



YOUR VISION.
YOUR FUTURE.

Climate Wise
Hornsby
– Draft



A large, semi-transparent teal silhouette of a person's head and shoulders is positioned in the center-left of the image. The person has short hair and is looking upwards and to the right. Overlaid on this silhouette is the text "LET'S SHAPE THE HORNSBY OF TOMORROW".

LET'S SHAPE
THE HORNSBY
OF TOMORROW



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Acronyms

BASIX:	Building Sustainability Index
BMS:	Building Management System
CCP:	Cities for Climate Protection
CO ₂ -e:	Carbon dioxide equivalent
CSP:	Community Strategic Plan
ECLs:	East Coast Lows
EPC:	Energy Performance Contract
ESS:	Environmental Sustainability Strategy
FFDI:	Forest Fire Danger Index
GHG:	Greenhouse Gases
GPC:	Global Protocol for Community Scale Greenhouse Gas Emissions Inventories
Gt:	Gigatonnes
ICLEI:	International Council for Local Environmental Initiatives
IP&R:	Integrated Planning and Reporting
IPCC:	Intergovernmental Panel on Climate Change
kWh:	Kilowatt Hour
LGA:	Local Government Area
LED:	Light Emitting Diode
LSPS:	Local Strategic Planning Statement
MJ:	Megajoules
MWh:	Megawatt hour
NCOS:	National Carbon Offset Standard
NSROC:	Northern Sydney Regional Organisation of Councils
NSW:	New South Wales
OEH:	Office of Environment and Heritage
PV:	Photovoltaic (electric solar system)
SLI:	Street Lighting Improvement Program
SLR:	Sea Level Rise
SSROC:	South Sydney Regional Organisation of Councils
UN:	United Nations
UNEP:	United Nations Environment Programme
W:	Watts
WMO:	World Meteorological Organisation





1. Executive summary

Hornsby Shire Council recognises that climate change is a global issue that requires significant and immediate action. Climate actions have often fallen into one of two categories: mitigation efforts to lower or remove greenhouse gas emissions from the atmosphere, and adaptation measures to reduce our vulnerability to the effects of climate change. Both approaches are needed, and Council will continue to implement mitigation and adaptation measures to reduce and manage the risks of climate change and play a leading role in the community.

This Climate Wise Plan sets out the future direction for Council as we embark on our journey to operate as a low carbon organisation and community that is resilient to climate impacts. This plan outlines immediate actions to be taken as well as a monitoring pathway, between now and 2050, to enable us to adapt to evolving data and projections.

Bold actions are required if we are to meet our target of net zero emissions by 2050. We will need to reduce our corporate emissions by 32% from 2018 levels by 2025 and 53% by 2030. Our community are tasked to reduce their emissions by 31% from 2017 levels by 2025 and 53% by 2030.

Our intention is to embed considerations of climate change into every day practices from 2020 onwards so that it becomes ‘business as usual’ across the organisation. The Climate Wise Plan fits under Council’s Environmental Sustainability Strategy - Sustainable Hornsby 2040 and Sustainability theme of the Community Strategic Plan. It provides input and support to other work areas across the organisation and we will need to work together to succeed and build climate resilience. Implementation of the Plan will be dynamic, collaborative and flexible to respond to changes and learn from experiences.

Building Climate Resilience

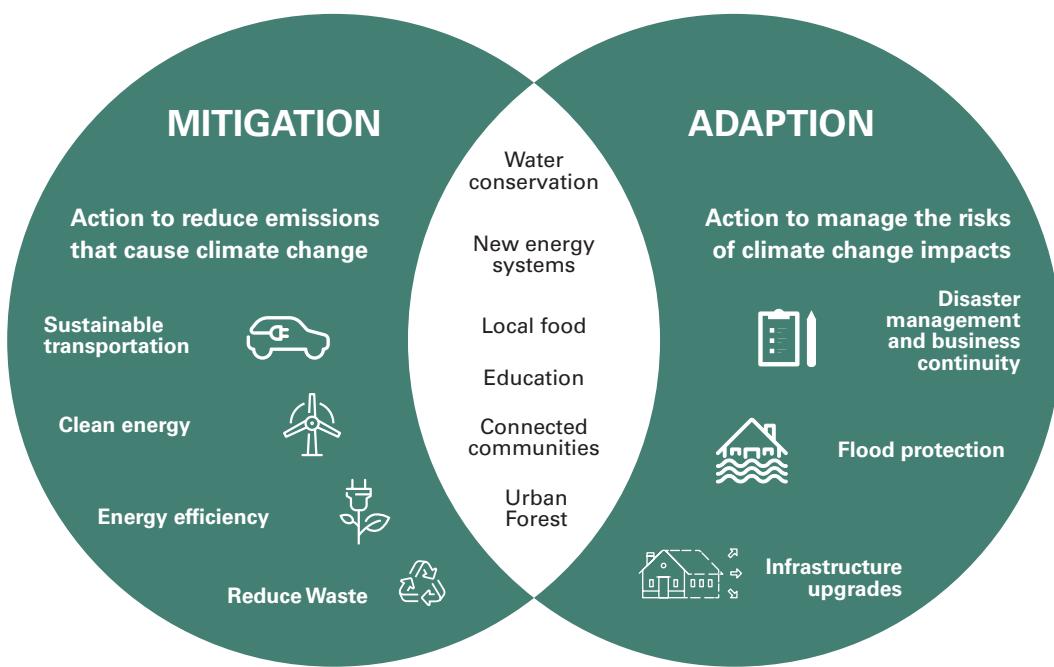


Figure 1: Building Climate Resilience

By addressing climate change mitigation and adaptation Council is contributing to the development of co-benefits such as cleaner air, resource efficiency, economic security and the sustainability of ecosystems.



2. Introduction

“

Resilience is the capacity of individuals, communities, businesses and systems within our Shire to survive, adapt and thrive no matter what kinds of chronic stresses and acute shocks we experience

- Resilient Sydney, 2018

”

Hornsby Shire Council Local Government Area (LGA) is home to just over 150,000 residents which is expected to increase to around 179,500 by 2036 (.id community, 2018). Adding to the pressure of population growth, the Shire will be challenged by a changing climate, with projected warmer and drier conditions, increased frequency and intensity of storm events and more frequent droughts and bushfires over the next 20 years (Jardine Lloyd Thompson, 2019).

Greenhouse gas (GHG) emissions drive climate change with emissions being generated through electricity and gas usage, transport, purchases of materials and waste generation. In 2019, Council reinforced its commitment to act on climate change by setting a target of net zero emissions by 2050. Council also worked with its insurer Statewide Mutual and Jardine Lloyd Thompson to undertake a climate change risk assessment (JLT).

Net zero emissions means all greenhouse gas emissions will be balanced by carbon storage. The more emissions are reduced, the less sequestration is needed to achieve net-zero (Office of Environment and Heritage, 2016). Although Council will work towards mitigating future impacts on climate change we are currently experiencing a changing climate both locally and globally. Council needs to prepare for and adapt to this changing climate to ensure our buildings, assets, infrastructure and community are well placed to withstand these future impacts.

Becoming a net zero emissions Council and community is a significant task. The risk of not acting will have significant social, economic and environmental implications. Achieving our targets will require a new approach and there will be many challenges along the way for which we do not yet have all the answers. Council will partner and collaborate with likeminded organisations locally, nationally and internationally to ensure best practice projects and programs as we move towards a more sustainable future and limit global heating to well below 2 degrees Celsius as outlined in the Paris Agreement (United Nations / Framework Convention on Climate Change, 2015).

To identify opportunities and to drive change, Council is actively reviewing its community and corporate emissions, taking stock of energy consumption, waste production and internal procedures. Council and the community need to be resilient and able to mitigate against and adapt to a changing climate.

This Climate Wise Hornsby Plan (the Plan) outlines our emissions reduction action plan (Appendix 1 and 2) to mitigate accelerated climate change and our climate change risk assessment to prepare for and/or adapt to the changing climate (Appendix 3). The completion of these actions will be dependent upon the availability of Council resources. Where possible, Council will realise opportunities through alternative funding pathways, by working in collaborative partnerships and applying for grants. We will also leverage our strong and productive relationships with state and local governments, not-for-profit organisations, research organisations and community groups to maximise our combined impact.

2.1 Objectives

The objectives of the Climate Wise Plan are to:

- Reduce Council's greenhouse gas emissions to net zero by 2050
- Support the community in the goal of reaching net zero emissions by 2050 through the delivery of programs and initiatives that further community greenhouse gas emission reduction efforts
- Reduce Council's and the community's vulnerability to a changing climate and implement adaptation measures associated with temperature, hot days, average rainfall, wind, fire weather, sea-level rise and rain intensity.

2.2 Strategic Principles

The following principles guide the development of our Climate Wise Plan and its implementation:

- **Factor climate change into decision making and operations** – Factor the consideration of medium- and long-term climate change projections in investment and planning decisions
- **Mitigation / adaptation balance** – Consider climate change mitigation as we develop adaptation solutions, to reduce our greenhouse gas emissions and reduce our vulnerability to a changing climate
- **Start to act, even with uncertainty** – Act now on measures that can be implemented without being certain about all dimensions of future climate change
- **Build regular reviews as a core part of the Plan**
 - Implementation of the Plan will be dynamic, collaborative and flexible to respond to changes and learn from experiences. Emerging information and technologies will be considered throughout implementation to ensure Council continues to implement the Plan in the most effective way
- **Involve all those who are impacted by climate change** – Recognise the importance and necessity of all areas of Council in implementing mitigation and adaption measures. Communicate, educate and engage with the community to help them mitigate and adapt.

3 Act locally but think globally

Climate change impacts are not confined by local government boundaries. We therefore need to act locally but think globally.

Intergovernmental Panel on Climate Change

The United Nations Intergovernmental Panel on Climate Change states, 'Climate change represents an urgent and potentially irreversible threat to human societies and the planet' (IPCC, 2018). The role of the Panel is to function as the United Nation's body to regularly assess the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation (IPCC, n.d.).



2015 Paris Agreement

Australia is a signatory to the Paris Agreement. The Paris Agreement 'brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects...' (United Nations Climate Change, 2020). It aims to pursue efforts to limit temperature to well below 2 degrees Celsius above pre-industrial levels; to pursue efforts to limit the increase to 1.5 degrees Celsius and to achieve emissions globally by the second half of the century.

United Nation's Sustainable Development Goals

The United Nations have developed 17 Sustainability Goals. These goals provide a blueprint to focus on developing an improved and more sustainable future (United Nations, n.d.). Actions contained in this Plan support the United Nation's Sustainability Goals of Affordable and Clean Energy (Goal 7); Industry, Innovation and Infrastructure (Goal 9); Sustainable Cities and Communities (Goal 11); Responsible Consumption and Production (Goal 12); Climate Action (Goal 13) and Partnerships for the Goals (Goal 17).

National

The Federal Government has committed to reducing greenhouse gas emissions to 26-28% below 2005 levels by 2030 (Australian Government, 2015).



State

The New South Wales (NSW) State Government has an aspirational target of reaching zero emissions by 2050 and has identified this commitment within its NSW Climate Change Policy Framework and its Net Zero Plan Stage 1: 2020-2030. The AdaptNSW website provides a portal for residents with information on climate change and its effects in NSW (AdaptNSW, 2020).



Region

The Greater Sydney Commission's Our Greater Sydney 2056, North District Plan (2018) is a 20-year plan to manage growth in the context of economic, social and environmental matters to achieve the 40-year vision for Greater Sydney.

Council is committed to the Resilient Sydney Strategy and Program. We are one of 33 councils across metropolitan Sydney working together to strengthen our ability to survive, adapt and thrive in the face of increasing global uncertainty and local shocks and stresses.



Local

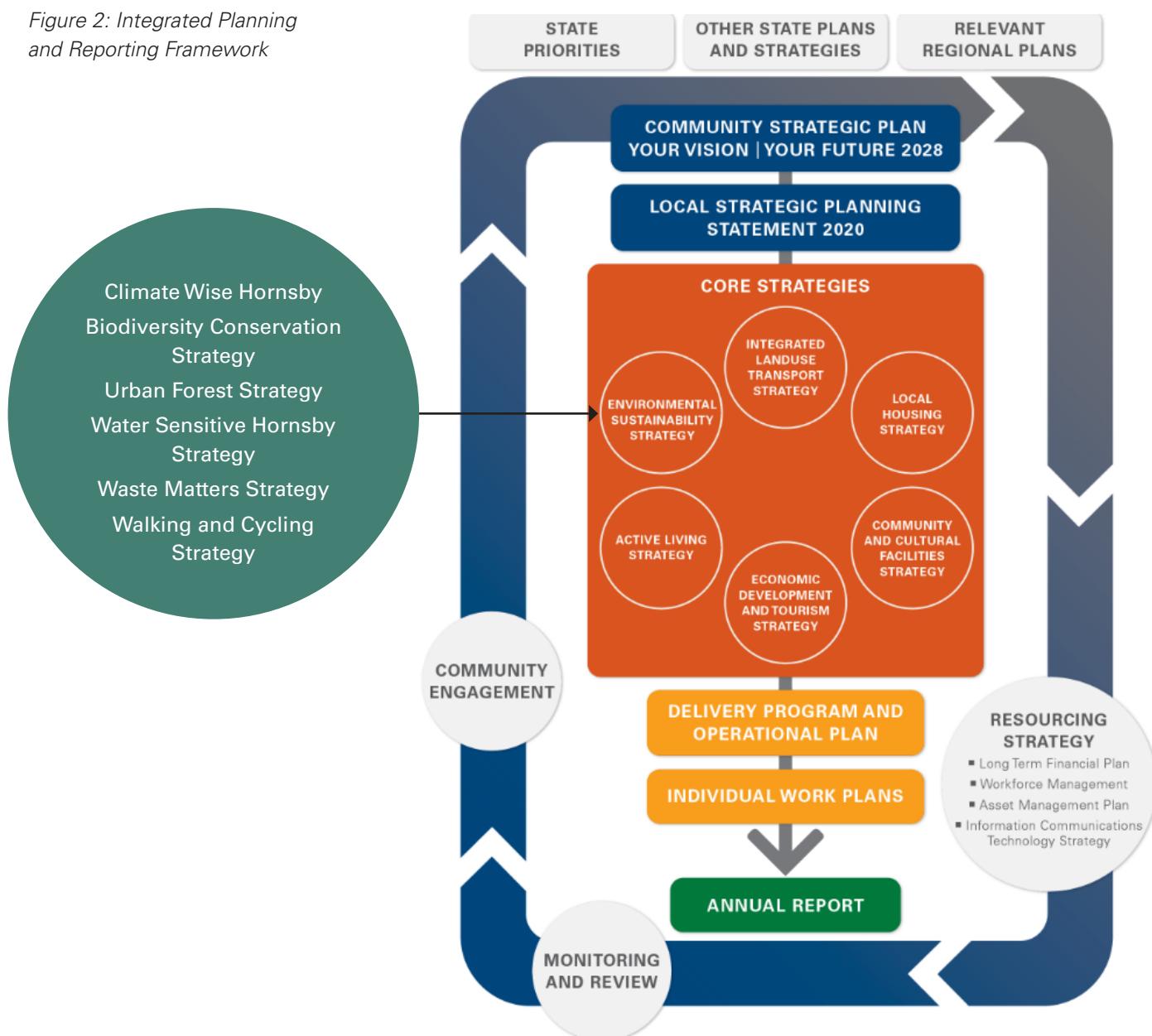
On 18 September 2019, Council adopted a target of net zero emissions by 2050, for Council and the community. The 2017/18 baseline for emissions from Council operations and 2016/17 baseline emissions for the community's activities will be used as a benchmark against which our progress will be measured.

The Hornsby Shire Council Community Strategic Plan 2018-2028 (CSP) demonstrates Council's commitment to addressing climate change by identifying the need for the Shire to be resilient and have the ability to respond to climate change events and stresses through mitigation and adaptation efforts. There are several core strategies and plans which will assist Council to deliver on this Plan as outlined below:

- The Local Strategic Planning Statement (LSPS) - Our 20-year vision for land use; the special character and values that are to be preserved; shared community values; and how Hornsby Shire Council will manage growth and change. The LSPS provides a link between the State Government's strategic plans, Council's land use guidelines and our CSP.
- Environmental Sustainability Strategy (ESS) - Our approach to environmental sustainability over the next 20 years, to ensure our environment is strong, resilient and adaptable into the future.

- Supporting plans and strategies – Council will cross-reference this Plan in other strategic documents to ensure that its aims and objectives are consistently applied across all service areas. Focus areas such as the Biodiversity Conservation Strategy, Urban Forest Strategy, Water Sensitive Hornsby Strategy, Waste Matter Strategy, Coastal Management Program, Emergency Management Plans, Bushfire Management Strategy, Walking and Cycling Strategy, Integrated Land Use Transport Strategy and flood mitigation will be integral to the success of climate change adaptation within Council and the community.

