



**CLIMATE
ACTION PLAN
RESILIENCE AND
ADAPTATION STRATEGY**



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Mosman Climate Action Plan
Resilience and Adaptation Strategy
Published November 2023

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Mosman
COUNCIL





Acknowledgement

Mosman Council acknowledges that it operates on the traditional lands of the Borogegal and Cammeraigal people, of the Gaimariagal clan of the Eora Nation, and we pay our respects to Elders past, present and future.

As the Traditional Custodians for thousands of years, the Cammeraigal people lived in and around the waterways of Mosman, and cared for and respected the land. Their spirit lives on. We acknowledge them and all Indigenous peoples past, present and future.

Commitment to Climate Action

This *Mosman Climate Action Plan - Resilience and Adaptation Strategy* outlines Mosman Council's commitment to preparing Mosman for the impacts of climate change, and managing the risks of its effects on residents and property.

It is the second part of Mosman's Climate Action Plan, which also includes the *Mitigation Strategy*.

Climate resilience and adaptation to climate change involves preparing for and acquiring new capabilities to be able to withstand and adjust to the anticipated impacts and effects of climate change.

This provides a long term strategy to guide decision making by Council. It will be informally reviewed as required and reported to Council every four years to ensure alignment with climate change predictions, priority issues and gaps in service provision.

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We understand climate change demands immediate, comprehensive and meaningful action, and the more we do now the better the outcomes for our residents, businesses and community as a whole.



From the Mayor

Following Mosman Council's inaugural *Mitigation Strategy*, *this Resilience and Adaptation Strategy* is the second critical part of Council's Climate Action Plan.

Together they form a roadmap for Council and the Mosman community to address climate change and navigate the impacts it will bring for our community and the Mosman area.

Council formally declared a Climate Emergency in late 2019 and since then has moved swiftly to address the multifaceted issues around climate change. Tangible actions include elevating and expanding programs to reduce environmental impact, adopting net zero emissions targets, appointing a Community Consultative Committee and developing these Climate Action Plan strategies to appropriately guide Council and the community into the future.

Council is putting forward a robust response to one of the most pressing and pervasive challenges of our time.

I am proud of Council's efforts in this area and it has been a special privilege to serve as Mayor at a time when Council has embraced and accelerated its responsibilities as a government and community leader on climate change.

We understand climate change demands immediate, comprehensive and meaningful action, and the more we do now the better the outcomes for our residents, businesses and community as a whole.

A handwritten signature in black ink that reads "Carolyn Corrigan". The signature is written in a cursive, flowing style.

Carolyn Corrigan
Mayor

From the General Manager



Climate change presents a myriad of risks and adapting to its impacts is a consideration across all Mosman Council operations and aspects of the local community.

Council has a critical role to play in helping the Mosman community develop climate resilience and in preparing the area for the future impacts associated with climate change.

This *Resilience and Adaptation Strategy* outlines how Council and Mosman can be climate resilient and prepare for and deal with anticipated climate change impacts intelligently and sustainably. This and the *Mitigation Strategy* make up the Mosman Climate Action Plan, which provides a sensible, considered, comprehensive and realistic commitment to action on climate change for the Council and the Mosman community.

Striving to improve efficiency across operations and embracing technological innovation are hallmarks of Mosman Council, and it is an approach well suited to managing complex challenges like building climate resilience and adaptation to climate change.

This strategy aims to ensure that the right steps are taken and the right projects prioritised to help the Mosman community deal with the impacts and effects of climate change in our suburb, and to prepare for and manage the future impacts that the science tells us to expect.

Dominic Johnson
General Manager



Council has a critical role to play in helping the Mosman community develop climate resilience and in preparing the area for the future impacts associated with climate change.

Introduction

Reducing carbon emissions can mitigate the acceleration of climate change, however the climate is changing and will continue to change as the Earth's system responds to the warming already underway. So as we work to avert the potential impacts of climate change, we must also become more resilient to those impacts that are now unavoidable.

Scientific data modelling enables us to predict the future impacts of a changing climate, influenced by the variable of our mitigation efforts. In any future scenario however global temperature increase is already built into the climatic system and therefore societies and communities must assess and prepare for its impacts.

Climate resilience and adaptation to climate change is about risk management and the ability to recover. It involves preparing for, managing, responding to and recovering from the current and predicted impacts and effects associated with climate change. These can be chronic and ongoing, such as temperature and sea level rise, or sudden and acute such as natural disasters and severe weather events.

Global temperature increase is expected to cause:

- Sea level rise due to thermal expansion caused by the warming of the oceans and melting of land-based ice such as glaciers.
- Changes to weather patterns including longer periods of extreme heat and less frequent, more intense rainfall.

Sea level rise is expected to cause coastal inundation leading to shoreline recession. Higher air temperatures present risks to human health and increase bushfire frequency and intensity. Rainfall changes are expected to generate more localised flooding events, potentially causing damage to assets. Drier conditions and infrequent, intense rainfall can both cause ecosystem degradation.

Both Communities and Governments have an important role to play in Climate Change. The Community can undertake several actions to enhance their resilience with Council's role involving updating infrastructure and helping vulnerable communities cope with extreme weather, sea-level rise and other climate impacts.

This report outlines the predicted impacts for Mosman, and Community and Council strategies for resilience and adaptation. Impacts and adaptation actions are dealt with in four categories:

- Temperature
- Sea level rise
- Rainfall
- Bushfire

The final sections focus on actions and include personal checklists and further resources.

Council acknowledges the potential scope for this strategy is broader than what is covered. It is not possible to include everything and Mosman's public and private assets, biodiversity, landscape and human impacts all need to be further assessed. The strategy will be updated and iterated over time in response to predictive data and actions undertaken.

Overall Mosman is well placed to meet the challenges posed by climate change and it is acknowledged that Community will need to play a major part in the implementation of the plan.



Climate Resilience

“Climate resilience is the ability to anticipate, prepare for and respond to hazardous events, trends, or disturbances related to climate. Improving climate resilience involves assessing how climate change will create new, or alter current, climate-related risks, and taking steps to better cope with these risks.

Climate resilience is often associated with acute events – like heavy downpours, hurricanes, or wildfires – that will become more frequent or intense as the climate changes. However, good resilience planning also accounts for chronic events, like rising sea levels, worsening air quality, and population migration.

Businesses and governments alike are planning now for the environment and economy they will face in the future.”

The climate resilience of a community relates to its ability to positively recover from chronic or sudden climate change impacts. Resilient communities are able to accommodate and adapt their systems and rebound from adverse events in a way that enables them to thrive.

It involves a combination of risk assessment, dissemination of information and knowledge, advocacy, building partnerships, local preparedness, community development and connectedness. These enable people to be better suited to process events and create positive outcomes. The qualities of climate resilience are listed in the table below.

Center for Climate and Energy Solutions (C2ES)

Table 1. Qualities of resilience. Adapted from Resilient Cities Network

| Quality | Description |
|-----------------|--|
| Reflection | Ability to learn from the past to inform future decisions. Recognising changing circumstances. Reviewing what works and what does not to create continual improvement. |
| Resourcefulness | Ability to recognise alternative ways of doing things at times of crisis in order to meet needs and achieve goals. |
| Robustness | Thoughtful, well conceived, well managed and constructed quality of design, including provisions to reduce the impact of failure. |
| Redundancy | Spare capacity built into provisions and infrastructure to accommodate disruption due to extreme pressures, surges in demand or external events. |
| Flexibility | Willingness and ability to adopt out-of-the-box strategies in response to changing circumstances or crises. |
| Inclusivity | Diverse and broad consultation to create a shared sense of ownership and vision. Co-Design and Asset-Based Community Development. |
| Integration | Bringing together systems and organisations to create shared benefits from resources and actors working together. |

Adaptation to Climate Change

Climate change adaptation is defined by the IPCC as *'the process of adjustment to actual or expected climate and its effects'* and the ability to adapt, referred to as adaptive capacity, as the *'ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences'*. (IPCC 2014)

It is the process of change that enables better suitability to the environment and learning how to live sustainably under new and different conditions. It involves decisions and actions that minimise vulnerability, help to prepare for the adverse consequences of climate change and take advantage of the opportunities. It requires research, an open and attentive attitude to new science and planning appropriately timed action.

Different types of climate change adaptation include:

- Incremental - relatively small actions and adjustments.
- Transformational - actions that result in significant changes.
- Anticipatory or proactive - adaptation undertaken before impacts are observed.
- Reactive - adaptation undertaken after an impact has been observed or experienced.
- Private adaptation - adaptation undertaken by individuals or private companies.
- Public adaptation - adaptation undertaken by a public entity, usually to benefit the broader community.

"Climate change adaptation helps individuals, communities, organisations and natural systems to deal with those consequences of climate change that cannot be avoided. It involves taking practical actions to manage risks from climate impacts, protect communities and strengthen the resilience of the economy. Adaptation can involve gradual transformation with many small steps over time, or major transformation with rapid change."

Australian Government, Department of Agriculture, Water and the Environment

Source: environment.gov.au/climate-change/adaptation

"Adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change. In simple terms, countries and communities need to develop adaptation solutions and implement action to respond to the impacts of climate change that are already happening, as well as prepare for future impacts.

Adaptation solutions take many shapes and forms, depending on the unique context of a community, business, organisation, country or region. There is no 'one-size-fits-all-solution' - adaptation can range from building flood defences, setting up early warning systems for cyclones and switching to drought-resistant crops, to redesigning communication systems, business operations and government policies. Many nations and communities are already taking steps to build resilient societies and economies, but considerably greater action and ambition will be needed to cost-effectively manage the risks, both now and in the future."

United Nations Framework Convention on Climate Change - Adaptation and Resilience

Source: unfccc.int

Snapshot of Mosman

Mosman is a relatively small local government area (LGA) on Sydney's lower north shore, eight kilometres north-east from Sydney's Central Business District. It occupies the Middle Head area of Sydney Harbour and is bordered by national park land, beaches and harbour foreshore, and includes a number of parks and areas of bushland.

It is home to approximately 28,123 residents living in 13,399 households. Population density is medium to high overall with large areas of suburban housing.

Multiple factors influence response to adversity and contribute to resiliency, including household stability, economic security, physical, mental, social wellbeing and environmental health. Considerations for developing residents' climate resilience and helping them adapt to climate change include dwelling type and tenure, income, age and living circumstances.

More than half of residents, 52%, live in a flat or apartment, 34.9% in a freestanding home and 12% in semi-detached homes. Of occupied private dwellings 38.3% are owned outright, 25.8% owned with a mortgage and 33.1% are rented. Compared to NSW overall a higher proportion of residents are tertiary-educated and employed as a professional or in management, and the median weekly income is much higher.

Children, older residents, unemployed and people with disability or mental health issues make up the proportion of the population identified as highly vulnerable in times of stress.

Some community members will experience multiple vulnerabilities.

The ageing population and social isolation – 31.7% of residents live in a single/lone person household – are likely to be the two biggest contributors to vulnerability. The last census showed the median age of residents 42 years old, children aged 0-14 years account for 17.9% of Mosman's population and people aged 65 years and over equate to 18.8% of the population.

An ageing population (see Figure 1) will increase the proportion of people in the community that are vulnerable to urban heat, respiratory issues and other chronic and sudden stresses.

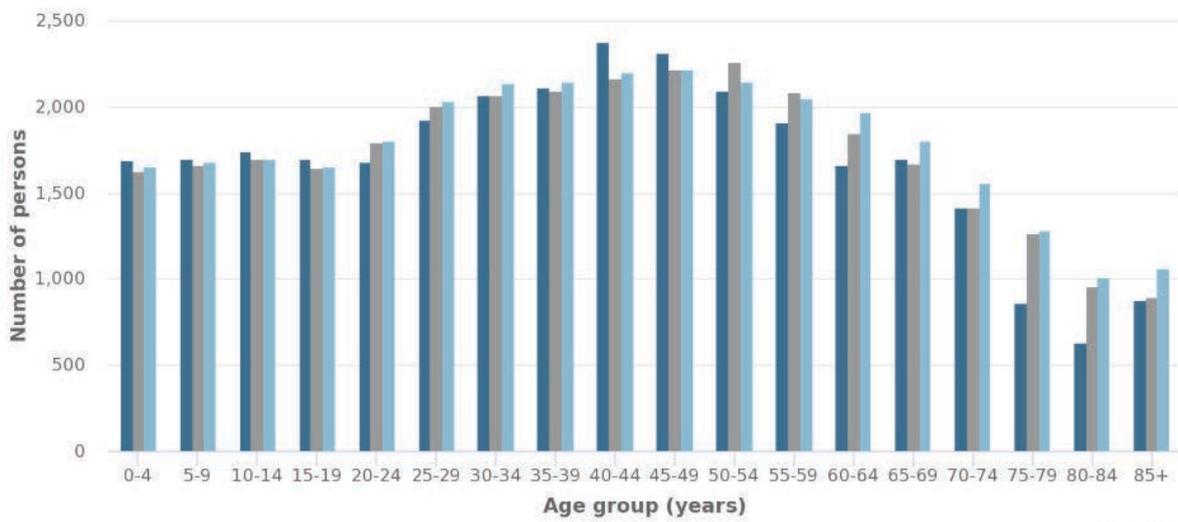
Vulnerable sectors of the community will require focused resilience planning especially for urban heat, infrastructure outages and sudden events. Vulnerable residents are expected to be the most exposed and Council will need to activate the community to prepare them and help them to recover from impacts.

Source: Australian Bureau of Statistics

Forecast age structure - 5 year age groups

Mosman Municipal Council - Total persons

2016 2026 2036



Population and household forecasts, 2016 to 2036, prepared by .id the population experts, December 2017.



Figure 1. Forecast age structure for Mosman 2016-2036. Source: ID Population Experts 2017



Context

Global

Global leadership on climate resilience and adaptation is provided by the United Nations through its Framework Convention on Climate Change (UNFCCC), the Sustainable Development Goals (SDGs), United Nations Development Programme (UNDP) and the Intergovernmental Panel on Climate Change (IPCC).

The UNFCCC's work includes the Paris Agreement and guidelines for National Adaptation Plans (NAPs). The UNDP works across thematic areas to support communities in building resilience to climate change. The IPCC assesses the science related to climate change.

The Paris Agreement aims to strengthen the global climate change response by *increasing the ability of all to adapt to adverse impacts of climate change and foster climate resilience*. It requires all Parties, as appropriate, to engage in adaptation planning and implementation.

The UNDP's *Call for Action on Raising Ambition for Climate Adaptation and Resilience* declares "As we urgently increase our efforts to reduce emissions, we must give equal and increased urgency to adapt to climate impacts and build resilience for the future" and commits signatories to "enhance adaptation and resilience action, particularly in three areas: Acting now to respond to immediate climate impacts and to support the most vulnerable members of society; building resilient futures by putting climate risk at the centre of decision making; urgently increasing the availability of adaptation and resilience finance".

Figure 2 below shows the adaptation cycle under the UN climate change regime, including four general components – plan for adaptation, implement adaptation measures, monitor and evaluate adaptation and assess impacts, vulnerability and risks.

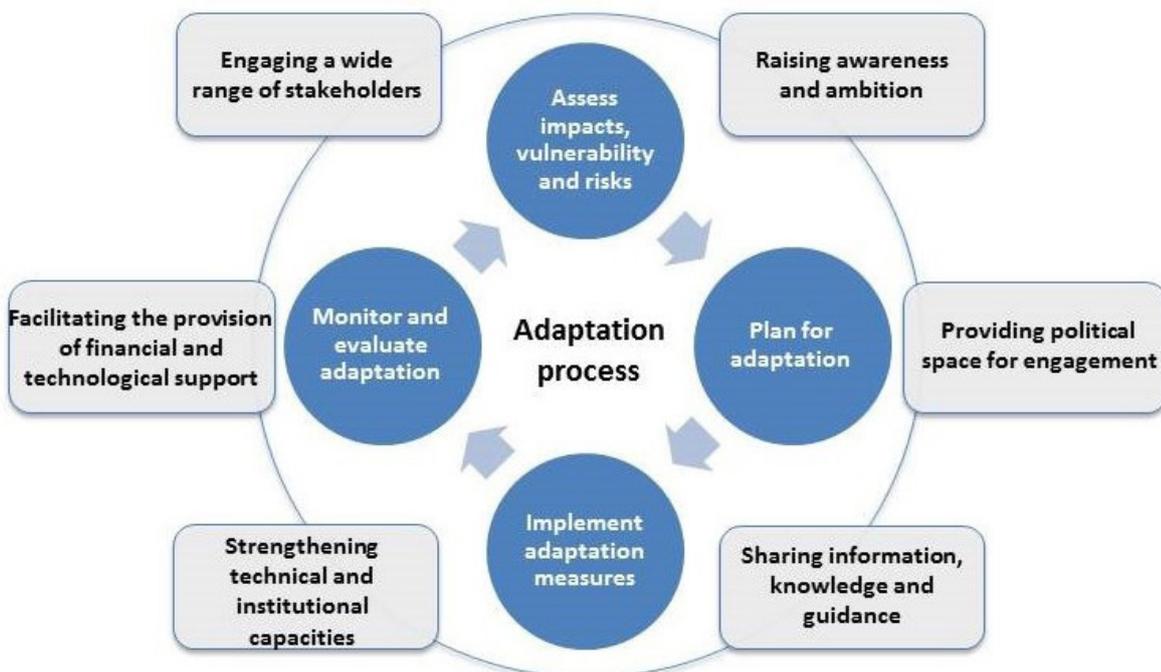


Figure 2. Adaptation cycle under the UN climate regime. Source: UNFCCC <https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/what-do-adaptation-to-climate-change-and-climate-resilience-mean>

The IPCC prepares comprehensive reports with climate modelling and research based on different greenhouse gas concentration trajectories. The IPCC's Fifth Assessment Report (AR5) published in 2014 listed four scenarios based on different forecasts of concentration of carbon dioxide equivalents in the atmosphere (parts per million volume of CO₂ particles) called Representative Concentration Pathways (RCP). Each RCP, based on how the concentration of greenhouse gas emissions in the atmosphere will change in the future as a result of human activities, involved predictions of temperature increase, sea level rise and frequency of extreme weather at certain points in time.

More recently, the IPCC's Sixth Assessment Report (AR6) published in 2022, contains a new set of five emissions scenarios to explore the climate response to a broader range of greenhouse gas (GHG), land use and air pollutant futures (SSP1-1.9, SSP1-2.6, SSP2-4.5, SSP3-7.0 and SSP5-8.5). Emissions vary between scenarios depending on socio-economic assumptions, levels of climate change mitigation and, for aerosols and non-methane ozone precursors, air pollution controls (Figure 4).

