13 November 2019

NOTICE OF MEETING

Dear Committee Member,

The next Environmental Advisory Committee meeting will be held at 6.00 pm on Wednesday, 20 November 2019 in the Committee Room, 7000 Great Eastern Highway, Mundaring.

The attached agenda is presented for your consideration.

Yours sincerely

Jonathan Throssell
CHIEF EXECUTIVE OFFICER

Please Note

If an Elected Member has a query regarding a report item or requires additional information in relation to a report item, please contact the senior employee (noted in the report) prior to the meeting.

AGENDA
ENVIRONMENTAL ADVISORY COMMITTEE MEETING
20 NOVEMBER 2019

ATTENTION/DISCLAIMER

The purpose of this Committee Meeting is to discuss and make recommendations to Council about items appearing on the agenda and other matters for which the Committee is responsible. The Committee has no power to make any decisions which are binding on the Council or the Shire of Mundaring unless specific delegation of authority has been granted by Council. No person should rely on or act on the basis of any advice or information provided by a Member or Employee, or on the content of any discussion occurring, during the course of the Committee Meeting.

The Shire of Mundaring expressly disclaims liability for any loss or damage suffered by any person as a result of relying on or acting on the basis of any advice or information provided by a Member or Employee, or the content of any discussion occurring during the course of the Committee Meeting.

CONTENTS

1.0 OPENING PROCEDURES

Acknowledgement of Country

Shire of Mundaring respectfully acknowledges the Whadjuk people of the Noongar Nation, who are the traditional custodians of this land. We acknowledge Elders past, present and emerging and respect their continuing culture and the contribution they make to the region.

1.1 Announcement of Visitors

1.2 Attendance/Apologies

Staff Ruth Broz Minute Secretary

Apologies

Guests

1.3 Election of Presiding Person

2.0 ANNOUNCEMENTS BY PRESIDING MEMBER WITHOUT DISCUSSION

3.0 DECLARATION OF INTEREST

3.1 Declaration of Financial Interest and Proximity Interests

Elected Members must disclose the nature of their interest in matters to be discussed at the meeting *(Part 5 Division 6 of the Local Government Act 1995).*

Employees must disclose the nature of their interest in reports or advice when giving the report or advice to the meeting *(Sections 5.70 and 5.71 of the Local Government Act 1995).*

3.2 Declaration of Interest Affecting Impartiality

An Elected Member or an employee who has an interest in a matter to be discussed at the meeting must disclose that interest *(Shire of Mundaring Code of Conduct, Local Government (Admin) Reg. 34C).*

4.0 CONFIRMATION OF MINUTES OF PREVIOUS MEETINGS

RECOMMENDATION

That the Minutes of the Environmental Advisory Committee Meeting held 21 August 2019 be confirmed.

5.0 PRESENTATIONS

5.1 Environmental Management

The Co-ordinator Environment and Sustainability will be giving a presentation on the above topic.

6.0 REPORTS OF EMPLOYEES

6.1 Local Biodiversity Strategy Review

File Code	GV.MTG 6/7
Author	Briony Moran, Coordinator Environment and Sustainability
Senior Employee	Mark Luzi, Director Statutory Services
Disclosure of Any Interest	Nil
Attachments	Nil

SUMMARY

Review of the Shire's Local Biodiversity Strategy is listed in the Corporate Business Plan for the 2019/20 and 2020/21 financial years.

This report recommends that the Environmental Advisory Committee (EAC) endorses the approach to preparing a Local Biodiversity Strategy that will consolidate and integrate a number of previous biodiversity related strategies into a single document. The formation of a working group is also recommended, to make use of specialist knowledge of EAC members in undertaking the project.

BACKGROUND

The Shire has limited environmental staff and funds and a range of competing priorities listed in multiple, interwoven plans and strategies. The current plans and strategies are:

- Wildlife Corridor Strategy 2000
- Weed Control Strategy 2002
- Community Education Strategy 2003
- Friends Group Strategy 2004
- Local Biodiversity Strategy 2009
- Private Land Conservation Incentives Strategy and Action Plan 2009
- Local Climate Change Adaptation Action Plan 2012
- Environmental Management Plan 2012-2022
- Eastern Region Catchment Management Plan 2012-2022 (Shire and partners)
- Roadside Conservation Strategy 2016
- Water Efficiency Action Plan 2016
- Energy and Emissions Reduction Strategy 2018

In addition to these environmental strategies there are substantial environmental protection provisions within Local Planning Scheme No. 4 (2014). Shire guidelines which inform decision making relating to planning approvals currently include the Landscape and Revegetation Guidelines (2015), Keeping of Stock Guidelines (2017), and Environmental Guidelines for the Construction of Dams (2000).

At its meeting of 28 August 2018 the EAC resolved (EAC5.08.18) that the Committee:

1. Supports the reviews of the 2002 Weed Control Strategy and 2000 Wildlife Corridor Strategy with the aim to develop an integrated Local Biodiversity Strategy in 2019/20; and

2. Supports the completion of the State of Environment Report within the 2021/22 financial year to inform the Shire's review of its Environmental Management Plan (2022).

Subsequent staff project planning resulted in the Local Biodiversity Strategy Review being listed in the Corporate Business Plan as a two-year project to be completed in 2020/21.

STATUTORY / LEGAL IMPLICATIONS

Nil

POLICY IMPLICATIONS

The Environmental Sustainability Policy adopted by Council in June 2018 has a number of relevant provisions:

1.1. Biodiversity and watercourse integrity should be maintained and mitigation measures will be considered where the works cannot be designed or constructed to avoid impacts.

1.2. The Shire will strive to lead by example in balancing bushfire risk management with maintaining biodiversity and conservation of natural landscapes.

1.3. Allocation of Shire resources for natural area management will take into account social and ecological values and the nature of threatening processes

1.4. Human induced climate change is recognised as a key threat to biodiversity, requiring mitigation action to reduce carbon emissions at all levels of government, and adaptation to local impacts.

3.1. The Shire recognises that healthy ecosystems and well-managed natural areas support the health and well-being of the community, and the Shire will strive to lead by example as a responsible custodian of public environmental assets

4.2. The Shire will remain agile; learning and collaborating with community groups, research institutions and relevant government agencies to adapt best practice environmental management to fit the Shire's context.

FINANCIAL IMPLICATIONS

Nil. Council allocates $25,000 per year to progress strategic environmental initiatives through the annual Corporate Business Plan process, consistent with previous funding decisions.

STRATEGIC IMPLICATIONS

Mundaring 2026 Strategic Community Plan

Priority 3 - Natural environment

Objective 3.2 – A place where the environment is well managed

Strategy 3.2.1 – Identify and mitigate threats to the natural environment

SUSTAINABILITY IMPLICATIONS

As stated in the Shire's Environmental Sustainability Policy, "Environmental sustainability includes… protecting ecosystems and biodiversity."

As Shire actions have direct environmental impacts on local natural areas and the Shire is also well placed to encourage biodiversity awareness and sustainable land management withinin the community, it is essential that the strategic framework supports effective action by Shire staff.

RISK IMPLICATIONS

Risk: Financial – Shire effort and activities for biodiversity conservation are not directed efficiently.		
Likelihood	**Consequence**	**Rating**
Possible	Moderate	Moderate
Action / Strategy		
Integrate biodiversity related strategies into a single Local Biodiversity Strategy.		

EXTERNAL CONSULTATION

No external consultation has been undertaken.

COMMENT

The previous approach to multiple, single issue strategies has allowed a focus on particular elements of biodiversity conservation each time, but with the end result that information is spread across a range of dated and sometimes overlapping strategies and it becomes difficult for stakeholders and Shire staff to gauge the Shire's current priorities.

The Priority Reserves Ecological Assessment Report completed in 2018 recommended that 'an integrated Dieback and Weed Management Plan and Rehabilitation Strategy, or more holistic Biodiversity Strategy, should be developed and implemented'. Development of a more holistic Local Biodiversity Strategy was recommended incorporating review and integration of the:

- Weed Control Strategy;
- Wildlife Corridor Strategy;
- Friends Group Strategy;
- Roadside Conservation Strategy; and
- Private Land Conservation Incentives Strategy.

A single Local Biodiversity Strategy will be more manageable for the Shire to maintain and update regularly, and simpler for Shire staff and environmental volunteers to follow. The timing of the Local Biodiversity Strategy review is shown below with related projects.

2019/20	2020/21	2021/2022	2022/23
Local Biodiversity Strategy (environmental mapping and integration of a range of older biodiversity related strategies including Wildlife Corridor Strategy)		**State of Environment Report** To inform next Environmental Management Plan	**Environmental Management Plan** (Updated)
	Watercourse Hierarchy Strategy development (links to ecological corridor and biodiversity mapping)		Participation in Eastern Region Catchment Management Plan review

Members of the EAC have specialist knowledge that will assist the Shire in the review and integration to prepare a more holistic Local Biodiversity Strategy. Formation of a smaller reference group is therefore recommended to assist Shire staff in this process. The reference group would be anticipated to meet approximately six times up until April 2021.

VOTING REQUIREMENT

Simple Majority

RECOMMENDATION

That the Committee:

1. Notes the Shire's commitment to prepare a more holistic Local Biodiversity Strategy; and
2. Nominates five EAC members to form a Biodiversity Strategy Reference Group to provide guidance and feedback during the preparation of the Local Biodiversity Strategy.

6.2 Climate Emergency Declaration

File Code	EV.PRG 13
Author	Briony Moran, Coordinator Environment and Sustainability
Senior Employee	Mark Luzi, Director Statutory Services
Disclosure of Any Interest	Nil
Attachments	1. City of Darebin Climate Emergency Response Framework ⇩ 2. Emergency Leaders for Climate Action joint statement ⇩ 3. Climate Change Risk to Australia's Built Environment - High Risk Local Government Areas ⇩ 4. Climate Change Risk to Australia's Built Environment - All Hazards Ranking ⇩ 5. Health Impacts of Climate Change - Tables 1 and 2 ⇩ 6. Key findings summary from Compound Costs: How Climate Change is Damaging Australia's Economy ⇩ 7. Energy and Emissions Reduction Plan ⇩

SUMMARY

Separate requests have been received from Committee members Jim Thom and Stephan Millett for the Environmental Advisory Committee (EAC) to advise Council to declare a climate emergency.

It is recommended that the EAC advises Council that climate change is a serious risk to the Shire of Mundaring that constitutes a climate emergency, and to request urgent efforts by State and Commonwealth Governments to reduce emissions, increase resources for firefighting, and assist local governments with adaptation.

BACKGROUND

The EAC was involved in the development and review of the Energy and Emission Reduction Strategy (EERS) adopted by Council on 11 September 2018 (C9.09.18). The EERS notes that:

> *The diverse and varied landscapes, activities and communities of the Shire are at risk from the impacts of climate change. Climate modelling indicates that the south west of Western Australia, including the Shire of Mundaring, will continue to be affected by increased temperatures, more frequent bushfires, and reductions in rainfall, surface and groundwater resources*.

In March 2019 Council resolved to endorse the Western Australian Local Government Association's Policy Statement on Climate Change (C3.03.19), which acknowledges that there is a global climate emergency, and calls for:

i) Strong climate change action, leadership and coordination at all levels of government.

ii) *Effective and adequately funded Commonwealth and State Government climate change policies and programs.*

The Policy Statement also states that Local Government seeks from State and Commonwealth Government 'partnering with and resourcing Local Government to deliver community emissions reduction programs that are most effectively implemented at the Local Government level.'

Committee member Jim Thom has submitted a request for the EAC to advise Council to endorse the statement:

Mundaring Shire acknowledges that we are currently living in a state of climate emergency which has the potential to adversely affect our way of life.

All future decisions made by the Council should be guided by this.

The Shire encourages state and federal governments to likewise declare a state of climate emergency.

Committee member Stephan Millett has submitted a separate request that:

1. *Mundaring Shire compile an inventory of initiatives it has taken, or plans to undertake, that will have the effect of mitigating the effects of climate change; and*
2. *The Shire build on its climate-change-relevant work to date by declaring a climate change emergency and acknowledge that this declaration shall be a principal guide for policy and decision-making for a period of five years.*

Note 1. We ask the Shire to take into account the recent declaration of a climate emergency by 11,000 scientists which makes clear that "The climate crisis has arrived and is accelerating faster than most scientists expected. It is more severe than anticipated, threatening natural ecosystems and the fate of humanity."

Note 2. The declaration should be used to channel resources in such ways that economies of scale might be achieved in climate change mitigating initiatives e.g. by combining otherwise disparate activities under a common theme.

Many local governments and other organisations around Australia have made declarations of a climate emergency. The City of Darebin was the first local government in Australia to declare a climate emergency and it has produced a four page framework to assist local governments (Attachment 1). Lists of jurisdictions that have made declarations and information to support Climate Emergency Declarations have been collated online and include the following note:

Our call for declaring a climate emergency is not structured movement with a specific guideline and a set of criteria as such. It is an open 'movement of movements', and there are many opinions floating around about what is the best strategy.

Eventually, it is up to each individual council to make up its mind about what it wants to suggest and to implement.

STATUTORY / LEGAL IMPLICATIONS

Section 1.3(3) of the *Local Government Act 1995* requires that:

In carrying out its functions a local government is to use its best endeavours to meet the needs of current and future generations through an integration of environmental protection, social advancement and economic prosperity.

POLICY IMPLICATIONS

Pursuing a range of local energy and emission reduction measures, whilst also advocating for broader actions to act to reduce emissions, is consistent with the following principles of the Environmental Sustainability Policy OR-23:

1.4. Human induced climate change is recognised as a key threat to biodiversity, requiring mitigation action to reduce carbon emissions at all levels of government, and adaptation to local impacts.

2.1. The Shire will pursue and promote improved water and energy efficiency, reduced carbon emissions and sustainable use of natural resources.

2.2. Energy and water efficiency is a key consideration in design, construction, maintenance or renovation of Shire facilities, and in the purchase of vehicles, machinery, fittings and appliances.

FINANCIAL IMPLICATIONS

A declaration of climate emergency in itself will not have direct financial implications. A range of actions are already undertaken by the Shire to reduce its own emissions, encourage community emissions reduction, and address climate risks.

Financial implications for the Shire of accelerating climate change are difficult to quantify and would include increased damage and loss of infrastructure from extreme weather events, including flood and bushfire.

STRATEGIC IMPLICATIONS

Mundaring 2026 Strategic Community Plan

Priority 2 - Community

Objective 2.1 – A community that is prepared for bush fire and other natural disasters

Strategy 2.1.4 – Plan in place for mitigating the effects of natural disasters

SUSTAINABILITY IMPLICATIONS

Rapid climate change is a critical threat to ecosystems, economies, infrastructure, human health and property. Investment in adaptation will reduce the impacts on communities of the extent of climate change that is unavoidable. Action to reduce emissions will have economic, social and environmental benefits by reducing the risk of catastrophic levels of global climate change.

RISK IMPLICATIONS

Risk: Reputational – declaring a climate emergency may be considered unwarranted or inappropriate by some members of the community		
Likelihood	**Consequence**	**Rating**
Possible	Minor	Moderate
Action / Strategy		
Issue a statement providing an explanation of the Shire's reasons and concerns if declaring a climate emergency		

EXTERNAL CONSULTATION

No external consultation has been undertaken. Community perceptions of climate change will include a range of views, however surveys of Australian attitudes to climate change indicate a high level of acceptance of climate science and concern about impacts.

The Lowy Institute has surveyed Australians about climate change and other matters for the past 14 years, including a question about which of these three statements are closest to their personal point of view:

- *Global warming is a serious and pressing problem. We should begin taking steps now, even if this involves significant costs.*
- *The problem of global warming should be addressed, but its effects will be gradual, so we can deal with the problem gradually by taking steps that are low in cost.*
- *Until we are sure that global warming is really a problem, we should not take any steps that would have economic costs.*

In 2019, 61% of the 2130 people surveyed said global warming is 'a serious and pressing problem' and we should begin taking steps now even if this involves significant costs. Only 10% said 'we should not take any steps that would have economic costs'.

