate Resilience and Adaptation Strategy, 2015. http://www.environment.gov.au/climate-change/adaptation/publications/national-climate-resilience-and-adaptation-strategy

City of Hobart, Hobart Climate Change Information for Decision Making, May 2016. http://www.hobartcity.com.au/Environment/Climate_and_Energy/Climate_Change_in_Southern_Tasmania

Commonwealth Scientific and Industrial Research Organisation, An Overview of climate change adaptation in Australian primary industries – impacts, options and priorities, February 2008. https://www.csiro.au/~/media/OnA/Files/AgAdaptationReport_CAF_PubTech%20Standard.pdf

Commonwealth Scientific and Industrial Research Organisation, Sea-Level Rise and Allowances for Tasmania based on the IPCC AR5, 15 May 2016. http://www.dpac.tas.gov.au/__data/assets/pdf_file/0016/313522/CSIRO_Sea_Level_Rise_Allowance_Report_December_2016.pdf

Department of the Environment and Energy, 'National Climate Change Adaptation Research Facility', undated. http://www.environment.gov.au/climate-change/adaptation/climate-change-adaptation-program/research-facility

Department of the Environment and Energy, 'National Environmental Science Programme', undated. http://www.environment.gov.au/science/nesp

Department of Premier and Cabinet, 'Bushfire and Climate Change Research Project', 2016. http://www.dpac.tas.gov.au/divisions/climatechange/Climate_Change_Priorities/climate_risks_and_opportunities/bushfire_research_project

Department of Premier and Cabinet, 'Local Government Area Climate Profiles', undated. http://www.dpac.tas.gov.au/divisions/climatechange/what_you_can_do/local_government/local_government_area_climate_profiles

Department of Premier and Cabinet, 'Coastal hazards in Tasmania, undated. http://www.dpac.tas.gov.au/divisions/osem/coastal_hazards_in_tasmania

Department of Premier and Cabinet, 'Tasmanian Coastal Adaptation Pathways project', undated. http://www.dpac.tas.gov.au/divisions/climatechange/Climate_Change_Priorities/climate_risks_and_opportunities/coastal

Department of Primary Industries, Parks, Water and Environment, Vulnerability of Tasmania's Natural Environment to Climate Change: An Overview, 2010. http://dpipwe.tas.gov.au/Documents/Vulnerability-of-Tasmanias-Natural-Environment-to-Climate-Change---An-Overview.pdf

Hobart City Council, Climate Change Snapshot, 2012. http://www.hobartcity.com.au/Environment/Climate_and_Energy/Climate_Change_in_Southern_Tasmania

Southern Tasmanian Councils Authority, Regional Councils Climate Change Adaptation Strategy, Southern Tasmania 2013–2017, 2013. http://www.hobartcity.com.au/Environment/Climate_and_Energy/Adapting_to_a_Changing_Climate

Tasmanian Climate Change Office, Climate Action 21: Tasmania's Climate Change Action Plan 2017–2021, June 2017. http://www.dpac.tas.gov.au/divisions/climatechange/tasmanias_climate_change_action_plan_20172021

ABBREVIATIONS AND GLOSSARY

Adaptation

Changing the way we do things in response to climate change impacts.

drought

a prolonged, abnormally dry period when the amount of available water is insufficient to meet our normal use, and is generally measured by assessing rainfall deficiencies over three or more months

evapotranspiration

where water lost from the land surface is both evaporated and transpired by plants.

Greater Hobart

All of the suburbs in the southern region surrounding Hobart's city centre that are captured by Glenorchy, Clarence and Kingborough local government areas.

heatwave

A heatwave is a prolonged period of excessive heat, which results from a certain combination of temperature, humidity, air movement and duration.

Hobart

Hobart municipal area

inundation

Flooding of an area.

preparedness

Arrangements and measures put in place so that the right resources and services are deployed during an emergency to help communities cope.

refugia

key places in the landscape that will be most resilient to climate change effects and so will act as a refuge for plants and animals.

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