



Wollongong City Council

Climate Change Adaptation Plan

March 2022





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Executive Summary

Our climate is changing. Although Wollongong City Council and other levels of government, industry and communities around the world are acting to reduce their greenhouse gas emission, some changes are already locked into the climate system and are impacting our lives. The CSIRO informs us that Australia's climate has warmed on average by 1.44°C since national records began in 1910. This is leading to a range of changes including an increase in the frequency of extreme heat events, changes to rainfall patterns, an increase in extreme fire weather (catastrophic bushfires), rising sea levels and ocean acidification. These climate hazards mean that we must adapt our buildings and infrastructure and services to ensure that we can continue to provide Councils services for our community. This Climate Adaptation Plan sets out how we will do that.

Wollongong City Council declared a climate emergency in 2019 and we are taking strong action to back up this declaration, through both mitigation (cutting our greenhouse gas emissions) and adaptation (preparing for the changes that are already locked into the climate system). Council has joined the Global Covenant of Mayors for Climate and Energy, which commits us to prepare this Adaptation Plan, to accompany our Climate Change Mitigation Plan 2020-2022. The approach outlined in this plan builds on the climate adaptation work Council has been undertaking since its first climate adaptation plan was produced in 2009.

As climate change is projected to occur throughout this century, Council is taking a long-term and staged approach to adaptation. This will be achieved by adopting a pathway of adaptation for coming decades that will inform detailed actions in our delivery program. It will be updated as science and technologies develop in response to the climate challenge. To do this, Council has analysed the climate risks specific to the Wollongong Local Government Area to help us understand what is projected to happen and when. A risk assessment of projected impacts to Council infrastructure,



services and activities was then undertaken with Council staff, to identify risks and what we can do to manage them. This process also identified many opportunities where Council can act to reduce climate impacts whilst helping create improvements and benefits for the community.

The adaptation actions identified in this plan have been set out in response to each group of climate hazards:

- Heat
- Flooding
- Bushfire
- Storms
- Drought
- Storm tide inundation
- Sea level rise and tidal inundation

The timeframes for delivery of actions are:

- Community Strategic Plan 2022-2026
- Short-term 2021-2030
- Medium-term 2030-2050
- Long-term 2050-2070

These timeframes are longer than those used in most Council supporting documents due to the gradual and on-going nature of changes to the climate.

Following public exhibition and endorsement by Council, the adaptation pathway outlined in this plan will be integrated into Council's Integrated Planning & Reporting framework of plans and documents.

Climate change is a complex topic. This Plan is written in plain English, that aims to be easy to understand. When technical terms and concepts are used, we have included break out boxes to explain and define key details. There is also a glossary of terms at the end of the Plan.

1. Introduction and purpose

1.1 Council must adapt with our community

The science is compelling

The science behind our understanding of climate change is compelling. In the latest State of the Climate report the CSIRO and the Bureau of Meteorology have documented that we have experienced “continued warming of Australia’s climate, an increase in extreme fire weather and length of the fire season, declining rainfall in the southeast and southwest of the continent, and rising sea levels”.

The risks are real

To prepare for the risks that this continued change in our climate presents we must be informed to understand the likely risks. This includes physical risks such as:

- Storm-tide inundation
- Sea-level rise and tidal inundation
- Erosion
- Flooding
- Heat and increased temperature
- Bushfire

Our response is informed and long-term

Council is taking an informed, long-term approach to addressing the risks and adapting to the projected changes. Climate change is expected to occur throughout this century, so we will take staged actions in response to issues as they occur.

Council will continue to factor climate change considerations into our planning and decision making. New assets and buildings will be designed to be resilient to projected climatic conditions. Much of our infrastructure will be renewed during the normal course of Council operations, so when the time comes, consideration will be given to climate-adapted designs and materials. Some challenges are going to be difficult, such as protecting our coastline from rising sea level and inevitable erosion and inundation. Some adaptations will enhance our quality of life, while addressing climate challenges. Improved tree canopy cover can help manage urban heat whilst increasing local beauty and improving biodiversity. Improvements to water harvesting and storage can increase the usability and beauty of public spaces. The need to improve buildings to withstand extreme weather may improve the overall design quality of community assets.



Lived experience:

In the summer of 2019/20, bushfires burnt large areas of the Shoalhaven, south of Wollongong. Several staff from Wollongong City Council contributed to supporting communities affected by the fires. A crew of council arborists were responsible for making it safe for residents to return to their properties where the fire had burnt vegetation next to the access road for their property. Paul Smith, one of the arborists involved in the work commented “for some of the residents, they were driving past us on their way to see what was left of their property for the first time since the fire. It was heart-breaking to see.”

Refugee perspective:

Extreme weather events can be particularly harrowing for members of the community that are not familiar with the local climate, such as refugees. The University of Wollongong has developed a co-learning disaster resilience toolkit to help support refugees to find safety when faced with environmental challenges which will be more likely with climate change. See www.preventionweb.net/files/57379_colearning_disaster_resiliencetoolkit.pdf

Difficult challenges:

Managing the implications of climate change and sea level rise is a challenge that requires longer term planning. The Wollongong Coastal Zone Management Plan (CZMP) has identified coastal hazards associated with 2030, 2050 and 2100 and sets out the measures to minimise their impact. Council is now in the process of updating the CZMP into a Coastal Management Program for the Open Coast. Council is well placed to undertake this work given it recently developed a Coastal Management Plan for Lake Illawarra in partnership with Shellharbour City Council.

1.2 Projected climate change

Council has used the NSW Government's AdaptNSW climate change reports and data to inform our climate change risk assessment and this Adaptation Plan. A strength of the AdaptNSW information is that it provides locally specific information and projections. So, as well as accessing climate science on the global and national trends, we have been able to focus on the likely changes and impacts for our region.

Figure 1 sets out the projected changes for our region in the near future (left column 2020-2039) and far future (right column 2060-2079) timeframes.

2020-2039	2060-2079
PROJECTED TEMPERATURE CHANGES 2020-2039	
 Maximum temperatures are projected to increase in the near future by 0.4-0.9°C	Maximum temperatures are projected to increase in the near future by 1.6-2.3°C
 Minimum temperatures are projected to increase in the near future by 0.4-0.7°C	Minimum temperatures are projected to increase in the near future by 1.5-2.4°C
 The number of hot days will increase	The number of cold nights will decrease
PROJECTED RAINFALL CHANGES 2020-2039	
 Rainfall is projected to decrease in winter	Rainfall is projected to increase in summer and autumn
PROJECTED FOREST FIRE DANGER INDEX (FFDI) 2020-2039	
 Average fire weather is projected to increase in spring	Severe fire weather is projected to increase in summer and spring in the far future

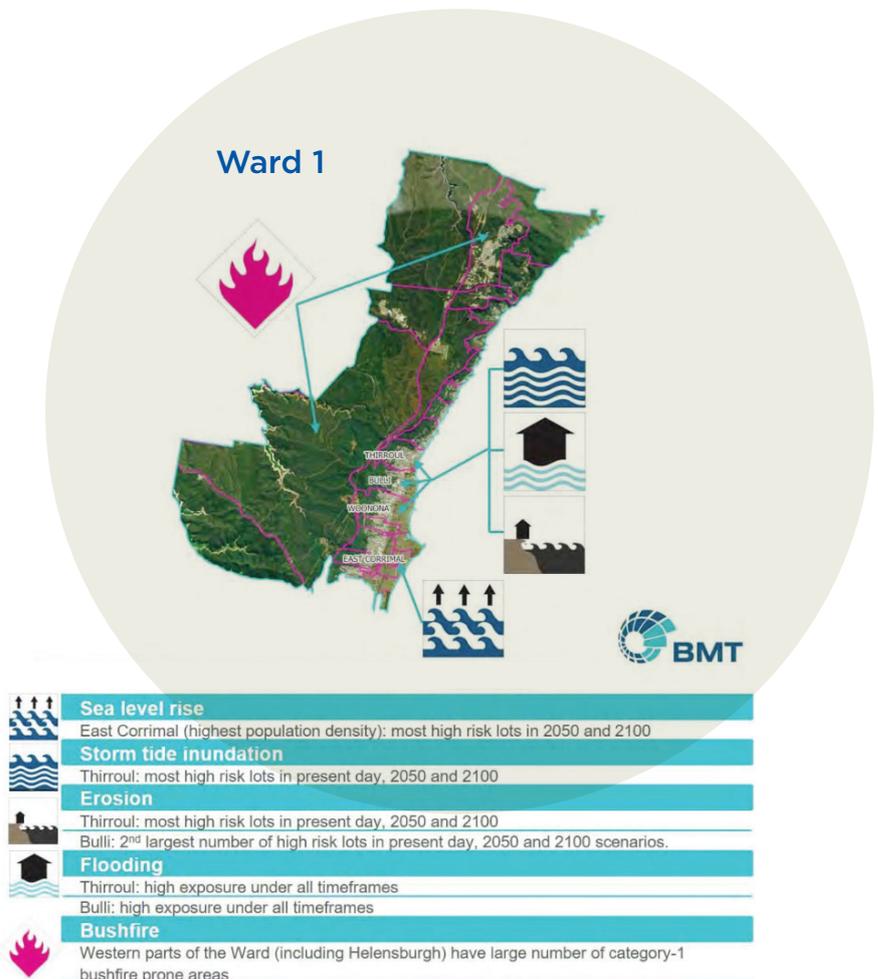
FIGURE 1: Projected climate changes in Illawarra region from AdpatNSW, Illawarra Climate Change Snapshot