Figure 2: Integrated Planning and Reporting Framework



4 What Science is Telling Us

Australian and International research bodies have been building a comprehensive evidence base to understand how our climate is already changing. Climate is the set of averages, variations and extremes of weather in a region over long periods of time and varies from place to place (AdaptNSW, 2020). Since the start of the Industrial Revolution in about 1750, human activities such as the burning of fossil fuels, including coal and oil, have dramatically increased the concentration of greenhouse gases (GHG) in our atmosphere. As a result, the rate of heat-loss from the Earth has slowed, creating a warming effect (AdaptNSW, 2020).

The main GHGs in the Earth's atmosphere are water vapour, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and ozone. The global warming impact of each different greenhouse gas can be expressed in terms of the equivalent amount of CO_2 ($\text{CO}_2\text{-e}$) that would create the same amount of warming. $\text{CO}_2\text{-e}$, or carbon dioxide equivalent, is a standard unit for measuring carbon footprints.

Human activities are estimated to have caused approximately 1 degree Celsius of global warming above pre-industrial levels, with a likely range of 0.8 degree Celsius to 1.2 degrees Celsius (IPCC 2019) to 1.2 degrees Celsius (IPCC 2019).

Global warming is likely to reach 1.5 degrees Celsius between 2030 and 2052 if it continues to increase at the current rate (IPCC 2019). There is a global imperative to limit warming to within two degrees Celsius to prevent and withstand even more dangerous climate change. Many scientists and policy makers believe that this should be 1.5 degrees, to further reduce the risk of 'tipping points' being reached, and unsurmountable climate change effects being experienced.

AdaptNSW climate data modelling indicates significant challenges for NSW in terms of scenarios for air temperature, rainfall, wind, bushfire incidence and sea level rise. The predictions for the Hornsby region can be seen in Table 1.

Continued changes to the global and local climate will have wide reaching negative impacts on the natural environment and damage to the built environment. In the past year alone, the country has seen drought, bushfires and floods. There is urgency in acting now to mitigate these impacts. Council must also adapt to the changing climate and in 2019 identified fifty-six (56) High and five (5) Extreme rated climate impact risks for all climate change scenarios which included temperature, hot weather, rainfall, wind, fire weather, sea level rise and extreme rainfall / rain intensity (Jardine Lloyd Thompson, 2019). The full list of climate impact risks can be seen in Appendix 3.

Table 1.

	Scenario	Projected Future Change	
	Bushfire Incidence	Increase in severe fire weather. Forest Fire Danger Index (FFDI) is used in NSW to quantify fire weather. The FFDI combines temperature, humidity and wind speed. Fire weather is classified as severe when the FFDI is above 50.	
	Sea Level Rise	Decrease in East Coast Lows (ECLs) during winter and an increase in frequency and intensity of ECLs during the summer months. ECLs impact on dam filling cycles. Projections from 2007 indicate that there is an expected Sea Level Rise (SLR) of 0.4 metres by 2050 and 0.9 metres by 2100.	
		2030 Projection	2070 Projection
	Air Temperature	Maximum temperatures to increase by 0.7°C Minimum temperatures to increase by 0.6°C 4 more days above 35°C / year	Maximum temperatures to increase by 1.9°C Minimum temperatures to increase by 2.0°C 11 more days above 35°C / year
	Rainfall	Rainfall is projected to decrease in spring and winter.	Rainfall is projected to increase in summer and autumn.
	Wind	Increase in average wind speed between -5% and +8%	Increase in average wind speed between -16% and +24%



“

I would challenge Council to be proactive on sustainability and climate change and excel beyond state and national objectives.

- Future Living Summit
Participant

”

5 What our Community told us

During the development of Council's Local Strategic Planning Statement Future Hornsby 2040, we extensively engaged our local community to determine their views on sustainability values and priorities through:

- A series of pop-up community kiosks. 180 people attended these sessions
- Internal workshops to harness the diverse expertise across all divisions of our organisation
- An online community survey via Have Your Say. We received 315 submissions during the 4-week engagement in April 2019
- A telephone survey that was demographically representative of residents across the Shire. 618 people completed the survey during April 2019
- Individual stakeholder interviews with 10 community group representatives. The purpose of the interviews was to discuss local environmental sustainability challenges and considerations in greater depth with highly engaged and environmentally aware local community members
- An online interactive collaborative mapping tool via Social Pinpoint. We received 392 unique users to the site and 204 comments

Across all engagement modes residents identified a strong preference for maintaining and enhancing a clean, leafy and biodiverse environment actively seeking out ways to improve environmental sustainability. This included the need to urgently address climate change, and/or mitigate its effects, and build community resilience to environmental changes and risks. Of those who indicated in a survey response they were 'concerned' about the environment, 79 percent indicated that they had some level of 'concern' about the effects of climate change. A slightly lower proportion (73 percent) indicated they were 'concerned' about the effects of extreme weather events.

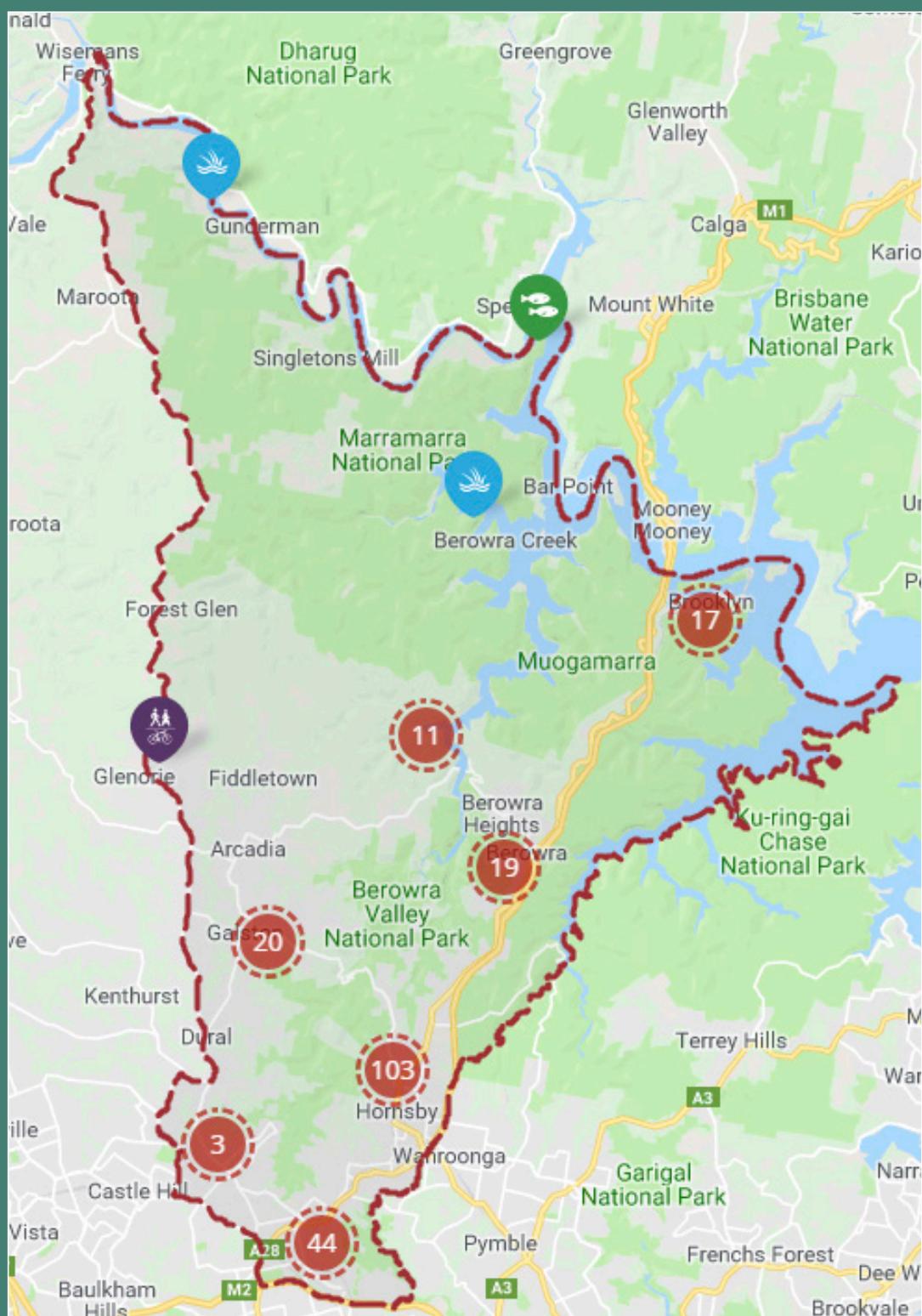


Figure 2: Integrated Planning and Reporting Framework

6 Greenhouse Gas Emissions Profiles

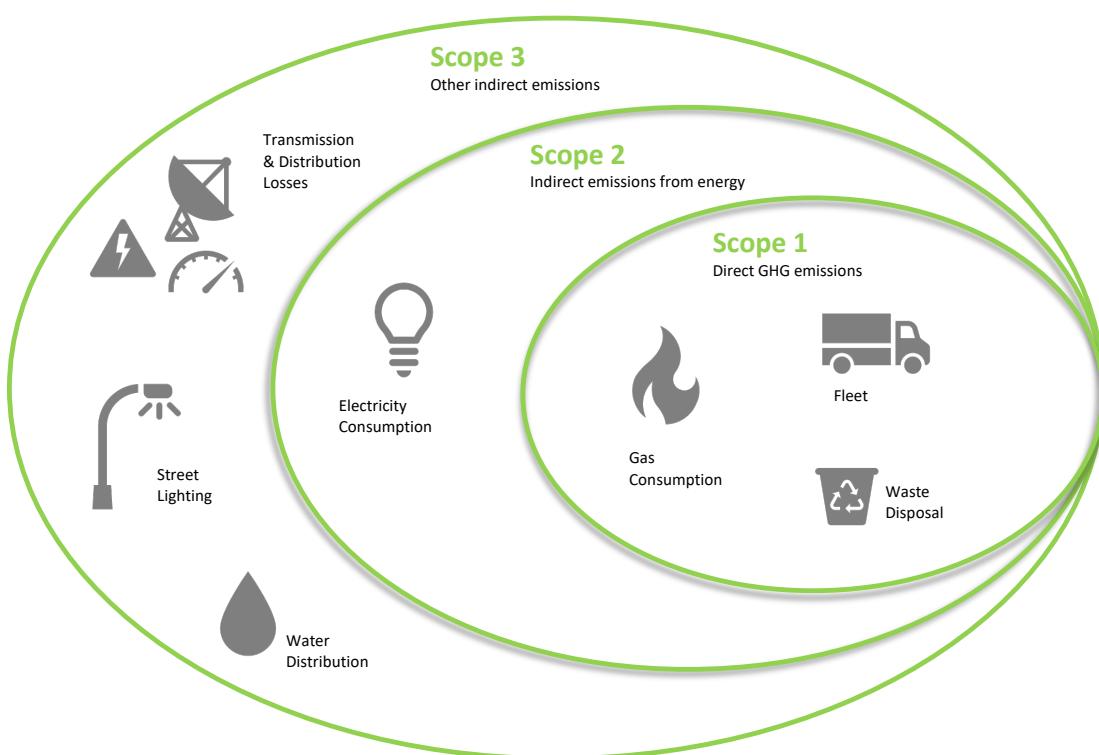
According to the IPCC, the world's carbon budget is 1,701 Gt CO₂-e to meet the Paris Climate Change Agreement's goal of limiting global temperature rise to under 2 degrees Celsius by 2050. The Australia Climate Change Authority has recommended a national carbon budget of 10.1 GtCO₂-e. As of July 2018, 7.5 Gt CO₂-e of this national budget remains (Ironbark, 2019).

To understand our greenhouse gas emission profile, we developed our inventory in line with the National Greenhouse and Energy Reporting Guidelines for corporate emissions reporting. Corporate emission profiles were also prepared in accordance with the international GHG Protocol Corporate Accounting and Reporting Standard, and the National Carbon Offset Standard (NCOS). The NCOS provides guidance on how to measure, reduce, offset, report and audit emissions that occur from the operations of an organisation. Community carbon emissions have been calculated using the Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories. These standards classify emissions into three scopes (illustrated in Figure 3):

Scope 1 – direct emissions from the activities of an organisation or under their control, including gas usage in buildings, fuel for vehicles and air-conditioning leaks.

Scope 2 – indirect emissions from electricity purchased and used by the organisation or in assets owned by it.

Scope 3 – all other indirect emissions from activities of the organisation, occurring from sources that they do not own or control, including emissions associated with streetlighting, procurement, waste and water.



*Figure 3: GHG Emissions Scopes
(Source: Adapted from Ironbark Sustainability, 2019)*

6.1 Corporate Emissions Profile

In 2019 Council engaged Ironbark Sustainability to prepare emissions inventories for Council's operations for the financial years 2016/17 and 2017/18. Overall Council's emissions remained stable between the two reporting periods and the 2017/18 inventory is considered the more complete of the two inventories and will form Council's baseline moving forward.

Table 2 outlines the National carbon budget and our Corporate Greenhouse Gas Emissions Inventory for the 2017/18 financial year. During 2017/18 Council's annual emissions were 12,080 tonnes CO₂-e, if Council were to keep emitting at this level, Council will expend our carbon budget of 143.3 ktCO₂-e in 12 years or by the year 2030 – we have termed this duration *Council's carbon "Runway"*. In order to meet our targets, we will need to reduce our emissions by 509 tonnes CO₂-e each year.

Calculation of Budget	National	Council Corporate	Units
Total Carbon Budget	5,554,964	143.3	kt CO ₂ -e
Annual Emissions	420,226.0	12.1	kt CO ₂ -e
Runway	13.2	11.9	years
Required per annum reduction rate	3.8%	4.2%	% per year
	15,894,782	509	tonnes CO ₂ -e/ year

Table 2: Hornsby LGA: Corporate Greenhouse Gas Emissions Inventory for the 2017/18 Financial Year
(Source: Ironbark Sustainability, 2019 Corporate Greenhouse Gas Emissions Inventory, p31)

6.2 Corporate Emissions Profile Summary by Sector - 2017/18

Figure 4 provides a breakdown of Council's GHG emissions by sector as a percentage. One third of Council's measured emissions comes from our corporate electricity consumption (35%), while another third comes from electricity consumption from public street lighting (35%). Other emissions of note were transport emissions, the majority of which come from Council fleet (11%), emissions from contractor fuels (9%), and emissions from natural gas consumption (7%). The contribution of emissions from all other sources were minor (3% collectively).

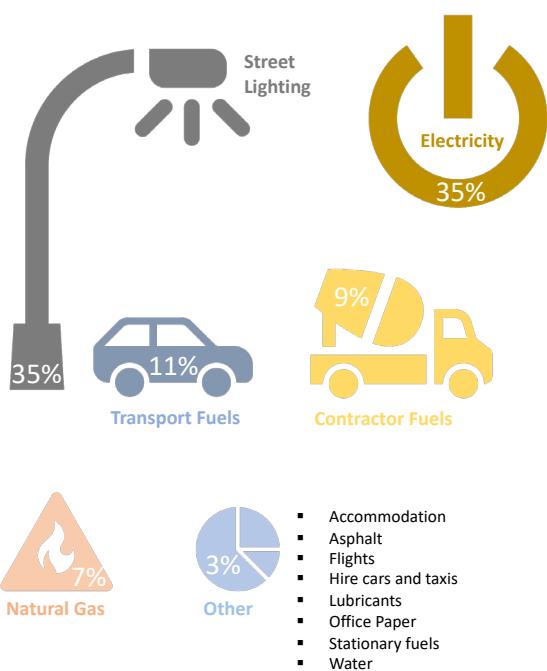


Figure 4: Hornsby Shire Council's Emissions Profile by Sector 2017/18 (Source: Adapted from Ironbark Sustainability, 2019, Corporate Greenhouse Gas Emissions Inventory, p18)

6.3 Community Emissions Profile

In partnership with Resilient Sydney, Council is participating in Action 13 - Measure Metropolitan Emissions and report on progress. This Action is listed under the 'Live with our Climate' section of Resilient Sydney - a Strategy for Resilient Sydney 2018. Resilient Sydney have used a baseline year of 2016/17 and this will form the baseline for our community emissions profile.

Our community GHG emissions profile for 2016/17 identifies that we produce 1.3 million tonnes CO₂-e emissions each year (Resilient Sydney, 2019). This profile has been informed by data on transport, waste and water practices in our LGA. Our community emission total represents 2.7% of Greater Sydney's emissions (Resilient Sydney, 2019).

Figure 5 identifies the distribution of our community emissions profile for each suburb across the LGA. The darker shaded areas include the suburbs of Hornsby, Dural, Thornleigh, Pennant Hills, Beecroft, Castle Hill and Cherrybrook and represent the areas with the highest emission levels.