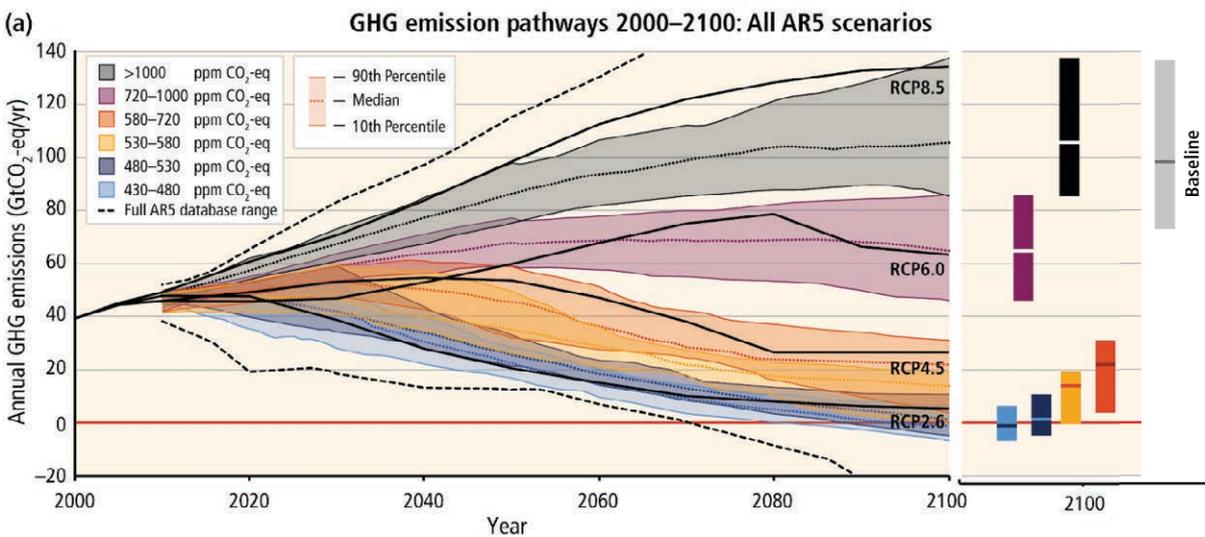
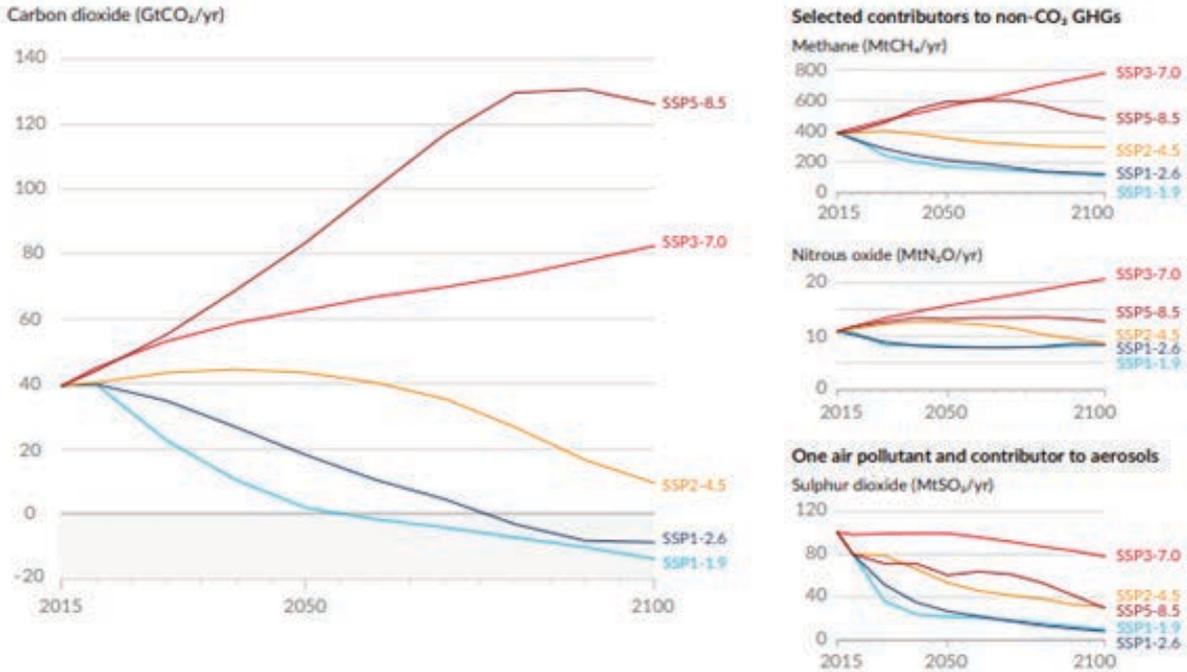


Figure 3. GHG emission pathways 200-2100. All AR5 Scenarios. Source: IPCC

Future emissions cause future additional warming, with total warming dominated by past and future CO₂ emissions

(a) Future annual emissions of CO₂ (left) and of a subset of key non-CO₂ drivers (right), across five illustrative scenarios



(b) Contribution to global surface temperature increase from different emissions, with a dominant role of CO₂ emissions

Change in global surface temperature in 2081-2100 relative to 1850-1900 (°C)



Total warming (observed warming to date in darker shade), warming from CO₂, warming from non-CO₂ GHGs and cooling from changes in aerosols and land use

Figure 4. (a) Future annual emissions of CO₂ (left) and of a subset of key non-CO₂ drivers (right), across five illustrative scenarios and warming contributions, (b) Contribution to global surface temperature increase from different emissions, with a dominant role of CO₂ emissions. Source: IPCC AR6.

National

Australia's National Climate Resilience and Adaptation Strategy is managed by the Federal Department of Agriculture, Water and the Environment. The Strategy states its scope and purpose is to: *set out what the Australian Government will do to support efforts across all levels of government, business and the community, to better anticipate, manage and adapt to the impacts of climate change.*

The Commonwealth's role in helping Australia adapt to the impacts of climate change include providing high quality national and regional climate projections for effective adaptation to the impacts of climate change and providing leadership on national adaptation reform.

Australia has endorsed the UNDP's *Call for Action on Raising Ambition for Climate Adaptation and Resilience* and proposed an initial \$12.9 million investment towards establishing Climate and Resilience Services Australia, a new capability to connect and leverage the Commonwealth's climate and natural disaster risk information to further prepare for and build resilience to natural disasters, and committing to the Coalition for Climate Resilient Investment, a flagship initiative of the 2021 UN Climate Change Conference, COP26.

State

The NSW Government's Climate Change Policy Framework commits to helping NSW achieve net-zero emissions by 2050 and to make NSW more resilient to a changing climate. Through its Climate Change Fund the NSW Government is providing \$30 million to help households, businesses and councils reduce their exposure to natural hazards and climate risks. This includes:

- Support to update the NSW and ACT Regional Climate Modelling (NARClIM) project to deliver climate projections out to 2100, provide detailed maps and reports of natural hazards to assist local councils, emergency services, water resource and bushfire managers, and research into how infrastructure and services could be adversely affected by more extreme weather events as well as options for managing these risks.
- Support for councils, communities and agencies to better prepare for and respond to heatwaves, storms, floods, droughts and bushfire as well as improved information, resources and guidance at a local level on climate change impacts, risks and adaptation options.
- Supporting local governments respond to identified climate risks and vulnerabilities through the Increasing Resilience to Climate Change grant scheme.

NSW's climate change adaptation programs are aimed at building the resilience of the State's natural environment, economy and communities by:

- Helping communities adapt (including assessing regional communities' vulnerability)
- Preparing for the impacts of climate change
- Protecting ecosystems and natural resources

More information

United Nations Framework on Climate Change
unfccc.int

United Nations Development Programme Climate Change
Adaptation
adaptation-undp.org

The Intergovernmental Panel on Climate Change
ipcc.ch

IPCC AR5 Synthesis Report
ipcc.ch/report/ar5/syr/

Australian Government, National Climate and Resilience
Strategy
environment.gov.au/climate-change/adaptation/strategy

NSW Climate and Energy Action
energy.nsw.gov.au

NSW Government, AdaptNSW
climatechange.environment.nsw.gov.au

Get Ready NSW
nsw.gov.au/emergency/get-ready



MOSMAN MUNICIPAL COUNCIL

Local Leadership

Climate Action

This *Resilience and Adaptation Strategy* builds on a solid foundation of climate action. It follows Mosman Council's declaration of a Climate Emergency, adoption of net zero emissions targets and development of a *Mitigation Strategy*.

In recognising climate science and the potential IPCC scenarios Council is better placed to prepare for current and future impacts.

Council is responsible for a broad range of services and the management of various assets and infrastructure. It is on the frontline in dealing with the impacts of climate change and has a critical role to play in ensuring an adequate local adaptation response and in taking a leadership role to guide, help and facilitate community response.

As with the *Mitigation Strategy* this *Resilience and Adaptation Strategy* will require high community participation. The plan's focus is on Council and Community actions, increasing community connectiveness and capacity building.

Council has a co-ordinated approach across internal departments and its Climate Action strategies dictate the inclusion of relevant considerations in all policies and operational procedures. Risk assessment will enable complex decisions to be made and vulnerability mapping will help to identify emerging needs in terms of services, amenities and support. Collectively this will enable Council to implement the best possible response to chronic and sudden developments.

Council is also part of Resilient Sydney, a collaboration of all 33 metropolitan councils of Greater Sydney to develop and implement a city-wide resilience strategy. Resilient Sydney is aligned to the global Resilient Cities Network (previously 100 Resilient Cities) pioneered by the Rockefeller Foundation.

Council is also committed to high standard emergency preparedness through membership of the Mosman North Sydney Willoughby Bushfire Committee and the Local Emergency Management Organisation and continued support of State emergency services such as the SES and NSW Fire and Rescue.

The community must be involved and Council acknowledges community members hold a range of views from those who do not believe in climate change to those who experience anxiety about climate change.

Community connection is critical for resilience and Council fosters this through programs to support seniors, youth and local environmental groups, networking with schools on sustainability and climate issues, Community Consultative Committees and volunteering programs. Council is also exploring an asset-based community development approach to sustainable community-driven development.

Strategic Direction

The *Mosman Climate Action Plan - Resilience and Adaptation Strategy* aligns with MOSPLAN, a suite of integrated documents that include Mosman Council's 10 year Community Strategic Plan.

This articulates the Vision for Mosman:

A vibrant, inclusive harbourside village where community and heritage are valued and where residents feel safe and connected.

It also outlines seven strategic directions for Council's delivery program and operations, in particular:

Strategic Direction 1

A safe, caring and inclusive community

Strategies:

1. Assist residents to feel connected to their community and each other
2. Ensure support is available for people in need
3. Promote opportunities to acknowledge and embrace diversity

Strategic Direction 3

An attractive and sustainable environment

Strategies:

1. Protect and enhance Mosman's natural areas and local biodiversity
2. Use and encourage sustainable practices
3. Effectively manage parklands for community use

Strategic Direction 4

An engaged, business-friendly Community with strong civic leadership

Strategies:

1. Actively inform, engage and support the community, including businesses
2. Deliver high quality, convenient service to customers
3. Collaborate locally and regionally to deliver the best outcome for Mosman

Council's aim is a stable, healthy, prosperous community that lives in cohesion with Mosman's dynamic and thriving natural environment, and for its practices and norms to ensure Mosman's eco-community is sustained for future generations.

To achieve these goals Council will build on its strong history of environmental stewardship and embed the *Resilience and Adaptation Strategy* into policy documents, operational manuals and procedures.

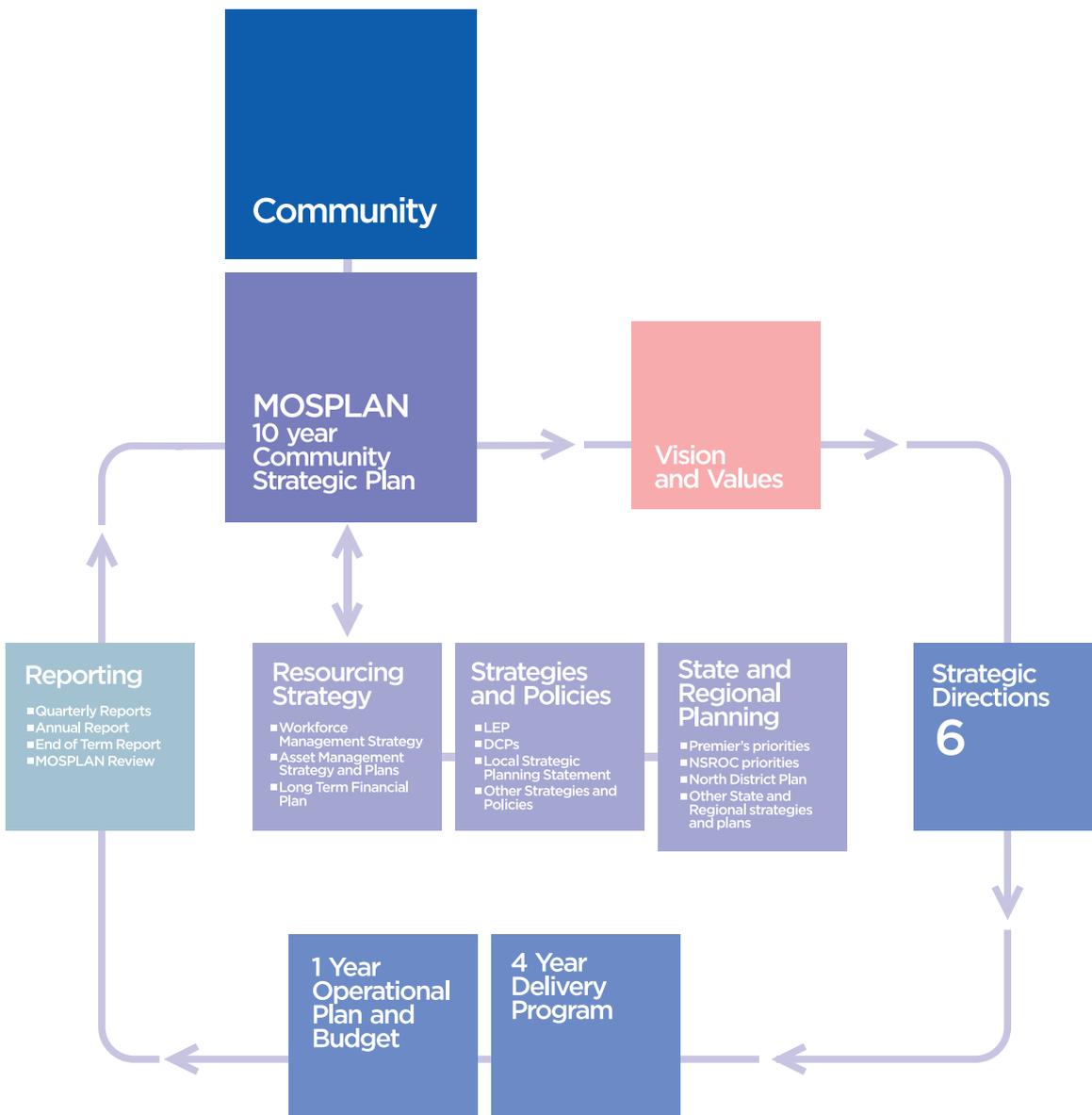


Figure 4 - Community Strategic Plan 2022-2032

Council and Community Collaboration

Working closely with the community - engaging, informing and collaborating - is paramount for the success of this plan. Council's approach to community engagement follows the International Association for Public Participation's (IAP2) Core Values and Public Participation Spectrum. This identifies the levels of engagement that evolve public participation from informing to empowering.

Commitments

In the course of implementing this plan Council commits to provide the community with timely and useful information, and wherever possible incorporate community input to improve outcomes.

Council will:

- Inform the community about the risks of climate change, through knowledge sharing and engagement.
- Ensure the community is kept up to date on Council actions and plan achievements.
- Actively engage the community and facilitate capacity building for resilience and adaptation.
- Obtain feedback and provide ample opportunities for community members to communicate their views, concerns and aspirations.
- Allocate adequate resources and staff to education and engagement activities.
- Lead by example and implement resilience and adaptation measures that can be replicated by residents and businesses.

INCREASING IMPACT ON THE DECISION

| | INFORM | CONSULT | INVOLVE | COLLABORATE | EMPOWER |
|----------------------------------|--|--|---|---|--|
| PUBLIC PARTICIPATION GOAL | To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions. | To obtain public feedback on analysis, alternatives and/or decisions. | To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered. | To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution. | To place final decision making in the hands of the public. |
| PROMISE TO THE PUBLIC | We will keep you informed. | We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision. | We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision. | We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible. | We will implement what you decide. |

Figure 5: IAP2 Spectrum of Public Participation. Source: iap2.org.au

Impacts and Effects

This section synthesises findings from the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5) with local information and data.

Prediction is a crucial step for adaptation and this strategy relies on the IPCC Representative Concentration Pathway (RCP) 8.5 climate model, or 'business as usual' model, which dominates predictions about climate change. It is the highest RCP and current emissions are tracking close to this pathway.

RCP 8.5 forecasts that global temperature will rise between 3.2 - 5.4°C above pre-industrial levels, sea level is expected to rise 84 - 110 cm and there will be a large increase in extreme weather events. Other major weather drivers such as the Interdecadal Pacific Oscillation (IPO), El Nino and La Nina will also be influenced by these changes.

Sources of information used to assess the impacts and effects of these predictions for Mosman include:

- NSW State Government
- Local topographical and asset data
- Research organisations that have used climate data sets to develop reliable local predictions and mapping tools such as the National Climate Change Adaptation Research Facility, CSIRO and NGIS Australia.
- A draft Climate Change Risk Assessment Adaptation Report prepared for Mosman Council by Echelon in 2010.

The table below provides an overview of predicted impacts and effects for Mosman in the four key categories of temperature, sea level rise, rainfall and bushfire. It is to be taken as a guide only. More detailed studies would be required for more accurate predictions. As climate science is continually changing, it is anticipated that this chapter will evolve as new research findings are released.

The following pages explore these impacts and scenarios in Mosman in more detail.

More information

National Climate Change Adaptation and Research Facility
- CoastAdapt
coastadapt.com.au

CSIRO - Climate Change in Australia
climatechangeinaustralia.gov.au

NGIS Australia - Coastal Risk Australia
coastalrisk.com.au

| Impact | Effects | Prediction |
|----------------|---|--|
| Temperature | <ul style="list-style-type: none"> ▪ Current temperature is 1.1°C above pre-industrial levels ▪ Temperatures to rise a further 3.2 - 5.4°C by 2100 ▪ Hot days will become hotter and more frequent ▪ Warm nights will become warmer and more frequent ▪ Heat waves will increase ▪ More severe storms and high wind events ▪ Increase in evaporation | <ul style="list-style-type: none"> ▪ Increased temperatures ▪ More hot days ▪ More warm nights ▪ Heat waves ▪ Increased storm damage ▪ Ecosystem degradation |
| Sea level rise | <ul style="list-style-type: none"> ▪ Sea levels will rise: <ul style="list-style-type: none"> - 40 cm by 2050 - 78 cm by 2100 ▪ Risk of 0.9 to 1.5 m storm surges by 2030 | <ul style="list-style-type: none"> ▪ Coastal inundation in low lying areas ▪ Shoreline recession ▪ Greater impacts from storm surge events |
| Rainfall | <ul style="list-style-type: none"> ▪ Increased intensity of rainfall ▪ 12% increase in rainfall by 2060 and 22% increase by 2090 ▪ Rainfall will be less frequent | <ul style="list-style-type: none"> ▪ Variation to existing rainfall patterns ▪ Higher evaporation ▪ Pollution events |
| Bushfire | <ul style="list-style-type: none"> ▪ Increased risk of fire | <ul style="list-style-type: none"> ▪ Bushfire risk increase to bushland urban interface areas ▪ Smoke pollution reducing air quality |

Table 2 – Impacts and effects for Mosman

Resilience Action Areas

Building the Mosman community's climate resilience involves capacity building, developing connectedness and cohesiveness, fortifying networks and preparing to support the more vulnerable members of the community.