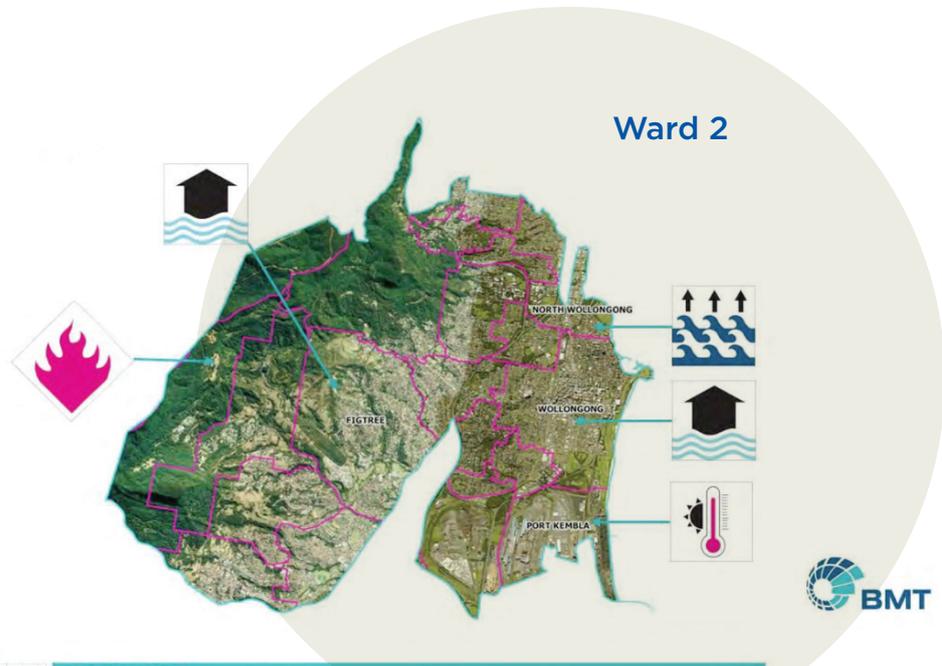
Climate Change Risk and Vulnerability Assessment

This plan is informed by the Climate Change Risk Assessment of Wollongong (CCRAW) undertaken for Council by BMT Commercial Australia in February 2021. The CCRAW examined Council's hazard mapping for storm-tide inundation, sea level rise, erosion and flooding as it related to projected conditions for present day, 2050 and 2100. It also considered the issues of increased heat and bushfire severity for the Wollongong LGA.

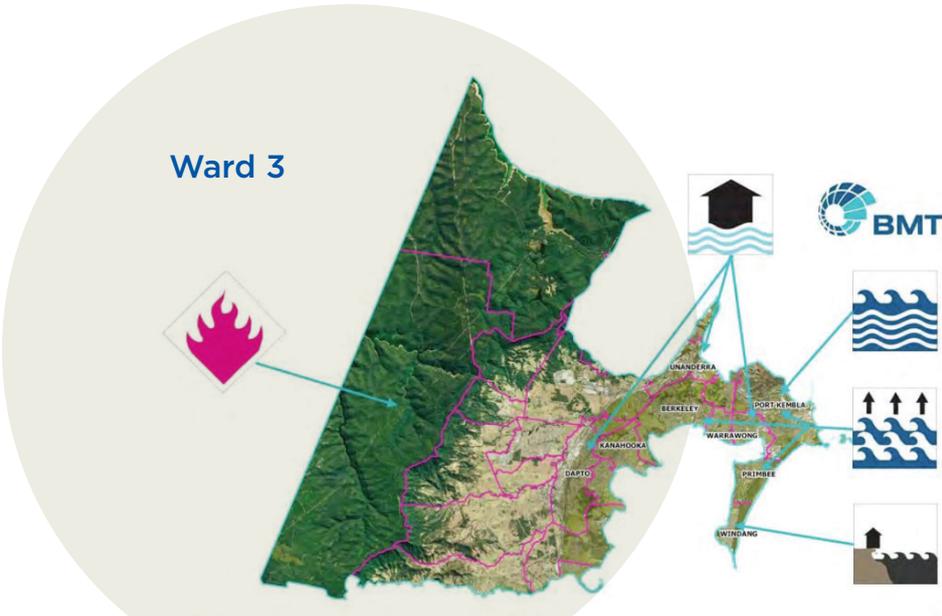
The CCRAW examined likely impacts on land parcels, network assets such as roads, bridges, stormwater networks and cycle pathways.

A summary of the physical risks was mapped across each Ward of the Wollongong local government area. Figures 2-4 summarise the projected impacts for each ward through to the end of this century.





- 
Sea level rise
 North Wollongong: most high risk lots in present day, 2050 and 2100
- 
Flooding
 Figtree: most high risk lots in present day, 2050 and 2100
 Wollongong: 2nd most high risk lots in present day, 2050 and 2100
- 
Bushfire
 Western parts of the Ward have large number of category-1 bushfire prone areas
- 
Land surface temperature
 Port Kembla/Springhill: highest Land Surface Temperature in summer (present day) compared to other areas



- 
Sea level rise
 Primbee: most lots at high risk in 2050 and 2100
 Kanahooka/ Port Kembla/ Berkeley: large number of at risk lots in 2050 and 2100
- 
Storm tide inundation
 Port Kembla: medium risk 2050 and 2100
- 
Erosion
 Windang: high risk 2050 and 2100
- 
Flooding
 Dapto: largest number of high risk lots in current day
 Unanderra/ Warrawong: medium risk in present day, 2050 and 2100
- 
Bushfire
 Western parts of the Ward have large number of category-1 bushfire prone areas

1.3 Scope of the Plan

Adaptation vs Mitigation

Responding to climate change involves both reducing greenhouse gas emissions (mitigation) and being prepared to adapt to any unavoidable impacts of climate change as they are realised (adaptation). This plan is focusing on how we plan to adapt to projected changes in climate. A separate Climate Change Mitigation Plan 2020-2022 (CCMP) has been prepared to address how Council and the community will cut our greenhouse gas emissions to minimise our contribution to manmade climate change. A second CCMP will be forthcoming. There are often synergies and co-benefits of actions for both mitigation of and adaptation to climate change. As Council continues to review and advance its planning and activities these synergies will be identified and pursued.

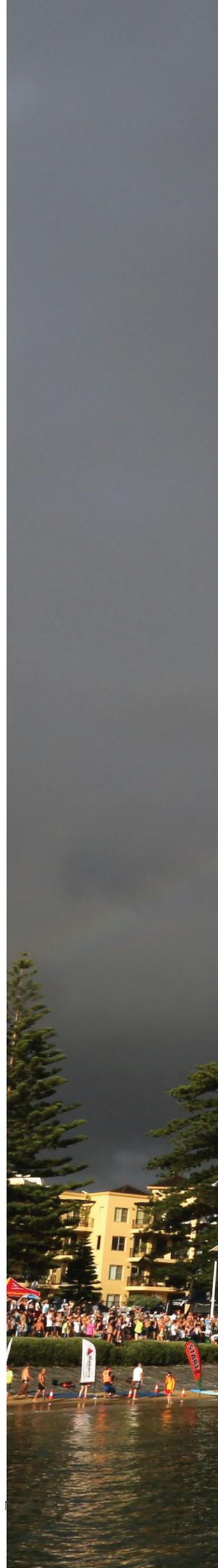
Role of local government

Climate change adaptation and mitigation is the responsibility of all spheres of government as well as businesses, the community and individuals. While Council recognises that local government has an important role in both mitigation and adaptation, it is also important to recognise that many strategies for adaptation are outside the statutory responsibility and influence of local government. Council's responsibilities relate to maintaining existing Council assets and services while it is viable and safe to do so and to ensure that climate change is factored into the planning and design of all relevant decisions, strategies and plans. We must also communicate openly with our community to help residents and businesses understand coming changes and how we can all best adapt.

1.4 Objectives of the Plan

The overarching objectives of the Plan are to:

1. Demonstrate leadership in climate change adaptation planning and action.
2. Identify and understand the risks to council infrastructure, services and operations.
3. Acknowledge the work that Council is already doing to adapt to climate change.
4. Set out what Council can do in coming years and decades to prepare for and adapt to climate change.





2. Context

2.1 International, Australia and New South Wales context

Climate change was formally recognised globally at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro. In 2015, a global commitment by countries was agreed at the 21st Conference of the Parties in Paris. The Paris Agreement includes a global commitment to limit global temperature rise to below 2°C above pre-industrial levels and pursue efforts to limit the rise to 1.5 degrees and a commitment to achieve net-zero emissions, globally, by the second half of the century.

The Sustainable Development Goals is a global strategy agreed by the United Nations General Assembly, and contains 17 goals for 2015-2030, including the following goals directly relevant to climate change mitigation and adaptation (United Nations, 2020) (Figure 5).



FIGURE 5: Sustainable Development Goals directly relevant to climate change, United Nations 2021.