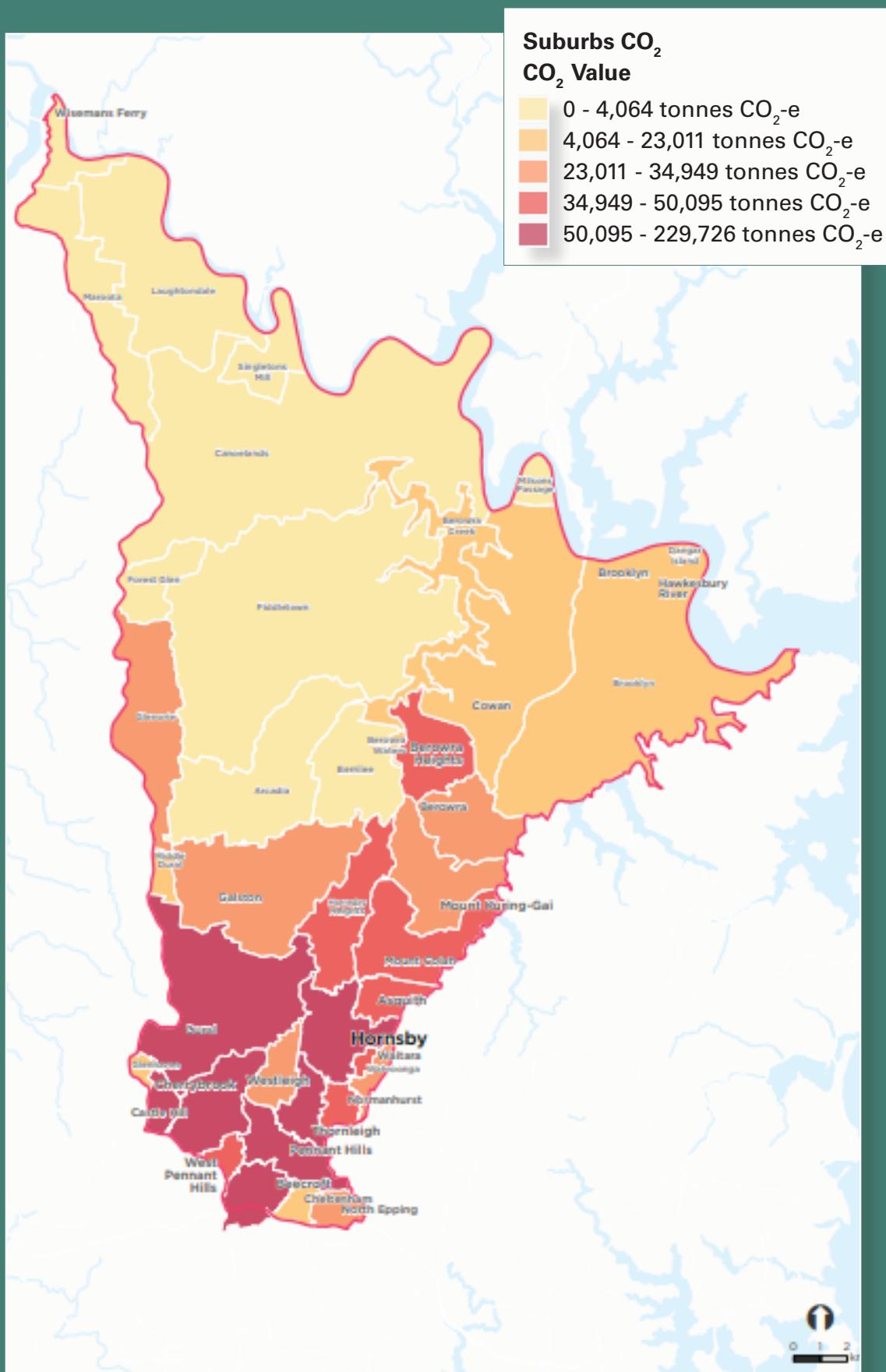


Figure 5: Community Carbon Emissions in Hornsby Shire by Suburb (Source: Resilient Sydney, 2019)

6.4 Sources of Community Emissions

Figure 6 identifies sources of community carbon emissions for the year 2016/17. Electricity usage was the largest contributor (58.9%) at 763,605 tonnes CO₂-e. On average, Hornsby Shire residents used 22kWh of electricity per day per dwelling (7.81 tonnes CO₂-e per year and an average of 2.80 tonnes CO₂-e/capita). Transport was the second largest contributor (25.7%), followed by waste (12.2%) and gas (3.2%).

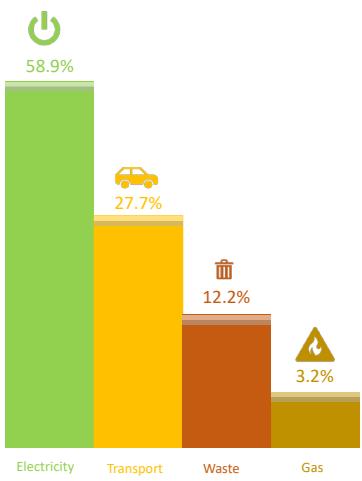


Figure 6: Hornsby LGA: all Emission by Source for 2016/17
(Source: Adapted from Resilient Sydney, 2016/17)

6.4.1 Community Energy Usage

Figure 7 shows the distribution of energy use (i.e. gas and electricity) by sector for 2016/17, and identifies that residents of Hornsby, residing in detached housing, are the largest contributors to emissions at 1.6B Megajoules (MJ) per year representing 46% of all energy use.

The retail sector is our second largest energy consumer, contributing 439.7 MJ per year representing 12.5% of all energy use.



Figure 7: Hornsby LGA: all Energy Use by Sector for 2016/17 (Source: Adapted from Resilient Sydney, 2016/17)

6.4.2 Community Transport

Transport was the second largest contributor (25.7%) to the total carbon emissions in 2016/17, at 333,489 tonnes CO₂-e. Our community travelled 1.8B km during 2016/2017, across various transport modes.

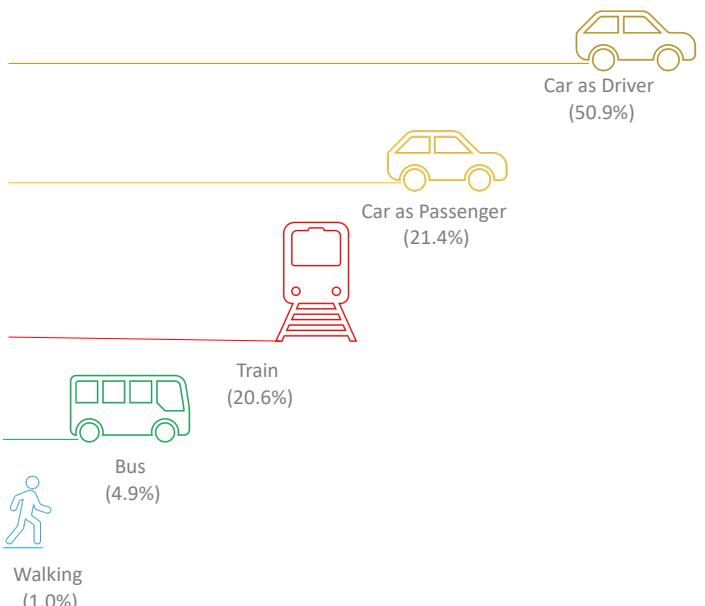


Figure 8: Hornsby LGA: resident transport mode travelling to work for 2016/17 (Source: Adapted from Resilient Sydney, 2016/17)

Our Shire's preferred mode of transport is by car, as shown in Figure 8. Car ownership totalled 48,447 vehicles in 2016/17. According to 2016/17 data, 37,157 residents travelled to work via private vehicle or taxi. In 2016 a total of 923,386,855km were travelled by car drivers.

Public transport was the second largest contributor to transport CO₂-e emissions at 25.5%. Of this percentage, 19,217 residents travelled to work via public transport including train, bus, tram and ferry.

6.4.3 Community Waste

The third largest emission source for our Shire in 2016/17 was waste. Figure 9 identifies the percentage of emissions generated by waste type. During 2016/17 recycling of waste accounted for 158,005 tonnes CO₂-e representing 40.4% of emissions from our total waste stream. Commercial and industrial waste has the second largest contribution, accounting for 38.3% of emissions. For further information regarding the Shire's waste profile, refer to the Waste Matters Strategy 2020.



Figure 9: Hornsby LGA: all waste generation by type for 2016/17 (Source: Adapted from Resilient Sydney, 2016/17)

6.4.4 Community Water Storage

As shown by Figure 10, the largest water users in our Shire are residents of detached dwellings representing 9,710,947.8 KL or 64.2% of the Shire's total water consumption. Residents residing in multi-units are the next largest water consumers using 2,605,303.9 KL or 17.2% of the total consumption. The carbon emissions resulting from water usage are associated with hot water supply as well as the process of delivering water to the user, such as water treatment and pumping facilities.

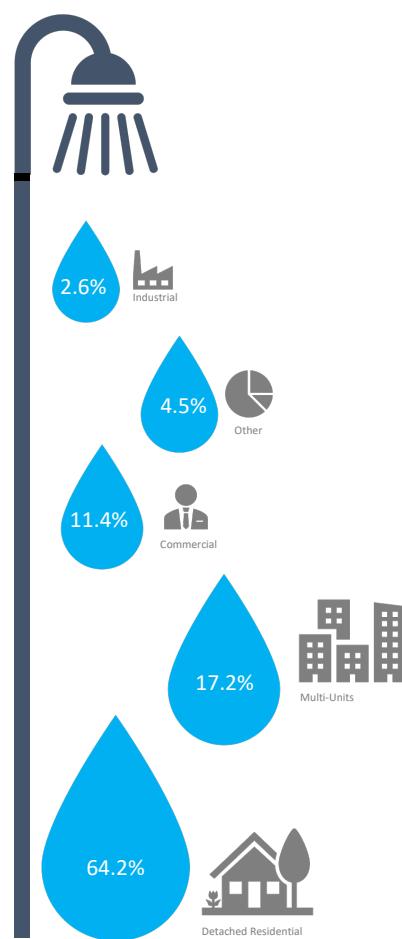


Figure 10: All Water Use by Sector for 2016/17
(Source: Adapted from Sydney Water 2016/17)

7 Climate Change Mitigation - aiming for Net Zero emissions by 2050

7.1 Overview of Corporate Emissions Reduction Measures

Council has been working to actively reduce our corporate carbon emissions since 1998/99, when we joined the Cities for Climate Protection (CCP) Program to implement and support our GHG emission reduction initiatives.



2003: Energy Performance Contract (EPC)

Council was a national leader in its reduction of GHG emissions and energy use and was one of the first councils to implement an Energy Performance Contract. The Contract led to the successful implementation of water and energy conservation measures across 250 Council buildings and park sites. The conservation measures included modification to improve the efficiency of air conditioning, energy and lighting systems, PV system installations, and rainwater tanks for park irrigation. The EPC resulted in annual reduction in Council's energy by 24%, water use by 5.4%, CO₂-e emissions by 22%, and cost savings of approximately \$180,000.

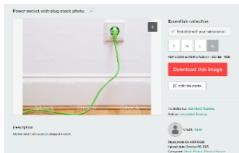
2004 - 2010: Cogeneration Project Trial

Our pioneer research project in partnership with the CSIRO to trial an innovative power generation and air conditioning system for Hornsby Library. The system involved a microturbine which produced greener electricity, in combination with a dehumidifier, heat exchanger and evaporative cooler to cool and heat the Library's air supply. When in operation, the system reduced electricity demand for cooling and heating of the building.



2003-2007: Green Power and Efficient Office Equipment

Council purchased 10% of its electricity supply for its major sites in the form of Green Power and replaced office equipment and computers with more efficient models and Energystar-enabled monitors.



2009: Sustainable Purchasing Project Recognition

The International Council for Local Environmental Initiatives (ICLEI) - Local Governments for Sustainability awarded Council Milestone 5 for ongoing sustainable procurement initiatives.



2009: Cowan Wind Turbine and Solar PV

Council installed a wind turbine and solar photovoltaic (PV) system at the Fire Control Centre at 1049 Pacific Highway, Cowan. The wind turbine has been designed to provide 30% (approximately 27,000 kWh pa) of the Centre's electricity requirements, consistent with our Sustainable Energy Policy for New Council Assets. The Proven Energy 15 kW wind turbine has a 3 bladed, 9 metre diameter rotor mounted upon a 25-metre galvanised steel tower pole and is connected to the national electricity grid. The 3kW solar PV system provides power during times of low wind speed.



2011 – 2015: Hornsby Library's Solar PV

In 2015, Council mounted a 78.1kW solar panel system at Hornsby Library adding to the existing 20.21kW system that was installed in 2011. The Library was chosen as an ideal site as it was a popular community use building that was open almost every day of the year. The solar panels generate around 135,000kWh of electricity annually, reducing the need for coal generated electricity. These systems are saving approximately 112 tonnes CO₂-e emissions and \$30,000 a year in electricity costs.



We prioritise our corporate measures according to a cost benefit analysis, importance in addressing each source of emissions and their potential to promote community awareness and participation. We have been innovators in trialling new sustainability concepts in our Shire, through partnering with research groups and utilising Council owned assets. Some of our exemplary initiatives include:



2018: Cities Power Partnership

Council joined Cities Power Partnership and pledged to implement five actions to support and promote energy saving and climate change mitigation initiatives. These actions were: 1) Provide Council resources to educate and support the uptake of renewable energy 2) Install renewable energy (solar PV and battery storage) on Council buildings 3) Adopt best practice energy efficiency measures across all Council buildings, and support community facilities to adopt these measures 4) Rollout energy efficient public lighting (particularly street lighting) across the Shire as public lighting can use a large proportion of a council's energy budget and 5) Implement an education and behaviour change program to influence the behaviour of council officers, local residents and businesses within the Shire to drive the shift to renewable energy, energy efficiency and sustainable transport.



2018 – 2019: Internal Lighting Initiative

Council installed custom-tailored LED lighting within the Administration Building. Each individual light can be tailored improving the comfort of staff and reducing energy requirements of the previous system.



2019: Street Lighting Improvement (SLI) Program

Council partnered with SSROC and Ausgrid to upgrade over 4,000 streetlights to more efficient LEDs. The upgrade forms part of Ausgrid's program to accelerate the replacement of inefficient older residential streetlights across LGAs in their network. The new LEDs are 18% more energy efficient and will reduce our corporate emissions by an estimated 1,120 tonnes CO₂-e a year and provide an annual energy saving of over \$460,000 each year.



2019 – 2020: Greening our Shire

Council has committed to planting 30,000 trees and greening the Shire. To date over 25,000 trees have been planted and it is anticipated that 30,000 trees will be planted by September 2020. Trees remove carbon dioxide from the atmosphere and store the carbon in their leaves, branches, stems, bark and roots.



2020: Net Zero by 2050

In September 2019 Council endorsed a Net Nero Emissions by 2050 target. This Plan promotes further actions to reduce Council's corporate greenhouse gas emissions. Actions include the continued roll-out of energy efficient lighting, opportunities to transition to 100% renewable, project support through partnerships with the community, improvements to the resource efficiency of procurement services and Council assets. A full list of actions is detailed in Appendix 1 and 2.

7.2 Corporate Emissions Reduction Pathway

To build on our past work and to reach our goal of net zero emissions by 2050 Council has developed a corporate emissions reduction action plan (Appendix 1). Actions have been assigned different priority status ranging from the short, medium, to long term. Completion of actions will be dependent upon the availability of Council's resourcing and budget. Where possible, Council will realise opportunities through alternate funding pathways by working in collaborative partnerships and applying for grants.

Appendix 1 lists and prioritises actions that can be undertaken by Council to help reduce our emissions profile. The Plan is based on 2017/18 emissions which totalled 12,080 CO₂-e. Our target is to reduce emissions by 509 tonnes CO₂-e per year. Figure 11 provides an overview of these initiatives as part of our emissions reduction pathway to meet our corporate target of net zero emissions by 2050. Council has also set interim targets of 32% reduction from 2018 levels by 2025 and 53% reduction from 2018 levels by 2030.