Another recurring climate survey, Climate of the Nation, has tracked concern about climate change since 2012. The 2019 survey by The Australia Institute of 1,960 people included 301 Western Australians. The results found that 80% think that Australians are already experiencing the impacts of climate change, and 84% agree that State and Territory Governments should be taking a leading role or contributing to action on climate change. Concern about climate change was highest among 18 to 34-year-olds (83% of respondents saying climate change worried them) compared to 67% of those aged 55 and over.

A larger recent survey undertaken by the Australian Broadcasting Corporation in collaboration with Vox Pop Labs surveyed over 54,000 Australians and found that climate change was listed as the leading worry (out of 27 factors) with 72% of respondents concerned it would affect their lives.

COMMENT

The basic concept of the atmospheric greenhouse effect and the risk that burning of fossil fuels could result in global warming has been known for over 100 years. Scientists have been working to understand the rate of change, potential feedback loops and impacts on particular locations, industries and ecosystems since the 1970s. The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 to assess climate change based on the latest science, synthesise research findings from many countries, and produce reports including technical papers, comprehensive assessments, and summaries for policymakers.

In 2014 the IPCC presented a summary for policymakers of the fifth comprehensive assessment of climate science. It was published in 2015 as *Climate Change 2014 Synthesis Report - Summary for Policymakers* and notes that 'Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history... Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen.'

Informed by the best available climate science, 195 nations adopted the Paris Agreement in December 2015, which aims to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.

In 2018 the IPCC issued a *Special Report on Global Warming of 1.5°C.* That report highlighted climate change impacts on natural and human systems and adaptation costs that could be avoided by limiting warming to 1.5°C, compared to 2°C. Risks of droughts are higher at 2°C than 1.5°C, as are risks of heavy rainfall and flooding associated with tropical cyclones. Coral reefs would decline by 70-90 percent with global warming of 1.5°C, whereas virtually all (> 99 percent) would be lost with 2°C. Sea level rise will continue beyond 2100 even if global warming is limited to 1.5°C, however thresholds of marine ice instability in Antarctica and/or irreversible loss of the Greenland ice sheet could be passed between 1.5°C and 2°C that lead to multiple metres of sea level rise over coming centuries.

The report also notes that allowing the global temperature to temporarily exceed or 'overshoot' 1.5°C would cause increasing sea level rise, irreversible damage to some ecosystems, and mean a greater reliance on techniques to remove carbon dioxide from the air to attempt to return global temperature to below 1.5°C by 2100. The effectiveness of such techniques are unproven at large scales and some may carry significant risks. Some 'carbon drawdown' mechanisms which may be effective at current temperatures, such as tree planting, may be much less effective at higher global temperatures with increased disruption to rainfall patterns and incidence of extreme fire conditions. The window of opportunity to avoid increases over 1.5°C is closing, requiring carbon emissions to stop increasing and begin declining as soon as possible to avoid irreversible ecological damage and increasing impacts on human health and settlements.

In August 2019 the IPCC issued a *Special Report on Climate Change and Land* addressing food security, land degradation, desertification, and terrestrial ecosystems. The summary for policymakers notes that the stability of food supply is expected to decrease as the magnitude and frequency of extreme weather events increases. Climate change has already affected food security in various areas due to warming, changing rainfall patterns and water scarcity, greater frequency and intensity of droughts in some regions, and greater frequency of some extreme weather events including heavy rainfall and flooding in some regions.

Over coming decades the frequency and intensity of droughts and heatwaves is projected to increase in many regions, at the same time as the frequency and intensity of extreme rainfall events are projected to increase in many regions. Even in regions where overall rainfall is declining, an increasing proportion can fall during extreme weather events and raise the risk of flooding. Cascading risks (where a series of risks exacerbate others like falling dominoes, such as flood following drought accelerating land degradation) will become increasingly severe. At around 1.5°C there are significant risks from dryland water scarcity, wildfire damage, and food supply instabilities (which can include high food prices if crops simultaneously fail in different regions). Crop failures and food supply instability can result in large scale 'forced migration' from areas affected by floods or drought, which can destabilise governments and lead to conflicts within and between nations. Risks from droughts, water stress, heat related events such as heatwaves and habitat degradation all increase between 1.5°C and 3°C warming.

Global carbon emissions have continued to increase, consistent with a trajectory previously considered as a worst case scenario. The 10 warmest years on record have all occurred since 1998, and 9 of the 10 have occurred since 2005. Positive feedback loops have begun to increase both warming and greenhouse gas concentrations, through:

- warmer air can hold more water vapour, which evaporates faster from warmer oceans, and water vapour in the atmosphere can act as a greenhouse gas and further increase warming;
- melting Arctic ice and glaciers are replaced by darker ocean waters and exposed rock, absorbing heat that previously would have been reflected by lighter coloured ice;
- forest fires are increasing in frequency and intensity and occurring in rainforests, Arctic and alpine environments where fire was previously limited or infrequent, releasing additional carbon;
- thawing of permafrost is increasing the release of methane from frozen marshes. Methane does not remain in the atmosphere as long as carbon dioxide (estimated at about 10-12 years) but is more effective at trapping heat in the atmosphere.

The current trajectory for global warming appears to be towards a global average increase of 1.5°C above pre-industrial levels by around 2040 and 2°C around 2060. There is speculation of potential climate tipping points, where continued carbon emissions and cascading feedback loops could accelerate global warming to a scenario of up to 8°C. There is also speculation on the use of experimental geoengineering methods, such as manipulating the atmosphere to increase reflectivity and slow the rate of warming.

On 5 November 2019 the scientific journal BioScience published an article titled *World Scientists' Warning of a Climate Emergency* (Ripple *et al*) which included the statements below:

> *Scientists have a moral obligation to clearly warn humanity of any catastrophic threat and to "tell it like it is." On the basis of this obligation and the graphical indicators presented below, we declare, with more than 11,000 scientist signatories from around the world, clearly and unequivocally that planet Earth is facing a climate emergency.*
>
> *Exactly 40 years ago, scientists from 50 nations met at the First World Climate Conference (in Geneva 1979) and agreed that alarming trends for climate change made it urgently necessary to act. Since then, similar alarms have been made through the 1992 Rio Summit, the 1997 Kyoto Protocol, and the 2015 Paris Agreement, as well as scores of other global assemblies and scientists' explicit warnings of insufficient progress. Yet greenhouse gas (GHG) emissions are still rapidly rising, with increasingly damaging effects on the Earth's climate. An immense increase of scale in endeavours to conserve our biosphere is needed to avoid untold suffering due to the climate crisis…*
>
> *The climate crisis has arrived and is accelerating faster than most scientists expected. It is more severe than anticipated, threatening natural ecosystems and the fate of humanity. Especially worrisome are potential irreversible climate tipping points and nature's reinforcing feedbacks (atmospheric, marine, and terrestrial) that could lead to a catastrophic "hothouse Earth," well beyond the control of humans. These climate chain reactions could cause significant disruptions to ecosystems, society, and economies, potentially making large areas of Earth uninhabitable.*

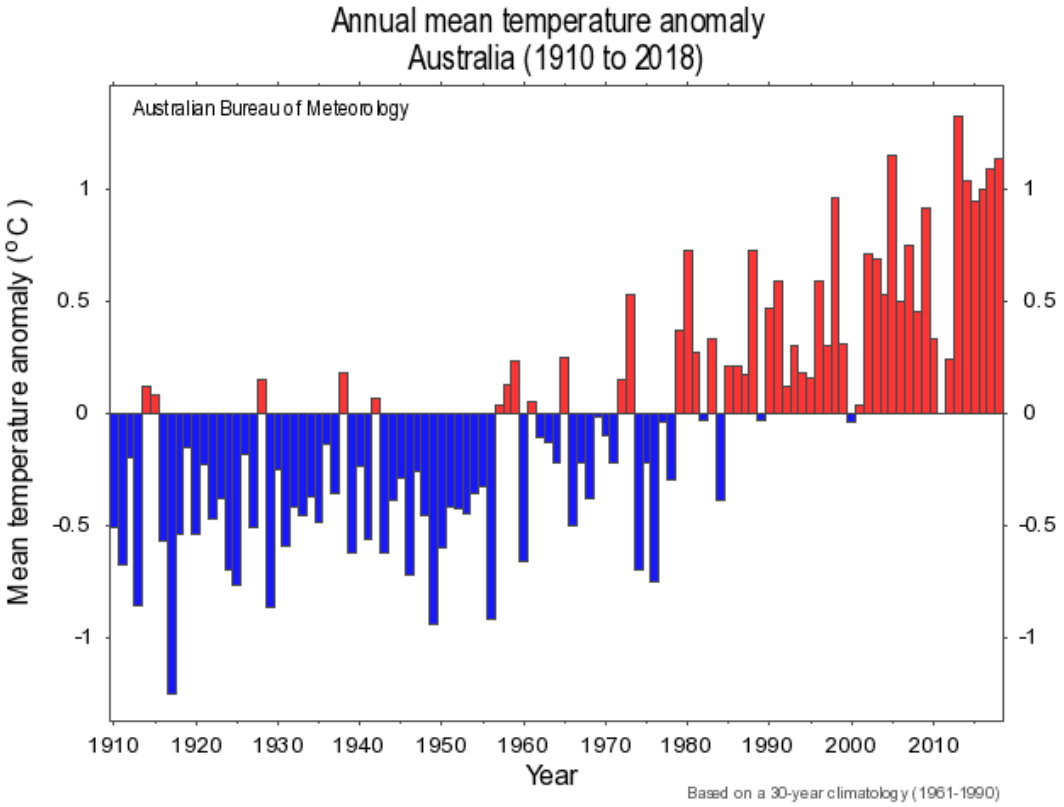
In the short term, continued warming and climate disruption is considered unavoidable, however local effects will vary widely.

Impacts for Australia

CSIRO researches and publishes climate change information for Australia and states:

The international scientific community accepts that increases in greenhouse gases due to human activity have been the dominant cause of observed global warming since the mid-20th century. Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Australia's changing climate represents a significant challenge to individuals, communities, governments, businesses, industry and the environment.

The Australian Bureau of Meteorology measures climate data and works with CSIRO and university researchers to model effects of climate change. The Australian climate variability and change time series graphs represent temperature and rainfall records, compared to the 30 year average between 1961-1990. The graph below represents the annual mean temperature between 1910-2018 compared to that average.



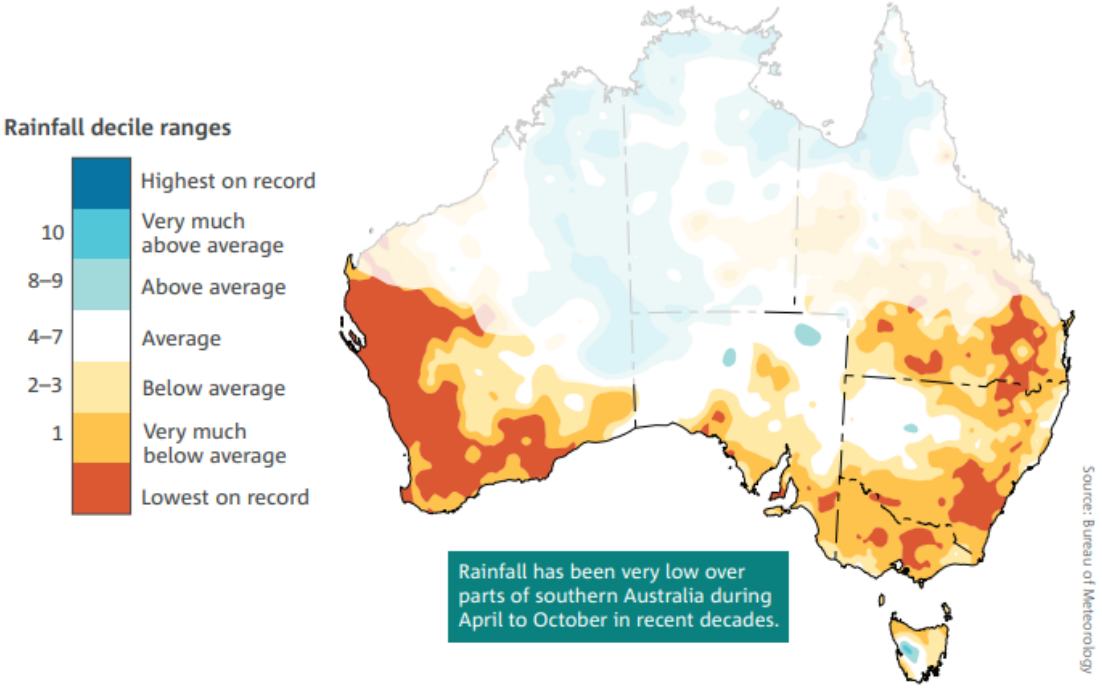
The joint CSIRO and Bureau of Meteorology report, *State of the Climate 2018*, provides an explanation of climate change science, a summary of the observed changes to date and an outline of impacts on Australia. These include ocean warming, acidification and sea level rise; significant changes in rainfall; increases in average temperatures, extreme heat events and fire weather; and the increasing risk of compound events. Analysis and projections of climate change impacts have often focussed on individual variables rather than compound events where those variables interact (such as drought followed by flood, or drought followed by heatwave and extreme fire weather) and therefore tended to significantly underestimate damage.

The 2018 report included the following key points:

- *Globally averaged air temperature has warmed by over 1 °C since records began in 1850, and each of the last four decades has been warmer than the previous one.*
- *The world's oceans, especially in the southern hemisphere, are taking up more than 90 per cent of the extra energy stored by the planet as a result of enhanced greenhouse gas concentrations.*

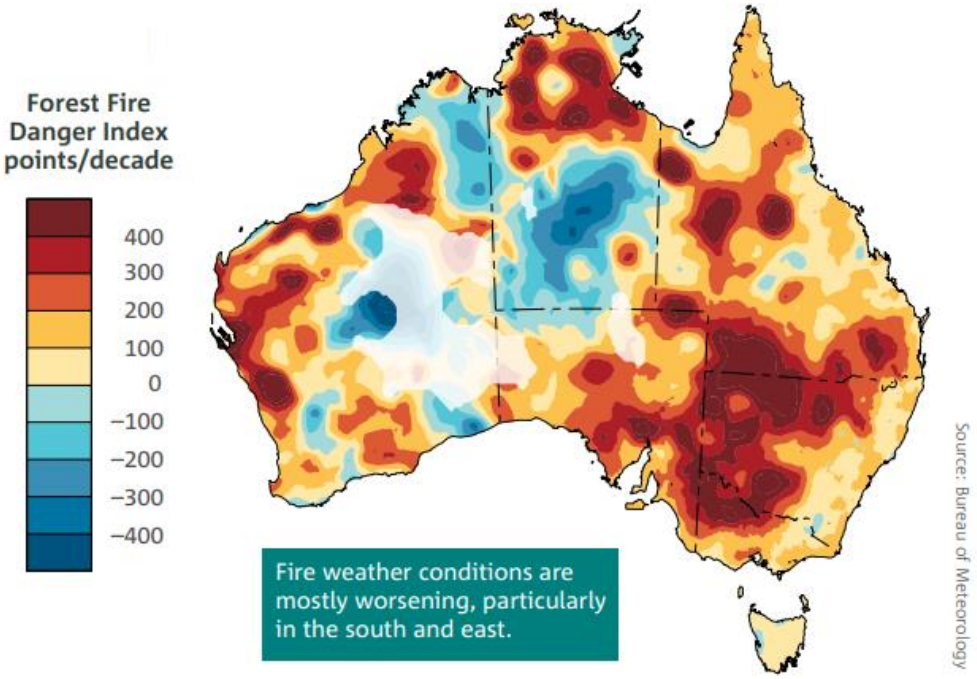
- *Oceans around Australia have warmed by around 1 °C since 1910, contributing to longer and more frequent marine heatwaves.*
- *Global sea level has risen by over 20 cm since 1880, and the rate has been accelerating in recent decades. Sea levels are rising around Australia, increasing the risk of inundation.*
- *The oceans around Australia are acidifying (the pH is decreasing).*
- *Australia's climate has warmed just over 1 °C since 1910 leading to an increase in the frequency of extreme heat events.*
- *April to October rainfall has decreased in the southwest of Australia. Across the same region May–July rainfall has seen the largest decrease, by around 20 per cent since 1970.*
- *There has been a decline of around 11 per cent in April–October rainfall in the southeast of Australia since the late 1990s.*
- *Rainfall has increased across parts of northern Australia since the 1970s.*
- *Streamflow has decreased across southern Australia. Streamflow has increased in northern Australia where rainfall has increased.*
- *There has been a long-term increase in extreme fire weather, and in the length of the fire season, across large parts of Australia.*

The *State of the Climate 2018* notes a shift towards drier conditions across southwestern and southeastern Australia. The image below, represents 'April to October rainfall deciles for the last 20 years (1999–2018). A decile map shows where rainfall is above average, average or below average for the recent period, in comparison with the entire rainfall record from 1900. Areas across northern and central Australia that receive less than 40 per cent of their annual rainfall during April to October have been faded.'