2.2 Wollongong City Council context

Council's Planning Framework

Our Wollongong 2028 is the Council's Community Strategic Plan. Our Wollongong 2028 includes a community vision and goals and guides Council's work. Climate change is highlighted as a key challenge for our future. This Plan contributes to multiple goals, objectives, strategies and actions from the Our Wollongong 2028, and specifically addresses the Strategy 1.2.2 'Government and community work together to mitigate and adapt to the impacts of climate change on our environment and future generations'.



Sustainable Wollongong: A Climate Healthy City Strategy

The Sustainable Wollongong: A Climate Healthy City Strategy outlines Council's commitment to environmental sustainability for both Council operations and our community and identifies pathways to create a sustainable, greener, healthier, cooler and more liveable City. The Strategy is an overarching document that brings together the many environmental programs that we are implementing across our City and Council's operations. The priority areas and goals of the Strategy are:

- Priority Area:** A city whose council shows leadership
Goal: Environmental and climate leadership underpins Council decision-making and service delivery which inspires the same in others
- Priority Area:** A city that works together
Goal: Together we protect our environment, reduce emissions and increase our resilience to climate change
- Priority Area:** A low emissions city
Goal: We will achieve net zero emissions by 2030 for Council operations, and together we will achieve net zero emissions by 2050 for the city
- Priority Area:** A city in harmony with our environment
Goal: Our ecosystems and waterways are enhanced, our urban areas are cooler and greener and our community is connected to our natural environment
- Priority Area:** A low waste city
Goal: Our community only take what they need, reuse and recycle what they can and are aware of the resources that they consume
- Priority Area:** A climate and water resilient city
Goal: Our infrastructure and community can adapt to a changing climate and water is valued as a vital natural resource

This Adaptation Plan falls within the suite of documents that underpin the Strategy, and the actions within this Plan aim to deliver on many of the goals of the Strategy.

Global Covenant of Mayors (GCoM) for Climate and Energy

The GCoM is an international alliance of cities and local governments with a shared long-term vision of promoting and supporting voluntary action to combat climate change and move to a low emission, resilient society. The GCoM merges the Compact of Mayors and the EU based Covenant of Mayors, with 9,209 cities around the world having committed to date.

The GCoM commits Council to undertake certain actions to respond to the risks and opportunities presented by climate change. The GCoM provides a structured framework for compliance. Key steps in the GCoM framework are:

- Public commitment to addressing climate change
- Undertake an emissions inventory
- Undertake a climate change hazard assessment
- Adopt science-derived emissions reduction target for the local government area





- Undertake a climate change vulnerability assessment
- Develop a climate change mitigation plan to reduce emissions
- Develop a climate change adaptation plan to manage unavoidable impacts of climate change

Council has completed the above steps other than the Climate Change Adaptation Plan. This plan represents the last milestone in the series of commitments outlined in the GCoM framework. It is important to note that mitigation and adaptation plans are intended to be reviewed and updated to ensure they are current and responsive to the latest climate science and social responses.

As a signatory to the GCoM, Council has committed to preparing this Adaptation Plan and the accompanying Climate Change Mitigation Plan. This Plan represents the last step in the series of commitments outlined in the GCoM framework. As part of the Plan, we are required to establish adaptation and mitigation targets and report against them.

One of the strengths of the GCoM organisation is that it requires its signatories to report on progress against their stated goals. By holding its members to account, the GCoM is able to drive climate action in the cities of the world through mutual support and accountability. Wollongong welcomes the opportunity to be part of this global climate action by committing to the targets set out in Table 1.

TABLE 1: Wollongong City Council targets for the Global Covenant of Mayors

TARGET	DUE DATE	STATUS
1 Community endorsement of this Adaptation Plan	2021	Draft
2 Inclusion of climate change adaptation in the revised CSP	2022	Yet to start
3 Implementation of short-term actions	2022-2030	Yet to start

It is important to note that mitigation and adaptation plans are intended to be reviewed and updated to ensure they are current and responsive to the latest climate science and social responses.

Climate Emergency

In 2019, Council declared we are in a state of climate emergency that requires urgent action by all levels of government. Council has set a target of net zero emissions by 2050 for the City of Wollongong. Council also recognised the significance of its own contribution to the City's emissions and the need to demonstrate leadership, and so set a target of net zero emissions by 2030 for its own operations. Council has developed a Climate Change Mitigation Plan 2020-2022 which describes the initial actions on our journey towards net zero emissions. A new CCMP is currently under development.

2.3 Council is already acting on climate adaptation

Adaptation - work to date

Much work has already been done to help Council and our community adapt to the changing climate. Here are the key steps we have taken so far:

- Council undertook our first comprehensive climate change risk assessment and adaptation plan in 2009.
- Soon after the first climate change adaptation plan was developed, Council began undertaking a coastal zone hazard assessment and management study, which was used to inform the development of the Coastal Zone Management Plan, finalised in 2017.
- Council integrated climate change projections related to increased rainfall intensity into floodplain risk assessments. Sea-level rise implications were also considered where relevant.
- Council developed a strategic asset management framework in 2011 to ensure that assets are managed systematically. This approach allows climate change to be integrated into asset planning over time.
- In partnership with Shellharbour and Kiama Councils, Wollongong Council developed a Biodiversity Strategy that considered climate change impacts on local ecosystems.
- Council undertakes natural area restoration and supports volunteers through Bushcare, Dunecare and FiReady programs to increase the resilience of natural areas.
- We have prepared and continue to deliver on strategic programs, incorporating climate change adaptation, including:
 - Urban Greening Strategy – Council has planted more than 5,000 new street trees and other plants to renew our urban forest and cool our urban environments.
 - Lake Illawarra Coastal Management Program (CMP) – in partnership with Shellharbour Council, relevant State Government Agencies, and residents, Council identified key values to be preserved and enhanced in and around Lake Illawarra. The CMP prescribes 39 actions for delivery over the next 10 years to protect and enhance the lake, its ecosystem and associated assets.
 - Coastal Zone Management Plan – Council has undertaken dune management works and estuary opening activities. Coastal hazards are considered in assessment of development and changes in beach and dunes are monitored over time.
- In 2021, we refreshed our climate change risk assessment by commissioning a detailed risk assessment of our assets, operations and key community services. This Adaptation Plan communicates how we will respond to these identified risks in the coming years.



Interdependency - working with others

Like many other areas of policy, climate change cannot be addressed by Council alone. We actively work with others to coordinate the delivery of services and to maintain our LGA. All levels of government, the Australian Government, the NSW Government and Wollongong City Council, have responsibilities, and all must collaborate to ensure the long-term wellbeing of our community. Council has defined powers and responsibilities, but many issues lie outside the limits of Council control yet remain important to us.

The community looks to Council to lead the way in addressing climate change impacts. To see results, Council often needs to work with government authorities and the community. Council contributes to a broad range of areas impacted by the changing climate such as the management of emergencies, bushfires, fresh water supply, mine operations, road and transport planning, heritage, biodiversity, pests and weeds, community health, community development and economic development.

Council has a Local Emergency Management Officer (LEMO) and several key staff that work with emergency authorities in a coordination role with State Emergency Service, National Parks and Wildlife Service, Rural Fire Service, Police and Ambulance as well as many other organisations in delivering local responses to emergencies such as bushfires, flooding and storms.

When issues lie outside Council control, we can act as an advocate, an enabler, an educator and a broker. The diagram in Figure 6 below shows Council's spheres of influence and helps to set out what we control, influence and what remains a concern even though outside our control.

We are staying connected with councils around the world, through our participation in the Global Covenant of Mayors, and in Australia through the Cities Power Partnership, Sustainability Advantage program and Climate Emergency Australia to learn from what others are doing.

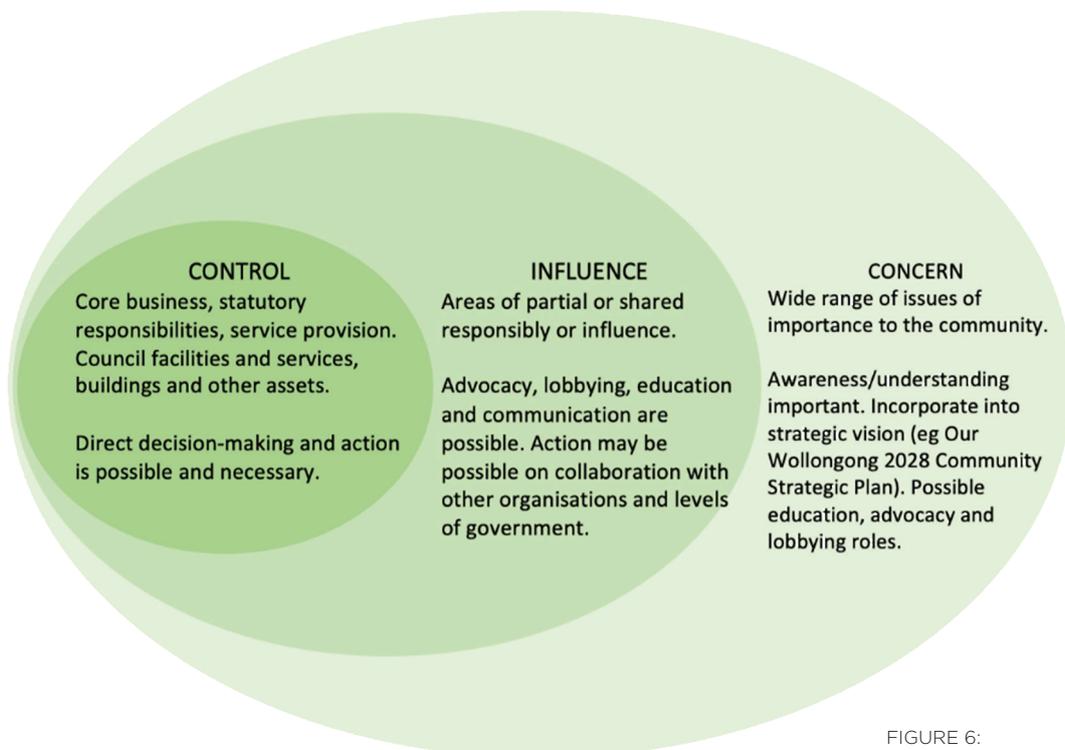


FIGURE 6:
Council's *spheres of influence*,
adapted from a similar diagram used by the
City of Sydney in its Sustainable Sydney 2030 Vision.