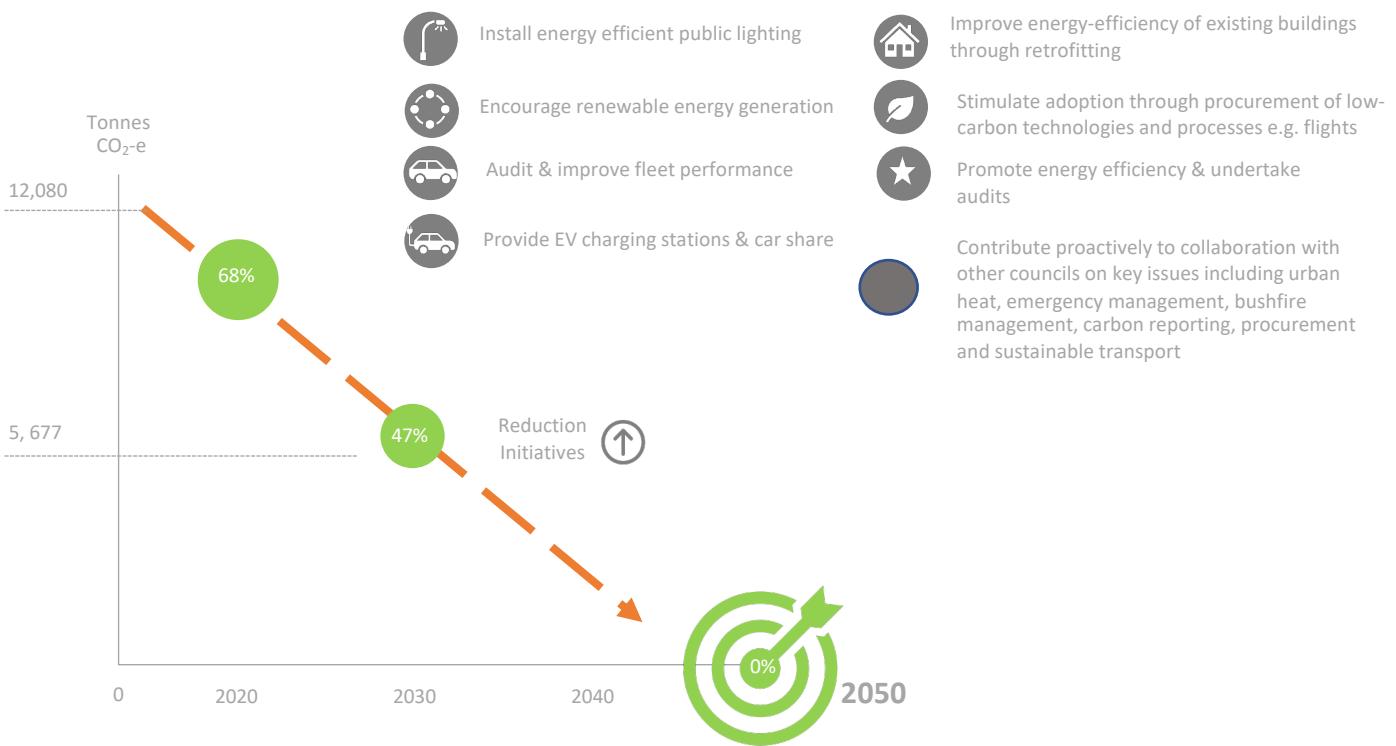


Figure 11: Corporate Emissions Reduction Pathway

7.3 Overview of Community Emissions Reduction Measures

Council is part of Resilient Sydney's online benchmarking platform which provides data for councils across Metropolitan Sydney detailing community emission profiles and science-derived reduction targets. The data is prepared and managed by Kinesis and provides a holistic overview of carbon emission performance across the Sydney region.



Figure 12: Typical Residential Solar PV Installation in the Shire (Source: Johnson, D, 2020)

In 2019 Council also engaged Ironbark Sustainability to provide a more detailed insight of our community carbon emissions. Our community reduction target has been calculated from the remaining 7.5 Gt CO₂-e national carbon budget. The target identifies that as a Shire, we need to reduce our emissions by 4.4% each year until 2050, equivalent to around 68,000 tonnes CO₂-e, which is the same as removing 15,827 medium-sized vehicles off the road each year.

By increasing renewable energy generation, such as community rooftop solar as seen in Figure 12, we will see the greatest reduction in community emissions. It is encouraging to see that there has been a strong growth in solar photovoltaic (PV) installation across residential rooftops in the Shire (Resilient Sydney, 2016/17). The number of PV systems has steadily increased every year since 2012, as shown in Figure 13. At the financial year 2017/18 a total of 6,830 PV systems were installed, and as at 30 September 2019 this number had risen to 7,089 which represents 16.1% of total households in our LGA and generates 29,668 kWh of electricity per year (Australian PV Institute, 2020).

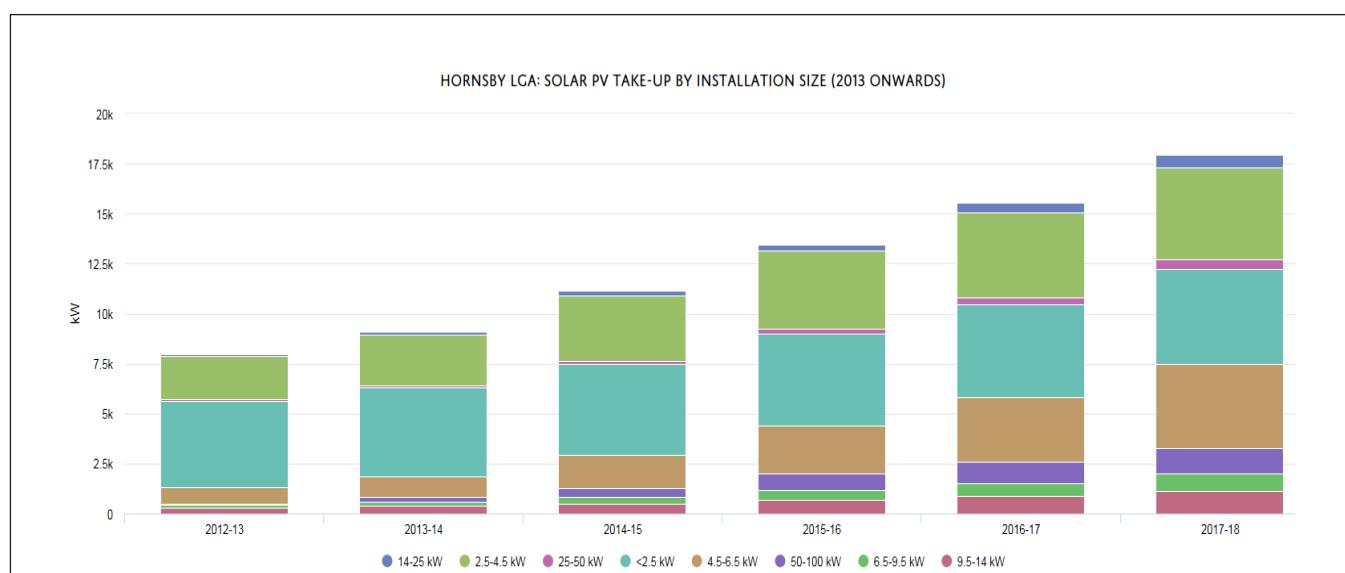


Figure 13: Hornsby LGA: Solar Take-Up by Installation Size, 2003 onward (Source: Resilient Sydney, 2016/17)

7.4 Community Emissions Reduction Pathway

Council's sphere of influence on the community varies. However, we can play a key role in reducing barriers, influencing resident's attitudes and transforming behaviours to facilitate change in reducing GHG emissions. As shown in Figure 14, Council will continue to seek out opportunities through advocacy, leading by example, engagement with the community, funding and partnerships, pushing our strategy levers and education initiatives.

Council will implement a shire wide emissions reduction program targeting 1.2 million tonnes CO₂ reduction to reduce Shire-wide emissions, which totalled ~1.2 million tonnes CO₂-e in 2016/17. Appendix 2 lists projects that will contribute to the interim community targets of 31% reduction from 2017 levels by 2025 and 53% reduction from 2017 levels by 2030.

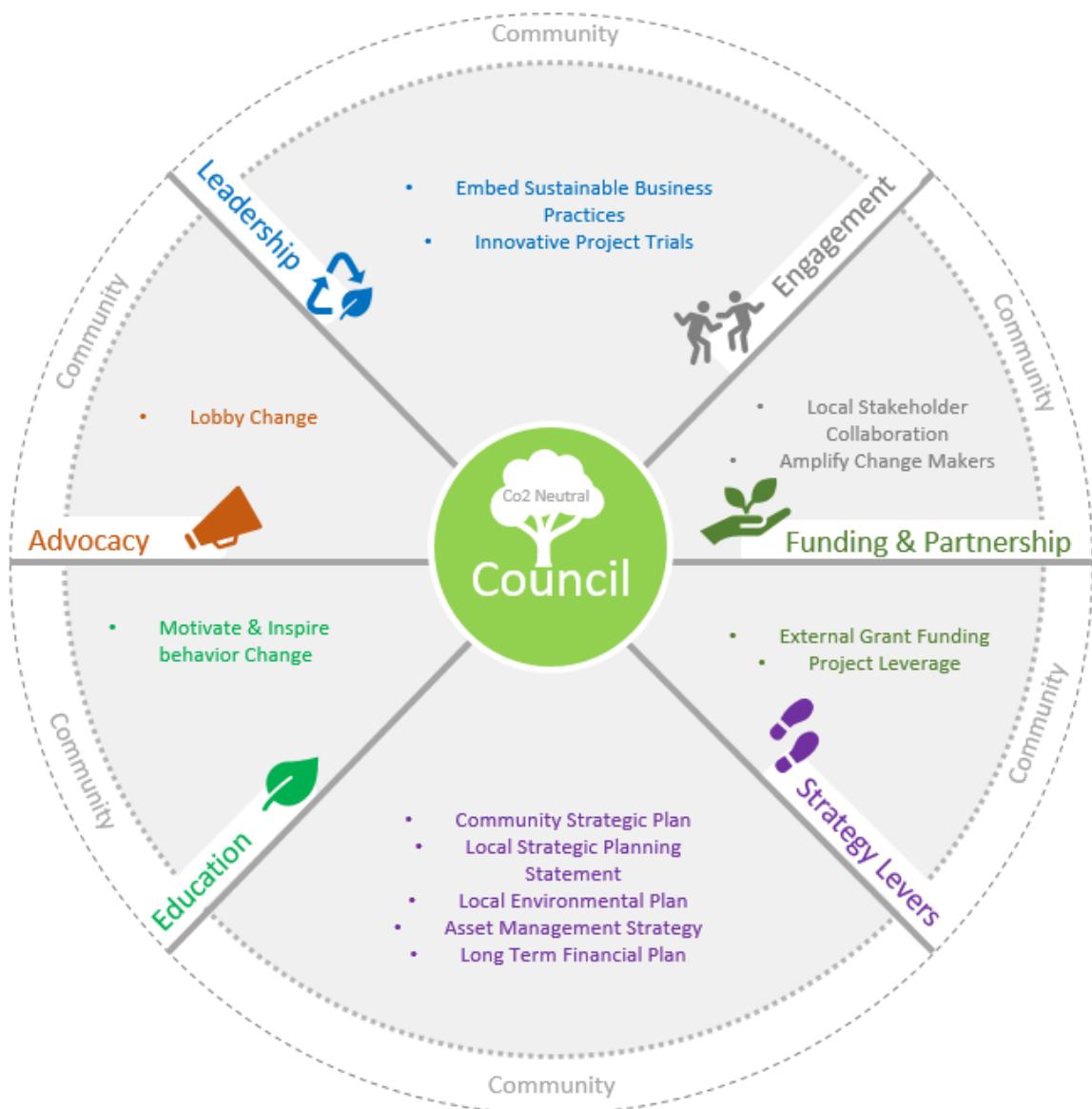


Figure 14: Council's Sphere of CO₂ Adaption influence

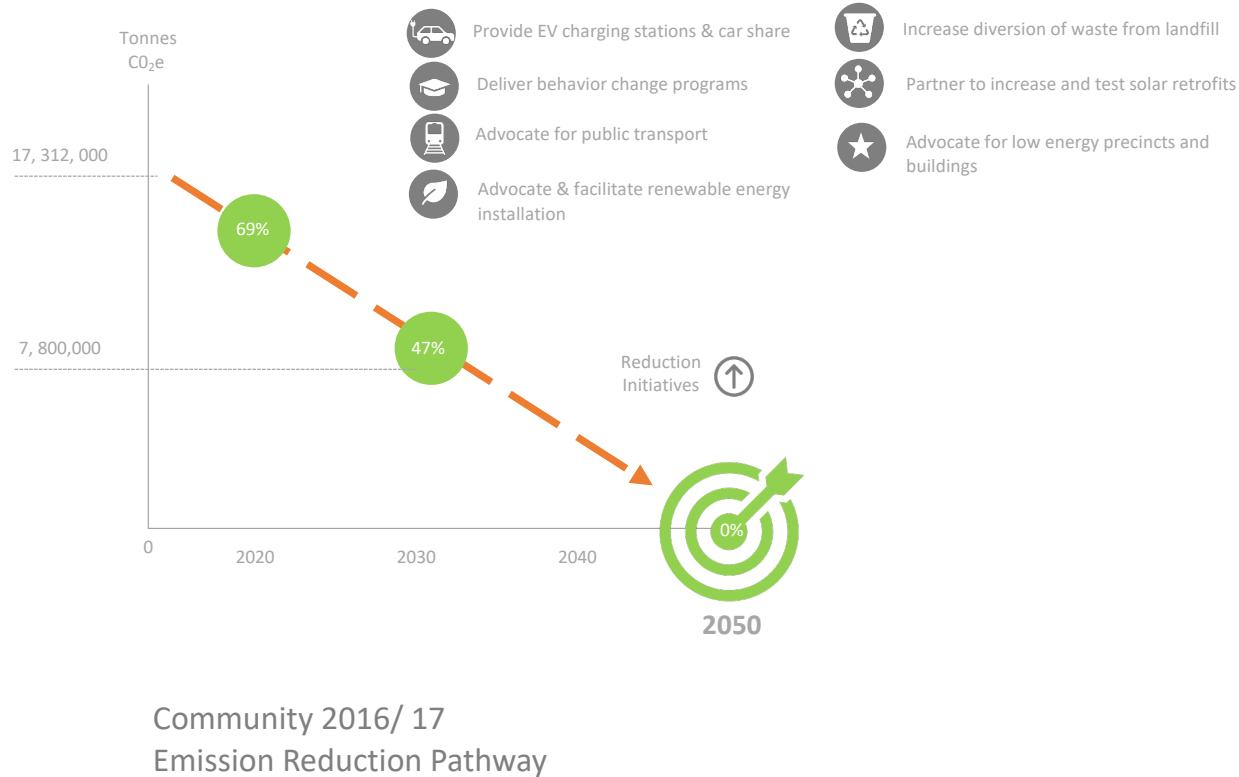


Figure 15: Community Carbon Reduction Pathway

Figure 15 provides an overview of these initiatives as part of our emissions reduction pathway to meet our community goal of net zero emissions by 2050.

In addition to these efforts Council will work with the community to increase canopy cover and sequester carbon through our urban forest. Hornsby Shire Council has an enviable level of tree canopy cover that many other local governments can only aspire to. Canopy cover for the whole local government area (LGA) is 59% and is distributed unevenly across the LGA. The total canopy cover far exceeds the 40% tree canopy target as set by the Sydney Commission and is the third highest canopy cover across Metropolitan Sydney.

Although we have a large canopy cover 202020 Vision in collaboration with The Royal Melbourne Institute of Technology (RMIT) undertook some baseline tree canopy mapping comparing the years between 2009 and 2016. This analysis suggested that tree canopy cover across Hornsby Shire Council reduced by 5% during that seven-year period (Amati et al, 2016). More detailed analysis was conducted to try to understand these causes and locations of loss. The report by Smith et al, (2017) found that the Hornsby Shire is more likely losing canopy in urban areas at approximately 3% each year. This is equivalent to 12,000 to 15,000 trees each year across the public and private realm.

While the urban forest is one of the most efficient and cost-effective mechanisms for adapting to climate change, there is a caveat: Hornsby's Urban Forest must be resilient, healthy, diverse and well managed. Warmer temperatures, increased occurrence of storm events and potentially lower average rainfall will have deep impacts on the urban forest. Research suggests that many endemic or indigenous tree species across Australia will simply not cope with increases in temperature or lower rainfall. The latest research from Macquarie University shows that the two-dominant species of street trees in Hornsby, Callistemons and Jacaranda's are not likely to thrive under Sydney's modelled climate scenarios (Burley et al, 2019). Increased storm events will see greater damage being caused by high winds and heavy rain. This means that any species of tree planted in Hornsby needs to be considered for their resilience in the face of climate change and a preferred species list constantly reviewed and updated based on the latest research.

8 Climate Change Adaptation – reducing vulnerability and increasing resilience to a changing climate

8.1 Corporate Adaptation

In addition to undertaking actions to reduce carbon emissions Council must work to monitor and report on performance, assess emergent technologies and solutions and regularly review hazards and risks to responsibly prevent and mitigate climate risks and adapt to our changing climate. In 2008 Council partnered with the CSIRO and the Sydney Coastal Councils Group (SCCG) in a vulnerability study (Preston et al 2008). The results of this vulnerability assessment formed the basis of Council's first Climate Change Adaptation Strategic Plan in 2009 (Aurecon, 2009). The Plan focused on five key impact areas identified as relevant for the Shire including: heat, bushfires, ecosystems, rainfall and sea level rise. The Plan assisted Council by:

- Generating information about the likely impacts of climate change (e.g. flooding, coastal erosion and temperature) and feasible adaptation strategies (e.g. capital works, education, and planning) in the Sydney region
- Deepening the understanding of the likely impacts of climate change, and resulting adaptation options in the Sydney region through integration of existing

models, vulnerability mapping, and an analysis of adaptive capacity

- Building the capacity of stakeholders in the Sydney region to implement, and monitor the success of, adaptation strategies (e.g. for infrastructure, health, and biodiversity)
- Working with stakeholders (e.g. SCCG member councils and other stakeholders) to build adaptation strategies into institutional structures and processes (e.g. asset management plans, coastal management plans, estuary management plans, floodplain management plans, local environment plans, and regional environmental plans).