The *State of the Climate 2018* also includes the image below, showing the change in daily Forest Fire Danger Index (FFDI) across Australia between 1978 and 2017. The FFDI is an estimate of the severity of fire weather conditions based on observations of temperature,

rainfall, humidity and wind speed. ‘Positive trends, shown in the yellow to red colours, are indicative of an increasing length and intensity of the fire weather season… Areas where there are sparse data coverage such as central parts of Western Australia are faded.’



National climate data projections for coming decades include further increases in temperatures, more extremely hot days, an increase in the number of high fire weather danger days, less cool-season rainfall in southern Australia and a longer fire season for southern and eastern Australia.

In April 2019, 23 former Australian fire and emergency leaders issued a joint statement as Emergency Leaders for Climate Action, warning that increasingly catastrophic extreme weather events are putting lives and properties at greater risk and overwhelming emergency services (see Attachment 2).

Impacts for Western Australia

In September 2019 the Department of Water and Environmental Regulation released an issues paper, *Climate Change in Western Australia*. The issues paper describes the range of risks and expected impacts within WA and outlines some possible responses, including the points below:

- *In the south-west, the prolonged period of drying will continue, affecting primary industries, water security and natural ecosystems… Climate change will see a need for greater emphasis on disaster preparedness, and increase the challenge of protecting infrastructure and vulnerable communities.*
- *Climate change will exacerbate existing health burdens by increasing injury, physical and mental illness, and the frequency of extreme weather events (floods, droughts, heatwaves and storms). Climate change will also lead to alterations in the distribution of vector-, water- and food-borne infectious diseases, and air pollution patterns.*
- *Climate risks are generally not spread evenly across the community, but are greater for vulnerable groups including Aboriginal communities, the elderly and the homeless.*

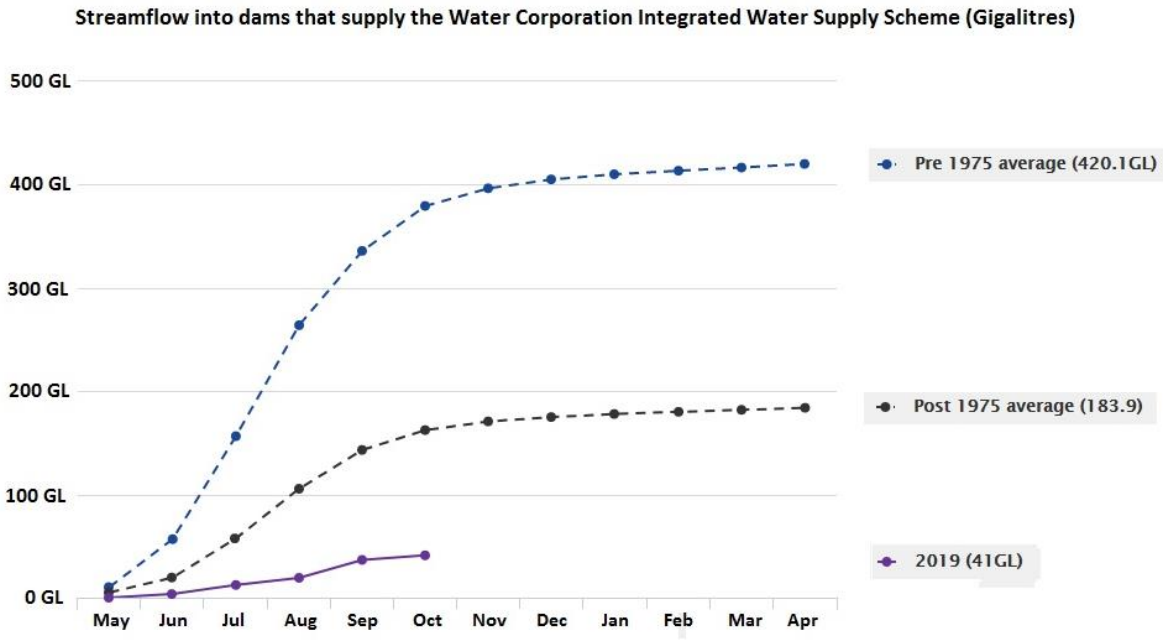
- *Perth is expected to be up to 2.7°C hotter by 2030. In eastern suburbs, where vegetation and tree canopy is lower, warming will be even greater.*
- *The fire season in Western Australia's south-west is expected to lengthen, placing more demands on personnel and equipment. A longer fire season will also narrow the seasonal window for prescribed burning and hazard reduction measures, and exacerbate the risk of severe fire.*
- *Extreme weather events may exacerbate land degradation, cause plant and animal deaths, and increase infrastructure and insurance costs.*
- *Climate change is anticipated to reduce biodiversity, including causing potential extinctions of species unable to cope with the rate of change or impacted by habitat loss.*
- *Our current infrastructure, along with our health, social and emergency services, have been planned on the basis of historic climate patterns and needs. The future volatility of our climate and the increasing prevalence of extreme weather events may strain or exceed the capacity of our existing health system and emergency management frameworks, and disrupt essential services and programs.*
- *Local governments are on the frontline of climate change adaptation. They are actively engaged in managing climate risks…. managing the implications of climate change for emergency services and considering how adaptation costs may be equitably shared. Local governments are best placed to identify the adaptation needs of local communities, and will typically be the first to respond to local impacts.*

The Department of Primary Industries and Regional Development updated online information on climate projections for Western Australia in May 2019, which includes:

- *In the south-west, by 2030, mean annual temperature is projected to increase by 0.5–1.2°C under intermediate- and high-emission scenarios, compared to current conditions (the average of conditions between 1986 and 2005). By 2090, mean annual temperature is projected to increase by 1.1–2.1°C in an intermediate-emission scenario and 2.6–4.2°C in a high-emission scenario.*
- *Perth could see the average annual number of days with maxima over 35°C increase from 28 in the recent past (1971–2000 average) to 36 in 2030, and to 40 and 63 in 2090 for intermediate- and high-emission scenarios, respectively.*
- *Annual rainfall in the south-west is projected to decline by 5-6% by 2030… By 2090, the mean rainfall will reduce by 12% (range 1–15%) in an intermediate-emission scenario. Rainfall will decline by 29% in winter, and 36% in spring by 2090 in a high-emission scenario.*
- *The number of dry days is likely to increase over all of WA. Agricultural drought months (defined as a month of extremely low soil moisture) are projected to increase by up to 20% over most of Australia by 2030 and up to 80% in the south-west by 2070. The projected duration and frequency of droughts in the south-west increased for all emission scenarios, with a high level of confidence in these projections.*
- *The number of days with severe fire danger rating and the cumulative forest fire danger index are likely to increase over most of WA in response to increased temperatures and decreased rainfall.*

Impacts on Water Supplies

Declining annual rainfall onto drier soils has reduced groundwater recharge and significantly reduced streamflow into dams (see streamflow graph below, sourced from Water Corporation interactive online water supply information).



Perth has not faced severe water shortages due to early action to install desalination plants, which began producing fresh water in 2006 and now supply 48% of Perth's water supply. While natural flow into dams such as the Mundaring Weir still occurs, much of the water contained in dams is now sourced from the ocean desalination plants and pumped up to the dams for storage.

Additional desalination plants are being planned to maintain scheme water supplies as Perth grows, however they require substantial energy to operate. Water Corporation is also moving to install more renewable energy infrastructure to reduce the carbon footprint of its operations.

The reduction in annual rainfall also reduces the recharge of groundwater. Parks staff have noted irrigation bores running dry more frequently however for Shire operations and irrigation of ovals, less available groundwater can be replaced with more scheme water (although at higher cost, and at odds with objectives to reduce scheme water use). The Shire has very limited involvement with private groundwater bores, but residents reliant on groundwater (and rainwater) may need to adapt through installing more tanks and supplementing their on-site water supply with water deliveries.

Local water supply issues can be managed through changing water sources, given that climate-independent desalination water is available. More significant impacts of the reduced rainfall for the Shire of Mundaring are dry conditions that increase bushfire risk, and threaten existing species and ecosystems.

Impacts on Biodiversity

CSIRO researchers have analysed the impacts of climate change on native species and ecosystems across Australia and produced a report in 2012; *The Implications of Climate Change for Biodiversity, Conservation and the National Reserve System: Final Synthesis*. They concluded that ecological change in response to climate change is unavoidable, it

will be widespread and it will be substantial. Within decades, environments across Australia will be substantially different at most locations:

> *The project predicts dramatic environmental change due to climate change: these changes will be ecologically very significant, and will result in many novel environments quite unlike those currently occurring anywhere on the continent, and the disappearance of many environments currently occupied by Australian biodiversity. While biodiversity impacts from these changed environments may be buffered when species exploit natural variation in the environment, our results suggest that the magnitude of change will overcome these buffering effects by 2070. Changing temperature, moisture availability and fire regimes are likely to lead to changes in vegetation structure, and it is likely there will be a gradual turnover of species along vegetation-structure gradients. Historical habitat loss and fragmentation due to land clearing will exacerbate the impacts of climate change; land-use intensification, as a response to climate change in agricultural and forestry sectors, remains a major threat to biodiversity. Increases in fire weather across much of Australia are very likely, which could have significant impacts on composition, structure, habitat heterogeneity and ecosystem processes.*

The Australian Department of the Environment and Energy states:

> *Australia faces significant environmental and economic impacts from climate change across a number of sectors. Decisions made today will have lasting consequences for future generations.*
>
> *The 2016 national State of the Environment report found climate change is one of the main pressures on the Australian environment and exacerbates other pressures including land-use change, habitat fragmentation and degradation, and invasive species. Climate change, particularly rising temperatures, increases the impact of these existing pressures, undermining the resilience of native species.*
>
> *Scientists expect climate change to cause changes to the abundance and geographic range of many species, restrict or alter species movement and interfere with their lifecycles (such as the timing of germination). Climate change presents a biosecurity risk for Australia's ecosystems by altering the distribution of pest and weed species.*
>
> *Ecosystems have a limited capacity to manage these multiple pressures compared to human systems. Rates of climate change, together with other pressures, limit the capacity of species to adapt in situ or migrate to more climatically suitable areas, where such areas exist.*

The current rate of climate change will lead to broad changes to temperature and rainfall patterns by mid-century, which would drive changes to local biodiversity that are beyond the Shire's capacity to ameliorate.

Impacts on Bushfire Risk

A previous national risk assessment focussed on the risks to settlements and infrastructure, natural ecosystems, and industries in the coastal zone. The report, *Climate Change Risks to Australia's Coast – A First Pass National Risk Assessment* was was released by the Australian Government Office of Climate Change and Energy Efficiency in 2009.

A recently published report *Climate Change Risk to Australia's Built Environment – A second Pass National Assessment* considers a greater number of hazards and covers all municipal areas in Australia. XDI analysed climate risk to over 15 million addresses between 2020 and 2100 based on a 'business as usual' continued emissions scenario, for five hazards (riverine flooding, coastal indundation, forest fire, subsidence and wind).

Shire of Mundaring appears within the top 10 local government areas at risk of forest fire in both 2020 and 2100, and is identified as the fifth most at risk local government area (percentage of high-risk properties) in 2100 (see Attachment 3).

The number of high-risk properties within the Shire of Mundaring is projected to increase from 153 (0.84%) in 2020 to 5,769 (31.5%) in 2100 (see Attachment 4). These numbers are based on existing development and do not account for new development.

The Emergency Leaders for Climate Action joint statement notes that bushfire seasons are lasting longer, the number of days of catastrophic bushfire danger each year are increasing, opportunities to carry out hazard reduction burns are decreasing, and higher temperatures mean that forests and grasslands ignite more easily and fires are harder to control.

The Department of Fire and Emergency Services (DFES) 2018/19 Annual Report notes that as the risk of natural hazards increase with climate change, policy, planning and investment decisions need to change appropriately. 'Climate change continues to manifest itself through increased likelihood and impact of natural hazards such as cyclones, storms, flooding and bushfires.'

Current arrangements for bushfire mitigation and firefighting have a heavy reliance on volunteers, which may be more difficult to maintain with a lengthening fire season and increased severity of fires. Increases in extreme fire weather may result in increased incidence of loss of property and potentially lives, which would have significant impacts on firefighters as well as the families and communities involved.

Impacts on Health

The WA Department of Health worked with the Curtin University to produce a report in 2007, Health Impacts of Climate Change: Adaptation Strategies for Western Australia. Attachment 5 contains an excerpt of that report, Tables 1 and 2 describing potential health impacts of extreme events and gradual climatic changes. A Chief Health Officer Inquiry is underway to assess WA preparedness for health impacts of climate change, and the final report is expected in March 2020.

In August 2019, the Australian Medical Association (AMA) joined other health organisations (including the British Medical Association and American Medical Association) in recognising climate change as a health emergency. The AMA noted that climate change affects health and wellbeing in multiple ways, including higher mortality from heat stress; food insecurity resulting from declines in agricultural outputs; injury and mortality from increasingly severe weather events; increases in mosquito and vector-borne diseases; and a higher incidence of mental ill-health.

Increasing intensity and duration of heatwaves will increase pressure on infrastructure including electrical grids, and power failures during heatwaves may take longer to resolve due to more stringent safety requirements to avoid sparking bushfires. Elderly and ill people, pregnant women and very young children are more vulnerable to heat stress. While they are not as dramatic or destructive as floods and bushfires and may not be seen as an emergency, more Australians actually die in heatwaves than any other natural disaster.

Economic Impacts

Climate change is often framed as a primarily environmental concern, without sufficient attention to economic and social impacts. In addition, estimates of economic impacts have

been informed by underestimates of damage and disruption that have not adequately accounted for compounding and cascading risks.

The Reserve Bank of Australia, Australian Prudential Regulation Authority and Australian Securities and Investment Commission have recently noted risks posed by climate change as a key concern for the Australian economy and financial stability.

In May 2019 the Climate Council released a report, *Compound Costs: How Climate Change is Damaging Australia's Economy* based on observed and projected impacts on agriculture, property and infrastructure. The key findings are summarised in Attachment 6. The report noted that:

> *There are few forces affecting the Australian economy that can match the scale, persistence and systemic risk associated with climate change… climate change is driving a trend change, increasing both the frequency and severity of many extreme weather events. This is shrinking the recovery times between events, and increasing the probability of simultaneous events in multiple locations. Climate change is also increasing the probability of compound events, where two or more extreme weather events combine to produce impacts that are worse than the effects of each event independently (e.g. coincident droughts and heatwaves worsening bushfires)...*
>
> *Direct macroeconomic shocks will arise from the impacts of climate change on housing, temporary or permanent contractions of some industries and subsequent reductions in employment, commodity price adjustments, and damages and disruption to critical infrastructure that provide essential services and facilitate economic activity. Australia's economy will also continue to be affected by climate change impacts on our trading partners...*
>
> *The total estimated damage-related loss of property value – excluding any disruptions to productivity – is expected to rise to $571 billion by 2030, $611 billion by 2050 and $770 billion by 2100. These costs are likely to be highly concentrated on about 5-6% of properties, and will represent an enormous cost for those affected, with likely flow-on effects to the whole economy, as governments become the insurers of last resort. The annual average risk costs of extreme weather and climate change to properties is projected to rise to $91 billion per year in 2050 and $117 billion per year in 2100. These will be felt through increased insurance costs and will predominantly impact the same households that will experience the steepest losses in property values.*

In June 2019 the Insurance Council of Australia issued a brief *Public Statement on Climate Change*, which included:

> *The members of the Insurance Council of Australia (ICA) accept the international scientific consensus presented by the Intergovernmental Panel on Climate Change and supported by the CSIRO… Climate change is occurring along a rapid and severe pathway, and without intervention it presents a serious risk to environments, economies and communities worldwide. The impacts of human-induced greenhouse gas emissions are becoming increasingly evident through the occurrence of more frequent and intense extreme weather events, sea level rise and global mean temperature increase.*

In October 2019 the Reserve Bank of Australia outlined climate change risks in its *Financial Stability Review*, including the points below:

> *Climate change is exposing financial institutions and the financial system more broadly to risks that will rise over time, if not addressed…*

The physical effects of climate change can have a significant impact on Australian financial institutions. As an example, inflation-adjusted insurance claims for natural disasters in the current decade have been more than double those in the previous decade. This impact is likely to grow over time.