Emission reductions in Wollongong

Council's current operational emissions are shown in Figure 7. We have set 2030 as the target by which time we will reach zero-emissions. See the Climate Change Mitigation Plan for 2020-2022 for full details.

FIGURE 7: Wollongong Council operational emission in baseline year 2017-18, total 139,404 tCO₂-e

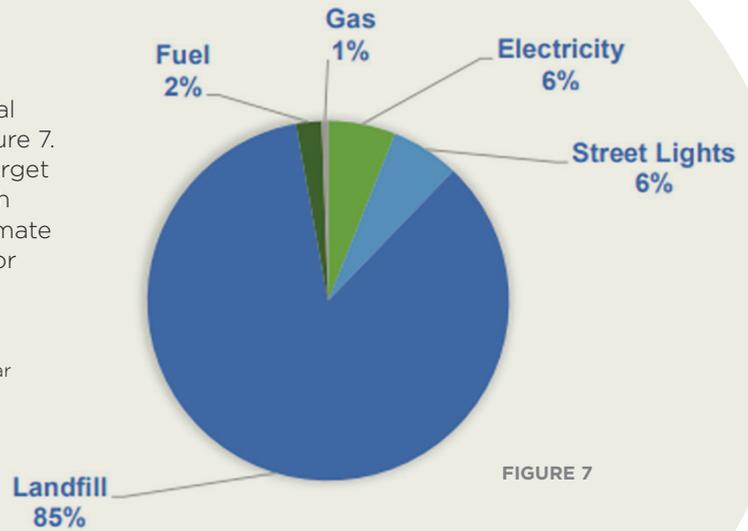


FIGURE 7

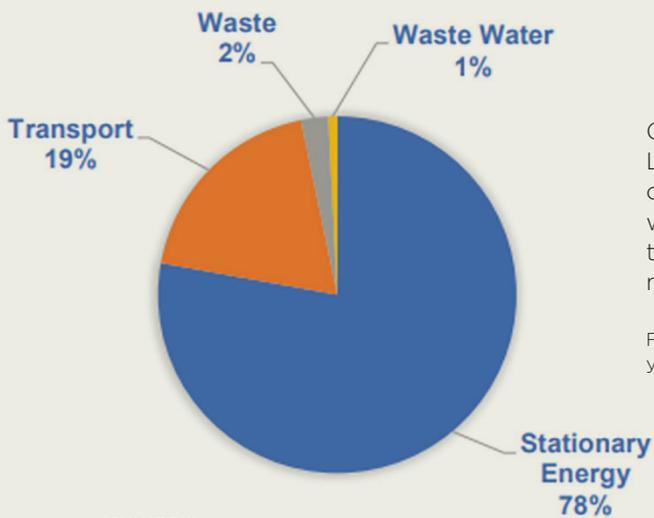


FIGURE 8

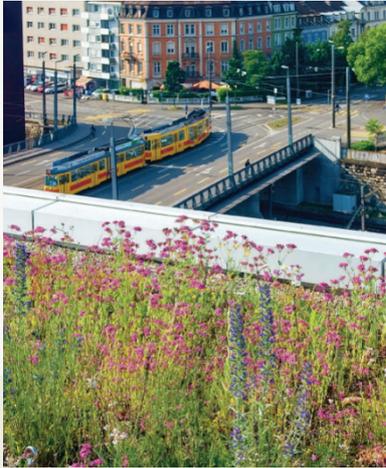
GHG emission for the whole LGA are shown in Figure 8. In consultation with the community, we have set 2050 as the target for the whole of Wollongong to reach net zero emissions.

FIGURE 8: Wollongong LGA emission in baseline year 2016-17, total 3,091,346 tCO₂-e

SOURCE: https://wollongong.nsw.gov.au/___data/assets/pdf_file/0014/121343/Climate-Change-Mitigation-Plan-2020.PDF

CASE STUDIES:

What are other councils doing to adapt to climate change?



International example: Basel, Switzerland

Population 198,000

The city of Basel has promoted the development of green roofs to increase the thermal performance of buildings, reduce runoff and flooding, increase biodiversity and absorb carbon dioxide. The program subsidises the cost of creating a green roof to be competitive with a traditional roof and is supported by regulations requiring green roofs to be constructed in newly developed flat roof structures.

SOURCE: https://www.stadtgaertneri.bs.ch/dam/jcr:daa3ff5e-1ce1-470e-9fd1-90de422d6c36/Stadtgaertneri_Flachdachbegr%C3%BCnung_2020.pdf



Australian example: Greater Geelong

The 2020 Environment Strategy includes the following actions related to climate adaptation:

- Increase tree canopy cover in urban Greater Geelong to 25 per cent by 2045, with an interim target of 20 percent by 2030.
- Develop an urban ecology plan by 2025.
- Develop an integrated water management strategy and waterway management plan by 2025.
- Plant one million new trees in Greater Geelong by 2030.
- Establish and maintain parkland areas within 400 metres of all households.
- Develop and implement a sustainable food policy to support community food production by 2023.
- Improve landscape planning controls to support desired urban greening outcomes by 2024.
- Complete urban heatwave vulnerability modelling and identify priority urban greening sites by 2023.

City of Greater Geelong.
The greenway Project, Council worked in partnership with community groups to plant 60,000 trees and direct seed 2 hectares of native grasses.

SOURCE: <https://www.geelongaustralia.com.au/environment/documents/item/8d854cb968cc72e.aspx>





3. Climate risks and adaptation actions

3.1 What are climate risks?

The risks resulting from climate change are generally broken into two main categories, physical risks and transition risks. The primary focus of Council's adaptation response is the management of physical risks associated with climate change, however, where possible, Council will encourage the most positive transition pathways towards a zero-carbon emission future for the City.

Physical risks

Physical risks refer to the impacts of climate hazards. These are further broken down into events known as shocks, which refer to acute events such as flooding, storms, extreme heat and bushfires, and stresses which refer to gradual and sustained changes over time such as rising sea-level, drought and habitat loss. Most of the climate change risks that Council and our community face are physical risks and these are the primary focus of our adaptation response.

There are many physical risks facing Council and our LGA resulting from the climate hazards projected to increase with climate change. This section of our plan explains the risks identified for the Wollongong LGA during Council's risk assessment process. It also sets out what actions we plan to take over time. As mentioned earlier, this is all about planning for the long term, so the risk assessment uses the best available climate science to look into the future, so that we are prepared.

Transition risks

Transition risks relate to how we transform our economy from one reliant on burning coal, petroleum and gas, to one where we get energy from the sun, wind and other sustainable sources. Much of this transition is outside the control or influence of Council, but we consider it in the context of climate adaptation as it is linked to our response to a changing climate.

For Council, and the Wollongong community, we need to plan for some assets no longer being useable because they run on old fuel sources, or some land uses no longer being an option due to sea level rise and flooding. Other potential transition risks include changes in insurance premiums due to the increased likelihood of extreme weather events and shrinking markets for carbon-intensive materials and products, such as conventionally made steel and the coal exported from Port Kembla.

Industries and businesses that are currently reliant on fossil fuels will lose market share and fall short of increasing global regulations aimed at reducing greenhouse gas emissions unless they transition rapidly to renewable energy-based business models. The impacts of the carbon transition will be felt in industries such as coal mining, conventional steel manufacturing and diesel-dependent transport systems and are likely to extend into related infrastructure and service providers. This transition is likely to impact Council and our local community as some economic activity faces these transition risks. However, such a significant economic change brings with it many opportunities for innovation and alternative materials and services.

Council will work with businesses in our region to support the planning of the transition to the zero-carbon economy. This is a complex challenge and one that can only be addressed in collaboration with business, other levels of government, the education sector and the community.

Opportunities

The transition to a low carbon economy will also bring many opportunities. Working collaboratively with other levels of government, community, businesses and centres of innovation like the University of Wollongong will support innovation and opportunities that will inevitably come from such a significant change.

A recent example of such opportunities is the planned Hydrogen Hub for Port Kembla. The first steps have been taken to establish The Port Kembla hydrogen mobility facility³ with further investment planned to harness existing local infrastructure. It is likely that with global efforts to transition to renewable energy, combined with the industrial focus of the Wollongong LGA, we will be at the forefront of applying new technology solutions.