Further work was then undertaken in 2011 with Council's insurer Statewide Mutual and Echelon Australia Pty Ltd with a risk assessment undertaken to determine the potential impacts on Council operations, asset management and corporate vulnerability. This assessment applied the same CSIRO climate change scenarios for NSW and included temperature, hot days, average rainfall, wind, fire weather, sea-level rise and rain intensity.

In 2019 Council reassessed our climate risks with Statewide Mutual and Jardine Lloyd Thompson (JLT) for climate change impacts now, in the near future (by 2030) and the far future (by 2070). The climate change risk assessment models the likelihood of future climate hazards and the potential impacts of these hazards on the Shire and our residents, as seen in Table 3. The risk review identified a total of 86 risks across the seven risk scenarios as seen in Table 4. Each impact was ranked against Council's Risk Matrix to identify a risk rating of Extreme, High, Medium or Low (Hornsby Shire Council Enterprise Risk Management Determination, 2017).

		CONSEQUENCE				
		Insignifi-cant	Minor	Moder-ate	Major	Cata-strophic
Likelihood	Almost Certain	MEDIUM	HIGH	HIGH	EX-TREME	EXTREME
	Likely	MEDIUM	MEDI-UM	HIGH	HIGH	EXTREME
	Possible	LOW	MEDI-UM	HIGH	HIGH	HIGH
	Unlikely	LOW	LOW	MEDIUM	MEDIUM	HIGH
	Rare	LOW	LOW	MEDIUM	MEDIUM	HIGH

Table 3: Risk Matrix (Source: Hornsby Shire Council Enterprise Risk Management Determination, 2017)

Five (5) Extreme and fifty-six (56) High rated climate impact risks form the focus of proposed adaptation strategies to be given further consideration through Council's mid to long-term planning. The full list can be found in Appendix 3. All risks including Low and Medium risks are to be reviewed on a regular basis to ensure any new impacts or risks are identified.

	Temperature	Hot Days	Rain	Wind	Fire Weather	Sea Level	Rain Intensity	Ranking all Impacts Total
Extreme	0	1	0	0	3	0	1	Extreme 5
High	8	10	6	4	8	7	13	High 56
Medium	3	4	2	2	4	3	7	Medium 25
Low	0	0	0	0	0	0	0	Low 0
Total	11	15	8	6	15	10	21	86

Table 4: Impact Rankings by Scenario
 (Source: Jardine Lloyd Thompson (2019)
Climate Change Risk Assessment Adaptation Report)

The purpose of adaptation is to prepare Council and the community for the inevitable changes to the climate that are at this stage unavoidable. In adapting to changes in the climate, Council will employ best practice approaches that are deemed appropriate and utilised by industry professionals. These will be founded on prevailing scientific data and methods, and Council will respond to emergent technologies and practices to improve performance. Council assessed the risks against a 'Success Criteria', as defined in Climate Change Impacts & Risk Management A Guide for Business, Australian Greenhouse Office 2006.

Each risk considered the impact of Climate Change in terms of Council's ability to:

- A. Maintain public safety
- B. Protect and enhance the local economy
- C. Protect existing community structures and the lifestyle enjoyed by the people in the region
- D. Sustain and enhance the physical and natural environment
- E. Ensure sound public administration.

Impact by Success Criteria

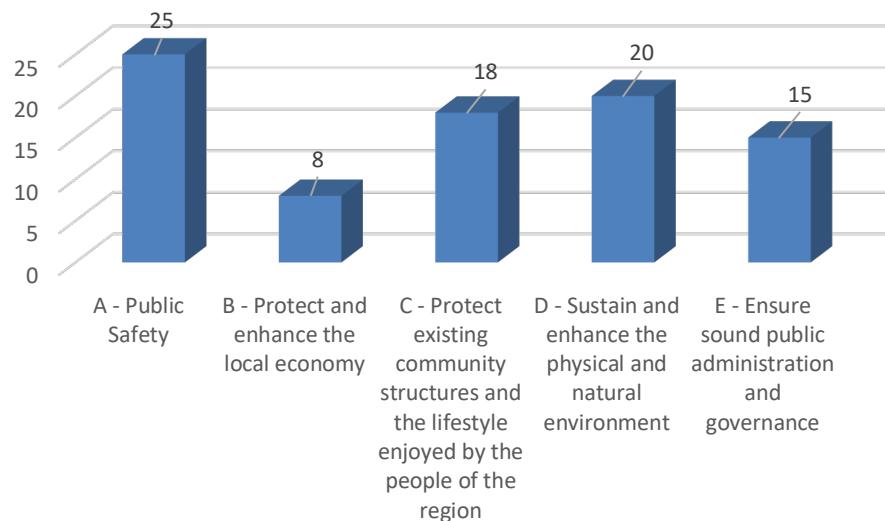


Figure 16: Impact by Success Criteria (Source: Jardine Lloyd Thompson (2019) *Climate Change Risk Assessment Adaptation Report*)

The greatest number of impacts is likely to be felt with Council's ability to "Maintain Public Safety", representing 29% of total impacts or 25 out of 86. This is followed by Council's ability to "Sustain and enhance the physical and natural environment" at 23% (20 out of 86) and 'Protect existing community structures and the lifestyle enjoyed by the people of the region' at 21% (18 out of 86).

8.2 Climate Change Adaptation Roles and Responsibilities

Climate change impacts affect all functional areas of Council and require collaborative efforts across Council and community to ensure mitigation and adaptation successes succeed. Infrastructure & Assets, Community Services, Land-Use Planning & Development, Emergency Management & Natural Disaster Preparedness along with Corporate Services are identified as the council responsibilities most impacted by this plan. These functional areas fall across various divisions within Council (as seen in Table 5 below) and project control groups will be established to ensure strong collaboration and accountability structures and ethos. Roles and responsibilities of asset managers are

also outlined further to this in Council's Asset Management Determination.

This is because the greatest number of hazards and risks are attributed to the area of Infrastructure & Assets; representing 38% of the total, with 33 potential impacts out of a total 86 risks identified.

Impact by Functional Area

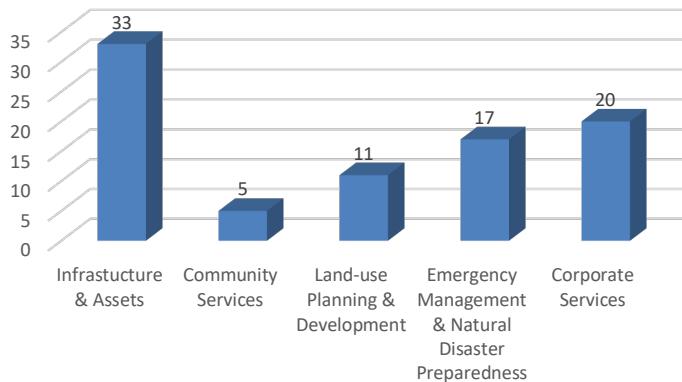


Figure 17: Impact by Functional Area (Source: Jardine Lloyd Thompson (2019) Climate Change Risk Assessment Adaptation Report)

	Infrastructure & Assets	Community Services	Land-use Planning & Development	Emergency Mgt & Natural Disaster preparedness	Corporate Services
	(I)	(CS)	(L)	E	(CO)
Division Involved	Corporate Support	Corporate Support	Planning and Compliance	Community and Environment	Corporate Support
	Community and Environment	Community and Environment	Strategy and Place	Infrastructure and Major Projects	Community and Environment
	Infrastructure and Major Projects	Infrastructure and Major Projects	Infrastructure and Major Projects	Corporate Support	Infrastructure and Major Projects
	Strategy and Place	Strategy and Place		Risk Audit and Business Improvement	Planning and Compliance
				Strategy and Place	Risk Audit and Business Improvement
					Strategy and Place

Table 5: Organisational Structure of Functional Areas (Source: Jardine Lloyd Thompson (2019) Climate Change Risk Assessment Adaptation Report)

8.3 Community Adaptation

A number of our residents, communities, businesses and visitors will be familiar with existing hazards and after recent years have some capacity and resilience in coping with impacts. This was in the recent bush fires in late 2019 early 2020 and the storm events felt across the Shire during 2018 and 2019. Further work will be required to enable stakeholders to meet future climate and environmental related challenges - balancing the complexity of illustrating how climate change will increase the frequency and severity of future events, whilst also enabling and bolstering meaningful action and response.

Climate related impacts are not evenly distributed across the Shire and marginalised communities are often in flood, fire or drought prone areas. They are often the last to receive meaningful support and the most affected by the disaster. Council will need to engage with our community with social and ecological justice in mind and will use the five types of engagement: inform, consult, involve, collaborate and empower to ensure that all our constituents are protected, supported and enabled to contribute to a brighter future.

To build resilience and assist our residents to adapt Council will use a cycle of engagement consisting of seven steps:

1. Map existing networks
2. Identify key champions within networks
3. Support engagement by key champions
4. Support adaptation initiatives
5. Monitor and evaluate effectiveness
6. Share innovations and lessons.
7. Celebrate successes to build momentum and joyful connection leading to new and more meaningful networks, projects and outcomes.

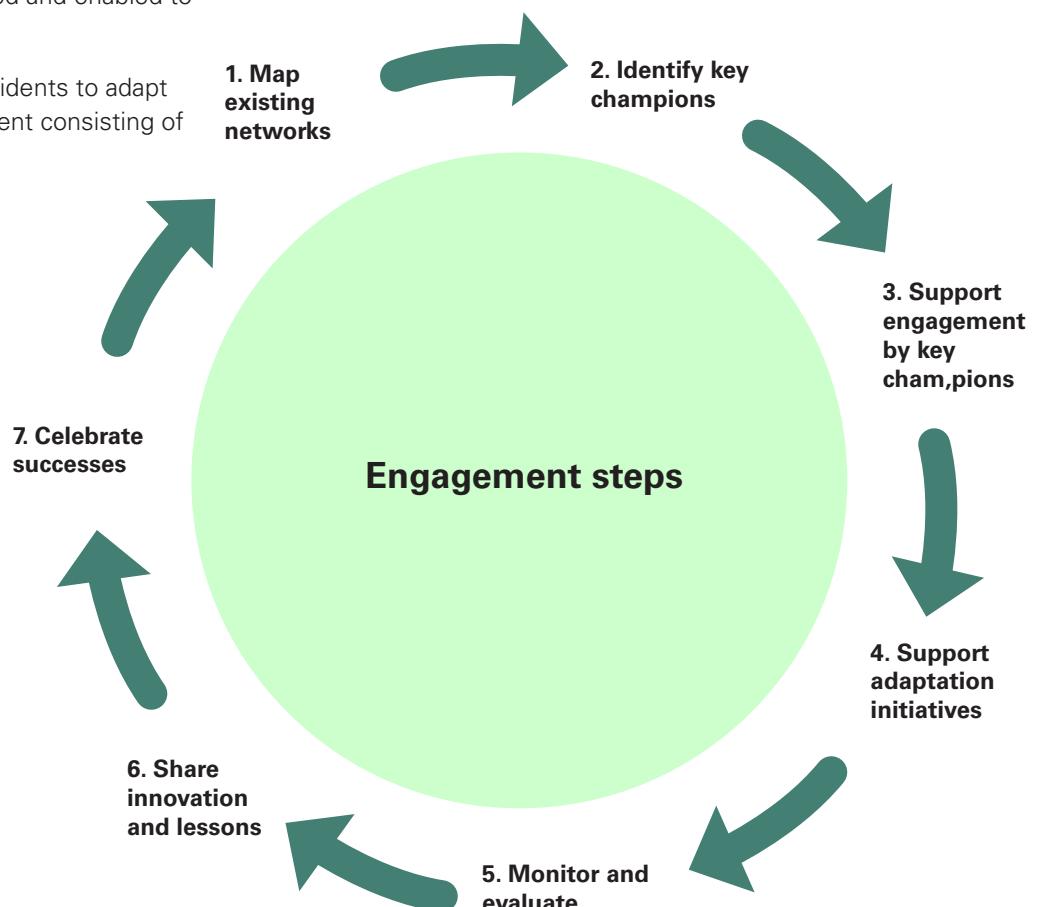


Figure 18: Engagement Cycle for Climate Change Adaptation (Source: Smith, T., A. Leitch, and D. Thomsen, 2016: Community Engagement. CoastAdapt Information Manual 9, National Climate Change Adaptation Research Facility, Gold Coast)

- bushfire management,
- biodiversity conservation
- urban heat mitigation
- water conservation and management
- flood mitigation
- coastal management planning
- emergency management planning.

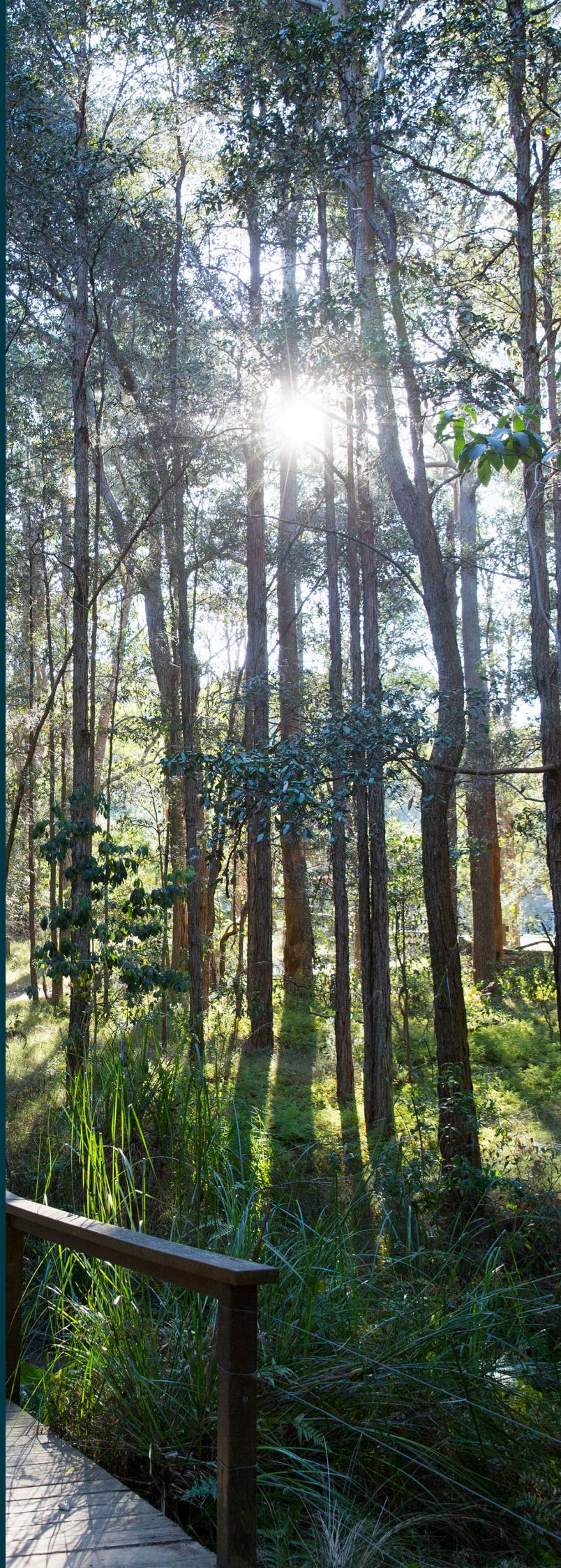
9 Monitoring and Reporting

Every four years, Council will revise the actions in this Plan and identify new ones. As part of this review, Council will identify and update actions that have not yet been implemented but remain effective ways to achieve the objectives of the Plan. This revision process will include a review and analysis of the opportunities and challenges to achieving the 2050 net zero target and the interim goal of reducing carbon emissions by 32% below 2018 levels by 2025 and 53% by 2030.

Our comprehensive annual GHG inventories will continue and we will report our progress in Council's Annual Report. We will also include initiatives from the emission reduction action plan and climate change adaptation plan and recommendations of other supporting studies in Council's Delivery Program and Operational Plan and will report back quarterly to the executive team and 6 monthly to the community via the Annual Report and Half Yearly Report. Regular updates will also be provided to the Environmental Sustainability Advisory Committee which will oversee the implementation of this Plan.

Implementation of the Plan will be dynamic, collaborative and flexible to respond to changes and learn from experiences. Emerging information and technologies will be considered throughout implementation to ensure Council continues to implement the strategy in the most effective way.

Council will also periodically review climate modelling data to ensure the most up to date data is being used for risk assessments and future emission targets.



10 Appendix 1 – Corporate Emissions Reduction Action Plan

CORPORATE – 2017/18 emissions tCO_{2-e} - 12,080 tonnes. 32% reduction by 2025, 53% reduction by 2030 and Net Zero by 2050.