Different individuals and groups within the community have different needs to support resilience. Resilience can be built through establishing and strengthening community networks and by creating a sense of belonging for individuals. Personal isolation can be reduced by reaching out to others. Resilience planning stimulates formal and informal networks and connections that keep people engaged in caring for each other.

To thrive under adversity a combination of protective factors can contribute: high trust communication; stable and engaged relationships; self-efficacy, perceived control and agency; the ability to ask for, or to offer help; cultural respect; positive regard and messaging to support a constructive interpretation of gratitude, and compassion in recovery.

Further research is required to quantify and identify residents who belong to more vulnerable groups including those with pre-existing health conditions, the elderly, culturally and linguistically diverse (CALD) communities and lower socio-economic demographics.

Strategies that will increase the Mosman community's adaptive capacity include:

- Identification of vulnerable people
- Improved collaboration between local councils and other local agencies
- Adopt an Asset Based Community Development approach to help build connection and social wellbeing
- Strengthen local emergency management plans based on rigorous assessment of risk
- Establish local recovery plans co-designed with the community
- Identify priority systems, planning legislation, strategies and investments (within and across Council areas) to mitigate risks to the community, Council operations and critical infrastructure
- Connect and advocate with regional networks focused on resilience e.g. Resilient Sydney

Utilizing the 'Steps To Resilience', U.S. Climate Resilience Toolkit - [toolkit.climate.gov](https://www.toolkit.climate.gov), the following actions have been developed. It should be noted that there are still gaps in Council's knowledge base and this is an evolving action list.



| Requirement | Existing programs and partners | Community Actions | Council Actions | Council Actions Status |
|--------------------------------------|--------------------------------------|--|--|--|
| Community connectedness | Council | Get to know your neighbors - Residents assisting other residents | Community Connections Roundtable events | Completed |
| | Volunteering | | | |
| | Sporting clubs | Have a meal with someone new | Develop a Community Connection Plan | In progress |
| | Beaches and parks | Join a local club/group | Public education events like workshops, projects and community collaborations | Ongoing |
| | Library and other public places | Support and involvement with local sporting clubs | | |
| | Churches | Volunteering at a local organisation | Promote and collaborate with Mosman schools on sustainability issues | Ongoing |
| | Local annual events | | | |
| | Social and other forms of media | | Install more bike racks and progress Active Transport Plan Actions | Active transport plan completed. Bike racks ongoing. |
| | Aged Services | | Youth mental health programs | Ongoing |
| | Local media | | | |
| NSW Government service and providers | | | | |
| NSW Police | | | | |
| Preparedness | Council | Being Emergency Prepared | Emergency preparedness promotion - provide checklist on website | Ongoing |
| | NSW Government service and providers | Download the Get Prepared app from the App Store or Google Play to get ready to make an emergency plan for your household. | Disability Inclusion Action Plan and other community services programs | Completed, ongoing programs |
| | SES | | Continuing to support local emergency groups | Ongoing |
| | NSW Fire and Rescue | Install Solar Panels with Battery Back up | Make available Council buildings in times of emergency | Ongoing |
| | Australian Red Cross | Maintain property and plan for climate change in future property developments | Explore cool zone options in the area for large air-conditioned spaces for high heat periods | Under investigation |
| | | Get to know your neighbors - Residents assisting other residents | Support Community Gardens and Bushcare | Ongoing |
| | | Participate in Community Gardens and Bushcare | | |
| | | Increase onsite rainwater capture and re-use | Provide opportunities for emergency ready training | Workshops planned for November |
| | | | | |
| | | | | |

| Requirement | Existing programs and partners | Community Actions | Council Actions | Council Actions Status |
|-------------|---|--|--|--|
| Recovery | SES | Get to know your neighbors - Residents assisting other residents | Continue to support SES headquarters in Mosman | Ongoing |
| | NSW Fire and Rescue | | Continue Council Depot Operations | Ongoing |
| | Council | Volunteering at a local organisation like SES | Council to coordinate clean ups to restore areas as required | Ongoing |
| | NSW government Disaster Customer Care Program | | Increase contingency funds for clean-up costs and emergency | Completed. Annual recurrent budget allocation for emergency response works |
| | An Aging Population Framework | | | |

Table 3 - Actions to build community resilience



Adaptation Action Areas

Adaptation involves decisions and actions that minimise vulnerability, help to prepare for the adverse consequences of climate change. This section outlines Council's proposed actions to address the predicted impacts and effects of climate change in Mosman. It's focused on building community adaptation to four key predicted impacts:



Temperature



Sea Level Rise



Rainfall



Bushfire

The IPCC's 2014 RCP 8.5 climate model provides the basis for Council's risk assessments. The scenario's are neither forecasts nor policy recommendations. The purpose of risk assessment is identify risks that require further investigation and action as a basis for decision making and planning. It also allows council staff and the community to familiarise themselves with local climate change risks and normalise the concept of climate change adaptation across all areas of council decision making.

Actions are based on an analysis (including gaps in knowledge) of the risks to public and private assets, and outline the existing mechanisms and processes, identified shocks and stresses and new actions and initiatives required.

There is currently no metrics to measure many of these actions. Council proposes to develop community surveys and benchmarks to report against these actions. Measurement and reporting will commence in 2022 and will be aligned with the MOSPLAN reporting.

It should be noted that whilst the below actions are detailed as

"Adaptation Actions" they can also be deemed Mitigation Actions as described in Councils "Climate Action Plan - Mitigation Strategy". It is considered that in order to adapt to Climate Change, both the Community and Council should consider their actions in the lens of actions that reducing Global Warming and the subsequent implications of this.

Temperature

| Community Actions | Council Actions | Council Action Status |
|---|--|-------------------------------------|
| Install solar PV and battery storage on private properties | Install solar PV and battery storage on Council buildings | In progress |
| Undertake energy audits and reduce energy consumption | Undertake energy audits and reduce energy consumption Council Buildings | Completed for Art Gallery and Depot |
| Participate in community battery projects in partnership with Ausgrid | Purchase renewable energy | Completed |
| Reduce hard areas on property, increase tree cover and reduce weeds | Reduce hard areas on property, increase tree canopy cover and reduce weeds | Ongoing |
| Purchase electric vehicles, utilise carshare and public transport | Continue implementation of biodiversity habitat links | Ongoing |
| Increase active transport use e.g. purchase an e-bike | Continued membership of Sydney Weeds Committee Network | Ongoing |
| Reduce use of potable water and increase use of recycled water | Progress Mosman Walking and Cycling Strategy Actions | Ongoing |
| Avoid and reduce waste that goes to landfill | Protection of trees on public and private lands | Ongoing |
| Increase recycling | Undertake actions in the Climate Action Plan - Mitigation Strategy | Ongoing |
| Reduce air travel | Install electric vehicle charging facilities | Ongoing |
| Purchase renewable energy | | |
| Undertake actions in the Climate Action Plan - Mitigation Strategy | | |

Table 4 - Temperature Actions

Overall global temperature is 1.1°C higher than pre-industrial levels and based on RCP 8.5 is predicted to rise a further 3.2 - 5.4°C by 2100. Ocean temperature is also expected to increase.

Research by the Australian government suggests local temperature intensity now ranges between 1°C and 7°C compared to 0.5°C to 3°C in the early 1990s (Yenneti et.al. 2017:5).

In Sydney there is very high confidence that hot days and heat waves will become hotter and more frequent, and based on RCP 8.5 the CSIRO predicts that by 2090 Sydney's sea surface temperature could increase by 3.1°C (2.8°C to 5.7°C).

Densely populated cities like Sydney are reported to be up to 5°C hotter compared to surrounding areas, and some parts of Sydney are much hotter than others, due to a phenomenon known as the heat island effect. This occurs when structures such as buildings, roads and other infrastructure absorb, retain and re-emit the sun's heat.

The heat island effect is shaped by latitude, elevation, surface morphology, vicinity to water, degree of urbanisation and industrial sites, vegetation cover, land usage, permeable surfaces, use of heating and cooling and road traffic density and air pollution. The urban heat island effect is becoming an increasingly significant issue in Sydney where large areas with dark surfaces such as bitumen roads and carparks in full sun create areas that are considerably hotter than natural surface areas.

In 2020 Sydney's coastal suburbs recorded six days at temperatures above 35°C. Humans and mammals can tolerate heat up to a wet-bulb point temperature of 35°C at 100% humidity, and beyond these conditions' morbidity levels rise.

Mosman's proximity to the ocean and high tree canopy cover make it less susceptible to the heat island affect. Tree cover can reduce ambient heat by up to 10°C. See Figures 5 and 6 for Mosman canopy cover and radiant heat areas.

Council has identified the need to address the existing traffic congestion in the Balmoral area during peak periods. Council is planning to engage a consultant to review the existing traffic and transport issues and constraints related to the existing local road network in the Balmoral area and identify improvement options. The report will also need to take into account increased visitation to Mosman beaches which will further increase traffic flow and congestion around foreshore areas.



Figure 6 - Canopy cover map 2020 where green represents canopy cover

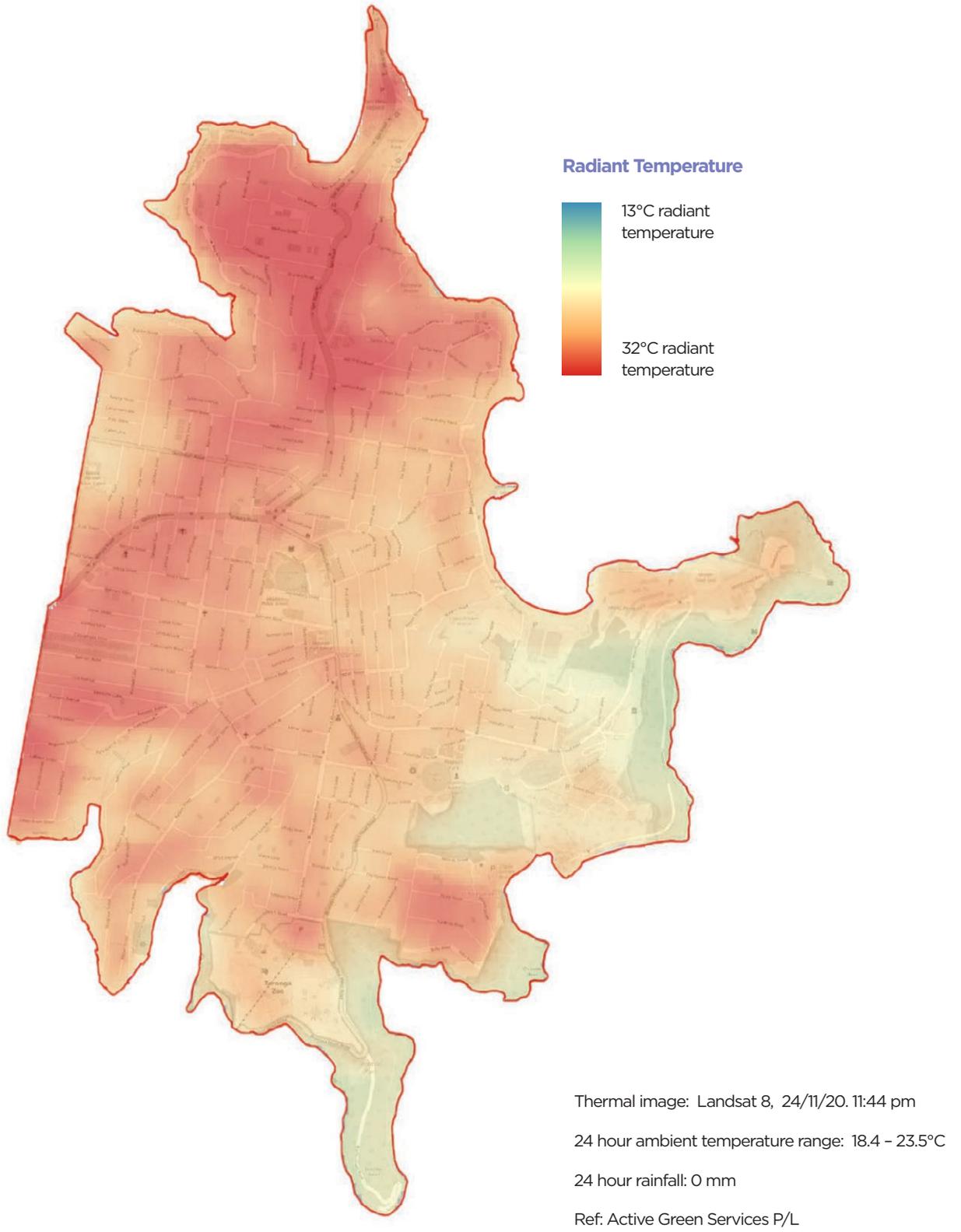


Figure 7 - Radiant heat map of Mosman

Based on RCP 8.5 the National Climate Change Adaptation Research Facility (NCCARF) predicts for Mosman:

- More hot days, with the mean annual number of days with a temperature greater than 30°C increasing from a historical average (1981-2010) of 26 to an average of 37 by 2030, 48 by 2050, 61 by 2070 and 81 by 2090.
- More warm nights, with the mean annual number of nights with minimum temperature greater than 25°C increasing from a historical average (1981-2010) of 0.1 to an average of 0.3 by 2030, 1.1 by 2050, 3.4 by 2070 and 9.6 by 2090.
- Heatwaves, with the average of longest running consecutive days in each year with a maximum temperature greater than 30°C increasing from the historic average (1981-2010) of 3.5 to 4.6 in 2030, 6.1 in 2050, 6.9 in 2070 and 8.6 in 2090.

Higher atmospheric and ocean temperatures will change climate systems and fluctuations in normal weather conditions. This will in turn increase storm activity and changes to evaporation and impact local flora and fauna.

As storm activity is expected to increase with greater intensity and greater frequency more damage can be expected to both private, public and natural assets.

Plant species distribution is closely linked to temperature and those plant species in Mosman at their northern range (that is the main population of species is found south of Mosman) will be most vulnerable and may not survive over the long term. The change in temperature may also favour other plant species and new plant species not normally found in Mosman including weeds.

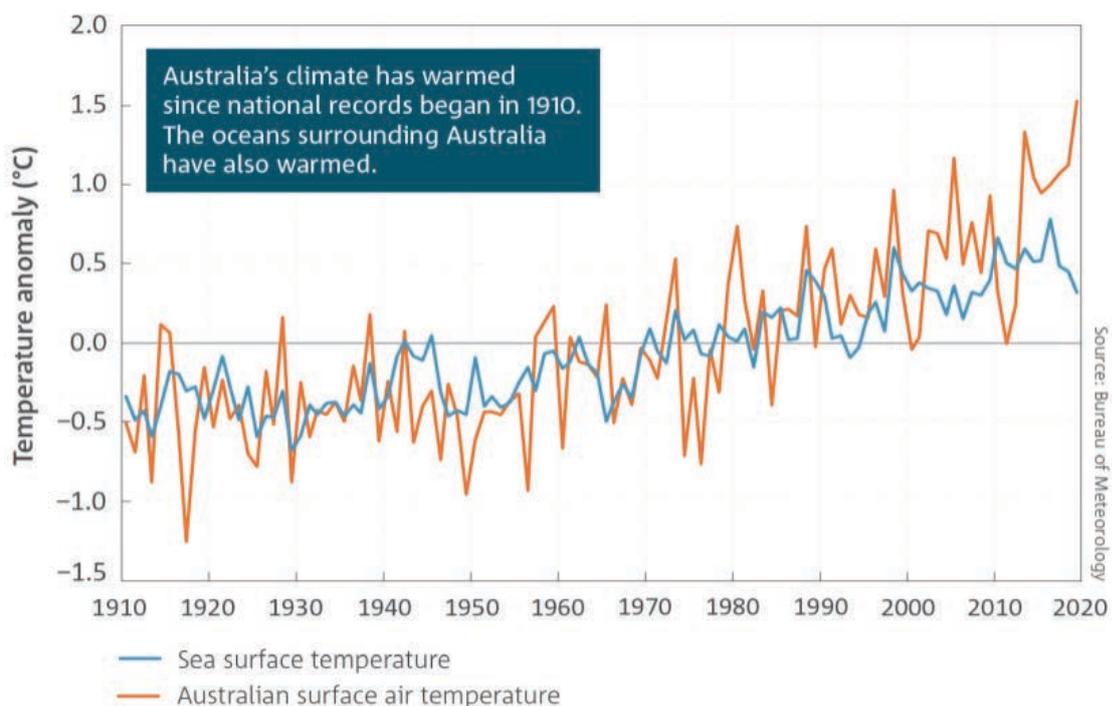


Figure 8 – Trend in surface air and sea surface temperatures in Australia. Source: Bureau of Meteorology 2020



Sea Level Rise

| Community Actions | Council Actions | Council Action Status |
|--|--|--|
| Reduce actions that contribute to Global Warming | Finalise the Mosman Coastal Management Zone Plan and undertake actions arising from the plan | In progress, Council is participating in the Greater Sydney Harbour Coastal Management Program |
| Install solar PV and battery storage on private properties | | |
| Undertake energy audits and reduce energy consumption | Participate in the Greater Sydney Harbour CMP and undertake actions arising from the plan | Ongoing |
| Purchase electric vehicles, utilise carshare and public transport | Consider alternative strategies to minimise beach loss including artificially replenish beach sand | Not started |
| Increase active transport use e.g. purchase an e-bike | Include provision in Plans of Management to undertake works including raising heights of seawalls | Dependent on Coastal Management Zone Plan recommendations |
| Increase active transport use | | |
| Purchase renewable energy | Collaboration with Transport for NSW on initiatives | Ongoing |
| Plan for sea level rise for private infrastructure in future development | Engage with NSW Government and other partners (e.g. SIMS) on initiatives | Ongoing |
| Use sustainable products in developments | | |
| Undertake actions in the Climate Action Plan - Mitigation Strategy | Implementation of planning controls where applicable | Ongoing |

Table 5 – Sea Level Rise Actions





As temperature increases sea levels rise due to thermal expansion caused by warming of the oceans and the melting of land-based ice. RCP 8.5 predicts that sea level will rise 40 cm above pre-industrial levels by 2050 and 78 cm by 2100.