An increase in the frequency and severity of natural disasters will increase the incidence of damage to, or destruction of, physical assets that are insured or used as collateral. Assets that are exposed to increasing physical risk (such as property located in bushfire-prone or coastal areas) could decline in value, particularly if these risks become uninsurable. Climate change could also reduce certain types of business income that is used to service loans. Examples include changing rainfall patterns that result in lower or less predictable income from agriculture, more frequent storms disrupting supply chains and therefore sales, and damage to natural assets that reduces tourism income.

Insurers are most directly exposed to the physical impacts of climate change. This can arise through natural disaster claims, crop insurance, and health and life insurance. While insurers can increase their premiums to reflect higher risk, it is difficult to accurately price new and uncertain climate risks. If insurers under-price these risks, it could threaten their viability in the event of extreme weather events resulting in very large losses. On the other hand, over-pricing would impede the risk pooling function provided by insurance and unduly limit economic activity. Even if correctly priced, more of these risks may become uninsurable, forcing households, businesses or governments to bear this risk…

Climate change will have a broad-based impact on Australian financial institutions and therefore clearly poses risks that are systemic in nature. However, it does not yet pose an imminent threat to financial stability. Change has so far occurred at a pace that has allowed financial institutions to adjust, and losses associated with climatic events have been manageable. But climate change could emerge as a risk to financial stability if it is not properly managed, or if the size of climate-related losses increased materially. Rising climate-related losses could also erode confidence in an institution or the financial system, leading to a withdrawal of funding. This would be more likely if the physical impacts of climate change are more severe or occur sooner than currently projected, or if the transition to a low-carbon economy occurs in a disruptive and costly manner.

Increases in risk can lead to increases in insurance pricing that may leave some areas effectively uninsurable or underinsured due to annual costs, and have a subsequent impact on property prices in high risk areas. If insurance for rebuilding after bushfires also becomes more difficult and expensive to obtain, this may have significant impacts on some localities within the Shire of Mundaring by mid-century. There would be parallel impacts on insurance for Shire facilities and infrastructure as well as private residential and commercial buildings.

Declaring a Climate Emergency

An emergency is generally defined as a serious and dangerous situation where there exists a risk of significant harm and an urgent response is required. Given the information above, the EAC may form the view that increasing climate change does represent an emergency and that a declaration is appropriate. Local government climate emergency declarations are seen as a way to publicly call for State and Commonwealth governments to acknowledge and respond to climate change with adequate mitigation and adaptation measures.

When used in relation to climate change, mitigation usually refers to carbon emissions reduction and is distinguished from adaptation to changed conditions. For the Shire of Mundaring, adaptation also includes mitigation of increased risks, particularly for bushfire. Taken broadly, mitigation measures are included in a number of Shire documents including the *Environmental Management Plan 2012-2022, Local Climate Change Adaptation Action Plan* and *Energy and Emissions Reduction Strategy*. Climate change is also acknowledged within the Shire's *Environmental Sustainability Policy, Local Planning Strategy* and *Local Planning Scheme No.4.* These documents are all publicly available from the Shire website.

The *Environmental Management Plan 2012-2022* includes relevant actions under the 'Atmosphere and Climate Change' focus area. These actions include the finalisation of the *Local Climate Change Adaptation Action Plan* and the implementation of a Carbon Reduction Strategy (now *Energy and Emissions Reduction Strategy,* adopted by Council in 2018) and Greenhouse Action Plan (now *Energy and Emissions Reduction Plan*, see Attachment 7). It is recommended that the range of actions being undertaken or planned under Council's current strategic framework be noted, in addition to bushfire risk mitigation work undertaken by Shire staff and volunteer bushfire brigades.

However, the Shire's capability to reduce its own emissions and encourage effective community emissions reduction is limited by the context in which it operates. Many emissions reduction initiatives require state or national level coordination and support. Some Shire buildings and facilities will not be suitable for solar panel installation due to the age of the building or the time of daily use, and will continue to rely on the Western Power electrical grid. Opportunities to replace streetlights with more efficient bulbs have been limited by Western Power ownership of poles, the previous restrictions on permitted bulbs, and potentially high costs to switch to new bulbs. There are very few electric vehicle charging facilities within the Shire, and financial incentives for electric vehicles that are common in other nations are lacking in Australia.

State-led action to quickly increase the proportion of renewable energy (and increase energy storage to maintain reliability) of the grid will be the most effective way to widely reduce emissions from electricity used across the Shire. Facilitation of electric vehicle charging networks would allow local governments, communities and businesses to take advantage of the increasing range of electric vehicles and move more quickly to low emissions transport. Commonwealth Government leadership is needed, along with financial support towards State and Local Government emissions reduction and climate change adaptation initiatives (including increasing firefighting resources).

Climate change was raised as a community concern during the consultation for the Shire's Strategic Community Plan, which is currently being prepared. However, many decisions made by local governments are not related to factors affected by climate change, or are decisions that must be made within a framework and legislation set or delegated by the State Government. While climate change should be given due regard in decision-making, it would be inappropriate for Council to commit to 'all future decisions made by the Council' being guided by the climate emergency declaration, or that such a declaration becomes 'a principal guide for policy and decision-making for a period of five years'.

The Shire's Energy and Emissions Reduction Strategy notes:

> *It is important to note that local governments alone cannot and should not be expected to manage emissions reduction to the extent necessary to avoid dangerous levels of climate change. Current international commitments are too low to avoid a global rise in temperature of over 2^{o}C. To date there has been a concerning lack of direction from the*

State and Commonwealth Governments, and Australia's emissions are well above the levels required to meet the national target of 26-28% reduction by 2030 (from 2005 levels). Advocacy for effective leadership and action from the State and federal governments will therefore be a necessary component of the Energy and Emissions Reduction Strategy and associated action plan.

It is therefore recommended that the EAC recommends Council resolve to declare a climate emergency and request urgent efforts by State and Commonwealth Governments to reduce emissions, increase resources for firefighting, and assist local governments with adaptation.

VOTING REQUIREMENT

Simple Majority

RECOMMENDATION

That Council:

1. Declares that climate change is causing serious and worsening risks for the Shire of Mundaring and urgent action is required to reduce emissions, constituting a climate emergency;
2. Writes to the Department of Premier and Cabinet and to the Department of the Prime Minister and Cabinet to request their urgent efforts to rapidly reduce emissions from all sources; increase resources for firefighting; and provide support for adaptation within the local government sector; and
3. Notes the range of actions undertaken, underway and planned within the Shire's *Local Climate Change Adaptation Action Plan, Environmental Management Plan 2012-2022*, and *Energy and Emissions Reduction Plan*.

Framework for Effective Local Government **Climate Emergency Response**

City of DAREBIN

the place to live

CONTENTS

What is the climate emergency and restoration of a safe climate

Climate emergency is understood in two ways:

1. The climate emergency ***situation*** refers to catastrophic changes to the world's climate caused by human activity and resulting in a loss of a safe climate, which threatens all life on earth.

   This aspect of the climate emergency is extensively documented. The science tells us that the earth has warmed, and is continuing to warm, and as a result we face serious consequences for the atmosphere, for weather systems, for human ability to produce food, and indeed for all people and species.[1][2]

2. The climate emergency ***response*** refers to a specific approach to tackling climate change, which seeks to mobilise and take action at a ***scale*** and ***speed*** that will restore a ***safe climate***, with the least possible loss and damage during the transition back to a safe climate.

The target is to provide ***maximum protection*** globally for all species and all people.

A ***safe climate*** allows existing and future generations, communities and ecosystems to survive and flourish. We know that the current climatic conditions are not safe for a huge range of species and are increasingly unsafe for millions of people.

A 1.5˚C rise is not considered safe, and will not avoid dangerous climate change.[3]

To restore a safe climate we need a rapid transition to zero emissions across all sectors, as well as the drawdown of all the excess greenhouse gases in the air.

'Business as usual' and incremental or gradual improvements will not be enough.

The technical solutions needed to transition to a zero emissions economy and beyond have been identified by science and research. What is needed now is appropriate political action and rapid implementation of the solutions.

Local government role in the climate emergency response

Local governments are fundamental in the climate emergency response.[4] Experience is showing that local government is the best place to start government commitment to climate emergency action across the world - with so many councils it has been possible to find communities that are keen to be early movers on the climate emergency. Innovation is also more likely to be initiated at the local government level, because with so much diversity at this level of government different approaches to responding to the climate emergency will emerge. Local governments are also in a good position to network and learn from each other.

A lot can be practically done at a local government level, and councils have a large role in eliminating emissions across their municipality.

Councils also have an enormous legacy and experience in educating and working with their community. Typically, people have much more interaction with a council than other levels of government.

It is a natural progression that local councils can not only provide services and support through a climate change lens, but can also assist with channelling their community's desire for advocacy to state and federal governments.

It is not sustainable, practical or effective enough for the responsibility to lie solely with local councils. State and federal government policy, legislation and funding will have the biggest impact on the climate emergency. At the state and national level, policy changes needed include transitioning to 100% renewables; ending native deforestation; switching to electric or zero emissions transport; changes to agriculture; and minimum energy standards for buildings. We need a bipartisan approach to the climate emergency to enable the necessary scale and speed of action, such as that which was seen during the World War Two response.

In acknowledging the climate emergency, government authorities (no matter how small) should take responsibility for trying to engage the world in achieving the goal of restoring a safe climate. Since global action is needed, this means a council needs to act substantially via influence rather than via only what it can directly control.

Key processes in effective climate emergency response

Five Key Processes

PROCESS 1

Taking leadership: Declaring a climate emergency

By declaring or acknowledging the climate emergency, your council is recognising the catastrophic changes to the world's climate caused by human activity and resulting in a loss of a safe climate, which threatens all life on earth. Your council is also committing to tackling climate change, by taking urgent action at a scale and speed that will restore a safe climate.

Example:[5]
'That Council recognises that we are in a state of climate emergency that requires urgent action by all levels of government, including by local councils.'

PROCESS 2

Get your house in order: Embed climate emergency action in all council strategies, plans and actions

Council has many levers to reduce greenhouse gas emissions and begin drawing down excess greenhouse gas emissions.

After declaring a climate emergency your council should develop a Climate Emergency Plan. This should outline all actions your council will take to embed a climate emergency response into its operations.

Engagement and advocacy should be a fundamental part of the Climate Emergency Plan.

Actions should include (but not be limited to):

- Switching to 100% renewable energy
- Getting off fossil gas
- Implementing energy efficiency across all facilities/buildings
- Redrafting procurement policy and practices to ensure suppliers to council are using renewable energy and resource recovery
- Embed climate emergency thinking into strategic planning and update planning schemes
- Refocus transport priorities to drive the shift to fossil fuel free transport
- Create a circular economy aimed at zero waste
- Increase your urban forest and/or revegetation activities
- Community education and empowerment to take action
- Increase community resilience to climate change impacts.

Climate emergency action also needs to be embedded across all of council, and reflected in all policies and strategies of council.

Inwards engagement with all staff and units of council is essential, particularly ensuring education and empowerment of managers happens early on.

PROCESS 3

Mobilise and build the climate emergency mandate: Get your community active

The current political situation combined with the climate emergency itself can seem an overwhelming, insurmountable problem, so large that it is difficult to imagine how our individual actions can have effect. By working together we can find the solutions locally, nationally and globally.

Councils can support our communities to take action, through raising awareness about the climate emergency; providing targeted programs to make homes and businesses powered by renewable energy; or mobilising volunteers to spread the climate emergency message to neighbourhoods, families, and workplaces.

Councils can show the community how to become politically active to encourage and motivate state and federal governments to act. Some ways for communities to become politically active are to join a climate action group and contact their state and/or federal member of parliament.

PROCESS 4

Global movement building: Reach out to other councils

Since the first council climate emergency declaration in 2016, we now have two national governments, eight state-level governments and over 600 local governments having declared, and this is rising every week.

The climate emergency movement has gained a huge momentum in a very short time because councils and their communities have been reaching out to engage their peers across their state, nation and globally. The current experience shows that this is a highly effective way of building the movement, and the necessary base of a democratic mandate for climate emergency action.

We now need to act strategically and collaboratively to figure out the key challenge: how we can make an effective and meaningful response beyond the declaration.

You can follow who has declared a climate emergency here: **https://www.cedamia.org/global/**, and reach out to other councils to learn and share.

PROCESS 5

Upwards: Advocate to state and federal government
Councils cannot do the safe climate restoration work alone, and it is state, federal and global levels which will have the most powerful impact on the climate emergency. Collaborative campaigns - involving partners such as other councils, educational institutions, industry groups and community organisations - must advocate for effective action and significant changes to state, federal and international government policy, legislation and funding.

Key challenges for local governments

- The scale and speed required is not the pace government administrations usually move at.
- Moving 'beyond business as usual' when this is not yet reflected across society or at state or federal levels.
- Not having control of all the levers or mechanisms necessary to implement the required changes, and needing policy change at state and federal levels.
- Re-prioritising budgets and resources to address the climate emergency, whilst still needing to deliver essential services and maintaining community support.
- Gaining the community mandate and understanding for a massive prevention program before climate catastrophe is fully felt.
- Embedding the response across the administration, which will take time, education and resources.
- Working in unchartered territory where there is as yet no set plan for how to undertake an effective climate emergency response.

1 http://www.bom.gov.au/state-of-the-climate/2016/
2 Spratt, David (2018) "Beyond urgent: the science of climate warming as existential risk". Presentation to Darebin Climate Emergency Conference https://www.youtube.com/watch?v=KaEfK-MII4U
3 Hansen, J., Sato, M., Kharecha, P., von Schuckmann, K., Beerling, D. J., Cao, J., Marcott, S., Masson-Delmotte, V., Prather, M. J., Rohling, E. J., Shakun, J., Smith, P., Lacis, A., Russell, G., and Ruedy, R.: Young people's burden: requirement of negative CO2 emissions, Earth Syst. Dynam., 8, 577-616, https://www.earth-syst-dynam.net/8/577/2017/
4 http://www.caceonline.org/
5 http://www.caceonline.org/motions-to-declare-a-climate-emergency.html

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Australia Unprepared for Worsening Extreme Weather

We, the undersigned, who are former senior Australian fire and emergency service leaders, have observed how Australia is experiencing increasingly catastrophic extreme weather events that are putting lives, properties and livelihoods at greater risk and overwhelming our emergency services.

Climate change, driven mainly by the burning of coal, oil and gas, is worsening these extreme weather events, including hot days, heatwaves, heavy rainfall, coastal flooding and catastrophic bushfire weather. Australia has just experienced a summer of record-breaking heat, prolonged heatwaves, and devastating fires and floods - there should be no doubt in anyone's mind: climate change is dangerous and it is affecting all of us now.