ID	Emission Source	Category	Action	Estimated CO _{2-e} reduction (tonnes)	Resource Type	Payback period	Funding Source	Status	Priority High(1- 2yrs) Med (3-5yrs) Low (5- 10yrs)	Responsibility
1.1	Public Lighting / Electricity	Operations	Complete the accelerated roll out of LED lighting on residential roads. Work with Ausgrid to install 4267 LED lightings	1135	\$	5yrs	Funded	Existing	High	Strategy and Place
1.2	Public Lighting / Electricity	Operations	Complete the accelerated roll out of LED lighting on residential roads. Work with Endeavour Energy to install 50 LED lights	17	\$	4yrs	Funded	Existing	High	Strategy and Place
1.3	Public Lighting / Electricity	Operations	Undertake roll out of LED lighting on main roads in partnership with Ausgrid	1054	\$	5.4yrs	Unfunded	New	High - Med	Strategy and Place
1.4	Public Lighting / Electricity	Operations	Upgrade all parks decorative lighting with LEDs	2	\$ and staff time	Unknown	Unfunded	New	Low	Parks, Trees and Recreation
1.5	Electricity Generation / Renewable Energy	Operations	Installation of solar at: Hornsby Aquatic Centre, Admin building, Galston Aquatic, Works depot, Pennant Hills Library, Fire Control, Overhead Bridge, Cherrybrook Community Centre, Recycling Centre, Berowra Library, Beecroft Community Centre, Berowra District Hall, Brooklyn Leisure and Learning, Arcadia Community Hall, Glenorie Community Centre, Hornsby Heights Community Centre, Mount Colah Community Centre, Thornleigh Community Centre and Wisemans Ferry Community Centre	1305	\$ and staff time	5.6yrs if purchase outright Or 15-year Power Purchase Agreement	Unfunded or Power Purchase Agreement	New	High	Strategy and Place & Building Services
1.6	Electricity / Buildings	Operations	Replace all old globes with LED	295	\$	2.7 years if purchase outright Or 3years under Power Purchase Agreement	Unfunded or Power Purchase Agreement	New	High	Strategy and Place and Building Services
1.7	Electricity	Operations	Purchase of green power or renewable energy through electricity contract 20%, 50%, 100%	1,505, 3764, 7,528	\$	TBA	Unfunded	New	High-Med	Strategy and Place & Procurement

ID	Emission Source	Category	Action	Estimated CO ₂ e reduction (tonnes)	Resource Type	Payback period	Funding Source	Status	Priority High(1-2yrs) Med (3-5yrs) Low (5-10yrs)	Responsibility
1.8	Procurement / Flights	Operations / Policy	Purchase green offsets when flying	6.85	\$ 0	Unfunded	New	High	Strategy and Place & Learning and Development	
1.9	Electricity / Buildings	Operations	<ul style="list-style-type: none"> Investigate installation of Building Management System at Pennant Hills Library, Administration Building and Hornsby Library Ensure appropriate temperature set points 	54	\$ and staff time	4.8yrs	Funded	New	High	Building Services and Strategy and Place
1.10	Gas / Buildings	Operations	<ul style="list-style-type: none"> Undertake energy audit at Hornsby Aquatic Centre Monitor and manage Hornsby Aquatic Centre to optimise consumption utilising the existing Building Management System 	36	\$ and staff time	10	Funded	Existing	High	Infrastructure & Recreation
1.11	Electricity / Buildings	Operations	<ul style="list-style-type: none"> Report target vs actual for energy use for facilities that have +/- 20% variation on contract Active management of high-end electricity users Increase awareness of operators and users of buildings 	N/A	Staff time	0	Funded	Existing	High	Strategy and Place
1.12	Electricity / Buildings	Operations	Plant trees where feasible to reduce heat load on buildings, winter winds and noise	Unknown	\$ and staff time	0	Unfunded	New	Med-Low	Natural Resources, Parks, Trees and Recreation and Building Services
1.13	Fleet / Transport fuel	Education and Engagement	<p>Develop and deliver an education program for fleet drivers to:</p> <ul style="list-style-type: none"> Ensure that appropriately sized vehicles are used for each load or trip to minimise fuel consumption ensure optimal use of vehicles Regular maintenance ensure vehicle is fit for purpose and utilise more renewable fuels Optimise tyre performance to reduce fuel consumption by selecting lighter wheel and tyre systems and tyres that lower rolling resistance Check tyre wear at least monthly and keep tyres inflated at, or 10% above the recommended level 	9	\$ and staff time	1.3	Unfunded	New	Med	Strategy and Place & Governance and Administration

ID	Emission Source	Category	Action	Estimated CO ₂ -e reduction (tonnes)	Resource Type	Payback period	Funding Source	Status	Priority	Responsibility
1.14	Fleet / Transport fuel	Procurement	<ul style="list-style-type: none"> Monitor fuel consumption for each vehicle (e.g. via fuel cards) to identify vehicles with unusually high fuel consumption. High fuel consumption is indicative of possible need for maintenance <p>Conduct fleet review to optimise and reduce emissions by changing over to hybrid and/or electric vehicles for Council owned vehicles, where financially feasible.</p>	30	\$ and staff time	TBA	Unfunded	New	Med-Low	Governance and Administration
1.15	Gas / Buildings	Operations	<p>For new and old Council owned buildings, augment building envelope where possible:</p> <ul style="list-style-type: none"> Through proper insulation Reduce heat loss / infiltration through buildings' exteriors Optimise window / blind operation Use double glazing Reduce summer heat with cool roofs Plant a green roof or green wall where feasible 	15	\$ and Staff time	Depends on building type	Funded	New	Low	All staff
1.16	All emission sources	Operations	Investigate the establishment of a carbon offset program through the planting of 25,000 trees	Unknown	\$ and Staff time	None	Unfunded	New	Med-Low	Strategy and Place, Natural Resources

11 Appendix 2 – Community Emissions Reduction Action Plan

COMMUNITY - 2016/17 Community emissions totalled ~1.2 million tonnes CO₂-e. Stretch target of 55% reduction by 2036

ID	Emission Source	Category	Description	Resource Type	Funding Source	Status	Priority	Responsibility
				Staff time	Funded	Existing	High	Strategy and Place
2.1	Transport	Policy	Implement Electric Vehicle (EV) Charging Stations on Public Land Policy	\$ and Staff time	Unfunded	New	Med	Strategy and Place
2.2	Transport	Administration and Strategy	Support the uptake of electric vehicles, including installation of public charging stations and investigation of planning controls to require charging infrastructure in new developments	\$ and Staff time	Unfunded	New	Med	Strategy and Place
2.3	Transport	Policy	Implement Car Share Parking Policy	Staff time	Funded	Existing	High	Strategy and Place
2.4	Transport	Advocacy and Education	Advocate for the reduction in use of private vehicles and increased use of public transport	Staff time	Unfunded	New	High-Med	Strategy and Place
2.5	Electricity / gas	Administration and strategy	Work with partners to develop a program for Environmental Upgrade Agreements	\$ and Staff Time	Unfunded	New	Med	Strategy and Place & Finance
2.6	Electricity	Administration and strategy	Work with the community to determine the viability of a community solar farm	\$ and Staff time	Unfunded	New	Med-Low	Strategy and Place
2.7	Electricity / Gas / Waste	Education	Deliver behaviour change and community education programs on sustainability	\$ Staff Time	Funded	Existing	High	Strategy and Place
2.8	Electricity	Facilitation	Seek a partnership to test and increase uptake of solar retrofit	\$ and Staff time	Unfunded	New	Med	Strategy and Place
2.9	Electricity	Advocacy	Produce a GIS layer of houses within the Shire with rooves unaffected by trees and target solar information to these households	\$ and Staff time	Unfunded	New	High-Med	Strategy and Place & Natural Resources
2.10	Electricity / Gas / Water	Advocacy	Advocate to developers for buildings designed to achieve low energy properties and precincts above planning policy regulations	\$ and Staff time	Unfunded	New	Med	Strategic Planning
2.11	Electricity / Gas / Water	Advocacy	Lobby State Government to increase BASIX requirements	Staff time	Unfunded	New	High-Med	Strategy and Place
2.12	Electricity	Facilitation	Investigate Solar My Schools program or other large-scale community solar roll out	\$ and Staff Time	Unfunded	New	Med-low	Strategy and Place
2.12	Electricity / Gas / Water / Waste	Strategic Planning	Incorporate carbon zero processes into the design, development and ongoing use of town centres i.e. Hornsby Town Centre e.g. building materials, waste generation & disposal, energy production on scale	\$ and Staff time	Funded	Existing	High	Strategic Planning & Strategy and Place
2.13	Waste	Administration and Strategy	Implement the Waste Matters Strategy to increase diversion of waste from landfill	\$ and Staff Time	Funded	Existing	High-Med	Waste
2.14	Electricity / Transport	Strategic Planning	Investigate combined solar farm and car parking with EV charging	\$ and Staff Time	Unfunded	New	Med-Low	Strategy and Place
2.15	Transport	Strategic Planning	Advocate to Transport for NSW for the provision of adequate commuter car parking and cycling facilities for customers of the public transport network – rail and ferry	\$ and Staff Time	Unfunded	New	High-Med	Strategy and Place

12 Appendix 3 – Climate Change Risk Assessment

12.1 Temperature

Risk ID	Scenario for (Average) Temperature	Will impact in our ability to:	Area	Current Controls	Risk Rating	
Future Adaptations (for risk rated HIGH and EXTREME)						
TDI1	By 2030 max average temperatures are projected to rise by 0.7 degrees C and continue to rise by 1.9 degrees C by 2070. By 2030 min average temperatures are projected to rise by 0.6 degrees C and continue to rise by 2 degrees C by 2070.	A - Maintain Public Safety B - Protect and Enhance Local Structures and Community Life C - Protect Environment D - Physical Environment E - Sound Public Administration and Governance	Functional Area	Adequacy of Controls	Likelihood Consequence	Risk Rating
TCI2	Increased average annual temperature will cause decline to ecosystems resulting in threats to biota within the natural environment	Infrastructure & Assets	- Maintenance program of natural assets (also condition based)	3- Adequate Mitigation	High	1) Implement Urban Forest Strategy 2) Implement Biodiversity Conservation Plan 3) Implement Water Sensitive Hornsby Strategy 4) Prepare a vulnerability assessment to determine future impact of climate change on biodiversity values 5) Prepare biodiversity adaptation strategy to minimise climate impacts through policy, planning instruments and operational activities 6) Maintain seed bank program and identify secondary seed bank storage 57 Establish partnerships with industry leaders such as Royal Botanic Gardens, Australian Plant bank at Mount Annan
						All risks including low and medium risks are to be reviewed on a regular basis to ensure any new impacts or risks are identified
						Medium

		(condition based)				
TD13	Increased average annual temperature will cause a possible decline in the integrity of Council's open space, reserves and recreational assets resulting in reduced usability of Council facilities	Infrastructure & Assets	- Proactive Asset Management Planning (condition based) - Maintenance program of natural assets (condition based)	2-Some Benefit Likely	high Moderate	1) Implement Urban Forest Strategy 2) Apply for exemptions with Sydney Water during times of drought 3) Investigate development of Urban Heat Policy with NSROC 4) Implement Play Plan 5) Implement Water Sensitive Hornsby Strategy
TE14	Increased average annual temperature will cause an increase in Council's greenhouse gas emissions due to higher energy usage within Council from increased use of air conditioners and electricity, affecting Council's carbon footprint	x	Infrastructure & Assets	2-Some Benefit - Monitoring systems - Sustainable Energy for New Council Assets Policy - Renewable Assets i.e. PV and wind turbine	High Minor	1) Review, update and implement Sustainable Energy for New Council Assets Policy 2) Review top 10 consuming facilities annually 4) Transition to 100% renewable energy and low carbon economy 5) Participate in Action 13 Resilient Sydney Strategy – Measure metropolitan carbon emissions and report on progress
TD15	Increased average annual temperature will cause an increased success and distribution of weed and pest species resulting in the threat to or loss of biota within the natural environment and the associated cost of resources to Council to manage the impact	x	Infrastructure & Assets	2-Some Benefit - Maintenance program of natural assets (condition based) - Implement Biosecurity Act	Moderate Likely	1) Continue to implement Biosecurity Act 2) Implement Biodiversity Conservation Plan 3) Develop an education program for residents on weeds and pest 4) Investigate the expansion of the Bushcare Volunteer Program
TAC06	Increased average annual temperature will cause increased property damage or personal injury as a result of falling limbs and trees.	x	Corporate Services	2-Some Benefit - Proactive maintenance of trees around Council's built assets - Informal monitoring of park assets - CRM system used to respond to customer complaints	Possible Major	1) Investigate mapping of all trees in public areas with condition assessment (inventory) 2) Prioritisation of risk areas 3) Investigate proactive inspection and maintenance - asset management plan to consider surrounding precinct not just built asset 4) Implement Urban Forest Strategy (including appropriate species selection) 5) Implement Biodiversity Conservation Plan 6) CRM system to link with Asset Management Plan (including

TECS11	<p>There is a risk that Council will not have the financial capacity to fund the works required in the future, including: the development of identified strategies, and in managing the community expectations associated with the impacts of an increase in the average annual temperature</p>	Corporate Services	<ul style="list-style-type: none"> - Long Term Financial Planning - Development Contributions - Grant funding 	<ul style="list-style-type: none"> 1) Investigate employment of a Grants Officer 2) Investigate alternative funding sources for Climate Change 3) Apply for grant funding where possible 4) Investigate the allocation of Developer Contributions 5) Integrate strategies to align with Long Term Financial Plan (QBL and business case development) 6) Delivery Program and Operational Plan to identify regional project opportunities 	High	Moderate	Almost Certain	X	

12.2 Hot Weather

Risk ID	Scenario for Hot Weather (Heat)	Will impact in our ability to:	Risk Rating			Future Adaptations (for risk rated HIGH and EXTREME)	
			Adequacy of Controls	Likelihood	Consequence	Risk Rating	
HWAE 1	By 2030 Metropolitan Sydney is projected to experience an average of 4 more days above 35 degrees C per year and continue to increase by 11 days per year by 2070. By 2030 Western Sydney and the Hawkesbury is projected to experience an additional 5 to 10 days above 35 degrees C per year and increasing to over 10 to 20 additional hot days per year by 2070.	Increased number of hot days above 35 degrees could cause an increased risk of heatstroke, mental health issues, possible death and general safety issues to the community, especially the young and elderly	Emergency Mgt & Natural Disaster preparedness	- Demographic profile and community vulnerability mapping completed - Urban heat mapping completed - Water refill stations in parks and reserves	Almost Certain	Major	Extreme
			Functional Area	Current Controls			
			E - Sound Public Administration and Governance				
			D - Physical and Natural Environment				
			C - Protect Community Structures and Lifestyle				
			B - Protect and Enhance Local Economy				
			A - Maintain Public Safety	x			

11) Participate in Get Prepared – Action 23 Resilient Sydney Strategy						
			All risks including low and medium risks are to be reviewed on a regular basis to ensure any new impacts or risks are identified			
			Medium			
			Likely	Minor		
		- Public notifications via social media on transport delays - Proactive maintenance regimes for Council assets	2-Some Benefit			
		x				
HWCI2	Increased number of hot days above 35 degrees could cause loss/damage to transport infrastructure (including railway lines and roads), affecting Council's public assets, businesses, residents and general commuters within the Hornsby Shire	Community Services	- Proactive maintenance regimes	2-Some Benefit	Minor	
HWCCS3	Increased number of hot days above 35 degrees could cause a possible decline in the integrity of Council's public assets resulting in a reduced usability of Council's facilities	x		Possible		
HWAЕ4	Increased number of hot days above 35 degrees could cause loss/damage to utility infrastructure including water supply, telecommunications, electricity supply and gas supply, affecting residents and businesses within the Hornsby Shire due to possible power outages/interruptions, damage to electricity supplier's infrastructure, etc.	x	Emergency Mgt & Natural Disaster preparedness		Likely	
HWCE5	Increased number of hot days above 35 degrees could cause an increase in the number of local emergencies within the Hornsby Shire resulting in an increased strain on Council services, resources and staff	x	Emergency Mgt & Natural Disaster preparedness		Possible	
			- Public facilities such as libraries used as refuge during hot weather		Minor	
					Medium	

HWEKO6	Increased number of hot days above 35 degrees could cause reduced productivity and workplace health and safety issues for Council workers and contractors	- WHS protocols for working in hot weather and personal protective equipment (PPE) - Alternate working hours - Volunteers policy for working in hot weather	Corporate Services	- WHS protocols for working in hot weather and personal protective equipment (PPE) - Alternate working hours - Volunteers policy for working in hot weather	High	1) Implement Urban Forest Strategy 2) Review WHS controls for comfort factor rather than just temperature specific, include for some personal variations 3) Develop pre-established alternative tasks and in-house training ready for hot days 4) Review consistency in managing contractor management and volunteers with Council's heat policy 5) Establish a Hot Weather Policy for events and event management 6) Participate in Get Prepared – Action 23 Resilient Sydney Strategy
HWEKO7	Increased number of hot days above 35 degrees could cause an increase in Council energy and water costs associated with climate change responses (e.g. cooling demand)	Corporate Services	- Sustainable Energy for New Council Assets Policy and maintenance regimes - Stormwater harvesting	Corporate Services	2-Some Benefit	1) Monitor facilities to identify trends and inefficiencies 2) Review, update and implement Sustainable Energy for New Council Assets Policy (including QBL) 3) Reduce threshold of capex review from \$5million for life cycle analysis to \$1million or large capital items 4) Include climate change projections in project management framework and asset management plans 5) Investigate alternative water supplies 6) Re-evaluate NSROC Renewable Energy Master Plan 7) Implement Urban Forest Strategy