Sea level rise can cause coastal inundation of low-lying areas, recession of shoreline and increased impacts from storm surge events. It would be felt most during high tide and storm events when wind and lower atmospheric pressure cause storm surge and waves. This can lead to greater inundation, erosion and wave over topping. Changes in the underwater landscape would also likely occur and lead to sand drift.

Based on RCP 8.5 the CSIRO and the National Climate Change Adaptation Research Facility (NCCARF) predict that relative to the average calculated between 1986 and 2005, by 2090 Sydney's and Mosman's mean sea level will rise will be 0.66 m (0.45-0.89), and the rate of change at 2100 (mm/yr) will be 11.4 (7.4-16.1).

Sea level rise predicted in RCP 8.5 would likely result in overtopping wave action at most full tides, a large-scale impact of waves on shore-based structures and shoreline recession. The allowance - the height that coastal defences would need to be raised in order to provide the same level of protection as they do today - would be 0.30 m in 2050 and 0.85 m in 2090.

Changes in sea level that impact wave action would also impact sand movement, which could reduce the size of beaches and impact seawalls.

Figure 9 shows the upward trend in tide height increase over the last 100 years in Sydney Harbour and Figure 10 shows sea level rise and waves from storm surge and wind.

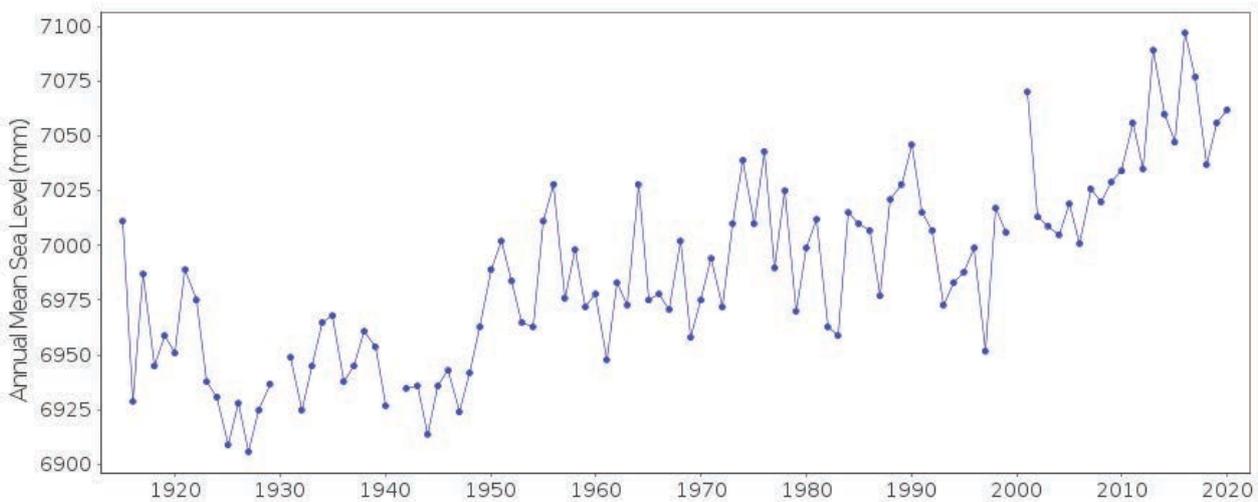


Figure 9 - Fort Denison Tide Gauge Data; mean sea level increases in Sydney Harbour from 1920 to 2020. Source: Bureau of Meteorology 2022

However, no detailed research has been completed for the NSW coastline so the scale of impact for Mosman cannot be confirmed. The NSW Government is drafting a Greater Sydney Harbour Coastal Management Program. This will consider the increase in average sea level and amplified ocean swell however no predicted sea level rise measurement will be included. The NSW Government has deferred this to local governments.

The highest tide recorded in Sydney was 2.4 m in Fort Denison and king tides in Mosman frequently reach 2.05 m. Current seawalls and other marine structures are currently within 1 m of tidal variation. Figure 11 shows the location of Mosman's seawalls and marine assets.

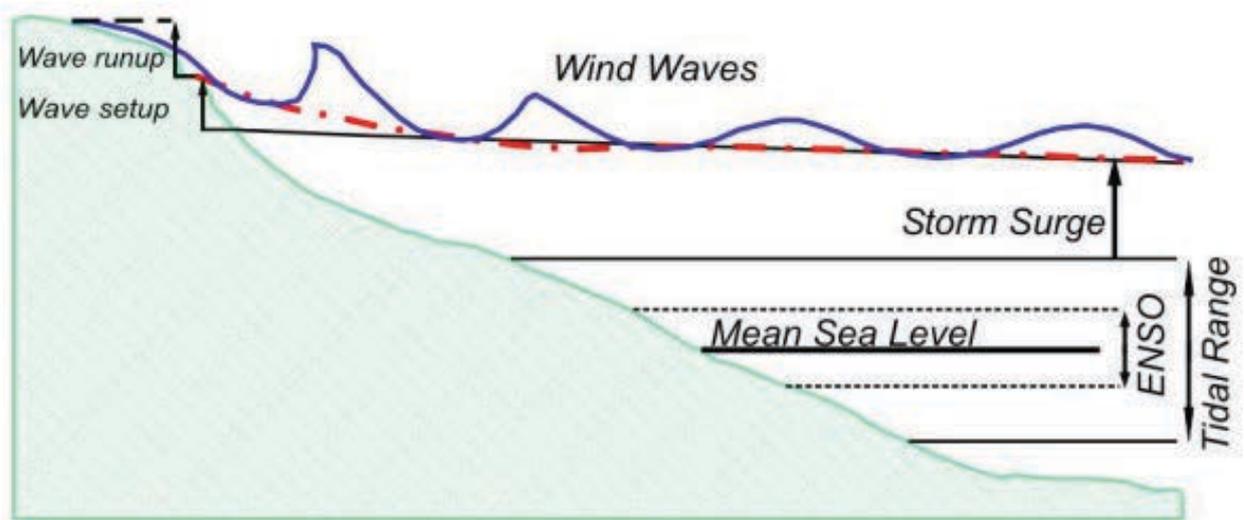


Figure 10: Storm surge and wind. Source: CSIRO Dec 2011



Figure 11: Mosman seawalls and marine structures

Parts of Council’s foreshore and open space recreational areas including beaches and coastal parks may be exposed to coastal inundation. This could affect the transport route through the Spit and heritage listed structures such as the Balmoral sea wall and Esplanade, the Balmoral Baths, Bathers Pavilion and Clifton Gardens Baths.

The shape of Sydney Harbour and Mosman’s position to Sydney Heads protects the majority of Mosman’s coastline from severe sea swell however areas such as the Spit, Balmoral and Chinamans Beach would likely be exposed. The current one in five-year storm surge event would likely become more frequent. The consequences of storm surge, especially when there is an East Coast low and high tide, would be greater causing shoreline recession and damage to coastal sandstone cliffs, beaches, parks and other public and private assets.

More frequent storm surge would also create regular and larger scale backwash onto land and into the stormwater drainage systems at Reid Park, Clifton Gardens, Balmoral, Rosherville Reserve and Sirius Cove.

Mosman Council joined with neighbouring Councils and is currently participating and contributing to the development of the Greater Sydney Harbour Coastal Management Program, (GSHCMP) with the aim to approach the coastal management issues in a holistic and integrated manner. This plan will examine coastal impacts and scenario’s and is scheduled for completion in the next five years.

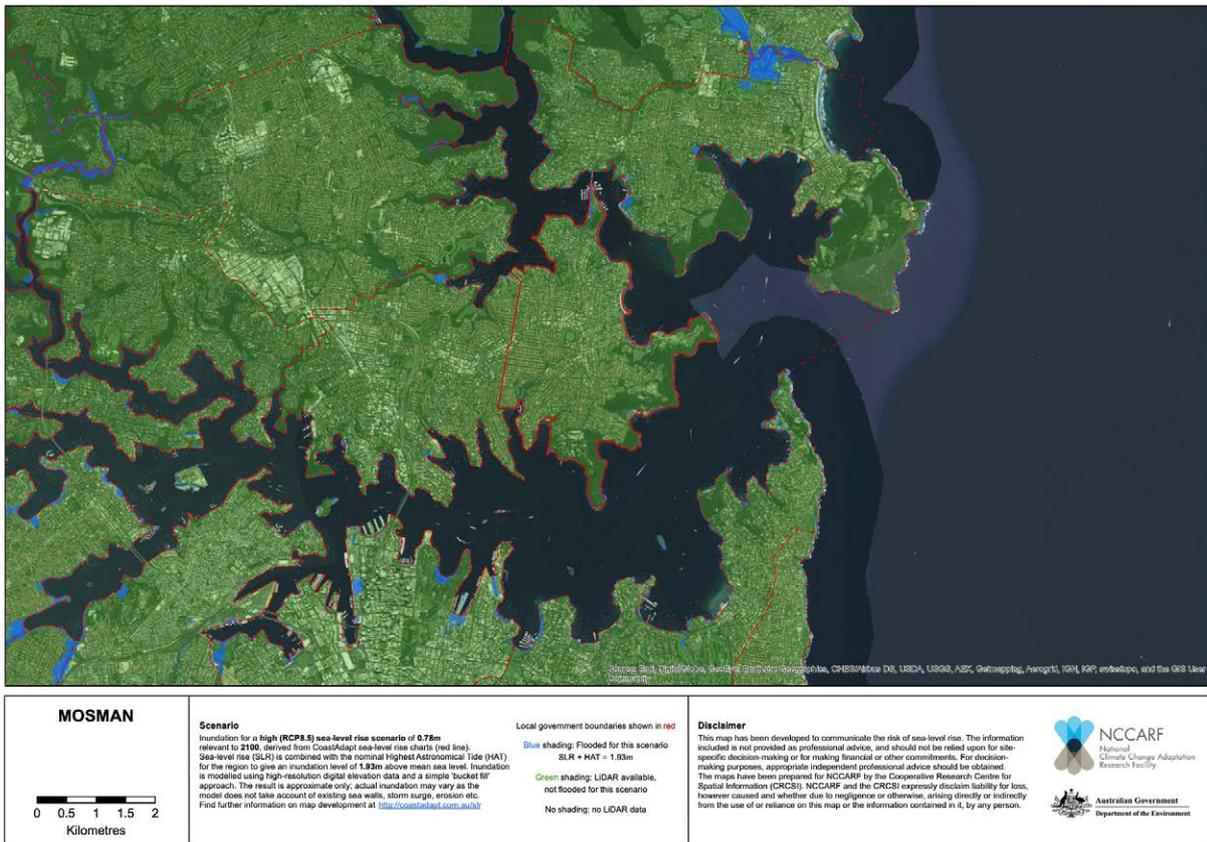


Figure 12: Map of projected coastal inundation for Mosman by 2100, based on RCP 8.5 and 0.78 m sea level rise. Source: CoastAdapt

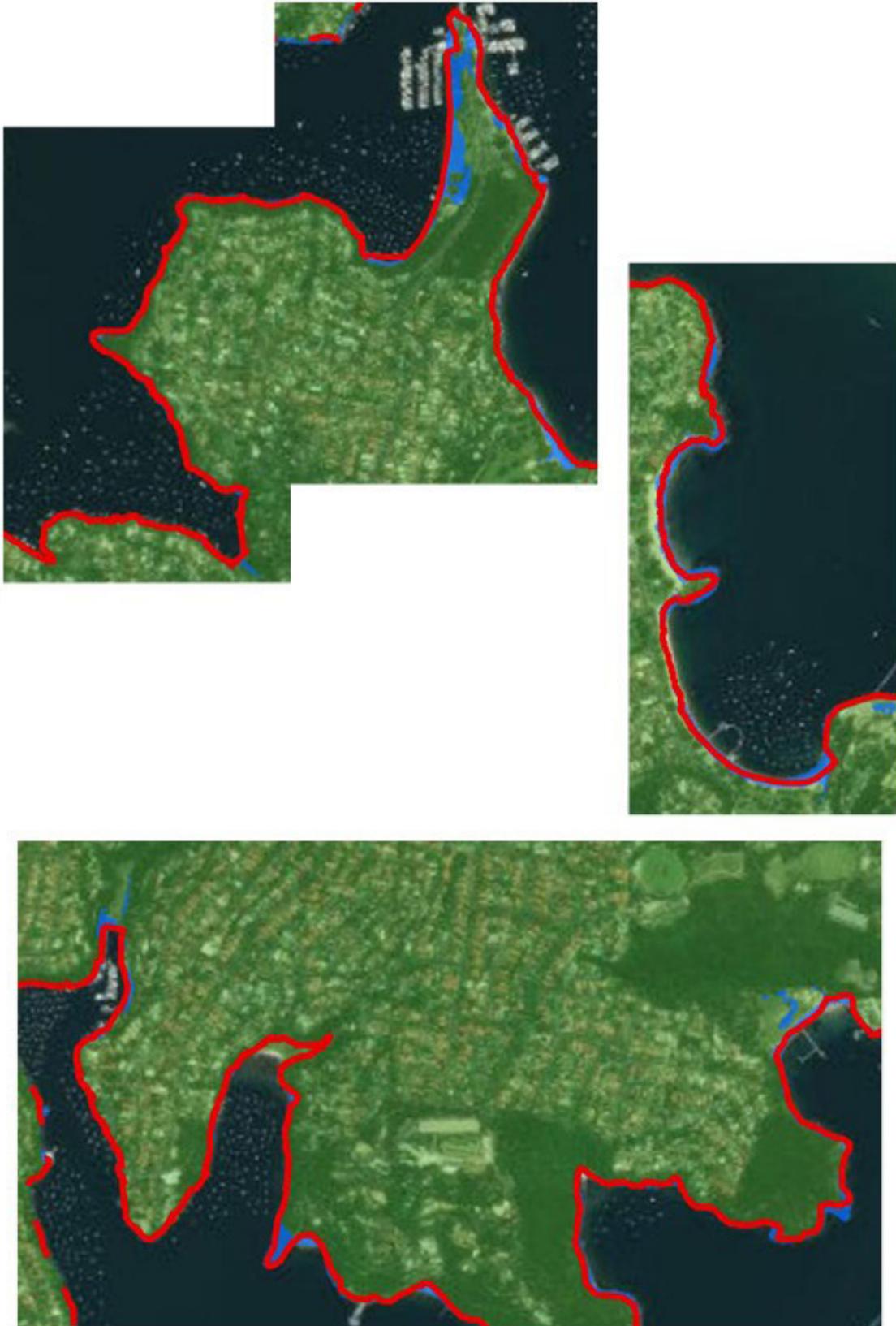


Figure 13: Enlarged map of projected coastal inundation for Mosman by 2100, based on RCP 8.5 and 0.78 m sea level rise. Source: CoastAdapt

Rainfall

| Community Actions | Council Actions | Council Action Status |
|--|---|-----------------------|
| Utilise Water sensitive urban design in developments | Encourage urban biodiversity regeneration through bushland, unmade roads and street tree planting works | Ongoing |
| Increase rainwater collection and re-use on private properties | Increase maintenance/ cleaning budget for SQIDs and stormwater system | Ongoing |
| Increase use of native plant species on private properties | Complete flood study and actions arising from study | In progress |
| Enhance flood controls on private properties | Explore further opportunities for stormwater harvesting/grey water use/bore water use/reuse systems | Ongoing |
| Reduce actions that contribute to Global Warming | Protect and enhance of natural riparian sites | Ongoing |
| Undertake actions in the Climate Action Plan – Mitigation Strategy | Review stormwater OSD policy/DA requirements to review discharge stormwater allowances | Not started |
| | Rainwater tanks/water reuse systems/BASIX/DA requirements | Ongoing |
| | Adapting gardens to endemic native species | Ongoing |

Table 6 – Rainfall Actions





RCP 8.5 predicts an increase of rainfall of 12% by 2060 and 22% by 2090, based on Climate Change Considerations discussed in Australian Rainfall & Runoff (2019) Book 1 Chapter 6.

Climate change is also expected to cause variations to existing rainfall patterns. Given the uncertainty in rainfall projections and their considerable regional variability, an increase in rainfall (intensity or depth) of 5% per degree of local warming is recommended (Geoscience Australia 2019). Long periods of no rainfall are also likely.

Localised intense rainfall would expose parts of Mosman to increased risk of flooding. A 2014 study of Mosman's rainfall shows there were two rain events that exceeded the Annual Exceedance Probability (AEP) that year and two hours of light rain or 30 minutes of heavy rain saturated the catchments and storm water capacity for much of the Mosman LGA. Increased rain at lower volumes would not have a significant impact because the steep terrain in Mosman assists with rapid runoff into surrounding harbours, usually within one hour after a mild event. However a one in five-year event (20% AEP) would cause significant flowpaths and potential flooding. Areas with greater exposure include Brierley Street, Rangers Avenue, Cowles Road, Noble Street, Bay Street, Sirius Cove Road, Botanic Road and The Esplanade.

Most of the estuaries, wetlands and natural watercourses in Mosman have been developed over and replaced by stormwater infrastructure. Some on ground wetlands such as Rosherville Reserve appear under heavy rain events and there are some natural watercourses still in situ. Most coastal parklands are reclaimed land, including Reid Park, Balmoral Oval, Clifton Gardens and Sirius Cove, and flooding is regularly experienced in these areas.

Long periods of no or low rainfall causing drought are likely to compact and dehydrate soil. Once this occurs soil is unlikely to absorb sudden heavy rainfall, making flooding, pollution events and small-scale erosion more likely. The water table is difficult to replenish – limiting the soil's sponge-like ability to absorb rain, and exacerbating drier, harder, soil conditions. Parched soil is also less friable, supports less biodiversity and can lead to ecosystem degradation.

As the population ages capacity for cleaning up after storm or flood damage decreases. In most circumstances the aims of Ageing in Place are very successful but increased chronic and sudden events such as flooding and storms present challenges especially for the most vulnerable people in the community.

Mosman Council is currently finalising a Flood Study of the Mosman area. Council received and noted a report outlining the current status and projected timeline for completion of the Mosman Flood Study. In June 2023 Manly Hydraulics Laboratory was engaged to assist with the Flood Study project, including data collection and modelling of areas that will be flooded, together with options and a plan to reduce flood risk. It is proposed that a Flood Risk Management Committee also be established to assist with the project, together with a Technical Working Group. The project is due to be completed by early 2025, with community consultation to be undertaken in early 2024.

Bushfire

| Community Actions | Council Actions | Council Action Status |
|---|---|-----------------------|
| Ensure property is maintained and bushfire safe | Implement planning controls relating to bushfire prone properties | Ongoing |
| Prepare a bushfire plan | Continue risk assessment and treatment plan for bushland burns through the Mosman North Sydney Willoughby Bushfire Management Committee | Ongoing |
| | Hazard reduction activities through ecological burns and manual reduction fuel loads | Ongoing |
| | Continue proactive tree maintenance | Ongoing |
| | Make Council facilities available in Emergency | Ongoing |

Table 7 - Bushfire Actions

The large-scale Black Summer bushfires of 2019-2020 indicate how quickly severe bushfires can affect regional and urban areas. Fires of this scale start to produce their own ecosystem, as the sooty dry air exacerbates the pyrocirrius clouds and smoky atmosphere. The conditions exacerbate the generation of lightning and the risk of new fires. Statewide bushfire at the scale of the black summer of 2019 will become increasingly likely. The impact to Mosman would be air pollution, with increased bushfires respiratory issues.