Facts You Need To Know

- Bushfire seasons are lasting longer and longer.
- The number of days of Very High to Catastrophic bushfire danger each year are increasing across much of Australia, and are projected to get even worse.
- Opportunities to carry out hazard reduction burns are decreasing because warmer, drier winters mean prescribed fires can often be too hard to control – so fuel loads will increase.
- Higher temperatures mean that forests and grasslands are drier, ignite more easily and burn more readily, meaning fires are harder to control.
- 'Dry' lightning storms are increasing in frequency, sparking many remote bushfires that are difficult to reach and control.
- Fire seasons across Australia and in the northern hemisphere used to be staggered – allowing exchange of vital equipment such as aerial water bombers, trucks and firefighters. The increasing overlap of fire seasons between states and territories and with the USA and Canada will limit our ability to help each other during major emergencies.
- A warmer atmosphere holds more moisture, increasing the risk of heavier downpours and flooding events - like that which recently affected Townsville.
- Current Federal Government climate policy has resulted in greenhouse gas pollution increasing over the last four years, putting Australian lives at risk. Communities, emergency services and health services across Australia need to be adequately resourced to cope with increasing natural disaster risk.

Tackling climate change effectively requires rapidly and deeply reducing greenhouse gas pollution here in Australia and around the world. We have the solutions at our disposal, we just need the political will to get on with the job.

We call on the Prime Minister to:

- Meet with a delegation of former emergency services leaders who will outline, unconstrained by their former employers, how climate change risks are rapidly escalating.
- Commit to a parliamentary inquiry into whether Australian emergency services are adequately resourced and equipped to cope with increasing natural disaster risks due to climate change.
- Recognise that strategic national firefighting assets like large firefighting aircraft are prohibitively expensive for states and territories, are currently leased from the northern hemisphere, and that increased overlap of fire seasons is restricting access to this equipment during times of need. A cost-benefit analysis of current arrangements and their effectiveness, and how Australia's strategic aerial firefighting needs can be best met and funded, needs to be initiated in consultation with the National Aerial Firefighting Centre.
- Ensure continued funding for stakeholder-driven research into how we can respond to, mitigate, and increase resilience to bushfires, natural hazards and escalating climate change risks.

We call on all State and Territory Governments to:

- Provide increased resources to enable forestry, national parks, urban and rural fire services to increase environmentally sensitive fuel reduction and fire mitigation programs.
- Focus on climate change adaptation and mitigation programs while taking strong action to significantly reduce state / territory emissions.
- Cease cutting the budgets and resources of forestry, national parks, urban and rural fire services, both directly and through instruments such as "efficiency dividends", so that the services can increase operational capacity to deal with our "new normal" of catastrophic weather risks.

This joint statement is signed by:

Mary Barry
Former CEO, Victorian State Emergency Service

Neil Bibby AFSM
Former Chief Executive Officer, Country Fire Authority Victoria, and former Deputy Chief Officer, Melbourne Metropolitan Fire Brigade

Tony Blanks AFSM
Former Fire Unit Manager, Tasmania National Parks, and former Fire Manager, Forestry Tasmania

Mike Brown AM, AFSM
Former Chief Fire Officer,
Tasmania Fire Service

Naomi Brown
Former CEO, Australasian Fire & Emergency Service Authorities Council

Bob Conroy
Former Fire Manager,
NSW National Parks and Wildlife Service

Major General Peter Dunn AO (Ret)
Former Commissioner,
ACT Emergency Services Authority

John Gledhill AFSM
Former Chief Fire Officer,
Tasmania Fire Service

Dr Jeff Godfredson AFSM
Former Chief Fire Officer,
Melbourne Metropolitan Fire Brigade

Dr Wayne Gregson APM
Former Commissioner,
WA Dept of Fire & Emergency Services

Craig Hynes AFSM
Former Chief Operations Officer,
WA Fire and Emergency Services Authority

Lee Johnson AFSM
Former Commissioner Qld Fire & Emergency Services. Director: Bushfire & Natural Hazards Cooperative Research Centre

Murray Kear AFSM
Former Commissioner,
NSW State Emergency Service

Phil Koperberg AO, AFSM, BEM
Former NSW Minister for the Environment, former Commissioner NSW Rural Fire Service

Craig Lapsley PSM
Former Emergency Management Commissioner and Fire Services Commissioner, Victoria, former Deputy Chief Officer, Country Fire Authority Victoria

Andrew Lawson AFSM
Former Deputy Chief Officer,
SA Country Fire Service

Grant Lupton AFSM
Former Chief Fire Officer,
South Australian Metropolitan Fire Service

Greg Mullins AO, AFSM
Former Commissioner Fire & Rescue NSW.
Climate Councillor

Frank Pagano AFSM, ESM
Former Executive Director, Emergency Management Queensland, and former Deputy Commissioner, Queensland Fire & Rescue Service

Steve Rothwell AFSM
Former Director and Chief Fire Officer,
NT Fire & Emergency Services

Stephen Sutton
Former Chief Fire Control Officer,
Bushfires NT

Ken Thompson AFSM
Former Deputy Commissioner,
Fire & Rescue NSW

Ewan Waller AFSM
Former Chief Fire Officer,
Forest Fire Management, Victoria

Emergency Leaders for Climate Action

www.emergencyleadersforclimateaction.org.au

TOP TEN LOCAL GOVERNMENT AREAS (LGAs) BY HAZARD RISK

The tables below rank the top ten LGAs at risk from a cohort of all 266 LGAs in Australia with over 10,000 addresses. Areas with very low density show bias in results and therefore are not represented here but can be found in the benchmarking table in the body of the report, which covers all 544 LGAs.

ALL HAZARDS

Top 10 LGAs at Risk All Hazards - 2020				
RANK	TTIP$	VAR%	HRP#	HRP%
1	Gold Coast, Qld	Greater Shepparton, Vic	Gold Coast, Qld	Greater Shepparton, Vic
2	Brisbane, Qld	Wangaratta , Vic	Brisbane, Qld	Wangaratta , Vic
3	Sunshine Coast, Qld	Mid Murray, SA	Greater Shepparton, Vic	Murray, WA
4	Greater Shepparton, Vic	Murray, WA	Sunshine Coast, Qld	Maranoa, Qld
5	Central Coast, NSW	Gold Coast, Qld	Fraser Coast, Qld	Mid Murray, SA
6	Fraser Coast, Qld	Fraser Coast, Qld	Wangaratta , Vic	Federation , NSW
7	Moreton Bay, Qld	Tweed , NSW	Mandurah, WA	Horsham , Vic
8	Wangaratta , Vic	Maranoa, Qld	Bundaberg, Qld	Mandurah, WA
9	Tweed , NSW	Noosa, Qld	Tweed , NSW	Fraser Coast, Qld
10	Mackay, Qld	Douglas, Qld	Moreton Bay, Qld	Hinchinbrook, Qld

Top 10 LGAs at Risk All Hazards - 2100				
RANK	TTIP$	VAR%	HRP#	HRP%
1	Gold Coast, Qld	Greater Shepparton, Vic	Gold Coast, Qld	Greater Shepparton, Vic
2	Brisbane, Qld	Wangaratta, Vic	Brisbane, Qld	Murray, WA
3	Sunshine Coast, Qld	Mid Murray, SA	Sunshine Coast, Qld	Adelaide Hills, SA
4	Greater Shepparton, Vic	Murray, WA	Central Coast, NSW	Wangaratta , Vic
5	Central Coast, NSW	Gold Coast, Qld	Newcastle, NSW	Mundaring, WA
6	Moreton Bay, Qld	Tweed, NSW	Greater Shepparton, Vic	Mid Murray, SA
7	Fraser Coast, Qld	Fraser Coast, Qld	Fraser Coast, Qld	Maranoa, Qld
8	Tweed, NSW	Mandurah, WA	Moreton Bay, Qld	Noosa, Qld
9	Mackay, Qld	Douglas, Qld	Mandurah, WA	Narrabri, NSW
10	Mandurah, WA	Noosa, Qld	Tweed , NSW	Western Downs, Qld

The reporting uses four key metrics for quantifying climate change impacts to the built environment in each local governmer area, defined on page 6 of the report as:

- Total Technical Insurance Premium (**TTIP**), which is the total annual cost of damage and assumes all hazards are insured
- Percentage of Value-at-Risk (**VAR%**), which is the TTIP as a percentage of the replacement cost of the property.
- Number of High Risk Properties (**HRP#**), which are those properties where the VAR is greater than 1%, consistent with US Federal Emergency Management Agency (FEMA) definitions.
- Percentage of High-Risk Properties (**HRP%**), which is the HRP# expressed as a percentage of all properties in the LGA.

RIVERINE FLOODING

FOREST FIRE

Top 10 LGAs at Risk Riverine Flooding - 2020		
RANK	TTIP$	VAR%
1	Greater Shepparton , Vic	Greater Shepparton , Vic
2	Gold Coast , Qld	Wangaratta , Vic
3	Brisbane, Qld	Mid Murray , SA
4	Wangaratta , Vic	Maranoa , Qld
5	Port Phillip, Vic	Horsham , Vic
6	Mid Murray, SA	Federation , NSW
7	Sunshine Coast, Qld	Esperance , WA
8	Loga , Qld	Western Downs , Qld
9	Albury, NSW	Albury , NSW
10	Western Downs, Qld	Port Phillip, Vic

Top 10 LGAs at Risk Forest Fire - 2020		
RANK	TTIP$	VAR%
1	Central Coast, NSW	Adelaide Hills, SA
2	Lake Macquarie, NSW	Mundaring, WA
3	Blue Mountains, NSW	Blue Mountains, NSW
4	Adelaide Hills, SA	Mitcham, SA
5	Gold Coast, Qld	Central Coast, NSW
6	Sunshine Coast, Qld	Byron , NSW
7	Shoalhaven, NSW	Hepburn, Vic
8	Yarra Ranges, Vic	Port Stephens , NSW
9	Mundaring, WA	Lake Macquarie, NSW
10	Logan, Qld	Burnside, SA

Top 10 LGAs at Risk `Riverine Flooding - 2100		
RANK	TTIP$	VAR%
1	Greater Shepparton, Vic	Greater Shepparton, Vic
2	Gold Coast, Qld	Wangaratta, Vic
3	Brisbane , Qld	Mid Murray, SA
4	Wangaratta, Vic	Horsham, Vic
5	Port Phillip, Vic	Murray, WA
6	Central Coast, NSW	Maranoa, Qld
7	Mid Murray, SA	Federation, NSW
8	Melbourne, Vic	Western Downs, Qld
9	Sunshine Coast, Qld	Port Phillip, Vic
10	Newcastle, NSW	Inverell, NSW

Top 10 LGAs at Risk Forest Fire - 2100		
RANK	TTIP$	VAR%
1	Central Coast, NSW	Adelaide Hills, SA
2	Lake Macquarie, NSW	Mundaring, WA
3	Blue Mountains, NSW	Blue Mountains, NSW
4	Adelaide Hills, SA	Mitcham, SA
5	Sunshine Coast, Qld	Hepburn, Vic
6	Yarra Ranges, Vic	Port Stephens , NSW
7	Shoalhaven, NSW	Central Coast, NSW
8	Gold Coast, Qld	Lake Macquarie, NSW
9	Mid-Coast, NSW	Byron, NSW
10	Port Stephens, NSW	Yarra Ranges, Vic

COASTAL INUNDATION

SUBSIDENCE

Top 10 LGAs at Risk Coastal Indundation - 2020		
RANK	TTIP$	VAR%
1	Gold Coast, Qld	Gold Coast, Qld
2	Sunshine Coast, Qld	Fraser Coast, Qld
3	Brisbane, Qld	Tweed , NSW
4	Fraser Coast, Qld	Murray, WA
5	Tweed , NSW	Mandurah, WA
6	Moreton Bay, Qld	Noosa, Qld
7	Mackay, Qld	Sunshine Coast, Qld
8	Mandurah, WA	Douglas, Qld
9	Redland, Qld	Mackay, Qld
10	Central Coast, NSW	Byron , NSW

Top 10 LGAs at Risk Subsidence - 2020		
RANK	TTIP$	VAR%
1	Brisbane, Qld	Ku-ring-gai , NSW
2	Sydney, NSW	Willoughby, NSW
3	Central Coast, NSW	Lane Cove , NSW
4	Canterbury-Bankstown, NSW	Ryde, NSW
5	Northern Beaches , NSW	Mosman , NSW
6	Inner West , NSW	North Sydney , NSW
7	Unincorporated ACT, ACT	Hornsby , NSW
8	Melbourne, Vic	Burwood , NSW
9	Sutherland Shire, NSW	Strathfield , NSW
10	Parramatta, NSW	Inner West , NSW

Top 10 LGAs at Risk Coastal Indundation - 2100		
RANK	TTIP$	VAR%
1	Gold Coast, Qld	Murray, WA
2	Sunshine Coast, Qld	Tweed , NSW
3	Brisbane, Qld	Gold Coast, Qld
4	Moreton Bay, Qld	Fraser Coast, Qld
5	Tweed , NSW	Douglas, Qld
6	Fraser Coast, Qld	Mandurah, WA
7	Central Coast, NSW	Noosa, Qld
8	Mackay, Qld	Sunshine Coast, Qld
9	Mandurah, WA	Mackay, Qld
10	Redland, Qld	Byron , NSW

Top 10 LGAs at Risk Subsidence - 2100		
RANK	TTIP$	VAR%
1	Brisbane, Qld	Tamworth Regional, NSW
2	Sydney, NSW	Tablelands, Qld
3	Unincorporated ACT, ACT	Campaspe, Vic
4	Moreton Bay, Qld	Perth, WA
5	Central Coast, NSW	Greater Shepparton, Vic
6	Stirling, WA	Barossa, SA
7	Northern Beaches , NSW	Mount Barker, SA
8	Canterbury-Bankstown , NSW	Isaac, Qld
9	Gold Coast, Qld	Hinchinbrook, Qld
10	Inner West , NSW	Vincent, WA