Many of the initial opportunities are to be found at the overlap of climate mitigation and adaptation, such as the implementation of Council's Urban Greening Strategy. This will help reduce the urban heat island effect, will help sequester carbon emissions and also increase natural beauty, amenity and habitat for local biodiversity.

Further examples of opportunities include:

- Further extension of the Urban Greening Strategy to facilitate community members/ organisations that want to plant suitable trees in verges and other designated public spaces and private land.

³ www.investregional.nsw.gov.au/news/first-steps-towards-port-kemblas-hydrogen-hub/

- Recycled water offers a huge opportunity for Council and the community to enjoy a recurrent source of non-potable water for irrigation (and other non-drinking uses) that is not weather-dependent. This would have to be investigated in collaboration with Sydney Water as set out in Section 3.2.
- On-site renewable electricity such as solar PV and eventually battery storage will help both reduce carbon emission and increase local resilience (assuming systems are appropriately wired to enable islanded operation).
- Working with University of Wollongong to trial technology or processes that solve climate-related challenges. This could lead to local investment, employment and problem solving.
- Council will look for opportunities to feed adaptation and mitigation measures into the three-year rolling review and annual inspection protocol of all Council-owned buildings. For instance, looking to improve thermal performance, adequacy of roofing, thermal comfort and energy efficiency.

Risk assessment process

To build our understanding of climate change risks and opportunities, Council has undertaken a thorough assessment of the risks that we face and must address with our community. This work started in 2009 and was reviewed and updated in 2021 through technical studies based on the latest climate science and planning from the NSW Department of Planning Industry and Environment (DPIE) and its AdaptNSW climate information service. This is underpinned by the NSW and ACT Regional Climate Model (NARClIM), a NSW Government-led partnership that provides high resolution climate change projections across NSW. By using the AdaptNSW resources, our climate risk assessment is based on consistent science used by other councils and government agencies throughout the state.

The technical analysis in our risk assessment used a geographical information systems-based (GIS) approach to identify where in the Wollongong local government area (LGA) and when physical risks are most likely to occur. This analysis fed into a risk assessment workshop and adaptation planning sessions with staff from across Council. Staff considered how the projected impacts could affect council operations, assets, people and our community. We then developed adaptation actions to help manage the risks and to make the most of potential opportunities that a changing climate may create.

Adaptation and uncertainty

Council is working hard to reduce and eventually eliminate our greenhouse gas (GHG) emissions that contribute to climate change. Despite our efforts and those of governments, communities and businesses around the world, some changes have already been locked into the global climate system which are already impacting our lives. The changes are projected to continue and will likely increase, meaning that we must adapt to climate changes.

The scientific investigation of the global climate system is based on observations and predictive models. The models used to make projections cannot predict the future. Rather, they give us a picture of what the future is likely to look like, depending on the global efforts to cut GHG emissions and the many complex interactions of natural systems. We then base our long-term adaptation pathway on this picture. The pathway sets our direction and estimated timeframes, without having to commit to details that will be worked out as projects become implemented to address issues. A pathway approach also gives us the flexibility to adjust our planning as new information becomes available.

Planning for a high carbon emissions future

The approach taken in this plan is consistent with many levels of government planning that use a high emissions scenario (RCP8.5). This has been chosen because despite the commitments made in the Paris Climate Agreement in 2015, global emissions continue to increase. Depending on global efforts towards achieving net zero emissions, lower emission scenarios may be used for adaptation planning in the future.

What is an emission scenario?

Emission Scenarios are used to model greenhouse gas emission over time and examine the likely impact of different levels of carbon emissions on our climate. They are used in climate change analysis, including climate modelling and the assessment of impacts, adaptation and mitigations (IPCC 2000).

Selecting a suitable emission scenario is an important decision when assessing potential climate change risks. The risk assessment on which this plan is based uses the projections from the NARClIM model, which in turn applies a high emissions scenario. This scenario assumes that the global population and economy will continue to grow with the same rate of greenhouse gas emission (primarily from fossil fuel use and land clearing), which would result in warming by approximately 3.4°C by 2100.

Figure 9 below shows the projected temperature increases for four modelled emission scenarios. Current global GHG emissions are tracking along the red line (high-emission scenario). Council and many other organisations are striving to cut our own greenhouse gas emissions, but we must plan for the likelihood that further climate change will occur in addition to changes that have already been locked into the global climate system.

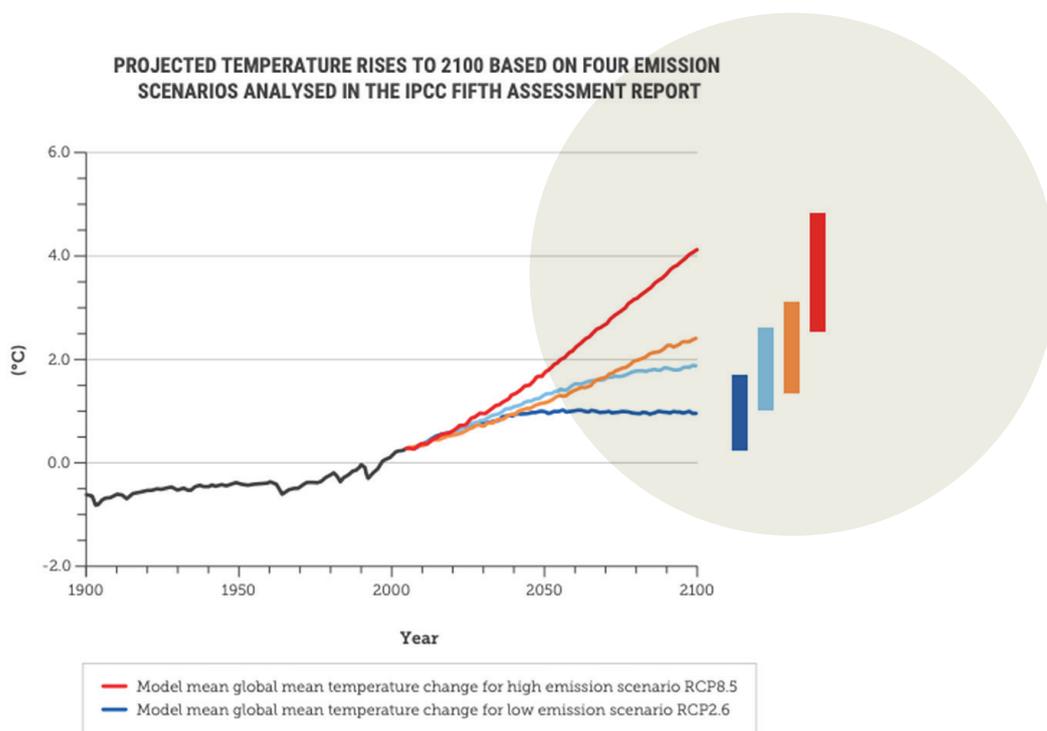


FIGURE 9: This Climate Council⁴ graph shows us: Projected temperature rises to 2100 based on four emission scenarios analysed in the IPCC Fifth Assessment Report. Key: Dark blue: RCP2.6; light blue: RCP4.5; orange: RCP6.0; red: RCP8.5. Source: Collins et al. 2013.

IPCC refers to the United Nation’s Intergovernmental Panel on Climate Change

3.2 Key climate hazards and associated adaptation pathways

3.2.1 Heat

The hazards

The climate of the Wollongong area is warming and projected to increase during this century. The maximum temperature is projected to increase by up to 0.4-0.9°C by 2039 and by up to 1.6 to 2.3°C by 2079⁵. We can expect an increase in periods of extreme heat and that these are projected to occur more frequently and last longer than in the past.

We take extreme heat seriously as it can cause health problems (heat stress and related illness, respiratory problems, increased ambulance callouts, increased hospital admissions). It also puts vital infrastructure such as the electricity system under strain.

Fortunately, our coastal location is a natural advantage for Wollongong due to the coastal breeze and beaches that offer respite from the heat of summer, but this may not be sufficient protection from extreme heat events. Many in our community are not able to access respite during heat events due to poor quality housing, mobility challenges or lack of income to support air-conditioning or other controls.

⁴ <https://www.climatecouncil.org.au/wp-content/uploads/2021/04/aim-high-go-fast-why-emissions-must-plummet-climate-council-report-210421.pdf>

⁵ <https://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/Illawarra-Climate-Change-Downloads>

In recent years, Wollongong's beaches have become increasingly popular for daytrip visitors from greater Sydney. This increase in visitor numbers is leading to challenges for residents and Council. Problems include increased traffic on Lawrence Hargrave Drive, full parking areas near beaches and facilities, overuse of public toilets, garbage bins and shelters, as well as increased swimming outside of patrolled areas of beach. This is an additional challenge to address at the same time as climate change impacts such as coastal erosion are putting our beaches and coastal facilities at increased risk.