Locally, Mosman has large bushland areas including national parks, Harbour Trust and naval bushlands dedicated to coastal and biodiversity protection. The changing weather patterns would cause a slight increase in bushfire risk and resulting smoke pollution causing a reduction in air quality.

Fortunately in Mosman only small sections of urban bushland interface areas exist. Mosman is urban enough that the direct spread and scale of bushfire is not likely although a spontaneous fire at North Head where a controlled burn jumped containment lines is a good example of how dry conditions and high fuel load in bushland is difficult to manage in small areas without risk.





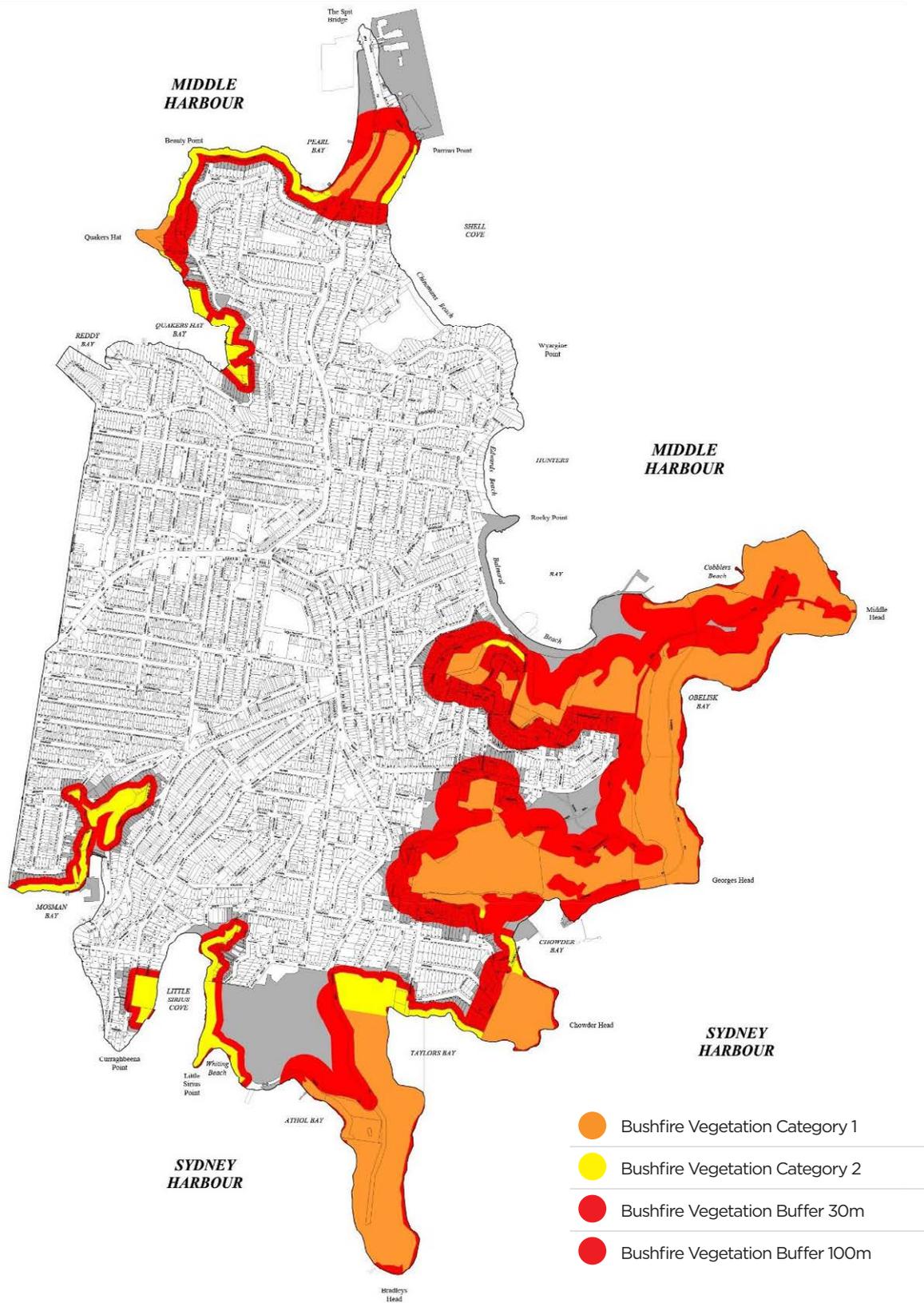


Figure 14: Map of bushfire prone areas in Mosman



Funding and Governance

Oversight and resourcing for the delivery of this plan will be provided by Mosman Council.

Performance against the plan will be measured via reports to Council in line with current MOSPLAN reporting. The Council will also be informed in regard to progress by the Mosman Climate Action Community Consultative Committee.

The plan will have links to other corporate documents including:

MOSPLAN – Mosman Community Strategic Plan
mosman.nsw.gov.au/council/plans/MOSPLAN

Climate Action Plan – Mitigation Strategy
mosman.nsw.gov.au/council/plans/climate-action-plan-mitigation-strategy

Mosman Local Strategic Planning Statement – Sustainability Directions 8,9 and 10
mosman.nsw.gov.au/planning-and-development/strategic-planning/local-strategic-planning-statement/

State of the Environment report –
mosman.nsw.gov.au/sites/default/files/2023-03/220234.001.SOE_Scorecard.LR_.pdf

Environmental Sustainability Policy –
mosman.nsw.gov.au/sites/default/files/2023-09/Environmental-Sustainability-Policy_0.pdf

Projects will be managed by various teams within Council. Building community resilience and cohesion will fall largely under the Community Services Team. Adaptation and physical change to address climate change will fall under the Engineering Team. The future management of private assets will fall under the Development Services Team. The management of public places and environment falls under the Environment and Open Space Team, which will also be responsible for oversight of the whole plan including updates and reporting outcomes to Council and the community.

Funding of projects will be subject to Council's annual budget process. This includes Council's review of projects against Council priorities and strategies at that time. Some projects will need to be prioritised so that Council can understand the full risk and exposure to public and private assets. This includes analysis of the Greater Sydney Harbour Coastal Management Program and commissioning a Flood Study for the LGA. Other works will be highlighted in Council's Draft 10-year Capital Works Program in the various Asset Management Plans. In addition, some works are already accounted for in Council's existing Operational Budget.

These 10-year programs are based on Council's Long Term Financial Plan which is regularly updated and should only be treated as a guide to funding allocations.

Some specific projects may be subject to a detailed cost benefit analysis. This would include a quadruple bottom line assessment evaluating economic, social, environmental, and governance impacts.

Personal Checklist

Anything that improves your wellbeing, connection, knowledge and security can potentially increase your resilience to a changing climate.

Build community connection

Check

Get to know your neighbours, local cafe and retailers

Be part of a local community or sport group

Volunteer for a local community organisation or service

Attend Council workshops and events

Make an emergency plan

Check

Use NSW SES's Get Ready NSW and Red Cross's resources and RediPlan to help prepare for an emergency including:

- Important and emergency contacts
- A plan for pets
- Important documents
- Survival/emergency kit
- First aid supplies and medications

ses.nsw.gov.au/get-involved/get-ready-nsw and redcross.org.au/prepare

Download the Red Cross Get Prepared app for iOS or Android

Home resilience and adaptation**Check**

| | |
|---|--------------------------|
| Install awnings and blinds, especially on apertures facing the sun | <input type="checkbox"/> |
| Install double glazing to improve insulation, and keep the house cool in summer and warm in winter. | <input type="checkbox"/> |
| Use water efficient taps and shower heads | <input type="checkbox"/> |
| Protect large native and canopy trees to reduce heat and encourage biodiversity | <input type="checkbox"/> |
| Use renewable energy | <input type="checkbox"/> |
| Install LED lighting | <input type="checkbox"/> |
| Install rooftop solar | <input type="checkbox"/> |
| Install a heat pump | <input type="checkbox"/> |
| If renovating consider passive design principles - yourhome.gov.au | <input type="checkbox"/> |
| Install a rainwater tank | <input type="checkbox"/> |
| Consider water sensitive urban design e.g., in the garden consider permeable surfaces to help soils absorb rainwater and drainage to reduce flooding and soil runoff. | <input type="checkbox"/> |
| Consider installing a battery for power in the event of an outage | <input type="checkbox"/> |
| Use a composting bins and worm farm to improve soil nutrients and structure. | <input type="checkbox"/> |
| Be waterwise - waterwise.tips | <input type="checkbox"/> |

Resources

Emergency information and contacts

Ambulance, Police, Fire
Triple Zero (000)

NSW State Emergency Service (SES) City of Sydney
(flood and storm)

132 500

Twitter: twitter.com/cityofsydneyses

Facebook: facebook.com/nswsessayd

News

ABC is the official emergency broadcaster, to provide essential up to date information, advice from authorities and support available:

Radio - ABC Radio Sydney - 702 AM, ABC News radio - 630 AM and digital radio.

Twitter: twitter.com/ABCemergency

Facebook: facebook.com/ABCemergency

Live Traffic NSW

livetraffic.com

NSW Fire & Rescue

9265 2999

Twitter: twitter.com/FRNSW

Facebook: facebook.com/frnsw

Bureau of Meteorology

bom.gov.au

National Emergency Management Agency

nema.gov.au

Red Cross

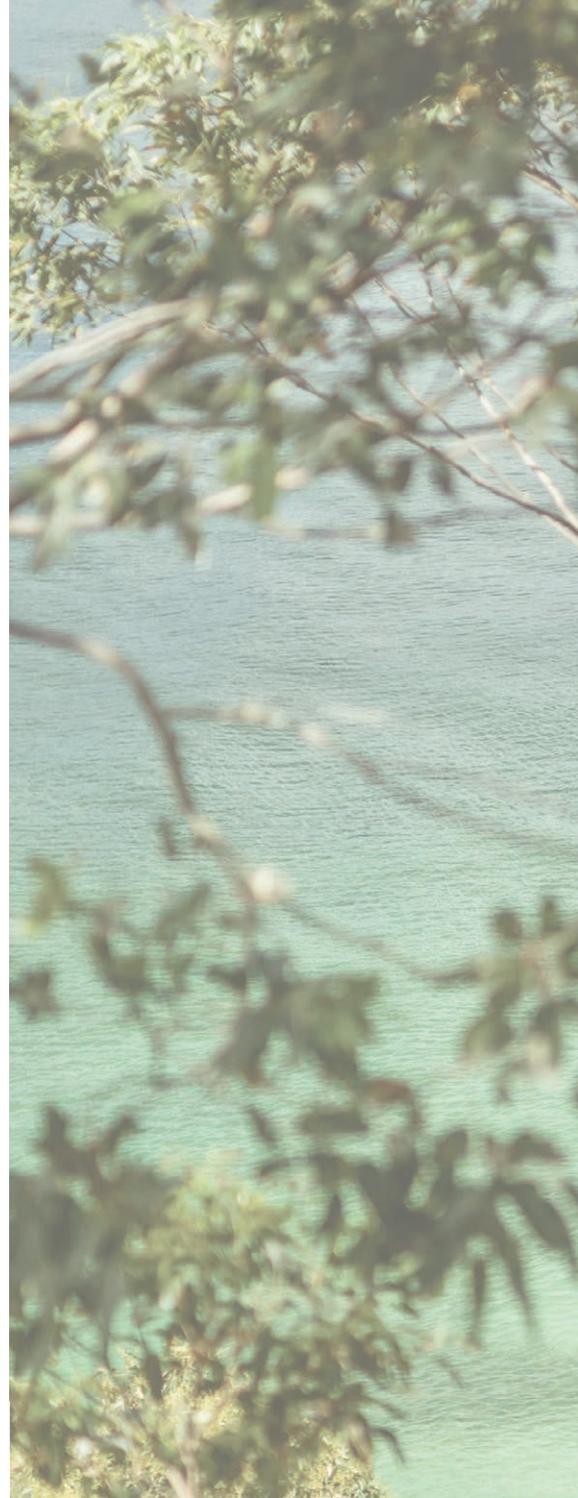
Redcross.org.au/prepare

Get Ready NSW

nsw.gov.au/emergency/get-ready

NSW Health

health.nsw.gov.au/beattheheat

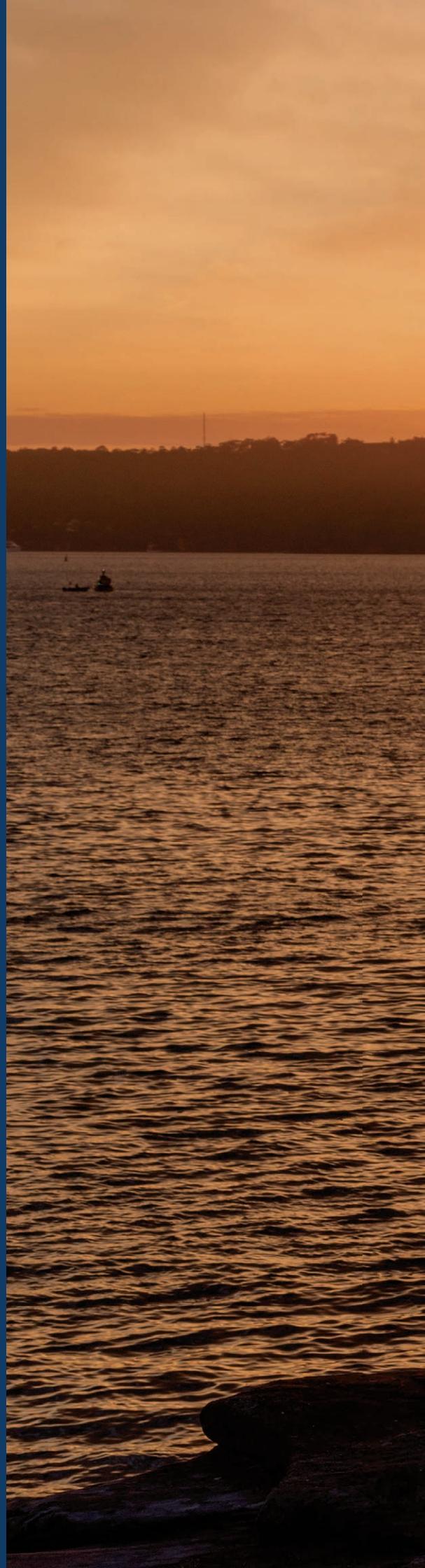




Mosman
COUNCIL

CLIMATE
ACTION PLAN
RESILIENCE AND
ADAPTATION STRATEGY

Mosman
COUNCIL





Mosman Climate Action Plan
Resilience and Adaptation Strategy
Published November 2023

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Mosman
COUNCIL





Acknowledgement

Mosman Council acknowledges that it operates on the traditional lands of the Borogegal and Cammeraigal people, of the Gaimariagal clan of the Eora Nation, and we pay our respects to Elders past, present and future.

As the Traditional Custodians for thousands of years, the Cammeraigal people lived in and around the waterways of Mosman, and cared for and respected the land. Their spirit lives on. We acknowledge them and all Indigenous peoples past, present and future.

Commitment to Climate Action

This *Mosman Climate Action Plan - Resilience and Adaptation Strategy* outlines Mosman Council's commitment to preparing Mosman for the impacts of climate change, and managing the risks of its effects on residents and property.

It is the second part of Mosman's Climate Action Plan, which also includes the *Mitigation Strategy*.

Climate resilience and adaptation to climate change involves preparing for and acquiring new capabilities to be able to withstand and adjust to the anticipated impacts and effects of climate change.

This provides a long term strategy to guide decision making by Council. It will be informally reviewed as required and reported to Council every four years to ensure alignment with climate change predictions, priority issues and gaps in service provision.

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We understand climate change demands immediate, comprehensive and meaningful action, and the more we do now the better the outcomes for our residents, businesses and community as a whole.



From the Mayor

Following Mosman Council's inaugural *Mitigation Strategy*, *this Resilience and Adaptation Strategy* is the second critical part of Council's Climate Action Plan.

Together they form a roadmap for Council and the Mosman community to address climate change and navigate the impacts it will bring for our community and the Mosman area.

Council formally declared a Climate Emergency in late 2019 and since then has moved swiftly to address the multifaceted issues around climate change. Tangible actions include elevating and expanding programs to reduce environmental impact, adopting net zero emissions targets, appointing a Community Consultative Committee and developing these Climate Action Plan strategies to appropriately guide Council and the community into the future.

Council is putting forward a robust response to one of the most pressing and pervasive challenges of our time.

I am proud of Council's efforts in this area and it has been a special privilege to serve as Mayor at a time when Council has embraced and accelerated its responsibilities as a government and community leader on climate change.

We understand climate change demands immediate, comprehensive and meaningful action, and the more we do now the better the outcomes for our residents, businesses and community as a whole.

A handwritten signature in black ink that reads "Carolyn Corrigan". The signature is fluid and cursive, with the first letters of each name being capitalized.

Carolyn Corrigan
Mayor

From the General Manager



Climate change presents a myriad of risks and adapting to its impacts is a consideration across all Mosman Council operations and aspects of the local community.

Council has a critical role to play in helping the Mosman community develop climate resilience and in preparing the area for the future impacts associated with climate change.

This *Resilience and Adaptation Strategy* outlines how Council and Mosman can be climate resilient and prepare for and deal with anticipated climate change impacts intelligently and sustainably. This and the *Mitigation Strategy* make up the Mosman Climate Action Plan, which provides a sensible, considered, comprehensive and realistic commitment to action on climate change for the Council and the Mosman community.

Striving to improve efficiency across operations and embracing technological innovation are hallmarks of Mosman Council, and it is an approach well suited to managing complex challenges like building climate resilience and adaptation to climate change.

This strategy aims to ensure that the right steps are taken and the right projects prioritised to help the Mosman community deal with the impacts and effects of climate change in our suburb, and to prepare for and manage the future impacts that the science tells us to expect.

A handwritten signature in black ink, appearing to read "D. B. Johnson". The signature is fluid and stylized, with a long horizontal line extending to the right.

Dominic Johnson
General Manager



Council has a critical role to play in helping the Mosman community develop climate resilience and in preparing the area for the future impacts associated with climate change.

Introduction

Reducing carbon emissions can mitigate the acceleration of climate change, however the climate is changing and will continue to change as the Earth's system responds to the warming already underway. So as we work to avert the potential impacts of climate change, we must also become more resilient to those impacts that are now unavoidable.

Scientific data modelling enables us to predict the future impacts of a changing climate, influenced by the variable of our mitigation efforts. In any future scenario however global temperature increase is already built into the climatic system and therefore societies and communities must assess and prepare for its impacts.