	ACTUALS				ALL HAZARDS RANKING - NATIONAL BRACKETS = (LARGE LGAs)				ALL HAZARDS RANKING - STATE			
LGA (STATE)	TTIP ($MILLION)	VAR%	HRP #	HRP%	TTIP	VAR%	HRP#	HRP%	TTIP	VAR%	HRP#	HRP%
Moyne, VIC, 2100	$13.24	0.39%	346	3.23%	298 (246)	346 (168)	241 (194)	243 (121)	67	38	53	30
Mukinbudin, WA, 2020	$0.52	0.29%	6	1.05%	494 (-)	309 (-)	465 (-)	314 (-)	109	53	95	67
Mukinbudin, WA, 2100	$0.93	0.52%	10	1.75%	488 (-)	251 (-)	462 (-)	323 (-)	111	57	91	63
Mundaring, WA, 2020	$24.76	0.43%	153	0.84%	174 (164)	186 (87)	275 (198)	337 (151)	21	30	35	71
Mundaring, WA, 2100	$44.39	0.77%	5,769	31.50%	154 (150)	136 (63)	29 (29)	22 (5)	22	25	3	6
Murchison, WA, 2020	$0.06	0.89%	1	4.55%	540 (-)	61 (-)	501 (-)	108 (-)	136	14	117	21
Murchison, WA, 2100	$0.06	0.94%	1	4.55%	539 (-)	104 (-)	507 (-)	184 (-)	136	20	118	37
Murray, WA, 2020	$73.89	2.11%	3,279	29.42%	68 (67)	18 (4)	21 (20)	15 (3)	3	5	2	3
Murray, WA, 2100	$181.71	5.20%	5,130	46.03%	34 (34)	6 (4)	32 (32)	9 (2)	3	1	4	1
Murray Bridge, SA, 2020	$30.39	0.62%	541	3.47%	154 (146)	103 (41)	125 (105)	145 (58)	9	8	5	10
Murray Bridge, SA, 2100	$49.11	1.00%	641	4.11%	147 (145)	93 (41)	173 (151)	203 (102)	10	11	10	16
Murray River, NSW, 2020	$17.77	0.61%	560	6.03%	218 (-)	106 (-)	123 (-)	81 (-)	73	28	43	15
Murray River, NSW, 2100	$26.22	0.90%	703	7.57%	225 (-)	108 (-)	167 (-)	111 (-)	73	27	66	35
Murrindindi, VIC, 2020	$28.43	0.82%	578	5.21%	164 (156)	70 (27)	120 (104)	93 (35)	46	7	26	10
Murrindindi, VIC, 2100	$36.59	1.05%	659	5.94%	182 (175)	85 (37)	172 (150)	140 (71)	45	8	33	12
Murrumbidgee, NSW, 2020	$7.33	0.71%	247	7.50%	314 (-)	85 (-)	212 (-)	70 (-)	104	17	70	12
Murrumbidgee, NSW, 2100	$8.27	0.80%	196	5.95%	353 (-)	131 (-)	302 (-)	139 (-)	110	37	98	43
Murweh, QLD, 2020	$15.62	1.27%	394	10.06%	239 (-)	40 (-)	159 (-)	48 (-)	41	18	39	19
Murweh, QLD, 2100	$20.95	1.71%	2,031	51.86%	250 (-)	41 (-)	80 (-)	4 (-)	41	16	23	2
Muswellbrook, NSW, 2020	$15.67	0.48%	319	3.04%	237 (213)	154 (70)	187 (151)	168 (69)	78	53	63	42
Muswellbrook, NSW, 2100	$22.64	0.69%	1,365	12.99%	242 (217)	155 (71)	112 (105)	66 (26)	78	45	49	13
Nambucca, NSW, 2020	$20.82	0.51%	420	3.21%	200 (183)	137 (60)	153 (126)	160 (67)	68	47	52	37
Nambucca, NSW, 2100	$39.81	0.97%	1,420	10.84%	167 (161)	96 (43)	110 (104)	79 (33)	58	23	47	18
Nannup, WA, 2020	$10.46	1.55%	332	15.46%	282 (-)	28 (-)	183 (-)	26 (-)	35	9	25	7
Nannup, WA, 2100	$10.26	1.52%	758	35.31%	330 (-)	51 (-)	161 (-)	18 (-)	50	10	21	3
Napranum, QLD, 2020	$2.41	1.37%	38	6.80%	421 (-)	36 (-)	390 (-)	75 (-)	56	15	62	32
Napranum, QLD, 2100	$2.21	1.26%	38	6.80%	451 (-)	61 (-)	418 (-)	123 (-)	60	25	64	38
Naracoorte and Lucindale, SA, 2020	$8.90	0.36%	127	1.63%	300 (-)	242 (-)	289 (-)	252 (-)	35	17	21	20
Naracoorte and Lucindale, SA, 2100	$14.05	0.57%	103	1.32%	285 (-)	218 (-)	350 (-)	361 (-)	36	26	36	37
Narembeen, WA, 2020	$0.97	0.43%	43	6.02%	464 (-)	187 (-)	383 (-)	82 (-)	90	31	62	18
Narembeen, WA, 2100	$0.99	0.44%	15	2.10%	484 (-)	303 (-)	448 (-)	303 (-)	107	69	82	58
Narrabri, NSW, 2020	$20.85	0.60%	384	3.45%	199 (182)	111 (47)	165 (134)	147 (59)	67	29	56	31
Narrabri, NSW, 2100	$38.40	1.10%	2,565	23.06%	173 (167)	76 (35)	61 (61)	28 (9)	61	19	26	5
Narrandera, NSW, 2020	$7.03	0.47%	166	3.46%	323 (-)	157 (-)	264 (-)	146 (-)	106	54	83	30
Narrandera, NSW, 2100	$8.72	0.58%	202	4.21%	350 (-)	213 (-)	299 (-)	198 (-)	109	62	96	63
Narrogin, WA, 2020	$3.82	0.32%	9	0.24%	388 (-)	272 (-)	451 (-)	449 (-)	59	45	87	96
Narrogin, WA, 2100	$8.69	0.74%	40	1.07%	351 (-)	144 (-)	417 (-)	379 (-)	53	28	67	73
Narromine, NSW, 2020	$7.96	0.56%	173	3.79%	307 (-)	122 (-)	255 (-)	131 (-)	100	38	80	26
Narromine, NSW, 2100	$12.45	0.87%	460	10.07%	305 (-)	115 (-)	214 (-)	84 (-)	97	29	77	21
Nedlands, WA, 2020	$4.05	0.12%	8	0.08%	383 (261)	494 (254)	455 (249)	487 (243)	56	114	91	115
Nedlands, WA, 2100	$10.97	0.33%	32	0.30%	321 (252)	406 (197)	426 (250)	472 (245)	47	107	70	100
Newcastle, NSW, 2020	$115.96	0.38%	3,540	3.61%	31 (31)	220 (104)	17 (17)	138 (53)	12	80	3	28

Table 1: Potential health impacts of extreme events

Impact type	Health impact	Potential impact pathway
Direct Impacts to Humans	Fatalities, injuries Heat stress	• Direct physical injuries from extreme events. • Direct temperature related effects from heatwaves.
Natural Environment		
Water borne	Gastro-intestinal diseases Diarrhoea, vomiting	• Run-off events from heavy rainfall - risk of contamination by disease pathogens such as Cryptosporidium spp. • Contamination from wildlife and stock deaths in drought, bushfires.
Water supply	Water stress	• Effect on quantity and quality of water to reservoirs - increase sediment, nutrient and debris flow. • Changes to land cover - change in runoff patterns.
Vector borne	Ross River Virus disease (RRv) Barmah Forest Virus disease (BFv) Dengue Murray Valley Encephalitis (MVE) Other exotic diseases	• Extreme events will impact on the complex ecological cycles of the diseases, as well as our ability to respond. Direction of impacts likely to be positive and negative. • Changes to climate may allow exotic diseases and vectors to establish.
Food borne	Food poisoning	• High temperatures may increase proliferation of bacterial pathogens including Salmonella, Campylobacter and Listeria spp. • Heavy rainfall events - increased risk of Cryptosporidiosis. • Temperature increase may cause increase in mycotoxins and aflatoxins.
Food production	Changes to diet	• All extreme events particularly in relation to reduced water from rainfall, destroy or damage a wide range of crops and livestock - changes in cost and availability of food.
Air quality	Respiratory effects Asthma Allergic reactions	• Bushfires - increase air pollutants. • Droughts/wind - increase dust. • Heat events - increase smog. • Links between high temperature and ground ozone levels.
Biodiversity	Very difficult to determine. Likely impacts on ecological goods and services	• Wide range of potential impacts on biodiversity, particularly drought and bushfires.
Other	Chemical exposure	• Damage to chemical pipelines, storage. • Drought increases concentration of soil and water contaminants.

Impact type	Health impact	Potential impact pathway
Built environment		
Infrastructure and essential services	Physical injuries Reduced access to health care, food, water Exposure to chemicals, fires, explosions, micro-organisms and other forms of environmental contamination	• Damaged infrastructure/buildings. • Damaged transport systems, energy, water, wastewater, communication. • Off-shore petroleum platforms, pipelines (chemical, gas, water), storage facilities. • Inability to meet increased demand for energy, water, health services. • Breakdown of equipment/computers/ machinery - impact on all services.
Social environment		
Dislocation	Psychological stress of loss of home, community	• Damage to property, homes. • Repeated events - permanent dislocation is possible.
Mental health	Traumatic stress conditions	• Experience of extreme event.
Community	Reduction in sense of community Loss of goods and services Dwindling population	• Negative impacts particularly from repeated extreme events and gradual nature of drought.
Lifestyle/behavioural	Increase in crime, particularly involving aggression Increase in accidents - workplace and traffic Decline in physical health	• Heat waves - hot nights - sleep deprivation. • Times of crisis such as drought and floods - physical health often neglected.
Economic	Stress from loss of income and loss of assets. Reduction of goods and services Inability to insure assets	• Wide range of economic pathways. Loss of income from damage to crops, property, infrastructure such as transport. • Increased cost of insurance, food. • Cost of rebuilding. • Higher maintenance and construction costs with more extreme weather.

Table 2: Potential health impacts of gradual climatic changes

Impact type	Health impact	Potential impact pathway
Direct impacts to humans	Heat stress Temperature related illnesses Cold-related illnesses	• Increase in summer temperature - increase in heat related stress. • Increase in winter temperature - reduction in cold-related illnesses.
Natural environment		
Water borne	Gastro-intestinal diseases Diarrhoea, vomiting Amoebic meningitis	• Temperature increase in recreational waters • Change in incidence of water-borne pathogens such as cryptosporidium, campylobacter, amoeba. • Increase in toxic algal blooms. • Increased use of grey-water - increase contact with pathogenic organisms.

Health impacts of climate change:

Impact type	Health impact	Potential impact pathway
Water supply	Water stress Water quality Higher cost of treatment	• Reduction in flows to reservoirs, groundwater. • Sea-level rise—salt water intrusion into coastal aquifers, estuaries, wetlands. • Warmer temperature—reduced dissolved oxygen—reduced water quality. • Reduced dam volumes - increases nutrients and contaminant concentration. • Thermal stratification-microbiological inactivation.
Vector borne	Ross River virus disease Barmah Forrest virus disease Dengue Murray Valley Encephalitis Other exotic diseases	• Increase in temperature, rainfall changes and sea-level increases will impact on the complex ecological cycles of the diseases, as well as our ability to respond. Direction of impacts likely to be positive and negative. • Changes to climate may allow exotic diseases and vectors to establish.
Food borne	Food poisoning Seafood poisoning	• High temperatures may increase proliferation of bacterial pathogens including Salmonella, Campylobacter and Listeria spp. • Temperature increase may cause increase in mycotoxins and aflatoxins. • Ocean temperature increase - increase in marine algal blooms -increase Ciguatoxin, southward movement of Vibrio spp.
Food production	Changes to diet Changes to availability of food Changes to nutritional content Changes to pesticide levels	• Climate changes especially in relation to reduced rainfall and available water - change in ability to grow certain foods in certain areas (+/-). • Temperature and CO2 increase - changes in crop yields and protein levels (+/-). • Temperature increase - affect feed intakes and animal reproduction. • Changes to pests, weeds and diseases—changes to use of agrochemicals.
Air quality	Respiratory effects Asthma Allergic reactions VOC gealth impacts Legionnaire's disease	• Increase winter temperature-decrease use wood-burning - improve winter air quality and decrease incidence cold-related illness. • Increase in CO2 levels and dry, hot conditions - increased production pollen, aeroallergens, dust, increased off-gassing of VOCs. • Increased use of evaporative air conditioners and water conserving products (mulch).
UV exposure	Skin cancer, melanoma, Eye disease	• Increased temperature - increase time spent outdoors—increase UV exposure.
Biodiversity	Very difficult to determine. Likely impacts on ecological goods and services Exposure to new diseases Changes to availability of traditional foods	• Wide range of potential impacts on biodiversity - distribution of bacteria, insects, plants and animals.

Impact type	Health impact	Potential impact pathway
Other	Chemical exposure Bites and stings Physical injuries	• Temperature increase—higher use pools and exposure to pool chemicals. • Higher evaporation rates in soils - increase concentration of contaminants. • Increase ocean temperature -southward movement marine tropical pests. • Coastal erosion.
Built environment		
Infrastructure and essential services	Physical injuries Reduced access to health care, food, water Exposure to chemicals, fires, explosions	• Sea-level increase - damage to wide range of coastal infrastructure - buildings, chemical storage, water treatment plants etc. • Drier soils - structural damage to buildings. • Inability to meet increased demand for energy and water.
Social environment		
Dislocation	Psychological stress of loss of home, community	• Sea-level rise and changes in agricultural productivity - forced dislocation for physical or economic reasons.
Mental health	Wide range mental health issues - stress, anxiety, depression	• Loss of income for some primary producers, small business, tourism.
Community	Reduction in sense of community Loss of goods and services Loss of amenities	• Cumulative effects of wide range of climate change impacts and others. • Cut in services to vulnerable communities • Water shortages - loss of green spaces, loss of gardens.
Lifestyle/behavioural	Effect on recreational opportunities Increase in alcohol consumption Decrease coping capacity for hot days.	• Increased temperature - changes to exercise patterns, changes to alcohol consumption. • Increased water temperature - lack of cold water - reduced ability to cool down.
Economic	Stress from loss of income and loss of assets. Reduction of goods and services Financial strain for LG's.	• Wide range of economic pathways. Decreased productivity for some primary producers, loss of income. • Sea-level rise - increase insurance costs, fall in property values, high costs to local coastal governments. • Higher costs of insurance, food, water, energy.

5.1.1 Identification of vulnerable groups

An important component of Phase One was the identification of the various aspects of vulnerability: regional, economic, social and infrastructure and services. Analysis of the workshop responses highlighted a number of vulnerabilities common to a wide range of potential health impacts.

Regional vulnerabilities

Regional vulnerabilities can occur in terms of exposure, sensitivity and adaptive capacity. The projections have indicated that changes to climate will not be experienced equally across the state. For example, reductions in rainfall are likely to be greater in the South West than other regions across WA. Coupled with decreases in rainfall that have already occurred since the mid 1970s, the South West is seen as a particularly vulnerable region.

Key Findings

1

Climate change is a major threat to Australia's financial stability, and poses substantial systemic economic risks.

- Direct macroeconomic shocks from climate change, including reduced agricultural yields, damage to property and infrastructure and commodity price hikes, are likely to lead to painful market corrections and could trigger serious financial instability in Australia and the region.
- Australia's financial regulators acknowledge that climate change is now a central concern for the economy and financial stability.

2

Detailed new modelling, based on the Federal Government's current approach to climate change, finds that the economic damage to Australia's property and agricultural sectors will be very significant.

- Australia's greenhouse gas emissions have been rising for four years and we are not on track to meet our weak 2030 emissions reduction target. If the world followed Australia's approach we would be on track for at least 3-4°C of global warming, which would have catastrophic economic consequences.

3

The property market is expected to lose $571 billion in value by 2030 due to climate change and extreme weather, and will continue to lose value in the coming decades if emissions remain high.

- One in every 19 property owners face the prospect of insurance premiums that will be effectively unaffordable by 2030 (costing 1% or more of the property value per year).
- Some Australians will be acutely and catastrophically affected. Low-lying properties near rivers and coastlines are particularly at risk, with flood risks increasing progressively and coastal inundation risks emerging as a major threat around 2050.
- Certain events which are likely to become more common because of climate change are not covered by commercial insurance, including coastal inundation and erosion.
- More than $226 billion in commercial, industrial, road, rail, and residential assets will be at risk from sea level rise alone by 2100, if greenhouse gas emissions continue at high levels.

4

Extreme events like droughts, heatwaves, cyclones and floods have an impact on agriculture and food production; this is already affecting Australia's economy and will cost us much more in the future.

- Climate change is increasing the severity and intensity of extreme weather events in Australia.
- On current trends, the accumulated loss of wealth due to reduced agricultural productivity and labour productivity as a result of climate change is projected to exceed $19 billion by 2030, $211 billion by 2050 and $4 trillion by 2100.
- By 2050, climate change is projected to halve the irrigated agricultural output of the Murray-Darling Basin region, which currently accounts for 50% of Australia's irrigated agricultural output by value (about $7.2 billion per year).
- By 2090, wheat yields on the 4,200 family farms in WA that produce half of Australia's wheat are projected to fall by 41-49% if greenhouse gas emissions remain high.
- Previous severe droughts have reduced Australia's Gross Domestic Product by around 1%; estimates suggest that increasing drought frequency and impacts in the future may reduce GDP by 1% every year.

5

The severe costs of climate change outlined in this report are not inevitable. To avoid the costs of climate change increasing exponentially, greenhouse gas emissions must decline to net zero emissions before 2050. Investments in resilience and adaptation will be essential to reduce or prevent losses in the coming decades.

- Increasing resilience to extreme weather and climate change should become a key component of urban planning, infrastructure design and building standards.
- Buildings and infrastructure must be built to withstand future climate hazards and to facilitate the transition to a net zero emissions economy.
- A credible national climate policy is needed to safeguard our economy by reducing the direct costs of climate change, and avoiding economic risks associated with a sudden, disruptive or disorderly transition to net zero emissions.