The Risks

An increase in the maximum temperature is likely to mean:

- Extreme heat events are expected to increase in severity, frequency and length.
- Physical and natural assets as well as staff and the community will be under increased stress leading to increased chance of accidents and failures.
- Increased pressure on biodiversity in our natural areas with a corresponding impact on amenity and ecosystem function.
- Increased demand on resources such as water and energy.
- Impacts on community health and safety, particularly vulnerable people, pets and livestock.
- Increased stress on native animals and plants.
- Increased demand on some Council services such as our pools, beaches, ocean pools, libraries, leisure centres, community centres and community transport.
- An increase in the Urban Heat Island (UHI) effect, where heat is trapped in built up areas when hard surfaces such as roads and buildings absorb heat and retain it long after natural areas have cooled down. This is mostly an issue in the south of the LGA.

Adaptation Pathway

We must plan for an increase in the number of hot days and work with our community to reduce the risks to our health and wellbeing.

Short-Term 2022-2030

- Continue to consider the impact of heat on council services and the community as part of ongoing strategic planning.

- Strategic land use planning must ensure adequate new greenspace is provided as part of land releases and protect riparian corridors from urban development.
- Summertime outdoor event planning will need to include extreme heat contingences such as shading, water stations, alternative date provisions and communication strategies.
- Strategic consideration should be given to planting programs in Council open spaces (transitional landscapes) to reduce urban heat and increase biodiversity and amenity.
- Review maintenance requirements for urban greening plantings - increased watering may be required to support recently planted vegetation.
- Undertake a review of existing hardstand surfaces in urban areas and identify opportunities to de-pave unnecessary hardstands (car parks / paved surfaces) and / or prioritise the use of permeable treatments.
- Work with government and community stakeholders to promote the care and safety of community members and animals during heat events.
- Consider future heat scenarios in the design of new building assets to be able to support employees and community, e.g. air conditioning and environmental controls and suitable power supply.
- Investigate road surface treatment options to increase performance in hot weather.

Medium-Term 2030-2050

- Strategic and statutory planning to consider open space, land use and design requirements to address heat.
- Future-proof building assets to be able to support employees and community, e.g. air conditioners and environmental controls and suitable power supply.
- Work with local business and communities to help understand and manage the impacts of increased extreme heat events.

Long-Term 2050-2070

- Review Council's infrastructure, buildings and facilities and services to assess their performance in the changing climate.
- Work with local business and communities to help understand and manage the impacts of increased extreme heat events.



Priority Actions			
ACTION	PART OF COUNCIL	TIMING	STRATEGY/PLAN IMPACTED
Further investigation of heat in the Wollongong area to understand this issue further and develop appropriate heat management strategies including city design, shade, construction materials and cooling infrastructure.	City Strategy Team	2022-2026	Climate Change Adaptation Plan Wollongong Development Control Plan
Council will contribute to communicating how heat can be dangerous to health and how to best deal with it.	Community Cultural and Economic Development	2022-2026	Sustainable Events Guidelines
Assess the suitability of Council facilities to be utilised for respite centres on hot days. This may include provisions for adequate water and food, power supply and potentially use of recycled water and appropriate landscaping to provide shade.	Library and Community Services	2022-2026	Places for People: Wollongong Social Infrastructure Planning Framework 2018-2028
Plan for the potential cost impacts of overlapping or more frequent heat events.	Library and Community Services	2022-2026	Business Planning
Develop and implement a transitional landscape program aimed at increasing shade cover in passive open space precincts across all Parks and Reserves in the LGA	Open Space and Environmental Services	2022-2026	Urban Greening Strategy
In partnership with Land Management Agencies and other Botanic Gardens, develop translocation programs for threatened Illawarra flora susceptible to mean temperature increase.	Open Space and Environmental Services	2022-2026	Urban Greening Strategy
Establish trial plantings of native tree species suited to predicted future climate for suitability and use in streets and parks	Open Space and Environmental Services	2022-2026	Urban Greening Strategy



3.2.2 Flooding

The hazard

The rainfall pattern in the Wollongong region ordinarily features a high level of natural variability. Climate change is likely to exacerbate this with a projected decrease of rain in winter and increased deluge events over summer. This means that we must prepare for more floods, which are likely to impact private property, council assets and cause danger to residents and visitors and disruption.

Wollongong has a history of significant flooding that has led to a high level of floodplain management planning incorporating climate change predictions.

The risks

- Increased flooding due to climate change will impact council assets, private property and cause disruption.
- Increased risk of landslip in geotechnically vulnerable areas
- Minor flood events impacts include:
 - Temporary inundation affecting roads and public spaces
 - Loss of access to sports fields and open spaces
 - Pipes/culverts exceeding capacity
 - Deposition of sand or silt on pathways and roads
 - Increased transport of plastic waste into natural areas and ocean
- Major flood event impacts include:
 - Major roads made inaccessible
 - Homes inundated
 - Increased risks of isolation of residents
 - Loss of life
 - Contamination of floodwaters from contaminated sites and sewer overflow discharge points
 - Blocked water/floodways
 - Damage to assets and public spaces
 - Expensive clean up
 - Un-budgeted costs

Adaptation pathway

We must plan for the likelihood of more floods and increased severity of flooding.

Short-Term 2022-2030

- Continue to take a precautionary approach in terms of planning for floods.
- Continue to plan for the strategic management of assets such as stormwater networks; watercourses, pipes, culverts, gross pollutant traps (GPTs) with consideration of increased future rainfall intensity.
- Review the location of emergency response centres to ensure they are protected from hazards such as bushfire and flooding.
- Design new Council assets for flood conditions expected to occur during their design life.

Medium-Term 2030-2050

- Continue to plan for the cost of post-flood clean up and recovery.
- Consider managed retreat if a defensive approach to flood risk management is not feasible.
- Review the ability of Council to fund flood mitigation with limited resources.

Long-Term 2050-2070

- Review Council's infrastructure, buildings and facilities and services to assess their performance in the changing rainfall and flood patterns.
- Work with local business and communities to help understand and manage the impacts of changing rainfall and flood patterns.

Priority Actions

ACTION	PART OF COUNCIL	TIMING	STRATEGY/PLAN IMPACTED
Continue managing flood risk through floodplain risk management plans, incorporating climate predictions.	Infrastructure Strategy and Planning	Ongoing	Catchment based floodplain risk management plans
Continue and monitor maintenance schedules to reduce the risk of drainage network blockages.	Infrastructure Strategy and Planning	Ongoing	Stormwater Asset Management Plans
Ensure new developments consider climate change projections including rainfall intensity and sea level rise.	Infrastructure Strategy and Planning	Ongoing	Catchment based floodplain risk management plans
Undertake community education to increase awareness of the dangers of floodwaters and precautions to minimize risks to people and property.	Infrastructure Strategy and Planning	Ongoing	Catchment based floodplain risk management plans

3.2.3 Bushfire

The hazards

Climate change is causing an increase in the weather conditions that contribute to bushfires. Hotter summers, drier winters and reduced periods when hazard reduction burning is possible, all contribute to the increased risk of bushfire. The direct risk from fire, poor air quality and disruption to transport and infrastructure are all likely impacts from bushfires in and near the Wollongong LGA.

Approximately half of the Wollongong LGA is bushland on steep gradients, making it particularly susceptible to bushfire hazard.

Council will continue to play a central role in emergency management via our Local Emergency Management Officer (LEMO) responsibilities. This means that in times of major emergencies we support the Rural Fire Service (RFS), the State Emergency Service (SES), NSW Fire and Rescue, Ambulance and Police services

The risks

- Danger to people and property directly exposed to bushfires.
- Health risks for Council staff and community members involved in outdoor work, travel and outside training and activities due to poor air quality from bushfire smoke.
- Inter-council volunteering/secondment to meet increased demand on resources during emergency periods resulting in service delays and disruption.
- Increased asset management needs to meet higher fire protection standards for Council assets such as power and telecommunications infrastructure, fire trails, buildings and facilities.
- Loss of tourism during and immediately after bushfires which may take time to return to full volume due to loss of natural beauty and perception of safety risk.
- Increased frequency of catastrophic bushfire events resulting in loss of resilience of the natural environment to recover fully.
- Bushfires may impact on aged care facilities, which poses a risk to vulnerable residents and staff.
- Increased injury and death of native plants and animals.
- Increased maintenance costs associated with managing bushfire risk in natural areas.

- Long-term disruption of natural systems from exposure to severe fire.
- Schools and childcare centres may need to close due to bushfire and air quality risks, which could cause disruption for Council and local business staff who have childcare responsibilities and may not be able to work.
- Damage to transport network from bushfires could cause major disruption to the community, businesses and Council's ability to deliver services.
- Greater reliance upon evacuation centres.

Adaptation pathway

Changes to fire weather and bushfire conditions means that we must plan ahead to ensure that the Wollongong community and its properties are safe and prepared for bushfire emergencies.

Short-Term 2022-2030

- Continue to implement the Planning for Bushfire Protection recommendations of the NSW Government.
- Consider regional scale implications and response to bushfire.
- Review strategic land use planning to ensure developments located in bushfire hazard zones are appropriately protected.
- Plan for inter-council volunteering and resource re-deployment in the event of large-scale bushfires.
- Consider requirements for managing injured wildlife following fires.
- Work with other government agencies and stakeholders to identify and promote places of refuge for the community with a focus on vulnerable people.
- Undertake training of staff in emergency management.
- Consider biodiversity implications of changing fire dynamics.