HWACO8	<p>Increased number of hot days above 35 degrees could cause increased property damage or personal injury as a result of falling limbs and trees.</p> <p>x</p>	<p>Corporate Services</p> <ul style="list-style-type: none"> - Proactive maintenance of trees around Council's built assets - Informal monitoring of park assets - CRM system used to respond to customer complaints - Insurance 	<p>2-Some Benefit</p>	<ul style="list-style-type: none"> 1) Investigate mapping of all trees in public areas with condition assessment (inventory) 2) Prioritisation of risk areas 3) Investigate proactive inspection and maintenance 4) Asset Management Plans to consider surrounding precinct not just built asset 5) Implement Urban Forest Strategy (including appropriate species selection) 6) Implement Biodiversity Conservation Plan 7) CRM system to link with Asset Management Plan (including trees) 8) Link to Statewide Mutual Visitation manual/ guideline - Signs used as Remote Supervision 9) Implement DCP controls pertaining to ongoing landscape maintenance plans required for medium-high density developments 10) Investigate proactive inspections to ensure landscape maintenance plans are being adhered to 	<p>High</p>	<p>Major</p>	<ul style="list-style-type: none"> 1) Investigate mapping of all trees in public areas with condition assessment (inventory) 2) Prioritisation of risk areas 3) Investigate proactive inspection and maintenance 4) Asset Management Plans to consider surrounding precinct not just built asset 5) Implement Urban Forest Strategy (including appropriate species selection) 6) Implement Biodiversity Conservation Plan 7) CRM system to link with Asset Management Plan (including trees) 8) Link to Statewide Mutual Visitation manual/ guideline - Signs used as Remote Supervision 9) Implement DCP controls pertaining to ongoing landscape maintenance plans required for medium-high density developments 10) Investigate proactive inspections to ensure landscape maintenance plans are being adhered to
HWECO9	<p>There is a risk that Council will not have the financial capacity to fund the works required in the future, including: the development of identified strategies, and in managing the community expectations associated with the impacts of an increase in the number of Hot Days above 35 degrees.</p>	<p>Corporate Services</p>	<ul style="list-style-type: none"> - Long Term Financial Planning - Development Contributions - Grant funding 	<ul style="list-style-type: none"> 1) Investigate employment of a Grants Officer 2) Investigate alternative funding sources for Climate Change 3) Apply for grant funding where possible 4) Investigate the allocation of Developer Contributions 5) Integrate strategies to align with Long Term Financial Plan (QBL and business case development) 6) Delivery Program and Operational Plan to identify regional project opportunities 	<p>High</p>	<p>Moderate</p>	<p>Almost Certain</p>

HWCL10	Infrastructure & Assets	Increased number of hot days above 35 degrees could cause increased demand on Council's facilities, such as pools, refuges (buildings), riverside parklands and boat ramps,	x	Almost Certain	Minor	<p>1) Investigate cost recovery to cover maintenance increases</p> <p>2) Investigate development of a community resilience program (include reviews of increased opening hours of facilities, staffing impacts etc)</p> <p>3) Investigate development controls to allow for extended operating hours above DA consent</p> <p>4) Investigate an Emergency Management Heatwave Response Plan</p> <p>5) Investigate backup power supply for key Council facilities</p> <p>6) Investigate development of NSROC Urban Heat Policy</p> <p>7) Establish links with BOM and Local Area Health Service</p> <p>8) Implement Urban Forest Strategy</p>	High
HWCL11				Land-use Planning & Development		<p>1) Develop a community resilience program</p> <p>2) Investigate an Emergency Management Heatwave Response Plan</p> <p>3) Investigate backup power supply for key Council facilities</p> <p>4) Investigate development of NSROC Urban Heat Policy</p> <p>5) Establish links to BOM and Local Area Health Service</p> <p>6) Create resilient open spaces in public domain planning (green and blue spaces)</p> <p>7) Building design to include shade opportunities (awnings etc.)</p> <p>8) Implement Urban Forest Strategy</p>	High
							Almost Certain

HWBL12	Increased number of hot days above 35 degrees may cause impacts on economic viability of the rural areas	x	Land-use Planning & Development		Almost Certain	Minor	High	1) Complete Rural Lands Study 2) Develop a community resilience program 3) Promote adaptive land use partnerships with DPI 4) Implement Urban Forest Strategy
HWBL13	Increased number of hot days above 35 degrees could cause reduced productivity and workplace health and safety issues for businesses in the Hornsby Shire	x	Land-use Planning & Development		Almost Certain	Minor	High	1) Develop a community resilience program 2) Promote Hornsby Localised program to shop local 3) Implement Urban Forest Strategy
HWC114	Increased number of hot days above 35 degrees may cause increased demand for shading on urban spaces	x	Infrastructure & Assets	-Planting of shade trees - 25,000 tree program	2-Some Benefit	Almost Certain	Minor	1) Implement Play Plan and Public Domain Strategies 2) Implement Urban Forest Strategy 3) Asset Management Plans to include climate change projections 4) Implement Hornsby Town Centre Review 5) Update Development Control Plan provisions
HWDE15	Increased number of hot days above 35 degrees may cause increased impact of heatstroke or heat related illness in animals	x	Emergency Mgt & Natural Disaster preparedness	x	Almost Certain	Minor	High	1) Develop a community resilience program 2) Implement Biodiversity Conservation Plan 3) Develop and implement a written procedure on managing animals on days reaching 35 degrees and above

12.3 Rainfall

Risk ID	Scenario for Rainfall	Will impact in our ability to:	Risk Rating
	Projections for the regions annual average rainfall range from a decrease (drying) of 13% to an increase (wetting) of 18% by 2030 and still span both drying and wetting scenarios (-9% to +24%) by 2070. By 2030 rainfall is projected to increase during autumn and decrease in spring across the region. By 2070 rainfall increases are projected for Summer, Autumn and most of the region during Spring. In the near future (2020-2039): Summer (-14% to +15%); Autumn (-22% to +43%); Winter (-19% to +23%); Spring (-27% to +17%). In the far future (by 2060-79): Summer (-7% to +28%); Autumn (-15% to +42%); Winter (-38% to +38%); Spring (-14% to +37%).	A - Maintain Public Safety B - Protect and Enhance Local Economy C - Protect Community Structures and Lifestyle D - Physical Natural Environment E - Sound Public Administration and Governance	
RD11	Decrease in the annual rainfall level may cause a change in the ecosystem that may result in the loss of trees, plant and animal species within the physical and natural environment	X	
RC12	Decrease in the annual rainfall level may see a reduction in the functionality of Council's recreational facilities, particularly Council's parks and reserves which may cause an increased strain on Council funds due to the financial costs with the upkeep of such facilities	X	
RD13	Decrease in the annual rainfall level may cause variations in the environmental flows which may affect water dependent ecosystems	X	
			Future Adaptations (for risk rated HIGH and EXTREME)
			Risk Rating Consequence Likelihood Adequacy of Controls Current Controls Functional Area

RD14	Decrease in the average annual rainfall level may result in an increased success of weed and pest species resulting in the threat to or loss of plant and animal species within the natural environment and the associated cost of resources to Council to manage the impact	x	Infrastructure & Assets	High
RAC05	Decrease in the average annual rainfall may cause increased property damage or personal injury as a result of falling limbs and trees caught by droughts, fire and storms	x	Corporate Services	High

RECO6	<p>There is a risk that Council will not have the financial capacity to fund the works required in the future, including; the development of identified strategies, and in managing the community expectations associated with the impacts of a decrease in the average annual rainfall level.</p>		<p>Corporate Services</p> <ul style="list-style-type: none"> - Long term financial planning - Development Contributions - Apply for grant funding <p>Almost Certain</p> <p>Moderate</p> <p>High</p> <p>2-Some Benefit</p> <p>1) Investigate employment of a Grants Officer</p> <p>2) Investigate alternative funding sources for Climate Change</p> <p>3) Apply for grant funding where possible</p> <p>4) Investigate the allocation of Developer Contributions</p> <p>5) Integrate strategies to align with Long Term Financial Plan (QBL and business case development)</p> <p>6) Delivery Program and Operational Plan to identify regional project opportunities</p>
			<p>RCCO7</p> <p>Decrease in the average annual rainfall, may cause increased impact on private properties and businesses who are reliant on non-mains water supply.</p> <p>Corporate Services</p> <p>Likely</p> <p>Minor</p> <p>Medium</p>
			<p>RBCO8</p> <p>Decrease in the average annual rainfall, may cause increased impact on businesses dependent on healthy waterways.</p> <p>Corporate Services</p> <p>Possible</p> <p>Minor</p> <p>Medium</p>

12.4 Wind

Risk ID	Scenario for Wind	Will impact in our ability to:			Risk Rating	
	(NO RECENT PROJECTION)		Adequacy of Controls	Likelihood	Consequence	Risk Rating
WA1	2010 Scenario - There is a risk that there will be an increase in average daily wind speed between -5% and +8% by 2030 and an increase of -16% and +24% by 2070.	An increase in average daily wind speed could cause increased property damage or personal injury as a result of falling limbs and trees caused by droughts, fire and storms	- Proactive maintenance of trees around Council's built assets - Informal monitoring of park assets - CRM system used to respond to customer complaints	2-Some Benefit	Possible	High
WD12	An increase in average daily wind speed could cause increased damage to ecosystems		Infrastructure & Assets	x	Moderate	High

2010 Scenario - There is a risk that there will be an increase in average daily wind speed between -5% and +8% by 2030 and an increase of -16% and +24% by 2070.

An increase in average daily wind speed could cause increased property damage or personal injury as a result of falling limbs and trees caused by droughts, fire and storms

VECO6		There is a risk that Council will not have the financial capacity to fund the works required in the future, including: the development of identified strategies, and in managing the community expectations associated with the impacts of an increased average daily wind speed.	High	<ul style="list-style-type: none"> 1) Investigate employment of a Grants Officer 2) Investigate alternative funding sources for Climate Change 3) Apply for grant funding where possible 4) Investigate the allocation of Developer Contributions 5) Integrate strategies to align with Long Term Financial Plan (QBL and business case development) 6) Delivery Program and Operational Plan to identify regional project opportunities
			Moderate	Almost Certain
	Corporate Services	- Long term financial planning - Development Contributions - Apply for grant funding	2-Some Benefit	
		x		

12.5 Fire Weather

Risk ID	Scenario for Fire Weather	Will impact in our ability to:	Adequacy of Controls	Likelihood	Consequence	Risk Rating	Future Adaptations (for risk rated HIGH and EXTREM)
FWACO1	Metropolitan Sydney is expected to experience an increase in average and severe fire weather in the near future (by 2030) and the far future (by 2070). Forest Fire Danger Index (FFDI) is used in NSW to quantify fire weather. The FFDI combines observations of temperature, humidity and wind speed. Fire weather is classified as severe when the FFDI is above 50.	A - Maintain Public Safety B - Protect and Enhance Local Economy C - Protect Community Structures and Lifestyle D - Physical and Natural Environment E - Sound Public Administration and Governance	Current Controls Functional Area	2-Some Benefit	- Funding for the RFS (12 fire stations maintenance and running costs, plus fire service levy), - Bushfire education programs. - Hazard mitigation program, - Collaboratively working with fire services and other land managers, - Bushfire mapping, - Planning controls	Almost Certain	Catastrophic Extreme
							1) Develop a community resilience program (include education on insurance) 2) Implement Hornsby Ku-ring-gai Bush Fire Risk Management Plan 3) Develop a Hornsby Bushfire Management Strategy 4) Lobby RFS for ongoing improvements to education and community engagement programs 5) Lobby RFS to confirm their position on development North of Asquith 6) Investigate Digital Signage Strategy (Smart Cities) 7) Improve linkage to Emergency warnings for Council communications and alert systems 8) Continue to fund emergency management response 9) Advocate and lobby Ausgrid to ensure assets are maintained 10) Investigate underground power lines 11) Investigate Development Cont Plan provisions for undergrounding of private electricity connections 12) Investigate alternative water supply and storage options 13) Investigate mapping water storage areas and supply data to RFS 14) Update/maintain bushfire mapping on Council's internal programs
				x			

15) Update Development Control Plan provisions						
FWDI2	Increased number of FFDI days may cause changes to the natural environment resulting in an increased risk to ecosystems and an increased cost to Council to manage or reverse impacts	Infrastructure & Assets	-Hazard reduction burn planning and buffers		High	
	x	Likely		Major		
FWCL3	Increased number of FFDI days may cause certain land use practices to change, affecting landholders, residents and businesses within the Hornsby Shire	Land-use Planning & Development	-Planning controls -LEP, DCP -Planning for bushfire -Planning Certificates	2-Some Benefit	Moderate	
	x	Almost Certain				
FWCCO4	Increased number of FFDI days may cause an increased level of greenhouse gas emissions due to bushfire smoke entering the atmosphere due to fire events	Corporate Services		Almost Certain	Minor	
	x					
FWAI5	Increased number of FFDI days may cause loss/damage to public property and Council assets due to fire, fallen trees etc.	Infrastructure & Assets	- Insurance, - Emergency response plans, - Resource Local emergency services	2-Some Benefit	Possible	Medium
	x					

FWEC09	There is a risk that Council will not have the financial capacity to fund the works required in the future, including: the development of identified strategies, and in managing the community expectations associated with the impacts of an increase in the number of FFDI days.		Corporate Services	- Long term financial planning - Development Contributions - Apply for grant funding	Almost Certain	Moderate	High	<ul style="list-style-type: none"> 1) Investigate employment of a Grants Officer 2) Investigate alternative funding sources for Climate Change 3) Apply for grant funding where possible 4) Investigate the allocation of Developer Contributions 5) Integrate strategies to align with Long Term Financial Plan (QBL and business case development) 6) Delivery Program and Operational Plan to identify regional project opportunities
FWAE10	Increased number of FFDI days will cause an increased risk of air pollution due to bushfire smoke entering the atmosphere which may affect the health of the public and natural environment	x		Emergency Mgt & Natural Disaster preparedness	Almost Certain	Moderate	High	<ul style="list-style-type: none"> 1) Investigate development of community resilience program 2) Investigate Digital Signage Strategy (Smart Cities) 3) Improve linkage to Emergency warnings for Council communications and alert systems
FWDL11	Increased number of FFDI days will cause an increase in water pollution due to sediment entering waterways as a result of erosion, which may threaten ecosystem health	x		Land-use Planning & Development	- Hazard reduction burn planning and buffers	Almost Certain	Minor	<ul style="list-style-type: none"> 1) Continue water quality monitoring program and report on results 2) Implement Water Sensitive Hornsby Strategy 3) Implement Biodiversity Conservation Plan
FWDC012	Increased number of FFDI days increases negative public perception of the risks of trees and bushland on public and private land, result in increased clearing of trees.		Corporate Services			Almost Certain	Major	<ul style="list-style-type: none"> 1) Additional effort to reinforce the value of trees in the community and context on the risks 2) Appropriate tree selection - right tree in the right location 3) Implement Urban Forest Strategy 4) Lobby State Govt to review 10:50 legislation 5) Advocate for improved reporting on RFS approvals for hectares of clearing 6) Investigate development of public education program on benefits of vegetation as well as the consequences of unauthorised tree removal 7) The Appropriate Regulatory Authority undertake proactive inspections of Asset Protection Zones required to be maintained in perpetuity pursuant to DA consent condition requirements.