Shire of Mundaring

Energy and Emissions Reduction Plan

Acknowledgement and Disclaimer

The Draft Energy and Emissions Reduction Plan was prepared in 2018 for the Shire of Mundaring by the Eastern Metropolitan Regional Council (EMRC) with valuable assistance from the Shire of Mundaring. In particular, the EMRC would like to acknowledge the contribution of the Coordinator Environment and Sustainability, Service Managers and Officers within the Shire of Mundaring, and community members of the Shire's Environmental Advisory Committee and Mundaring in Transition (Energy and Emissions Working Group).

The Plan has been prepared to assist with implementation of the Shire of Mundaring's Energy and Emissions Reduction Strategy 2018. Analysis has been performed on data provided by Planet Footprint through the Shire's subscription and the information is correct at the time of publication. It should be noted that data may change over time due to revisions by utilities.

The Energy and Emissions Reduction Plan remains the property of the Shire of Mundaring, as owner of the facilities, consumer of energy and producer of emissions. The Plan was amended in 2019 to reflect the Cities Power Partnership pledge actions selected by the staff of the Shire's Energy Team.

Executive Summary

Council adopted an Energy and Emissions Reduction Strategy (EERS) on 11 September 2018. The EERS includes an emissions reduction target, to reduce corporate emissions by 30% by 2030 (from 2016/2017 levels). This target is achievable provided investments are made in renewable energy for Shire facilities, as well as broader energy efficiency measures across the Shire.

The primary focus of the EERS is on reducing the Shire's corporate emissions, for which the Shire has the most accurate information, direct control and responsibility, and where future energy cost savings will be shared by all ratepayers. For example, some initial actions will be focussed on installing solar systems at Shire facilities.

While making changes within its facilities and operations, the Shire can also raise community awareness of the urgent need to act on climate change. Providing access to information about energy and emissions through talks and publications can prompt voluntary changes to reduce emissions from local residents, schools and businesses.

The EERS also notes that advocacy for effective leadership and action from the State and Commonwealth Governments will be necessary:

> *"It is important to note that local governments alone cannot and should not be expected to manage emissions reduction to the extent necessary to avoid dangerous levels of climate change. Current international commitments are too low to avoid a global rise in temperature of over 2°C. To date there has been a concerning lack of direction from the State and Commonwealth Governments, and Australia's emissions are well above the levels required to meet the national target of 26-28% reduction by 2030 (from 2005 levels).*

At its meeting of 11 September 2018, Council also decided to join the Climate Council's Cities Power Partnership (CPP) program. CPP activities includes advocating on behalf of local governments for effective State and Commonwealth Governments action for emissions reduction. The Shire can undertake its own advocacy, as well as seek to join with other Western Australian local governments in calling for leadership and assistance from the State Government.

This Plan outlines a range of actions to be undertaken or investigated, with estimated cost ranges, emissions reduction potential, timeframes and the responsible Shire Services for each action. This Plan can also support grant applications if relevant funding opportunities become available.

Due to the speed of political and technological changes relating to energy efficiency and renewable energy, this Plan will require frequent review. The EERS suggests that the Plan be reviewed every two years to ensure that actions are progressing and remain relevant given changes in policy, funding and technology.

Contents

Introduction

The Energy and Emissions Reduction Plan will guide work to reduce energy costs and emissions, towards the Shire's Emissions Reduction Target of 30% as set in the Energy and Emissions Reduction Strategy 2018 (EERS).

The EERS provides the principles that the Shire will follow to reduce its overall emissions:

1. Reduce energy requirements by implementing efficiency measures and purchasing more efficient items and vehicles;
2. Directly increase use of renewable energy by installing Photovoltaic (PV) systems at suitable Shire facilities;
3. Reduce or offset some emissions by purchasing decisions, such as GreenPower or accredited carbon offsets.

The EERS notes that implementation will include:

- Measuring carbon footprints for Shire operated facilities;
- Identifying cost effective opportunities to reduce emissions;
- Forming an Energy Team to implement emissions reduction and energy management actions across the organisation;
- Purchasing accredited carbon offsets;
- Regular monitoring and reporting of progress (including State of Environment Report); and
- Reviewing opportunities and actions to adapt to rapid change.

Actions in this plan are consistent with the Shire of Mundaring Environmental Sustainability Policy, including the following principles:

1.4 Human induced climate change is recognised as a key threat to biodiversity, requiring mitigation action to reduce carbon emissions at all levels of government, and adaptation to local impacts.

2.1 The Shire will pursue and promote improved water and energy efficiency, reduced carbon emissions and sustainable use of natural resources.

3.3 Information will be made available for schools and residents on sustainability and local environmental issues through publications, talks, workshops and other mediums.

4.2 The Shire will remain agile; learning and collaborating with community groups, research institutions and relevant government agencies to adapt best practice environmental management to fit the Shire's context.

For more information regard the strategic framework supporting this plan, refer to the Energy and Emissions Reduction Strategy, and Strategic Community Plan.

The Cost of Energy

The Shire currently spends over a million dollars per year on electricity and gas. This is in addition to the annual cost of fuel for the Shire's vehicle fleet.

The Shire pays for the electricity used by street lights which costs around $600,000 per year. Western Power owns nearly all street lighting infrastructure and has control over maintenance and energy efficiency retrofits. Overall, this means that the Shire has had limited influence on energy efficiency of lamps or the cost of streetlighting.

The cost of energy in Perth has increased substantially in the last decade. In 2016/2017, the Shire of Mundaring spent $401,310 on energy consumption (electricity and gas) in addition to street lighting. This included electricity for buildings and community facilities, lighting in parks and reserves, and powering irrigation infrastructure. Approximately $110,000 is from energy costs for the Administration and Civic Centre, currently the Shire's highest energy consuming facility.

The Sports and Recreation facilities group includes Bilgoman Aquatic Centre, Boya Oval, Chidlow Oval, Mundaring Oval, Parkerville Oval, Lake Leschenaultia and many more. In the baseline year of 2016/2017, energy for these facilities cost the Shire over $150,000.

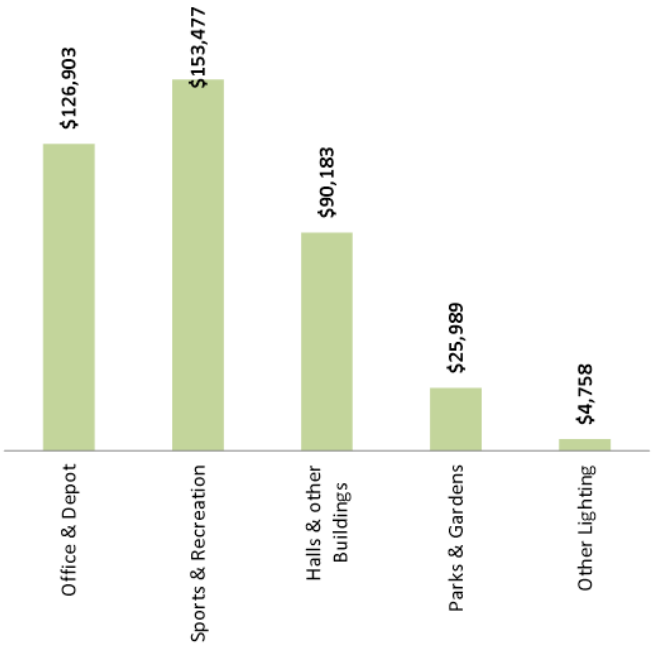

Figure 1 – Electricity and gas costs for 2016/2017 (excluding streetlighting)

Energy efficiency technology that can save energy costs and emissions includes solar PV systems, retrofitting buildings with LED lighting, replacing old inefficient appliances (particularly air conditioners), and promoting sustainable design for new facilities. These technologies can reduce the cost of powering the Shire's facilities and assets, as well as reduce carbon emissions.

Often the purchase of energy efficient vehicles, appliances or solar PV systems will have a 'payback period'. This is the number of months or years before the energy or fuel savings have covered the higher purchase cost or installation cost. After the payback period, the lower operating costs result in annual savings.

Past Actions and Achievements

The Shire has already installed solar PV systems and improved lighting and energy efficiency on some buildings and facilities. The Shire has also provided some tools, information and educational workshops for the community.

Below are some of the measures that have been implemented by the Shire:

- Installation of Solar PV Systems at Administration and Civic Centre, Shire Depot and Swan View Youth Centre
- Solar pool heating and variable speed drives for pumps at Bilgoman Pool
- Energy Audits conducted on Shire Depot and Bilgoman Pool
- Smart lighting at Shire Administration and Civic Centre, and Shire Depot
- Solar hot water system installed at Shire Depot
- Tracking corporate carbon emissions via Planet Footprint
- Participated in EMRC Achieving Carbon Emissions Reduction Program since 2009
- Home Energy Audit Kits and powermates available in Shire Libraries
- Living Smart Courses for residents (as part of Perth Solar City Program)

Cities Power Partnership

The Shire joined the Climate Council's Cities Power Partnership (CPP) in September 2018. CPP is a network of Australian local governments making commitments to reduce emissions and act on climate change. The Shire's Energy Team selected the following five key actions from the Round 3 Partnership Action Pledge options. These actions are also listed in the Action Table with (CPP) to indicate that they are pledge actions.

1. Install renewable energy (solar PV and battery storage) on council buildings.
2. Create a revolving green energy fund to finance renewable energy projects and receive $ savings.

3. Roll out energy efficient lighting (particularly street lighting) across the municipality.
4. Lobby state and federal government to address barriers to the take up of renewable energy, energy efficiency and/or sustainable transport, and to support increased ambition.
5. Implement an education and behaviour change program to influence the behaviour of council officers, local residents and businesses within the municipality to drive the shift to renewable energy, energy efficiency and sustainable transport.

Corporate Carbon Footprint

The Shire's carbon footprint is the sum of emissions from its corporate operations and activities that use energy or fuel (electricity, gas, unleaded petrol and diesel).

To ensure the success of the Energy and Emissions Reduction Plan, the Shire will need to monitor its carbon footprint regularly and report progress to responsible staff. The Shire's carbon footprint has been calculated for the Emissions Reduction Target's baseline year (2016/2017) and is regularly reported to the Shire by EMRC.

The Shire's 2016/2017 total carbon footprint was 3,361.8 tCO_2-e. Streetlighting emissions accounted for 39% of the total carbon footprint followed by Fleet with 27% and Sports and Recreation at 13% of the total (Figure 3).

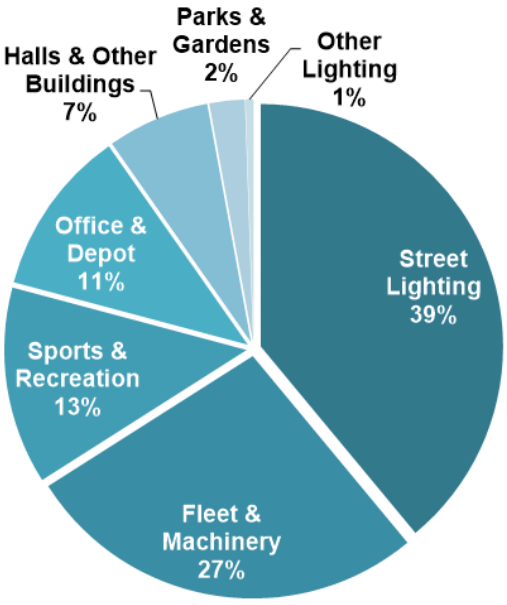

Figure 2 –Shire corporate emissions sources in baseline year 2016/2017

In order for the Shire to achieve its Emissions Reduction Target, it will have to reduce emissions by around 874.1 tCO2-e (approximately 67.2 tCO2-e reduction per year). Measures will need to be funded by Council and implemented by staff in order to meet this target.

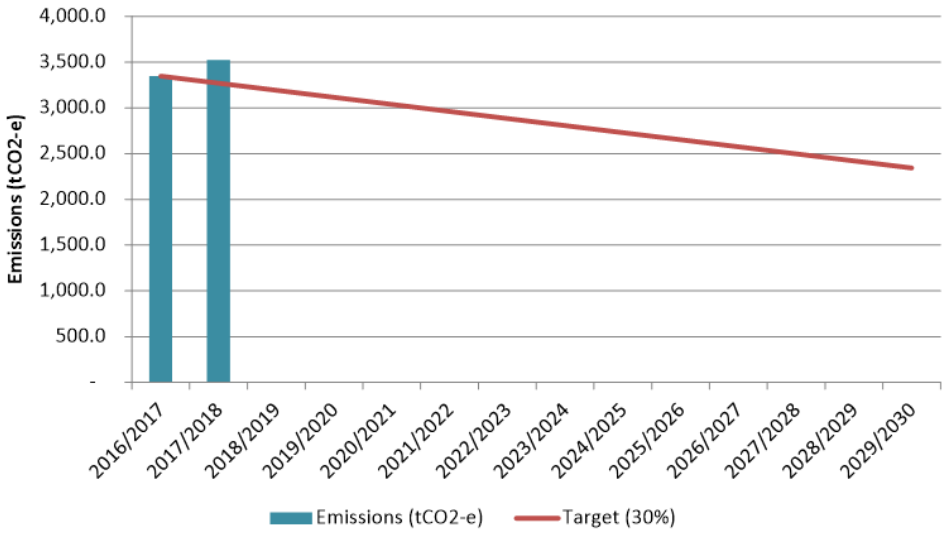

Figure 3 – Total corporate emissions (tCO2-e) and target from baseline year

Community Carbon Footprint

The Shire was provided with a community emissions summary for the Shire's community by Ironbark Sustainability. The emissions profile below briefly shows the estimated total emissions by the Shire's community, as well as, a breakdown to source of emissions. It should be noted that the profile contains a mix of modelled and detailed data. As new data sources and information become available, the profile for the Shire will change. Below is the profile as of June 2018 (refer to appendix A for full profile summary report).

The summary is sourced from state and national data, scaled based on a number of factors including census data and a variety of third parties. Stationary energy is the largest emissions source overall - this includes the use of electricity and gas for powering homes, business and industry. Transportation is the estimated figure for emissions produced from vehicles. Solid waste is from what the community sends to landfill, and wastewater is the emissions produced with the transport and decomposition of sewerage.

Table 1 – estimated community emissions data for the Shire of Mundaring

Source	Emissions (tCO_2-e)	Percentage (%)
Stationary Energy	832,425	79%
Transportation	196,491	19%
Solid Waste	13,833	1.5%
Wastewater	4,531	0.5%
TOTAL	1,047,279	100%

Within the Shire, over 31.3% of the Shire's dwellings have solar installed on their rooftops and a total installed capacity of 15,424kW[i]. This percentage is above the state average for dwellings with PV installations at 25.9%.

Asset Groups and Scopes

Corporate Activities

EMRC assists with collation and analysis of Shire energy use. The energy data management platform, Planet Footprint, groups assets within organisational units and a summary of those units is displayed below:

Street Lighting - Western Power owned street lamps

Fleet & Machinery - Operational vehicles, heavy operational vehicles, passenger vehicles, plant and equipment

Sport & Recreation - Bilgoman Pool, Mundaring Arena, Lake Leschenaultia, ovals, change rooms, pavilions and recreation reserves

Office & Depot - Administration and Civic Centre, and Shire Depot

Halls & Other Buildings - Halls, community centres, libraries, public toilets, fire stations, and waste transfer stations

Parks & Gardens - Irrigation, parks, road reserves, median strips, and small reserves

Other Lighting - Shire owned security, street and decorative lighting

Baseline Year

The Shire's Emissions Reduction Target set in 2018 is:

To reduce corporate emissions by 30% by 2030 (from 2016/2017 levels)

Emissions baselines are defined under the National Greenhouse and Energy Reporting Scheme (NGERS) as 'the reference point against which future emissions performance will be measured[ii]. The Shire's target used a baseline year of 2016/2017 as this was the Shire's most recent and reliable dataset available. The Shire's corporate carbon emissions in 2016/2017 were 3,361.8 tCO_2-e.