Medium-Term 2030-2050

- Ongoing community awareness and preparedness planning for bushfires and other extreme events.
- Improved biodiversity management alongside bushfire management.



Long-Term 2050-2070

- Re-evaluate and update plans and actions needed to respond to bushfire risks.

Priority Actions			
ACTION	PART OF COUNCIL	TIMING	STRATEGY/PLAN IMPACTED
Review work health and safety policies to ensure they address outdoor working risks during bushfire events and risks associated with smoke pollution.	Human Resources	2022	Work Health and Safety Plans
Review Council's response to manage air pollution for Council buildings and facilities.	Infrastructure Strategy and Planning	2022-2024	Building and Facilities Asset Management Plans
Work with the NSW Rural Fire Service to update the region's Bushfire Risk Assessment to include climate projections with a focus on vulnerable people.	Infrastructure Strategy and Planning	2022-2024	Illawarra Bush Fire Risk Management Plan
Engage with First Nations traditional owners on cultural land management and burning and how it might be incorporated as part of the regional bushfire management approach.	Open Space and Environmental Services	2022-2024	Illawarra Bush Fire Risk Management Plan
Review bushfire risk and emergency management plans for Council operational or leased buildings.	Infrastructure Strategy and Planning	2022-2024	Illawarra Bush Fire Risk Management Plan
Proactively maintain fire trails and other bushfire related infrastructure to be fire ready e.g. hazard reduction.	City Works	2022-2024	Illawarra Bush Fire Risk Management Plan

3.2.4 Storms

The hazards

Storms are a normal part of the weather pattern for Wollongong, but climate change is likely to increase the occurrence and severity of storms. This could cause damage to private property and to Council assets and place pressure on service delivery causing additional impacts on the community. Storms are associated with very high-speed winds, intense rainfall, lightning strikes, large ocean swells and increased ocean levels from the effect of low-pressure weather systems.

Storms will exacerbate the risk of floods addressed in Section 3.3 above.

The risks

- Increased coastal erosion and flooding due to storms.
- More frequent storms will increase recovery costs.
- Stormwater management assets including dams, detention basins, channels and creeks will come under extra pressure and may need repairs following storms.
- Increase requirement for Emergency Operations Centre staffing.
- Damage to council and private property, roads and transport systems due to falling branches and trees, wind and water.
- Power blackouts leading to disruption of response efforts, lost revenue for businesses and inconvenience.

Adaptation pathway

We must plan for an increase in storm events so that Council and our community are prepared and can quickly respond, then return to normal.

Short-Term 2022-2030

- Emergency plans to be reviewed for consideration of likely future coastal hazards.
- Consider coastal management as part of the Illawarra Local Emergency Management Committee.
- Review Dam Safety Emergency Plans – consider climate change and dam sensors.
- Further funding for dealing with major emergencies is required in addition to existing emergency funding.
- Continue risk based maintenance program for public trees.

Medium-Term 2030-2050

- Ongoing community awareness and preparedness planning for storms and extreme weather events.
- Ongoing review of adequacy of infrastructure to cope with storm events.

Long-Term 2050-2070

- Re-evaluate and update plans and actions needed to respond to storms and extreme weather events.



Priority Actions			
ACTION	PART OF COUNCIL	TIMING	STRATEGY/PLAN IMPACTED
Prepare and implement an Open Coast Coastal Management Program.	City Strategy Team	2022-2026	Coastal Zone Management Plan
Review Work Health and Safety provisions to address the increased likelihood of storm and extreme weather events and the safety and operational impacts this could have on staff.	Human Resources	2022	Work Health and Safety Plans
Recovery plans from emergencies are to be developed in partnership with communities and other relevant service providers.	Library and Community Services	2022-2024	Coastal Zone Management Plan
Identify Council's business continuity plans (BCPs) and review and updated as required to address increase the likelihood of storm and extreme weather events.	Governance and Customer Service	2022-2024	Business continuity plans



3.2.5 Drought

The hazard

Climate change is leading to changes in the rainfall patterns throughout Australia. In our region, we can expect reduced winter rainfall and increased periods of drought (as well as the increase in the risk of deluges and flooding as set out in Section 3.2.2 above).

The risks

- Water restrictions are likely to be introduced when extreme drought conditions occur. This will result in reduced water availability for gardens and open space areas causing reduced scenic and social amenity that will impact leisure time and recreational activities.
- Hardening of playing fields and surfaces may lead to reduced access for physical activities and leisure.
- Lack of rainfall and restricted water availability for irrigation will lead to the reduced cooling from public green space will contribute to the urban heat island effect.
- Drought periods increase the cost of fresh food leading to reduced access for people living in poverty.
- Drought periods also lead to the degradation of natural areas which will impact local biodiversity and can impact physical and mental health of residents.

Adaptation pathway

We must plan for increased periods of drought and reduced winter rainfall.

Short-Term 2022-2030

- Council will consult with Sydney Water to investigate augmentation of the existing recycled water systems in the LGA. Capture, treatment and distribution would provide an ongoing supply of non-potable water that is not dependent on rainfall.
- Council continue support for food security for vulnerable communities in response to cost and access fluctuations due to climate.

Medium-Term 2030-2050

- Review water cycle management and planning, green space management and biodiversity management noting the latest climate change science and information.

Long-Term 2050-2070

- Review water cycle management and planning, green space management and biodiversity management noting the latest climate change science and information.

Priority Actions

ACTION	PART OF COUNCIL	TIMING	STRATEGY/PLAN IMPACTED
Council will review the water efficiency of its operations including detecting leaks in water supply (for Council managed section of water network).	Infrastructure Strategy and Planning	Ongoing	Asset Management Plans
Council to consider rainwater, sewerage mining/ recycling and stormwater harvesting and usage, in particular to support irrigation for sports fields.	Property and Recreation	2022-2026	Sportsground and Sporting Facilities Strategy



3.2.6 Sea-level rise

The hazards

Climate change is leading to increased sea-levels. This is leading to an increased risk of Storm-tide inundation (STI) and tidal inundation (TI) due to rising sea levels. Tidal inundation is where high tides inundate areas that are normally above the high tide level due to rising sea levels. When a coastal storm leads to a temporary increased sea-level and this combines with tidal inundation, it is referred to as storm-tide inundation (STI). The rate of sea-level rise is expected to increase over the next 80 years and the severity of coastal storms is also expected to increase due to a warming ocean.

The characteristic of this hazard is that areas near water such as the edge of Lake Illawarra, or coastal areas of Wollongong will experience more extensive and more regular inundation which is likely to impact Council assets, public spaces and the community such as rock pools, caravan parks, stormwater assets. This is likely to be a recurring risk.

Sea-level rise (SLR) is likely to become a chronic risk, meaning that it will become an ongoing situation as the world's oceans expand.

STI, TI and SLR present significant challenges to Council and our community due to our coastal location and the number of properties, facilities, assets, infrastructure and public spaces in exposed areas along our foreshore.

The risks

- SLR and STI will cause erosion or beaches which will impact amenity and access.
- Erosion is also likely to damage assets and infrastructure along the coastal fringe, such as roads, cycleways, car parks, parks, surf clubs, stormwater assets, ocean pools, jetties and harbours.
- Increased coastal erosion is likely to expose and damage cultural heritage such as middens.
- Biodiversity impacts are also expected with likely salt march destruction and mangrove incursion and long-term changes will occur to coastal plant communities from changing exposure to salt water.
- SLR and STI are likely to cause occasional loss of access to some areas and could pose safety risks to the community.
- SLR is projected to cause permanent loss of access and damage to exposed areas of the coast.
- The groundwater level may be impacted by STI and SLR and saltwater intrusion may reduce the longevity of some coastal assets. This could impact low-lying infrastructure on the LGA.

Priority Actions			
ACTION	PART OF COUNCIL	TIMING	STRATEGY/PLAN IMPACTED
Prepare and implement an Open Coast Coastal Management Program.	City Strategy Team	2022-2026	Coastal Zone Management Plan
Review Work Health and Safety provisions to address the increased likelihood of storm and extreme weather events and the safety and operational impacts this could have on staff.	Human Resources	2022	Work Health and Safety Plans
Recovery plans from emergencies are to be developed in partnership with communities and other relevant service providers.	Library and Community Services	2022-2024	Coastal Zone Management Plan
Identify Council's business continuity plans (BCPs) and review and updated as required to address increase the likelihood of storm and extreme weather events.	Governance and Customer Service	2022-2024	Business continuity plans

Adaptation pathway

STI, TI and SLR present long-term on-going challenges for Council and our community and there will be difficult choices to be made.

Short-Term 2022-2030

- Council to work with relevant agencies, and the community, to prepare a Coastal Management Program (CMP) for the Open Coast in accordance with the NSW Coastal Management Framework, to set out the long-term strategy for co-ordinated management of land within the coastal zone to meet local needs. The CMP will address risks of coastal hazards such as beach erosion, shoreline recession, coastal lake or watercourse entrance instability, coastal inundation, coastal cliff or slope instability, tidal inundation, and erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters. The CMP will define specific actions to address:

- Climate change projections relating to SLR and STI being considered in the development of policies and regulations related to coastal management.,
- Better coordination of responses to storm events, both within council and with other relevant government agencies, including update of the Emergency Action Sub Plan.
- Options for management of infrastructure and assets at risk.
- Review of existing planning controls to assess their adequacy to protect properties and infrastructure under threat from coastal erosion and inundation.
- Multi-cultural communication strategies to connect with communities vulnerable to coastal processes.