FWBC013	Increased number of FFDI days may impact on viability of businesses due to increase insurance costs	x						Corporate Services	1) Investigate development of community resilience program
FWAE14	Increased number of FFDI days may cause increased demand on Council properties for as residents seek refuge (look at hot weather and rewrite)	x				Emergency Mgt & Natural Disaster preparedness	- IEM/P - Maintenance and Access to Neighbourhood safe places	Almost Certain	High
FWCE15	Increased number of FFDI days may cause potential conflict between the need to access to natural water courses for heat relief and pressures to close these public facilities due to public safety risks		x			Emergency Mgt & Natural Disaster preparedness		Minor	Medium
								Possible	Medium
								Minor	Medium
								All risks including low and medium risks are to be reviewed on a regular basis to ensure any new impacts or risks are identified	

12.6 Sea Level Rise and Coastal Inundation

Risk ID	Scenario for Sea Level Rise	Will impact in our ability to:	Functional Area	Adequacy of Controls	Likelihood	Consequence	Risk Rating	Future Adaptations (for risk rated HIGH and EXTREME)
	Future projections indicate that there will be a decrease in East Coast Lows (ECLs) during winter and an increase in frequency and intensity of ECLs during the summer months ECLs impact on the dam filling cycles. (2007 projections – expected SLR of 0.4 metres by 2050 and 0.91 mts by 2100) (IPCC 5th Assmnt Rpt - 2013) likely mean seal level rise range by 2100: - 0.28 - 0.61 m if Emissions (RCP 2.6) are significantly reduced; - 0.52 - 0.98 m if Highest Emissions (RCO 8.5) They also suggest the possibility of up to several tens of centimetres above these values if marine-based sectors of the Antarctic ice sheet collapse. Beyond 2100, the IPCC concludes that it is virtually certain that global mean sea level will continue to rise for many centuries owing to thermal expansion of the oceans. Data provided by the IPCC also indicate that sea level rise along the east coast of Australia might be 0% to 10% above the global average by 2100 (relative to 1986–2005), with higher rates offshore	E - Sound Public Administration and Governance D - Physical and Natural Environment C - Protect Community Structures and Lifestyle B - Protect and Enhance Local Economy A - Maintain Public Safety						1) Ensure planning controls refer to NSW coastal management areas and DCP controls developed. 2) Ensure sea level rise is included in the development of the Coastal Management Program 3) Work collaboratively with neighbouring councils to complete the Coastal Management Program and develop a Coastal Management Plan 4) Prepare a vulnerability assessment to determine future impact of climate change on biodiversity values 5) Prepare biodiversity adaptation strategy to minimise climate impacts through policy, planning
SLD11	An increase in sea level may cause a loss or changes to key ecosystems which could impact on tree, plant and animal species and may reduce ecosystem services such as nutrient and sediment removal, fish production, etc from wetland areas		Infrastructure & Assets	- No specific controls. We have completed a past research project on the impacts of sea level rise on macrophytes in the estuary	Possible	Moderate	High	

		instruments and operational activities	
SLC12	An increase in East Coast Lows and coastal inundation events may result in impacts on coastal nature reserves, beaches, natural public recreational sites, roads, cararks, jetties foreshore/ coastal natural walking paths (erosion) – loss of foreshore vegetation, beaches, boats moored closed to shore.	<p>Infrastructure & Assets</p> <ul style="list-style-type: none"> - Revegetate and protect riparian vegetation - Floating Landcare - Reactive approaches 	<p>Likely</p> <p>Moderate</p> <p>High</p> <p>1) Continue funding of floating Landcare and current revegetation project 2) Investigate and partner with researchers on the effects of east coast lows to quantify the issue and impacts 3) Ensure planning controls align with NSW coastal management framework and NSW Coastal Management Areas 4) Ensure sea level rise and coastal inundation are included in the development of the Coastal Management Program</p>
SLC13	An increase in sea level may cause loss/damage to coastal transport infrastructure (including roads, wharfs, jetties cararks and bridges) affecting Council assets, businesses and residents	<p>Infrastructure & Assets</p> <ul style="list-style-type: none"> - Current asset and maintenance schedule 	<p>Possible</p> <p>Moderate</p> <p>High</p> <p>1) Liaise with NSW Transport regarding the potential impacts and adaptation for the trainline along the estuary 2) Local emergency management/ evacuation plan for localised flooding 3) Development of community resilience program 4) Ensure sea level rise is integrated into asset design and management</p>
SLBL4	An increase in sea level may cause changes to private and public land use due to erosion and salinisation, affecting landholders, residents and businesses within the Hornsby Shire	<p>Land-use Planning & Development</p>	<p>Possible</p> <p>Moderate</p> <p>High</p> <p>1) Review information on 10.7 Certificates and other Council controls in the DCP to ensure best practice 2) Local emergency management/ evacuation plan for localised flooding</p>

	proactive compliance inspections of properties under construction and located on/near waterways						
SLA16	An increase in sea level may cause loss/damage to public property including Council assets due to erosion, re-alignment of shores, increased flooding, etc, which could impact on Council's services to the public	Infrastructure & Assets	- Current asset and maintenance schedule		1) Planning control requirements for existing structures e.g. retrofits/ extensions 2) Investigate installation of sea walls 3) Protection of existing mangroves to act as sea level rise buffers- slowing down erosion/inundation 4) Consider the accumulative impacts of increase boat use/ boat wash in addition to sea level rise 5) Liaise with Maritime and Fisheries to address potential sea level rise issues/impacts 6) Investigate development of community resilience program	High	
SLDL7	An increase in sea level may impact water quality due to the salinisation of coastal freshwaters and the inundation of mangroves which could cause damage/loss to the natural environment	Land-use Planning & Development	x	Possible	Minor	Medium	

SLDL8	An increase in sea level may cause possible soil contaminants to leach into groundwater resulting in changes to the physical and natural environment	x	Land-use Planning & Development	Possible	Minor	Medium	All risks including low and medium risks are to be reviewed on a regular basis to ensure any new impacts or risks are identified
SLEL9	An increase in sea level may cause uncertainty in decision making around coastal planning and development resulting in legal liability or loss of reputation	x	Land-use Planning & Development	- Current planning controls	Likely	Moderate	1) Undertake further research and monitoring
SI ECO10	There is a risk that Council will not have the financial capacity to fund the works required in the future, including: the development of identified strategies, and in managing the community expectations associated with the impacts of an increase in the sea level.	x	Corporate Services	- Long term financial planning - Development Contributions - Apply for grant funding	2-Some Benefit	Almost Certain	1) Develop a community resilience program 2) Adequately consider and assess financial implications of managing coastal hazard through coastal management planning

12.7 Extreme Rainfall and Storm

Risk ID	Will impact in our ability to:	Functional Area	Current Controls	Adequacy of Controls	Likelihood	Consequence	Risk Rating	Future Adaptations (for risk rated HIGH and EXTREME)
ERCE1	Rainfall extremes are projected to increase in the near future (by 2030) and the far future (by 2070). The increases in the near future are not considered to be significant. However, in the far future, significant increases in several rainfall indices are projected for some regions of NSW. 2010 Scenario - There is a risk that the number of days annually when the total rainfall is defined as 1 in 40-year intensity will change by -3% and 12% by 2030 and -7% and +10% by 2070.	E - Sound Public Administration and Governance	Emergency Mgt & Natural Disaster preparedness	- Proactive maintenance asset management, - Flood risk management plan, - Land use planning, - Safety by design in new assets.	2-Some Benefit	Likely	Minor	All risks including low and medium risks are to be reviewed on a regular basis to ensure any new impacts or risks are identified
ERAEE2	An increase in the number of extreme rainfall/storm events may increase the risk of damage to Council, private assets and infrastructure which will affect Council Services	C - Protect Community Structures and Livestock	x	Emergency Mgt & Natural Disaster preparedness	- Around Council's built assets there is proactive maintenance of trees. - Some informal monitoring of park assets. - CRM system used to respond to customer complaints. - Insurance, - Disaster Relief Funding.	2-Some Benefit	Possible	1) Investigate mapping of all trees in public areas with condition assessment (inventory) 2) Prioritisation of risk areas 3) Proactive inspection and maintenance 4) Asset Management Plans to consider surrounding precinct not just built asset 5) Implement Urban Forest Strategy (including appropriate species selection) 6) Implement Biodiversity Conservation Management Plan 7) CRM system to link with Asset Management Plan (including trees)
		D - Physical and Natural Environment					Major	High
		A - Maintain Public Safety						
		B - Protect and Enhance Local Economy						
		C - Protect Community Structures and Livestock						
		D - Physical and Natural Environment						
		E - Sound Public Administration and Governance						

An increase in the number of extreme rainfall/storm events may cause variations in environmental flows which may affect the natural ecosystems	<p>Infrastructure & Assets</p> <ul style="list-style-type: none"> - WSUD, - Stormwater detention - Planning controls - Water quality monitoring buoys in the river 	<p>2-Some Benefit</p> <p>Likely</p> <p>x</p>	<p>1) Implement Flood Planning and Mitigation</p> <p>2) Work with other Councils to improve upstream development</p> <p>3) Participate in Hawkesbury River Flood Management Studies</p> <p>4) Implement Water Sensitive Hornsby Strategy (sensitivity analysis)</p> <p>5) Deploy flow gauges</p> <p>6) Update Development Control Plan</p> <p>7) Investigate Onsite Stormwater Detention requirements and landscaped area review based on size of development</p> <p>8) Continue to implement CRR works</p> <p>9) Develop catchment specific targets - sub catchment management plans</p> <p>10) investigate resourcing of enforcement and compliance to enable proactive inspection regimes of development sites (appropriate and maintained sediment and erosion control measures)</p>
			<p>Infrastructure & Assets</p> <ul style="list-style-type: none"> - Existing capital works program, - Conditions of consent
An increase in the number of extreme rainfall/storm events may cause increased rates of erosion which may result in surface runoff and stormwater pollution, affecting the natural and physical environment within the Hornsby Shire		<p>2-Some Benefit</p> <p>Likely</p> <p>x</p>	<p>1) Review Councils flood planning and control measures</p> <p>2) OSD requirements and landscaped area review based on size of development</p> <p>3) Investigate resourcing of enforcement and compliance to enable proactive inspection regimes of development sites</p> <p>4) Extreme erosion index</p> <p>5) Utilise data to improve planning controls for reduction of stream erosion</p> <p>6) Maintain water quality monitoring program</p> <p>7) Implement Eco health (riparian areas)</p> <p>8) Proactive capital works to mitigate erosion in creeks</p> <p>9) Implement Biodiversity Conservation Management Plan and Water Sensitive Hornsby Strategy</p>

An increase in the number of extreme rainfall/storm events may cause possible soil contaminants to leach into groundwater resulting in changes to the physical and natural environment	x	Infrastructure & Assets	- Planning certificates	2-Some Benefit	Likely	Moderate	High	<ul style="list-style-type: none"> 1) Undertake Groundwater assessment 2) Update DCP to include groundwater report for developments doing excavations 3) Layer on Intramaps of contaminated sites. 4) Review DCP controls for water quality
An increase in the number of extreme rainfall/storm events may cause an increased risk to the general safety of the community	x	Emergency Mgt & Natural Disaster preparedness	- Local emergency response and clean up	2-Some Benefit	Almost Certain	Minor	High	<ul style="list-style-type: none"> 1) Participate in local emergency response and clean-up 2) Investigate development of community resilience program including proactive communications of storm events 3) Work with local oyster farmers to monitor the impact on harvesting
An increase in the number of extreme rainfall/storm events may cause a reduction in the use of certain Council facilities due to water related damage or threat	x	Community Services	- Proactive maintenance of assets	2-Some Benefit	Almost Certain	Minor	High	<ul style="list-style-type: none"> 1) Proactive maintenance of assets
An increase in the number of extreme rainfall/storm events may cause loss/damage to transport infrastructure (including roads, wharfs, jetties, train lines and bridges) affecting Council assets, businesses, residents and general commuters within the Hornsby Shire	x	Infrastructure & Assets	- Public notifications on transport delays. - Proactive maintenance regimes for Council assets. - Insurance	2-Some Benefit	Possible	Minor	Medium	All risks including low and medium risks are to be reviewed on a regular basis to ensure any new impacts or risks are identified
An increase in the number of extreme rainfall/storm events may impact the water quality of water catchments within Hornsby Shire due to surface runoff and sewer overflows, onsite waste water treatment systems entering the stormwater system and affecting creeks, wildlife and the natural environment	x	Infrastructure & Assets	- Licensing - Public notifications - Water quality monitoring sensors - Conditions of consent - Proactive investigation of source pollution (bacto)	2-Some Benefit	Almost Certain	Minor	High	<ul style="list-style-type: none"> 1) Record Sydney Water notifications for bypass and overflow 2) Quantify impact and report on licensing conditions 3) Lobby Sydney Water and EPA about licensing and to upgrade facilities 4) Investigate resource for enforcement and compliance to undertake proactive management of onsite waste water treatment systems 5) Consider fees and charges for inspection regimes (cost recovery) 6) Update OSSM Strategy to incorporate proactive inspection regime (surface runoff adaptations from above)

ERAE10	An increase in the number of extreme rainfall/storm events may cause loss/damage to private property due to possible flooding, fallen tree branches, etc, affecting residents and businesses	x	Emergency Mgt & Natural Disaster preparedness	- Planning controls and conditions of consent, - Education on tree selection	2-Some Benefit	Almost Certain	Major	Extreme	<ul style="list-style-type: none"> 1) Education 2) Provide residents with recommended trees species list 3) Implement Urban Forest Strategy - share species lists as part of conditions of consent 4) Tree protection plans for new developments 5) Update LEP and ensure Council undertakes adequate flood planning activities inline with the NSW Flood Prone Lands Policy with regards to Flood Mapping. 6) Advocate/ lobby state govt to require private certifiers to certify landscape plans 7) Investigate resource to continuing monitoring of landscape plans
EREKO11	An increase in the number of extreme rainfall/storm events may cause an increased strain on Emergency Services (RFS and SES) possibly resulting in an increased strain on Council's resources		Corporate Services	- Disaster relief funding, - Support local emergency management (as per fire financial support)	2-Some Benefit	Likely	Minor	Medium	All risks including low and medium risks are to be reviewed on a regular basis to ensure any new impacts or risks are identified
EREI12	An increase in the number of extreme rainfall/storm events may increase the risk of loss of public utility services (electricity, water, gas, telecommunications, etc) which will cause for power outages/interruptions to Council buildings and services caused by damage to electricity suppliers' infrastructure during periods of extreme rainfall periods and impacting on air-conditioning, communications, equipment, IT, lighting, etc		Infrastructure & Assets	- Asset management planning, -Reactive response	2-Some Benefit	Likely	Minor	Medium	All risks including low and medium risks are to be reviewed on a regular basis to ensure any new impacts or risks are identified
ERBE13	An increase in the number of extreme rainfall/storm events may increase the risk of loss of public utility services (electricity, water, gas, telecommunications, etc) which will cause for power outages/interruptions to private properties and businesses	x	Emergency Mgt & Natural Disaster preparedness			Likely	Moderate	High	<ul style="list-style-type: none"> 1) Emergency response communications 2) Proactive updates to Councils website and social media to inform residents on actions 3) Investigate development of community resilience program

ERA14	An increase in the number of extreme rainfall/storm events may increase damage to properties, roads and bridges from landslides and landslides	x	Infrastructure & Assets	- Risk assessments undertaken on vulnerable assets, - Asset management system - Conditions assessments	2-Some Benefit	High	1) Proactive Asset Management Plans (AMPs) 2) Map current vulnerability, and AMPs review to include assessment of risks from landslips and landslides 3) Additional submission requirements for developments assessments relating to dilapidation reports and construction vehicle plans of management 4) Asset Management Plans to incorporate climate change projections and risk assessment
ERAE15	An increase in the number of extreme rainfall/storm events may increase damage to private properties, roads and bridges from landslips and landslides	x	Emergency Mgt & Natural Disaster preparedness	- Resource emergency services (as Forest Fire Index) - Mapping of steep land - Notified via planning certificates	Major	High	1) Investigate development of community resilience program 2) Education on emergency management plans and Hornsby Local Emergency Plan (smaller and larger plans). 3) Asset Management Plans to incorporate climate change projections and risk assessment
ERECO 16	An increase in the number of extreme rainfall/storm events may increase damage to private properties, roads and bridges from landslips and landslides	x	Corporate Services	- Long term financial planning - Development Contributions - Apply for grant funding	Almost Certain	Moderate	1) Investigate employment of a Grants Officer 2) Investigate alternative funding sources for Climate Change 3) Apply for grant funding where possible 4) Investigate the allocation of Developer Contributions 5) Integrate strategies to align with Long Term Financial Plan (QBL) and business case development 6) Delivery Program and Operational Plan to identify regional project opportunities
ERDL17	An increase in the number of extreme rainfall/storm events increases negative public perception of the risks of trees and bushland on public and private land, result in increased clearing of trees.		Land-use Planning & Development	- Community education on benefits of trees, - Insurance	Minor	High	1) Additional effort to reinforce the value of trees in the community and context on the risks 2) Appropriate tree selection - right tree in right location 3) Implement Urban Forest Strategy

ERAE	Impact	Resilience Action	Owner	Risk Level	Impact Level	Notes
ERAEE18	An increase in the number of extreme storm events may cause increased risk of damage to infrastructure or wild fires due to lightning strike.	x		Emergency Mgt & Natural Disaster preparedness	Possible	Minor
ERACO 19	An increase in the number of extreme rainfall/ storm events may cause an increased pressure on waste services as a result of storm.	x	Corporate Services	- Drop off centre established at Community Recycling Centre for spoiled food	Likely	Minor
ERAEE20	An increase in the number of extreme rainfall/ storm events may cause an increased demand for use of council facilities as refuges and for access to electricity and water	x		Emergency Mgt & Natural Disaster preparedness	Likely	Minor
ERACS 21	An increase in the number of extreme rainfall/ storm events may cause an increased impact on public health (asthma etc) due to storm events	x	Community Services		Possible	Major

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A dark, atmospheric landscape photograph showing silhouettes of trees against a bright sky. The scene is mostly in shadow, with the tops of several trees visible against a lighter, overexposed background.

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