Climate resilience and adaptation to climate change is about risk management and the ability to recover. It involves preparing for, managing, responding to and recovering from the current and predicted impacts and effects associated with climate change. These can be chronic and ongoing, such as temperature and sea level rise, or sudden and acute such as natural disasters and severe weather events.

Global temperature increase is expected to cause:

- Sea level rise due to thermal expansion caused by the warming of the oceans and melting of land-based ice such as glaciers.
- Changes to weather patterns including longer periods of extreme heat and less frequent, more intense rainfall.

Sea level rise is expected to cause coastal inundation leading to shoreline recession. Higher air temperatures present risks to human health and increase bushfire frequency and intensity. Rainfall changes are expected to generate more localised flooding events, potentially causing damage to assets. Drier conditions and infrequent, intense rainfall can both cause ecosystem degradation.

Both Communities and Governments have an important role to play in Climate Change. The Community can undertake several actions to enhance their resilience with Council's role involving updating infrastructure and helping vulnerable communities cope with extreme weather, sea-level rise and other climate impacts.

This report outlines the predicted impacts for Mosman, and Community and Council strategies for resilience and adaptation. Impacts and adaptation actions are dealt with in four categories:

- Temperature
- Sea level rise
- Rainfall
- Bushfire

The final sections focus on actions and include personal checklists and further resources.

Council acknowledges the potential scope for this strategy is broader than what is covered. It is not possible to include everything and Mosman's public and private assets, biodiversity, landscape and human impacts all need to be further assessed. The strategy will be updated and iterated over time in response to predictive data and actions undertaken.

Overall Mosman is well placed to meet the challenges posed by climate change and it is acknowledged that Community will need to play a major part in the implementation of the plan.



Climate Resilience

“Climate resilience is the ability to anticipate, prepare for and respond to hazardous events, trends, or disturbances related to climate. Improving climate resilience involves assessing how climate change will create new, or alter current, climate-related risks, and taking steps to better cope with these risks.

Climate resilience is often associated with acute events – like heavy downpours, hurricanes, or wildfires – that will become more frequent or intense as the climate changes. However, good resilience planning also accounts for chronic events, like rising sea levels, worsening air quality, and population migration.

Businesses and governments alike are planning now for the environment and economy they will face in the future.”

The climate resilience of a community relates to its ability to positively recover from chronic or sudden climate change impacts. Resilient communities are able to accommodate and adapt their systems and rebound from adverse events in a way that enables them to thrive.

It involves a combination of risk assessment, dissemination of information and knowledge, advocacy, building partnerships, local preparedness, community development and connectedness. These enable people to be better suited to process events and create positive outcomes. The qualities of climate resilience are listed in the table below.

Center for Climate and Energy Solutions (C2ES)

Table 1. Qualities of resilience. Adapted from Resilient Cities Network

| Quality | Description |
|-----------------|--|
| Reflection | Ability to learn from the past to inform future decisions. Recognising changing circumstances. Reviewing what works and what does not to create continual improvement. |
| Resourcefulness | Ability to recognise alternative ways of doing things at times of crisis in order to meet needs and achieve goals. |
| Robustness | Thoughtful, well conceived, well managed and constructed quality of design, including provisions to reduce the impact of failure. |
| Redundancy | Spare capacity built into provisions and infrastructure to accommodate disruption due to extreme pressures, surges in demand or external events. |
| Flexibility | Willingness and ability to adopt out-of-the-box strategies in response to changing circumstances or crises. |
| Inclusivity | Diverse and broad consultation to create a shared sense of ownership and vision. Co-Design and Asset-Based Community Development. |
| Integration | Bringing together systems and organisations to create shared benefits from resources and actors working together. |

Adaptation to Climate Change

Climate change adaptation is defined by the IPCC as *'the process of adjustment to actual or expected climate and its effects'* and the ability to adapt, referred to as adaptive capacity, as the *'ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences'*. (IPCC 2014)

It is the process of change that enables better suitability to the environment and learning how to live sustainably under new and different conditions. It involves decisions and actions that minimise vulnerability, help to prepare for the adverse consequences of climate change and take advantage of the opportunities. It requires research, an open and attentive attitude to new science and planning appropriately timed action.

Different types of climate change adaptation include:

- Incremental - relatively small actions and adjustments.
- Transformational - actions that result in significant changes.
- Anticipatory or proactive - adaptation undertaken before impacts are observed.
- Reactive - adaptation undertaken after an impact has been observed or experienced.
- Private adaptation - adaptation undertaken by individuals or private companies.
- Public adaptation - adaptation undertaken by a public entity, usually to benefit the broader community.

“Climate change adaptation helps individuals, communities, organisations and natural systems to deal with those consequences of climate change that cannot be avoided. It involves taking practical actions to manage risks from climate impacts, protect communities and strengthen the resilience of the economy. Adaptation can involve gradual transformation with many small steps over time, or major transformation with rapid change.”

Australian Government, Department of Agriculture, Water and the Environment

Source: environment.gov.au/climate-change/adaptation

“Adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change. In simple terms, countries and communities need to develop adaptation solutions and implement action to respond to the impacts of climate change that are already happening, as well as prepare for future impacts.

Adaptation solutions take many shapes and forms, depending on the unique context of a community, business, organisation, country or region. There is no ‘one-size-fits-all-solution’ - adaptation can range from building flood defences, setting up early warning systems for cyclones and switching to drought-resistant crops, to redesigning communication systems, business operations and government policies. Many nations and communities are already taking steps to build resilient societies and economies, but considerably greater action and ambition will be needed to cost-effectively manage the risks, both now and in the future.”

United Nations Framework Convention on Climate Change - Adaptation and Resilience

Source: unfccc.int

Snapshot of Mosman

Mosman is a relatively small local government area (LGA) on Sydney's lower north shore, eight kilometres north-east from Sydney's Central Business District. It occupies the Middle Head area of Sydney Harbour and is bordered by national park land, beaches and harbour foreshore, and includes a number of parks and areas of bushland.

It is home to approximately 28,123 residents living in 13,399 households. Population density is medium to high overall with large areas of suburban housing.

Multiple factors influence response to adversity and contribute to resiliency, including household stability, economic security, physical, mental, social wellbeing and environmental health. Considerations for developing residents' climate resilience and helping them adapt to climate change include dwelling type and tenure, income, age and living circumstances.

More than half of residents, 52%, live in a flat or apartment, 34.9% in a freestanding home and 12% in semi-detached homes. Of occupied private dwellings 38.3% are owned outright, 25.8% owned with a mortgage and 33.1% are rented. Compared to NSW overall a higher proportion of residents are tertiary-educated and employed as a professional or in management, and the median weekly income is much higher.

Children, older residents, unemployed and people with disability or mental health issues make up the proportion of the population identified as highly vulnerable in times of stress.

Some community members will experience multiple vulnerabilities.

The ageing population and social isolation – 31.7% of residents live in a single/lone person household – are likely to be the two biggest contributors to vulnerability. The last census showed the median age of residents 42 years old, children aged 0-14 years account for 17.9% of Mosman's population and people aged 65 years and over equate to 18.8% of the population.

An ageing population (see Figure 1) will increase the proportion of people in the community that are vulnerable to urban heat, respiratory issues and other chronic and sudden stresses.

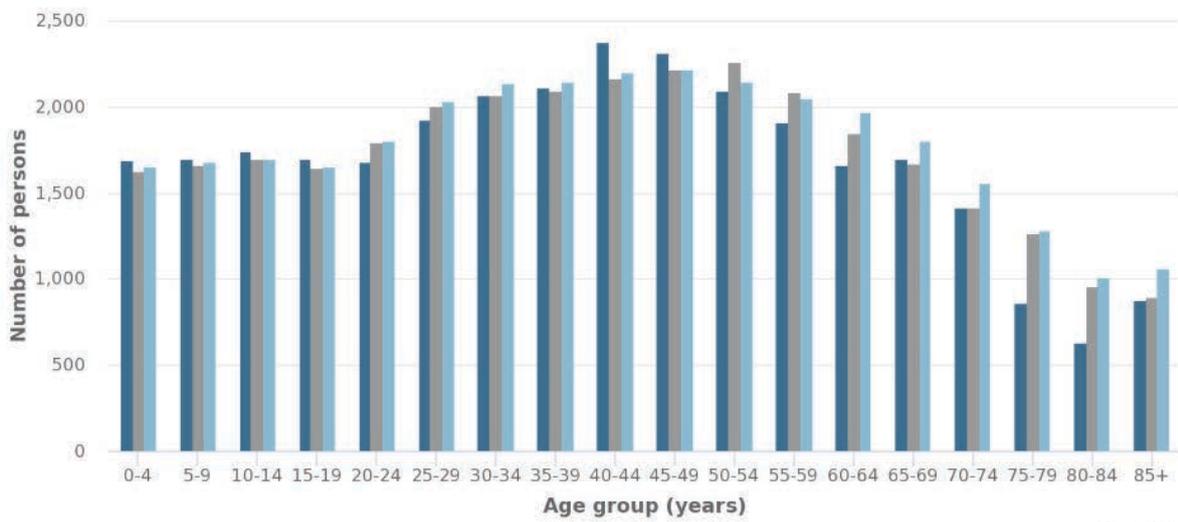
Vulnerable sectors of the community will require focused resilience planning especially for urban heat, infrastructure outages and sudden events. Vulnerable residents are expected to be the most exposed and Council will need to activate the community to prepare them and help them to recover from impacts.

Source: Australian Bureau of Statistics

Forecast age structure - 5 year age groups

Mosman Municipal Council - Total persons

2016 2026 2036



Population and household forecasts, 2016 to 2036, prepared by .id the population experts, December 2017.



Figure 1. Forecast age structure for Mosman 2016-2036. Source: ID Population Experts 2017



Context

Global

Global leadership on climate resilience and adaptation is provided by the United Nations through its Framework Convention on Climate Change (UNFCCC), the Sustainable Development Goals (SDGs), United Nations Development Programme (UNDP) and the Intergovernmental Panel on Climate Change (IPCC).

The UNFCCC's work includes the Paris Agreement and guidelines for National Adaptation Plans (NAPs). The UNDP works across thematic areas to support communities in building resilience to climate change. The IPCC assesses the science related to climate change.

The Paris Agreement aims to strengthen the global climate change response by *increasing the ability of all to adapt to adverse impacts of climate change and foster climate resilience*. It requires all Parties, as appropriate, to engage in adaptation planning and implementation.

The UNDP's *Call for Action on Raising Ambition for Climate Adaptation and Resilience* declares "As we urgently increase our efforts to reduce emissions, we must give equal and increased urgency to adapt to climate impacts and build resilience for the future" and commits signatories to "enhance adaptation and resilience action, particularly in three areas: Acting now to respond to immediate climate impacts and to support the most vulnerable members of society; building resilient futures by putting climate risk at the centre of decision making; urgently increasing the availability of adaptation and resilience finance".

Figure 2 below shows the adaptation cycle under the UN climate change regime, including four general components – plan for adaptation, implement adaptation measures, monitor and evaluate adaptation and assess impacts, vulnerability and risks.

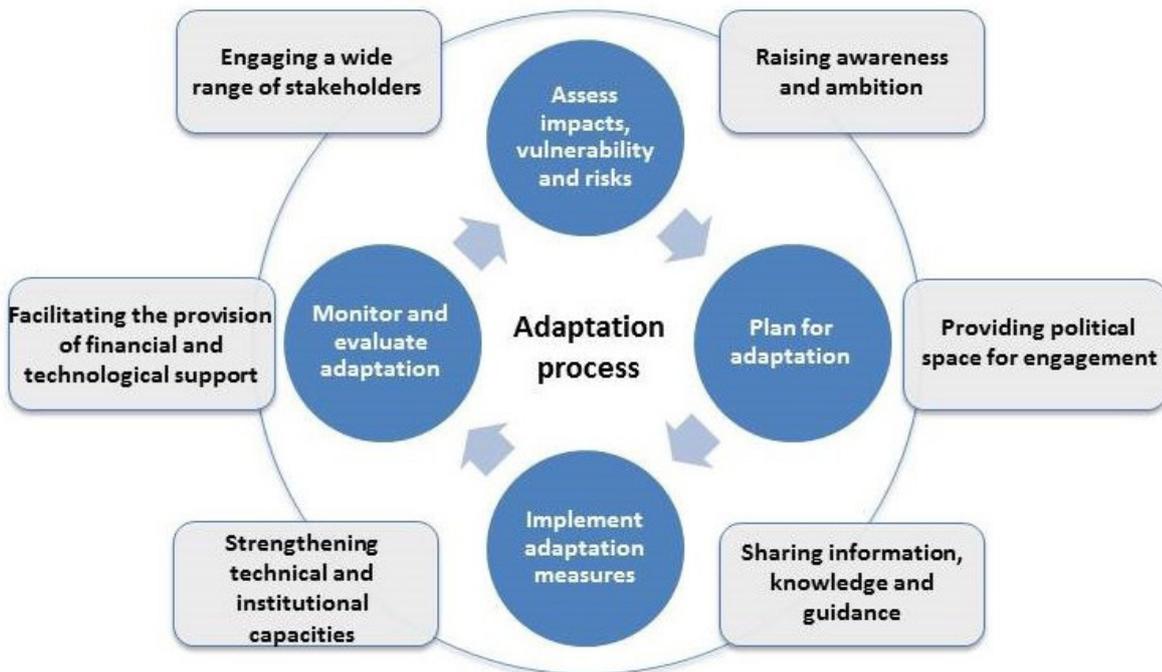


Figure 2. Adaptation cycle under the UN climate regime. Source: UNFCCC <https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/what-do-adaptation-to-climate-change-and-climate-resilience-mean>

The IPCC prepares comprehensive reports with climate modelling and research based on different greenhouse gas concentration trajectories. The IPCC's Fifth Assessment Report (AR5) published in 2014 listed four scenarios based on different forecasts of concentration of carbon dioxide equivalents in the atmosphere (parts per million volume of CO₂ particles) called Representative Concentration Pathways (RCP). Each RCP, based on how the concentration of greenhouse gas emissions in the atmosphere will change in the future as a result of human activities, involved predictions of temperature increase, sea level rise and frequency of extreme weather at certain points in time.

More recently, the IPCC's Sixth Assessment Report (AR6) published in 2022, contains a new set of five emissions scenarios to explore the climate response to a broader range of greenhouse gas (GHG), land use and air pollutant futures (SSP1-1.9, SSP1-2.6, SSP2-4.5, SSP3-7.0 and SSP5-8.5). Emissions vary between scenarios depending on socio-economic assumptions, levels of climate change mitigation and, for aerosols and non-methane ozone precursors, air pollution controls (Figure 4).

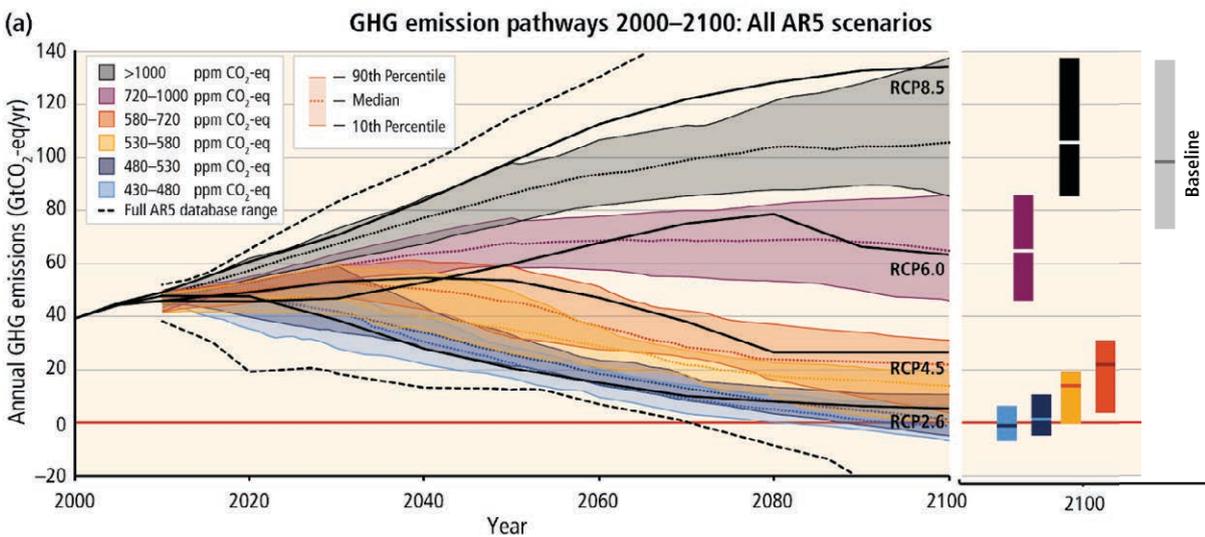
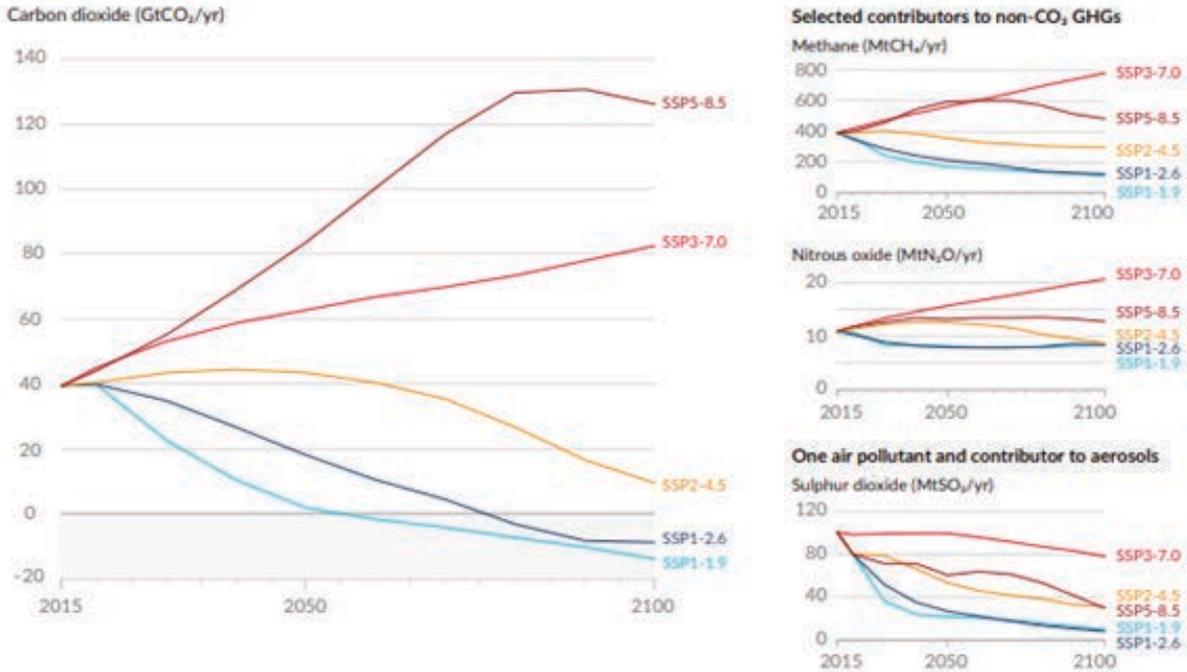


Figure 3. GHG emission pathways 200-2100. All AR5 Scenarios. Source: IPCC

Future emissions cause future additional warming, with total warming dominated by past and future CO₂ emissions

(a) Future annual emissions of CO₂ (left) and of a subset of key non-CO₂ drivers (right), across five illustrative scenarios



(b) Contribution to global surface temperature increase from different emissions, with a dominant role of CO₂ emissions

Change in global surface temperature in 2081-2100 relative to 1850-1900 (°C)



Total warming (observed warming to date in darker shade), warming from CO₂, warming from non-CO₂ GHGs and cooling from changes in aerosols and land use

Figure 4. (a) Future annual emissions of CO₂ (left) and of a subset of key non-CO₂ drivers (right), across five illustrative scenarios and warming contributions, (b) Contribution to global surface temperature increase from different emissions, with a dominant role of CO₂ emissions. Source: IPCC AR6.