- Identification of the key locations of risk (see BMT GIS-based risk assessment).

- Continue to implement Lake Illawarra CMP actions related to tidal inundation.
- Consider smart cities LoRaWan network for monitoring SLR, STI and TI.

Medium-Term 2030-2050

- Continued monitoring of climate science and local sea level rise studies to adjust Council's response as required.
- Work with the community to understand the risks and management options.

Long-Term 2050-2070

- Long-term monitoring of impacts and adjustments to Council's response.

4. Implementation & accountability

The City of Wollongong's approach to climate change is based on the best available science, which we have evaluated to determine what the risks and opportunities mean for the Council and our community. Taking adaptation actions across our planning and decision-making based upon these findings is crucial to our success.

Integrated Planning and Reporting

The Community Strategic Plan (CSP) is the overarching document that guides what Council will do in the coming decade. It is developed in consultation with our community on a four yearly basis and is the centre piece of Council's Integrated Planning and Reporting (IP&R) process. And so, at the next revision opportunity we will align the CSP with the pathways approach in this Plan.

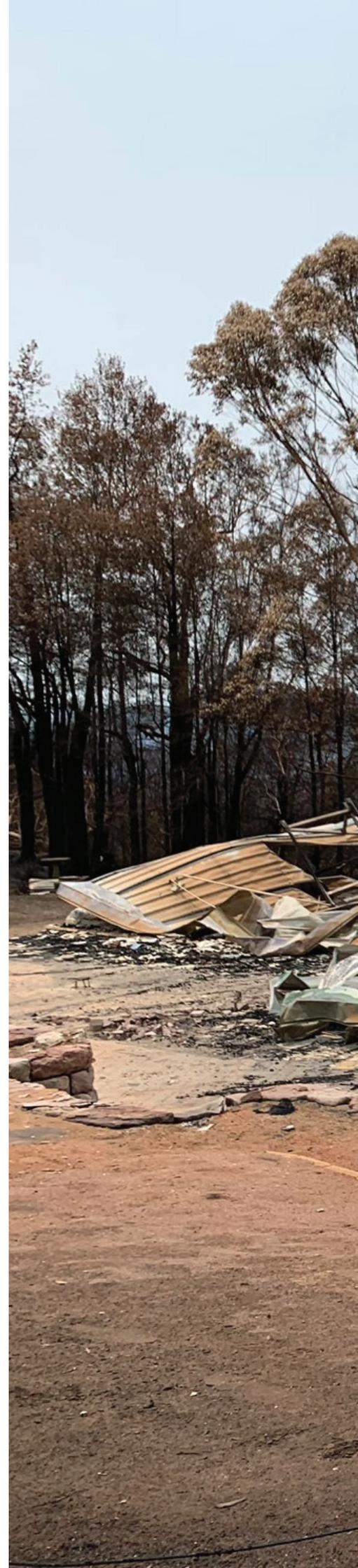
Just as safety considerations are embedded in everything that Council does, climate must also now be considered. This means that whenever a Council officer makes a decision, they must consider if climate is likely to have an impact. For instance, when designing a piece of infrastructure, buying new equipment, planning an event, maintaining and repairing existing buildings and infrastructure it will be important to consider the climate change dimension of the decision.

The strategic plans set out in the CSP then guide Council's business planning process which gain greater details as the delivery plan for each year is prepared. This series of plans applies to all areas of council activity (explained in Section 1.3 and 2.2). The final stage of the IP&R framework is to communicate what we have done each year. Council reports on the progress and implementation actions as part of the Annual Report and in specific Climate Change information when appropriate.

On-going review

The cycle of review and updating the CSP then starts again. This aligns well with the ongoing review of climate science, which continues to evolve as the global scientific community continues to refine its understanding of our complex climate system through the IPCC Assessment Reports.

In the mid- to long-term, Council will monitor the latest climate change science, NSW and federal policies and regulations to understand what they mean for Wollongong and to keep the action plan up to date.





5. Glossary

Term	Definition
Adaptation	The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects (IPCC 2013).
Carbon neutral & Net-zero emission	Carbon neutrality, or having net-zero emissions, refers to achieving net-zero carbon dioxide emissions by balancing carbon emissions reductions and carbon removal (sequestration).
Climate change scenario	A coherent, plausible but often simplified description of a possible future state of the climate as influenced by climate change. It is not a prediction about the future, but rather it provides a means of understanding the potential impacts of climate change.
Emissions scenario	Emission Scenarios are a tool with which to analyse how driving forces may influence future greenhouse gas emission outcomes and to assess the associated uncertainties. They are used in climate change analysis, including climate modelling and the assessment of impacts, adaptation and mitigations (IPCC 2000).
Greenhouse gas (GHG)	Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. Water vapour (H ₂ O), carbon dioxide (CO ₂), nitrous oxide (N ₂ O), methane (CH ₄) and ozone (O ₃) are the primary greenhouse gases in the Earth's atmosphere.
Interdependent risks	Risks (and solutions) that are dependent on other organisations, systems and infrastructure.
Liability risk	Risks for those associated with and responsible for contributing to, or not acting to address, climate change risks.
Mitigation	Climate change mitigation includes action we take globally, nationally and individually to limit changes caused in the global climate by human activities. Mitigation activities are designed to reduce greenhouse gas emissions and/or increase the amounts of greenhouse gases removed from the atmosphere by greenhouse sinks (AdaptNSW).
NARClIM	The NSW and ACT Regional Climate Modelling (NARClIM) initiative provides an ensemble of robust regional climate projections for south-eastern Australia that can be used by the NSW and ACT community to plan for the range of likely future changes in climate. It can be accessed via the AdaptNSW website.
Paris Agreement	<p>At the 21st session of the Conference of the Parties ('COP21') to the UNFCCC (see definition below) held in Paris in 2015, the world agreed to a global goal to limit average temperature increases to 'well below 2°C' and pursue efforts to keep warming below 1.5°C above pre-industrial levels.</p> <p>A total of 176 Parties have ratified the Paris Agreement, including Australia, which officially did so on 10 November 2016. All signatory countries are to set emissions reduction targets from 2020 and review their targets every five years to build ambition over time, informed by a global stocktake.</p>
Physical risk	The impact of climate hazards, both shocks such as flooding, extreme heat and bushfires, and stresses such as drought and habitat loss.

Term	Definition
Resilience	Ability of an organisation to anticipate, absorb, accommodate, or recover.
Risk management process	The systemic application of policies, procedures and practices to the tasks of communication, consultation, establishing the context and assessing, treating, monitoring, reviewing, recording and reporting risk (Treasury NSW 2015).
Shocks	Acute events with direct impacts, such as extreme heat, bushfires and floods.
Scope 1 emissions	Direct emissions from owned or controlled sources, ie fuels burnt on site and manufacturing process emission
Scope 2 emissions	Indirect emissions from the generation of purchased energy, ie emission shipped in via electricity.
Scope 3 emissions	All indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions, supply chain and embodied carbon
Stresses	Chronic phenomenon with longer-term and drawn out impact, such as drought and changes in habitat.
Transition risk	The disruptive changes that will occur in the transition to the low carbon economy, eg stranded assets, changes to regulations, obtaining insurance, shrinking markets.
Urban Heat	A general term that refers to high temperatures in urban areas that pose a risk to our communities and infrastructure.
Urban Heat Island	The tendency of cities to be much warmer than their rural counterparts. Urban surfaces such as roads and roofs absorb, hold, and re-radiate heat; raising the temperature in our urban areas. Human activities such as traffic, industry, and electricity usage also generate heat that adds to the urban heat island effect.
Vulnerability	The degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity and its adaptive capacity.

A further, more detailed glossary of climate change terms is available from the CSIRO at: www.climatechangeinaustralia.gov.au/en/support-and-guidance/glossary/#A

6. References and further reading

Wollongong City Council's other climate change policy documents:

- Our Wollongong 2028; Community Strategic Plan
- Sustainable Wollongong 2030; A Climate Healthy City Strategy
- Wollongong City Council Climate Change Mitigation Plan 2020
- Global Covenant of Mayors for Climate and Energy
- Climate Emergency Declaration

There is a significant body of material that communities and councils can draw upon when assessing and responding to climate change risks. Some useful reference points include:

- The NSW Government AdaptNSW portal provides many resources for communities, government and business, specific to local regions.
- NARCLiM climate model
- CSIRO; State of the Climate 2020 report
- The United Nations Sustainable Development Goals, in particular, number 13 Climate Action, sets out a series of targets around climate mitigation and adaptation. There is likely to be alignment between the Council's other priorities and the SDGs, which provide a broad and deep set of goals to guide human development.
- The Climate Council
- Climate Emergency Declaration
- Climate Change Risk Assessment for Wollongong 2021, BMT Commercial Pty Ltd





Our Wollongong Our Future

From the mountains to the sea...

We value and protect our environment

We have an innovative and sustainable economy

Wollongong is a creative, vibrant city

We are a connected and engaged community

We have a healthy community in a liveable city

We have affordable and accessible transport



Wollongong City Council

wollongong.nsw.gov.au

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