The full emissions dataset for the baseline year is available via the Shire's Planet Footprint Platform and is subject to ongoing data revision due to the right of utilities (such as Synergy and Alinta Energy) to update previous meter readings and data collection figures. Therefore, the baseline year total emissions figure (and subsequently, other year totals) could change slightly.

Scopes

Shire staff are not required to use 'scopes' but EMRC and Planet Footprint classify emissions based on the principles in the National Greenhouse and Energy Reporting System (NGERS). For the purpose of formal emissions reporting, carbon emissions are categorised into Scope 1, Scope 2 and Scope 3 with 'emissions boundaries' listed under each scope.

Scope 1 Emissions: Direct Emissions released to the atmosphere as a result of an activity, or series of activities at a facility level.

- Emissions for fuel combusted for transport and fuel combusted for stationary energy (Fleet, Plant Equipment and bottled gas).

Scope 2 Emissions: Indirect Emissions from energy consumption such as electricity, heating, cooling or piped gas consumed by the Shire's facilities and assets.

- Electricity and gas use from all Shire owned assets.

Scope 3 Emissions: Emissions generated from activities that are outside of the Shire's control.

- Electricity used by street lighting which is currently owned by Western Power.

Actions

The tables below list actions which will contribute towards the Shire's Emissions Reduction Target, as well reducing the Shire's ongoing energy costs. After two years, a review is recommended to monitor progress, refine and identify further actions to achieve the Shire's target. The regular reviews can also take into account internal service changes, technological improvements, new regional partnerships or the introduction of incentives or assistance from the State or Commonwealth Governments.

Reading the Action Table

Item # - This is a reference for each action to use in the Shire's communication and reporting.

Responsible Departments - This identifies Shire Services or Directorates that are responsible for specific actions including implementation, monitoring and reporting.

Timeframes - The timeframes are based on need and take into consideration past and current actions. This plan's timeframes range between 2018 and 2023.

Timeframe	Description
Short	By end of 2019/2020
Medium	By end of 2020/2021
Long	By end of 2022/2023
Ongoing	Continuing actions

Budget - Each action has been placed in one or more of these categories for budget purposes:

Category (abbreviation)	Description
Staff	The action can be implemented by existing Shire staff or EMRC staff without additional costs
Normal Budget Expenditure (NBE)	Budget allocation will be required in addition to staff time, e.g. consulting, materials, external contractors, small appliances, maintenance, etc.
Capital Expenditure (CEx)	The actions will require the purchase of an substantial asset (e.g. solar panels, solar battery or low/zero emissions vehicle)
Grants	The action will likely require external funding such as grant funding, or partnership with another agency/organisation.

Cost ($) - The cost of each action is dependent on the Budget Type and the potential expenditure required for implementation. Below are the estimated cost ranges that actions fall within:

Cost Range	Icon	Description
$ 0-5,000	$	Low expenditure may be required from the Shire
$ 5 -10,000	$$	Moderate expenditure may be required from the Shire
$ 10-20,000	$$$	Large expenditure may be required from the Shire
No Cost or Staff	-	The action has no extra cost to implement or is included as staff time (such as investigations, reviews and advocacy)

Cost Savings Potential (SP$) – Implementing the actions could provide the Shire with cost savings immediately, gradually or consistently over time. Cost savings are influenced by the expenditure required to implement actions as this may require a pay-back cost to be included when accurately calculating total savings as actions are completed. Below are the cost savings potential ranges that actions fall within:

Cost Savings Potential	Icon	Description
$ 0-5,000	**SP$**	Small savings may be realised when the action has been implemented
$ 5-10,000	**SP$$**	Moderate savings may be realised when the action has been implemented
$ 10-20,000	**SP$$$**	Large savings may be realised when the action has been implemented
No Saving or N/A	**-**	The action by itself is unlikely to lead to cost savings (such as investigations, reviews and advocacy)

Emissions Reduction Potential (E↓) - Identifies the impact that each action may have on the Shire's total carbon footprint. Some actions have actual emissions potential, where the action directly reduces emissions from implementation, while others have future emissions potential. Community emissions reduction does not directly affect the Shire's corporate carbon footprint, however can reduce emissions from businesses or households within the Shire.

The Emissions Reduction Potential is listed for each action using the abbreviations below:

Emissions Reduction Potential	E↓
Low Emissions Reduction	L
Moderate Emissions Reduction	M
High Emissions Reduction	H
Future Emissions Reduction	F
Community Emissions Reduction	C
Not applicable	-

Whole Organisation

Actions listed in this section will impact the Shire's corporate energy and emissions across multiple areas. Implementation will require communication and cooperation between business units. (All Scopes)

#	Action	Responsible Departments	Timeframe	Budget	Cost / Saving	E↓
1.1	Lobby state and federal government to address barriers to the take up of renewable energy, energy efficiency and/or sustainable transport, and to support increased ambition (CPP)	Environmental Services; EMRC	Ongoing	Staff	- -	F
1.2	Participate in climate change networks, partnerships or alliances to share information and collaborate for delivery of regional emissions reduction programs	Environmental Services; EMRC	Ongoing	Staff	- -	F
1.3	Continue measuring, monitoring and reporting on Shire energy use and carbon emissions annually	Environmental Services; EMRC	Ongoing	NBE	$$ -	F
1.4	Source funding opportunities for the Shire such as energy efficiency loans, grants or other assistance that can assist with energy efficiency, renewable energy or batteries	Environmental Services; EMRC	Ongoing	Staff	- $$	F
1.5	Pursue continued divestment from fossil fuels in financial investments*	Finance	Ongoing	NBE	- -	F
1.6	Implement an education and behaviour change program to influence the behaviour of council officers, local residents and businesses within the municipality to drive the shift to renewable energy, energy efficiency and sustainable transport (CPP)	Environmental Services	Ongoing	NBE	$ SP$	F
1.7	Review tariffs applied to the Shire's electricity for various assets and pursue lower cost arrangements, particularly for high tariff or high use, contestable sites	Building Assets; EMRC	Ongoing	NBE	$ SP$$$	-

1.8	Update the Shire's purchasing policy to include sustainable purchasing in regards to reducing carbon emissions and prioritising energy efficiency	Corporate Services	Short	Staff	- -	F
1.9	Establish a revolving green energy fund to finance energy efficiency and renewable energy projects, receiving savings from implemented energy initiatives (CPP)	Finance; Environmental Services	Short	Staff	$ -	F
1.10	Integrate energy efficiency and carbon emissions reduction considerations into tender criteria for future Shire buildings and facilities	Building Assets; Corporate Services	Short	Staff	- SP$$	F
1.11	Investigate options for carbon offsetting and/or carbon sequestration as a way for the Shire to offset a portion of its annual emissions	Environmental Services; EMRC	Medium	Staff	$ -	F
1.12	Ensure that all relevant policies, strategic plans and local planning schemes are up-to-date with the Shire's carbon emissions commitments as well as best practice energy efficiency	Planning Services; Corporate Services	Long	Staff	- -	F
1.13	Investigate potential for Shire revenue and increasing renewable energy generation by investing in Shire owned electric charging stations, micro-grids, large-scale solar farms or similar	EMRC; Strategic Services	Long	NBE	- -	F

* These actions may contribute to broader emissions outside of the Shire's corporate emissions boundary.

Buildings and Facilities

The Buildings and Facilities unit comprises of Shire owned and operated assets, as well as leased facilities where the Shire pays the electricity or gas bills. Included are administration buildings, community facilities, and sports and recreation facilities. Emissions sources include electricity and gas (Scope 2).

#	Action	Responsible Department	Timeframe	Budget	Cost Saving	E↓
2.1	Use energy audits for high energy use buildings and facilities to prioritise and schedule improvements (such as replacement air conditioners, solar PV and battery systems)	Building Assets; EMRC	Ongoing	Staff; NBE	$ -	F
2.2	Participate in building/facility benchmarking opportunities and local government information sharing to improve energy efficiency practices and renewable energy systems	Building Assets; EMRC	Ongoing	Staff; NBE	$ -	F
2.3	Adjust building management systems to reduce energy use (including night purging of warm air where possible)	Building Assets	Ongoing	Staff; NBE	- SP$	L
2.4	Replace or modify air-conditioners within Shire buildings and upgrade to more energy efficient models where required	Building Assets	Ongoing	CEx	$$$ SP$$$	H
2.5	Replace inefficient lighting in buildings with more energy efficient globes (such as LED's) as an ongoing program within the Shire's lighting maintenance schedule	Building Assets	Ongoing	Staff; NBE	$ SP$$	M
2.6	Install renewable energy (such as solar PV and battery storage) on council buildings (CPP)	Building Assets	Ongoing	CEx; Grants	$$$ SP$$$	H
2.7	Advocate for State Government support for solar battery installation at local government buildings and facilities, to reduce energy costs and support grid stability	Environmental Service; EMRC	Ongoing	Staff	- SP$$	M
2.8	Research energy efficient technology and appliances for implementation into the Shire's buildings and facilities	Building Assets; EMRC	Ongoing	Staff	-	F

2.9	Require the use of energy efficient design principles in all new Shire buildings to minimise ongoing energy costs	Building Assets	Ongoing	Staff	- SP$$	L
2.10	Undertake monitoring, cleaning and maintenance of renewable energy assets to ensure optimum performance, electricity savings and emissions reduction	Building Assets	Ongoing	Staff	- SP$$	M
2.11	Investigate performance issues with Administration and Civic Centre solar PV system and upgrade or replace to ensure optimum energy generation	Building Assets	Short	NBE	$ SP$	L
2.12	Ensure that energy saving functions on appliances and equipment are activated such as sleep mode, hibernation, etc.	Building Assets; Information Technology	Short	Staff	- SP$	L
2.13	Install sensor and automated lighting into building toilet and change-room facilities where appropriate	Building Assets; Recreation and Leisure	Medium	NBE	$ SP$	L
2.14	Investigate the use of electricity management systems for the Shire's sporting field lights to reduce vandalism and excessive energy use	Design Service; Recreation and Leisure	Medium	Staff	- -	F
2.15	Provide energy efficiency training, reminders, prompts or resources to leased facility staff and club managers to reduce energy use	Recreation and Leisure	Medium	Staff; NBE	- SP$	F
2.16	Investigate options and trial technology or products that can reduce energy usage related to pool heating at Bilgoman Aquatic Centre.	Recreation and Leisure; EMRC	Medium	Staff	- -	F
2.17	Retrofit existing Shire buildings in line with sustainable design principles such as awnings, green landscaping and design, ventilation or insulation improvements, window tinting and window treatments	Building Assets; Environmental Services	Long	NBE; CEx	$$ SP$$	M

Fleet Vehicles and Equipment

The Shire's fleet vehicles and equipment includes several types of vehicles such as passenger, trucks, and plant and equipment. The emissions from each asset are classed as fuel combustion for transport or stationary energy (Scope 1). The majority of the Shire's vehicles and equipment either run on unleaded petrol or diesel.

#	Action	Responsible Department	Timeframe	Budget	Cost Saving	E↓
3.1	Continue to purchase fuel efficient vehicles and equipment, and monitor incentives and opportunities to purchase or trial lower emissions vehicles and equipment	Operations; EMRC	Ongoing	Staff	$ SP$$	M
3.2	Encourage staff to use alternative transport options to travel to external meetings such as public transport, active transport, webinar options and car pooling	Environmental Services	Ongoing	Staff	- SP$	L
3.3	Provide regular information to staff with fuel charge cards on the cheapest fuel options to reduce the cost of fuel for staff allocated vehicles	Corporate Services; Finance	Ongoing	Staff	- SP$	-
3.4	Advocate to state and federal governments for incentives for hydrogen or electric vehicles and coordinated provision of charging infrastructure	Environmental Services; EMRC	Short	Staff	- SP$$	F
3.5	Purchase electric, hybrid or hydrogen vehicles into the Shire's fleet once charging/refuelling infrastructure is available and costs are reasonable	Operations	Medium	NBE	$ SP$	F

Parks and Gardens

The Parks and Gardens unit includes the Shire's small reserves, road verges, irrigation and median strips. The main emissions source is through electricity used for irrigation and park lighting (Scope 2). There is usually only one electricity account for a number of uses on site.

#	Action	Responsible Department	Timeframe	Budget	Cost Saving	E↓
4.1	Review the Shire's irrigation practices to ensure efficient use of bores and scheme water to reduce energy usage	Operations; Recreation and Leisure	Ongoing	Staff	- SP$	L
4.2	Retrofit park and reserve lighting with energy efficient technology such as LED or solar lighting	Operations; Recreation & Leisure	Medium	NBE	$ SP$	L
4.3	Replace inefficient bores within the Shire to reduce energy use and improve irrigation practices	Operations	Long	NBE; CEx	$$$ SP$$	L

Street and Other Lighting

These actions relate to street lighting, auxiliary lighting and decorative lighting within the Shire. Street Lighting emissions from infrastructure owned by Western Power are more difficult to reduce as the Shire has limited control over maintenance and upgrades of the lamps (Scope 3). Auxiliary lighting is owned by the Shire and can be more easily retrofitted with energy efficient technology (Scope 2).

#	Action	Responsible Department	Timeframe	Budget	Cost Saving	E↓
5.1	Support WALGA and the EMRC in advocating to Western Power for energy efficiency improvements to street lighting	Infrastructure; Environmental Services	Ongoing	Staff	- SP$$$	H
5.2	Review street lighting times and tariffs for opportunities to reduce electricity use and costs of streetlighting	Infrastructure; EMRC	Ongoing	Staff	- SP$$	L
5.3	Roll out energy efficient lighting across the Shire, ensuring all new lighting (particularly street lighting) is energy efficient and existing lighting is targeted for replacement (CPP)	Infrastructure; Planning Service	Ongoing	NBE	$$ SP$$$	H
5.4	Identify appropriate sites and introduce timers, sensors, use-tracking and other technology to reduce energy use for lighting	Recreation & Leisure; Building Assets	Medium	NBE	$$ SP$$	L

Community

These actions are directed at reducing energy use and carbon emissions in the broader community. They are focussed on information, education and encouraging voluntary actions and behaviour changes.

#	Action	Responsible Department	Timeframe	Budget	Cost / Saving	E↓
6.1	Work with Environmental Advisory Committee to understand community attitudes and obstacles to improving household energy efficiency and uptake of renewable energy	Environmental Services	Ongoing	Staff	- / -	F
6.2	Encourage and support schools, businesses and community organisations within the Shire to use renewable energy and implement energy efficiency measures	Environmental Services	Ongoing	Staff	$ / -	C
6.3	Provide information to residents to encourage energy saving and emissions reduction actions (including household energy, solar panels, reducing vehicle use, food, waste, clearing and burning)	Environmental Services	Ongoing	Staff; NBE	$ / -	C
6.4	Provide easy to understand information to encourage passive solar design, better energy efficiency and renewable energy choices for new homes and buildings	Environmental Services	Short	Staff	$ / -	C
6.5	Investigate options and assistance for an energy expo (or similar) to include talks, stalls and suppliers of energy efficient appliances, renewable energy technology etc.	Environmental Services; EMRC	Medium	NBE; Grants	$$ / -	C
6.6	Investigate options and partnerships to facilitate a community solar bulk-buy program or similar initiative	Environmental Services; EMRC	Long	NBE; Grants	$$$ / -	C

[i] Australian Photovoltaic Institute. (2018). *Australian PV Institute (APVI) Solar Map.* Australian Renewable Energy Agency. Sourced via http://pv-map.apvi.org.au/historical#11/-31.9230/116.1742 (26/03/2018)

[ii] Clean Energy Regulator. (2016). *National Greenhouse and Energy Reporting Scheme.* Retrieved from http://www.cleanenergyregulator.gov.au/NGER/Pages/default.aspx

7.0 URGENT BUSINESS (LATE REPORTS)

8.0 CLOSING PROCEDURES

8.1 Date, Time and Place of the Next Meeting

The next Environmental Advisory Committee Meeting will be held on Wednesday 19 February 2020 at 6.00pm in the Committee Room.

Dates for Future EAC Meetings

Wednesday 20 May 2020

Wednesday 19 August 2020

Wednesday 18 November 2020

8.2 Closure of the Meeting