National

Australia's National Climate Resilience and Adaptation Strategy is managed by the Federal Department of Agriculture, Water and the Environment. The Strategy states its scope and purpose is to: *set out what the Australian Government will do to support efforts across all levels of government, business and the community, to better anticipate, manage and adapt to the impacts of climate change.*

The Commonwealth's role in helping Australia adapt to the impacts of climate change include providing high quality national and regional climate projections for effective adaptation to the impacts of climate change and providing leadership on national adaptation reform.

Australia has endorsed the UNDP's *Call for Action on Raising Ambition for Climate Adaptation and Resilience* and proposed an initial \$12.9 million investment towards establishing Climate and Resilience Services Australia, a new capability to connect and leverage the Commonwealth's climate and natural disaster risk information to further prepare for and build resilience to natural disasters, and committing to the Coalition for Climate Resilient Investment, a flagship initiative of the 2021 UN Climate Change Conference, COP26.

State

The NSW Government's Climate Change Policy Framework commits to helping NSW achieve net-zero emissions by 2050 and to make NSW more resilient to a changing climate. Through its Climate Change Fund the NSW Government is providing \$30 million to help households, businesses and councils reduce their exposure to natural hazards and climate risks. This includes:

- Support to update the NSW and ACT Regional Climate Modelling (NARClIM) project to deliver climate projections out to 2100, provide detailed maps and reports of natural hazards to assist local councils, emergency services, water resource and bushfire managers, and research into how infrastructure and services could be adversely affected by more extreme weather events as well as options for managing these risks.
- Support for councils, communities and agencies to better prepare for and respond to heatwaves, storms, floods, droughts and bushfire as well as improved information, resources and guidance at a local level on climate change impacts, risks and adaptation options.
- Supporting local governments respond to identified climate risks and vulnerabilities through the Increasing Resilience to Climate Change grant scheme.

NSW's climate change adaptation programs are aimed at building the resilience of the State's natural environment, economy and communities by:

- Helping communities adapt (including assessing regional communities' vulnerability)
- Preparing for the impacts of climate change
- Protecting ecosystems and natural resources

More information

United Nations Framework on Climate Change
unfccc.int

United Nations Development Programme Climate Change
Adaptation
adaptation-undp.org

The Intergovernmental Panel on Climate Change
ipcc.ch

IPCC AR5 Synthesis Report
ipcc.ch/report/ar5/syr/

Australian Government, National Climate and Resilience
Strategy
environment.gov.au/climate-change/adaptation/strategy

NSW Climate and Energy Action
energy.nsw.gov.au

NSW Government, AdaptNSW
climatechange.environment.nsw.gov.au

Get Ready NSW
nsw.gov.au/emergency/get-ready



MOSMAN MUNICIPAL COUNCIL

Local Leadership

Climate Action

This *Resilience and Adaptation Strategy* builds on a solid foundation of climate action. It follows Mosman Council's declaration of a Climate Emergency, adoption of net zero emissions targets and development of a *Mitigation Strategy*.

In recognising climate science and the potential IPCC scenarios Council is better placed to prepare for current and future impacts.

Council is responsible for a broad range of services and the management of various assets and infrastructure. It is on the frontline in dealing with the impacts of climate change and has a critical role to play in ensuring an adequate local adaptation response and in taking a leadership role to guide, help and facilitate community response.

As with the *Mitigation Strategy* this *Resilience and Adaptation Strategy* will require high community participation. The plan's focus is on Council and Community actions, increasing community connectiveness and capacity building.

Council has a co-ordinated approach across internal departments and its Climate Action strategies dictate the inclusion of relevant considerations in all policies and operational procedures. Risk assessment will enable complex decisions to be made and vulnerability mapping will help to identify emerging needs in terms of services, amenities and support. Collectively this will enable Council to implement the best possible response to chronic and sudden developments.

Council is also part of Resilient Sydney, a collaboration of all 33 metropolitan councils of Greater Sydney to develop and implement a city-wide resilience strategy. Resilient Sydney is aligned to the global Resilient Cities Network (previously 100 Resilient Cities) pioneered by the Rockefeller Foundation.

Council is also committed to high standard emergency preparedness through membership of the Mosman North Sydney Willoughby Bushfire Committee and the Local Emergency Management Organisation and continued support of State emergency services such as the SES and NSW Fire and Rescue.

The community must be involved and Council acknowledges community members hold a range of views from those who do not believe in climate change to those who experience anxiety about climate change.

Community connection is critical for resilience and Council fosters this through programs to support seniors, youth and local environmental groups, networking with schools on sustainability and climate issues, Community Consultative Committees and volunteering programs. Council is also exploring an asset-based community development approach to sustainable community-driven development.

Strategic Direction

The *Mosman Climate Action Plan - Resilience and Adaptation Strategy* aligns with MOSPLAN, a suite of integrated documents that include Mosman Council's 10 year Community Strategic Plan.

This articulates the Vision for Mosman:

A vibrant, inclusive harbourside village where community and heritage are valued and where residents feel safe and connected.

It also outlines seven strategic directions for Council's delivery program and operations, in particular:

Strategic Direction 1

A safe, caring and inclusive community

Strategies:

1. Assist residents to feel connected to their community and each other
2. Ensure support is available for people in need
3. Promote opportunities to acknowledge and embrace diversity

Strategic Direction 3

An attractive and sustainable environment

Strategies:

1. Protect and enhance Mosman's natural areas and local biodiversity
2. Use and encourage sustainable practices
3. Effectively manage parklands for community use

Strategic Direction 4

An engaged, business-friendly Community with strong civic leadership

Strategies:

1. Actively inform, engage and support the community, including businesses
2. Deliver high quality, convenient service to customers
3. Collaborate locally and regionally to deliver the best outcome for Mosman

Council's aim is a stable, healthy, prosperous community that lives in cohesion with Mosman's dynamic and thriving natural environment, and for its practices and norms to ensure Mosman's eco-community is sustained for future generations.

To achieve these goals Council will build on its strong history of environmental stewardship and embed the *Resilience and Adaptation Strategy* into policy documents, operational manuals and procedures.

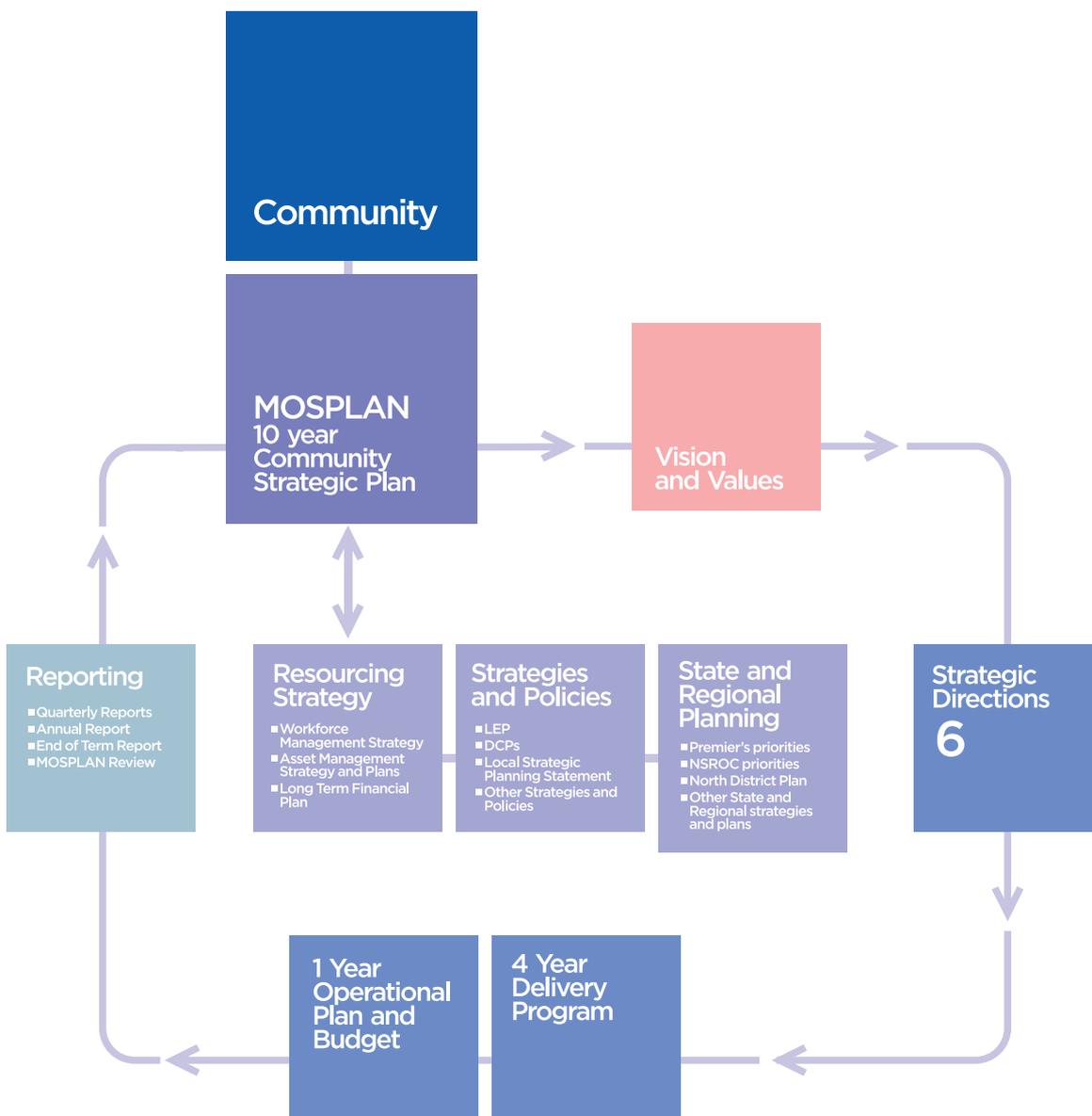


Figure 4 - Community Strategic Plan 2022-2032

Council and Community Collaboration

Working closely with the community - engaging, informing and collaborating - is paramount for the success of this plan. Council's approach to community engagement follows the International Association for Public Participation's (IAP2) Core Values and Public Participation Spectrum. This identifies the levels of engagement that evolve public participation from informing to empowering.

Commitments

In the course of implementing this plan Council commits to provide the community with timely and useful information, and wherever possible incorporate community input to improve outcomes.

Council will:

- Inform the community about the risks of climate change, through knowledge sharing and engagement.
- Ensure the community is kept up to date on Council actions and plan achievements.
- Actively engage the community and facilitate capacity building for resilience and adaptation.
- Obtain feedback and provide ample opportunities for community members to communicate their views, concerns and aspirations.
- Allocate adequate resources and staff to education and engagement activities.
- Lead by example and implement resilience and adaptation measures that can be replicated by residents and businesses.

INCREASING IMPACT ON THE DECISION

| | INFORM | CONSULT | INVOLVE | COLLABORATE | EMPOWER |
|----------------------------------|--|--|---|---|--|
| PUBLIC PARTICIPATION GOAL | To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions. | To obtain public feedback on analysis, alternatives and/or decisions. | To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered. | To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution. | To place final decision making in the hands of the public. |
| PROMISE TO THE PUBLIC | We will keep you informed. | We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision. | We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision. | We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible. | We will implement what you decide. |

Figure 5: IAP2 Spectrum of Public Participation. Source: iap2.org.au

Impacts and Effects

This section synthesises findings from the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5) with local information and data.

Prediction is a crucial step for adaptation and this strategy relies on the IPCC Representative Concentration Pathway (RCP) 8.5 climate model, or 'business as usual' model, which dominates predictions about climate change. It is the highest RCP and current emissions are tracking close to this pathway.

RCP 8.5 forecasts that global temperature will rise between 3.2 - 5.4°C above pre-industrial levels, sea level is expected to rise 84 - 110 cm and there will be a large increase in extreme weather events. Other major weather drivers such as the Interdecadal Pacific Oscillation (IPO), El Nino and La Nina will also be influenced by these changes.

Sources of information used to assess the impacts and effects of these predictions for Mosman include:

- NSW State Government
- Local topographical and asset data
- Research organisations that have used climate data sets to develop reliable local predictions and mapping tools such as the National Climate Change Adaptation Research Facility, CSIRO and NGIS Australia.
- A draft Climate Change Risk Assessment Adaptation Report prepared for Mosman Council by Echelon in 2010.

The table below provides an overview of predicted impacts and effects for Mosman in the four key categories of temperature, sea level rise, rainfall and bushfire. It is to be taken as a guide only. More detailed studies would be required for more accurate predictions. As climate science is continually changing, it is anticipated that this chapter will evolve as new research findings are released.

The following pages explore these impacts and scenarios in Mosman in more detail.

More information

National Climate Change Adaptation and Research Facility
- CoastAdapt
coastadapt.com.au

CSIRO - Climate Change in Australia
climatechangeinaustralia.gov.au

NGIS Australia - Coastal Risk Australia
coastalrisk.com.au

| Impact | Effects | Prediction |
|----------------|---|--|
| Temperature | <ul style="list-style-type: none"> ▪ Current temperature is 1.1°C above pre-industrial levels ▪ Temperatures to rise a further 3.2 - 5.4°C by 2100 ▪ Hot days will become hotter and more frequent ▪ Warm nights will become warmer and more frequent ▪ Heat waves will increase ▪ More severe storms and high wind events ▪ Increase in evaporation | <ul style="list-style-type: none"> ▪ Increased temperatures ▪ More hot days ▪ More warm nights ▪ Heat waves ▪ Increased storm damage ▪ Ecosystem degradation |
| Sea level rise | <ul style="list-style-type: none"> ▪ Sea levels will rise: <ul style="list-style-type: none"> - 40 cm by 2050 - 78 cm by 2100 ▪ Risk of 0.9 to 1.5 m storm surges by 2030 | <ul style="list-style-type: none"> ▪ Coastal inundation in low lying areas ▪ Shoreline recession ▪ Greater impacts from storm surge events |
| Rainfall | <ul style="list-style-type: none"> ▪ Increased intensity of rainfall ▪ 12% increase in rainfall by 2060 and 22% increase by 2090 ▪ Rainfall will be less frequent | <ul style="list-style-type: none"> ▪ Variation to existing rainfall patterns ▪ Higher evaporation ▪ Pollution events |
| Bushfire | <ul style="list-style-type: none"> ▪ Increased risk of fire | <ul style="list-style-type: none"> ▪ Bushfire risk increase to bushland urban interface areas ▪ Smoke pollution reducing air quality |

Table 2 – Impacts and effects for Mosman

Resilience Action Areas

Building the Mosman community's climate resilience involves capacity building, developing connectedness and cohesiveness, fortifying networks and preparing to support the more vulnerable members of the community.

Different individuals and groups within the community have different needs to support resilience. Resilience can be built through establishing and strengthening community networks and by creating a sense of belonging for individuals. Personal isolation can be reduced by reaching out to others. Resilience planning stimulates formal and informal networks and connections that keep people engaged in caring for each other.

To thrive under adversity a combination of protective factors can contribute: high trust communication; stable and engaged relationships; self-efficacy, perceived control and agency; the ability to ask for, or to offer help; cultural respect; positive regard and messaging to support a constructive interpretation of gratitude, and compassion in recovery.

Further research is required to quantify and identify residents who belong to more vulnerable groups including those with pre-existing health conditions, the elderly, culturally and linguistically diverse (CALD) communities and lower socio-economic demographics.

Strategies that will increase the Mosman community's adaptive capacity include:

- Identification of vulnerable people
- Improved collaboration between local councils and other local agencies
- Adopt an Asset Based Community Development approach to help build connection and social wellbeing
- Strengthen local emergency management plans based on rigorous assessment of risk
- Establish local recovery plans co-designed with the community
- Identify priority systems, planning legislation, strategies and investments (within and across Council areas) to mitigate risks to the community, Council operations and critical infrastructure
- Connect and advocate with regional networks focused on resilience e.g. Resilient Sydney

Utilizing the 'Steps To Resilience', U.S. Climate Resilience Toolkit - [toolkit.climate.gov](https://www.toolkit.climate.gov), the following actions have been developed. It should be noted that there are still gaps in Council's knowledge base and this is an evolving action list.



| Requirement | Existing programs and partners | Community Actions | Council Actions | Council Actions Status |
|--------------------------------------|--------------------------------------|--|--|--|
| Community connectedness | Council | Get to know your neighbors - Residents assisting other residents | Community Connections Roundtable events | Completed |
| | Volunteering | | | |
| | Sporting clubs | Have a meal with someone new | Develop a Community Connection Plan | In progress |
| | Beaches and parks | Join a local club/group | Public education events like workshops, projects and community collaborations | Ongoing |
| | Library and other public places | Support and involvement with local sporting clubs | | |
| | Churches | Volunteering at a local organisation | Promote and collaborate with Mosman schools on sustainability issues | Ongoing |
| | Local annual events | | | |
| | Social and other forms of media | | Install more bike racks and progress Active Transport Plan Actions | Active transport plan completed. Bike racks ongoing. |
| | Aged Services | | Youth mental health programs | Ongoing |
| | Local media | | | |
| NSW Government service and providers | | | | |
| NSW Police | | | | |
| Preparedness | Council | Being Emergency Prepared | Emergency preparedness promotion - provide checklist on website | Ongoing |
| | NSW Government service and providers | Download the Get Prepared app from the App Store or Google Play to get ready to make an emergency plan for your household. | Disability Inclusion Action Plan and other community services programs | Completed, ongoing programs |
| | SES | | Continuing to support local emergency groups | Ongoing |
| | NSW Fire and Rescue | Install Solar Panels with Battery Back up | Make available Council buildings in times of emergency | Ongoing |
| | Australian Red Cross | Maintain property and plan for climate change in future property developments | Explore cool zone options in the area for large air-conditioned spaces for high heat periods | Under investigation |
| | | Get to know your neighbors - Residents assisting other residents | | |
| | | Participate in Community Gardens and Bushcare | Support Community Gardens and Bushcare | Ongoing |
| | | Increase onsite rainwater capture and re-use | Provide opportunities for emergency ready training | Workshops planned for November |
| | | | | |
| | | | | |

| Requirement | Existing programs and partners | Community Actions | Council Actions | Council Actions Status |
|-------------|---|--|--|--|
| Recovery | SES | Get to know your neighbors - Residents assisting other residents | Continue to support SES headquarters in Mosman | Ongoing |
| | NSW Fire and Rescue | | Continue Council Depot Operations | Ongoing |
| | Council | Volunteering at a local organisation like SES | Council to coordinate clean ups to restore areas as required | Ongoing |
| | NSW government Disaster Customer Care Program | | Increase contingency funds for clean-up costs and emergency | Completed. Annual recurrent budget allocation for emergency response works |
| | An Aging Population Framework | | | |

Table 3 - Actions to build community resilience



Adaptation Action Areas

Adaptation involves decisions and actions that minimise vulnerability, help to prepare for the adverse consequences of climate change. This section outlines Council's proposed actions to address the predicted impacts and effects of climate change in Mosman. It's focused on building community adaptation to four key predicted impacts:



Temperature



Sea Level Rise



Rainfall



Bushfire

The IPCC's 2014 RCP 8.5 climate model provides the basis for Council's risk assessments. The scenario's are neither forecasts nor policy recommendations. The purpose of risk assessment is identify risks that require further investigation and action as a basis for decision making and planning. It also allows council staff and the community to familiarise themselves with local climate change risks and normalise the concept of climate change adaptation across all areas of council decision making.

Actions are based on an analysis (including gaps in knowledge) of the risks to public and private assets, and outline the existing mechanisms and processes, identified shocks and stresses and new actions and initiatives required.

There is currently no metrics to measure many of these actions. Council proposes to develop community surveys and benchmarks to report against these actions. Measurement and reporting will commence in 2022 and will be aligned with the MOSPLAN reporting.

It should be noted that whilst the below actions are detailed as

"Adaptation Actions" they can also be deemed Mitigation Actions as described in Councils "Climate Action Plan - Mitigation Strategy". It is considered that in order to adapt to Climate Change, both the Community and Council should consider their actions in the lens of actions that reducing Global Warming and the subsequent implications of this.

Temperature

| Community Actions | Council Actions | Council Action Status |
|---|--|-------------------------------------|
| Install solar PV and battery storage on private properties | Install solar PV and battery storage on Council buildings | In progress |
| Undertake energy audits and reduce energy consumption | Undertake energy audits and reduce energy consumption Council Buildings | Completed for Art Gallery and Depot |
| Participate in community battery projects in partnership with Ausgrid | Purchase renewable energy | Completed |
| Reduce hard areas on property, increase tree cover and reduce weeds | Reduce hard areas on property, increase tree canopy cover and reduce weeds | Ongoing |
| Purchase electric vehicles, utilise carshare and public transport | Continue implementation of biodiversity habitat links | Ongoing |
| Increase active transport use e.g. purchase an e-bike | Continued membership of Sydney Weeds Committee Network | Ongoing |
| Reduce use of potable water and increase use of recycled water | Progress Mosman Walking and Cycling Strategy Actions | Ongoing |
| Avoid and reduce waste that goes to landfill | Protection of trees on public and private lands | Ongoing |
| Increase recycling | Undertake actions in the Climate Action Plan - Mitigation Strategy | Ongoing |
| Reduce air travel | Install electric vehicle charging facilities | Ongoing |
| Purchase renewable energy | | |
| Undertake actions in the Climate Action Plan - Mitigation Strategy | | |

Table 4 - Temperature Actions

Overall global temperature is 1.1°C higher than pre-industrial levels and based on RCP 8.5 is predicted to rise a further 3.2 - 5.4°C by 2100. Ocean temperature is also expected to increase.

Research by the Australian government suggests local temperature intensity now ranges between 1°C and 7°C compared to 0.5°C to 3°C in the early 1990s (Yenneti et.al. 2017:5).

In Sydney there is very high confidence that hot days and heat waves will become hotter and more frequent, and based on RCP 8.5 the CSIRO predicts that by 2090 Sydney's sea surface temperature could increase by 3.1°C (2.8°C to 5.7°C).

Densely populated cities like Sydney are reported to be up to 5°C hotter compared to surrounding areas, and some parts of Sydney are much hotter than others, due to a phenomenon known as the heat island effect. This occurs when structures such as buildings, roads and other infrastructure absorb, retain and re-emit the sun's heat.

The heat island effect is shaped by latitude, elevation, surface morphology, vicinity to water, degree of urbanisation and industrial sites, vegetation cover, land usage, permeable surfaces, use of heating and cooling and road traffic density and air pollution. The urban heat island effect is becoming an increasingly significant issue in Sydney where large areas with dark surfaces such as bitumen roads and carparks in full sun create areas that are considerably hotter than natural surface areas.

In 2020 Sydney's coastal suburbs recorded six days at temperatures above 35°C. Humans and mammals can tolerate heat up to a wet-bulb point temperature of 35°C at 100% humidity, and beyond these conditions' morbidity levels rise.

Mosman's proximity to the ocean and high tree canopy cover make it less susceptible to the heat island affect. Tree cover can reduce ambient heat by up to 10°C. See Figures 5 and 6 for Mosman canopy cover and radiant heat areas.

Council has identified the need to address the existing traffic congestion in the Balmoral area during peak periods. Council is planning to engage a consultant to review the existing traffic and transport issues and constraints related to the existing local road network in the Balmoral area and identify improvement options. The report will also need to take into account increased visitation to Mosman beaches which will further increase traffic flow and congestion around foreshore areas.



Figure 6 - Canopy cover map 2020 where green represents canopy cover

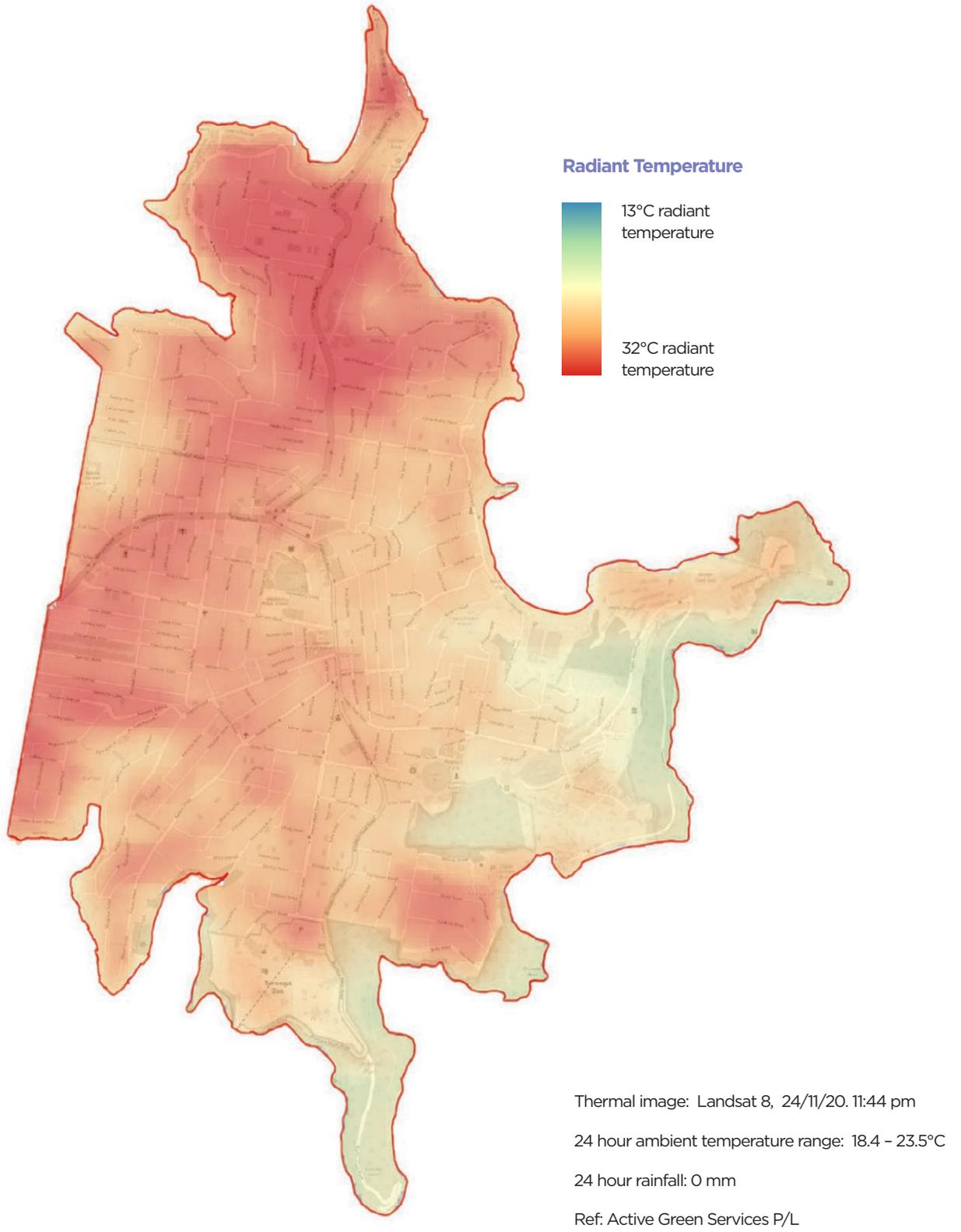


Figure 7 - Radiant heat map of Mosman

Based on RCP 8.5 the National Climate Change Adaptation Research Facility (NCCARF) predicts for Mosman:

- More hot days, with the mean annual number of days with a temperature greater than 30°C increasing from a historical average (1981-2010) of 26 to an average of 37 by 2030, 48 by 2050, 61 by 2070 and 81 by 2090.
- More warm nights, with the mean annual number of nights with minimum temperature greater than 25°C increasing from a historical average (1981-2010) of 0.1 to an average of 0.3 by 2030, 1.1 by 2050, 3.4 by 2070 and 9.6 by 2090.
- Heatwaves, with the average of longest running consecutive days in each year with a maximum temperature greater than 30°C increasing from the historic average (1981-2010) of 3.5 to 4.6 in 2030, 6.1 in 2050, 6.9 in 2070 and 8.6 in 2090.

Higher atmospheric and ocean temperatures will change climate systems and fluctuations in normal weather conditions. This will in turn increase storm activity and changes to evaporation and impact local flora and fauna.

As storm activity is expected to increase with greater intensity and greater frequency more damage can be expected to both private, public and natural assets.

Plant species distribution is closely linked to temperature and those plant species in Mosman at their northern range (that is the main population of species is found south of Mosman) will be most vulnerable and may not survive over the long term. The change in temperature may also favour other plant species and new plant species not normally found in Mosman including weeds.

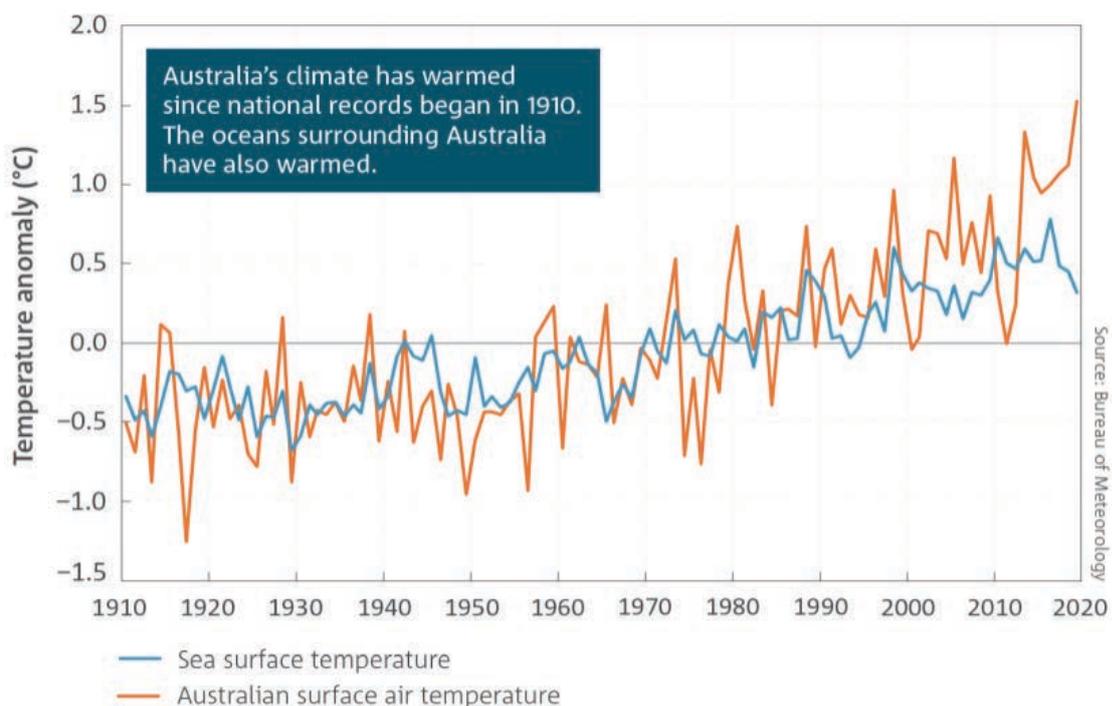


Figure 8 – Trend in surface air and sea surface temperatures in Australia. Source: Bureau of Meteorology 2020



Sea Level Rise

| Community Actions | Council Actions | Council Action Status |
|--|--|--|
| Reduce actions that contribute to Global Warming | Finalise the Mosman Coastal Management Zone Plan and undertake actions arising from the plan | In progress, Council is participating in the Greater Sydney Harbour Coastal Management Program |
| Install solar PV and battery storage on private properties | | |
| Undertake energy audits and reduce energy consumption | Participate in the Greater Sydney Harbour CMP and undertake actions arising from the plan | Ongoing |
| Purchase electric vehicles, utilise carshare and public transport | Consider alternative strategies to minimise beach loss including artificially replenish beach sand | Not started |
| Increase active transport use e.g. purchase an e-bike | Include provision in Plans of Management to undertake works including raising heights of seawalls | Dependent on Coastal Management Zone Plan recommendations |
| Increase active transport use | | |
| Purchase renewable energy | Collaboration with Transport for NSW on initiatives | Ongoing |
| Plan for sea level rise for private infrastructure in future development | Engage with NSW Government and other partners (e.g. SIMS) on initiatives | Ongoing |
| Use sustainable products in developments | | |
| Undertake actions in the Climate Action Plan - Mitigation Strategy | Implementation of planning controls where applicable | Ongoing |

Table 5 – Sea Level Rise Actions





As temperature increases sea levels rise due to thermal expansion caused by warming of the oceans and the melting of land-based ice. RCP 8.5 predicts that sea level will rise 40 cm above pre-industrial levels by 2050 and 78 cm by 2100.

Sea level rise can cause coastal inundation of low-lying areas, recession of shoreline and increased impacts from storm surge events. It would be felt most during high tide and storm events when wind and lower atmospheric pressure cause storm surge and waves. This can lead to greater inundation, erosion and wave over topping. Changes in the underwater landscape would also likely occur and lead to sand drift.

Based on RCP 8.5 the CSIRO and the National Climate Change Adaptation Research Facility (NCCARF) predict that relative to the average calculated between 1986 and 2005, by 2090 Sydney's and Mosman's mean sea level will rise will be 0.66 m (0.45-0.89), and the rate of change at 2100 (mm/yr) will be 11.4 (7.4-16.1).

Sea level rise predicted in RCP 8.5 would likely result in overtopping wave action at most full tides, a large-scale impact of waves on shore-based structures and shoreline recession. The allowance - the height that coastal defences would need to be raised in order to provide the same level of protection as they do today - would be 0.30 m in 2050 and 0.85 m in 2090.

Changes in sea level that impact wave action would also impact sand movement, which could reduce the size of beaches and impact seawalls.

Figure 9 shows the upward trend in tide height increase over the last 100 years in Sydney Harbour and Figure 10 shows sea level rise and waves from storm surge and wind.

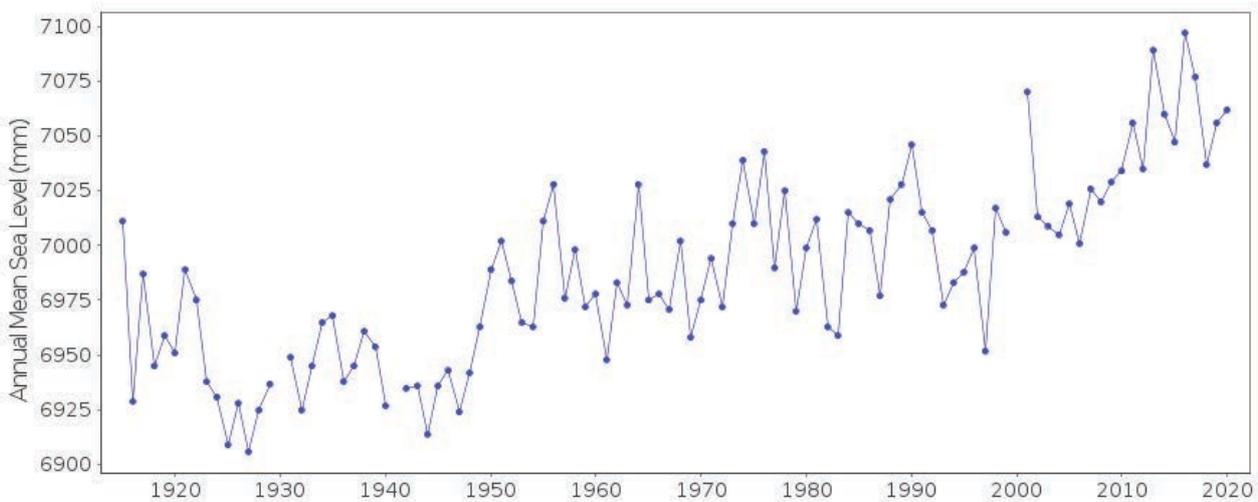


Figure 9 - Fort Denison Tide Gauge Data; mean sea level increases in Sydney Harbour from 1920 to 2020. Source: Bureau of Meteorology 2022

However, no detailed research has been completed for the NSW coastline so the scale of impact for Mosman cannot be confirmed. The NSW Government is drafting a Greater Sydney Harbour Coastal Management Program. This will consider the increase in average sea level and amplified ocean swell however no predicted sea level rise measurement will be included. The NSW Government has deferred this to local governments.

The highest tide recorded in Sydney was 2.4 m in Fort Denison and king tides in Mosman frequently reach 2.05 m. Current seawalls and other marine structures are currently within 1 m of tidal variation. Figure 11 shows the location of Mosman's seawalls and marine assets.

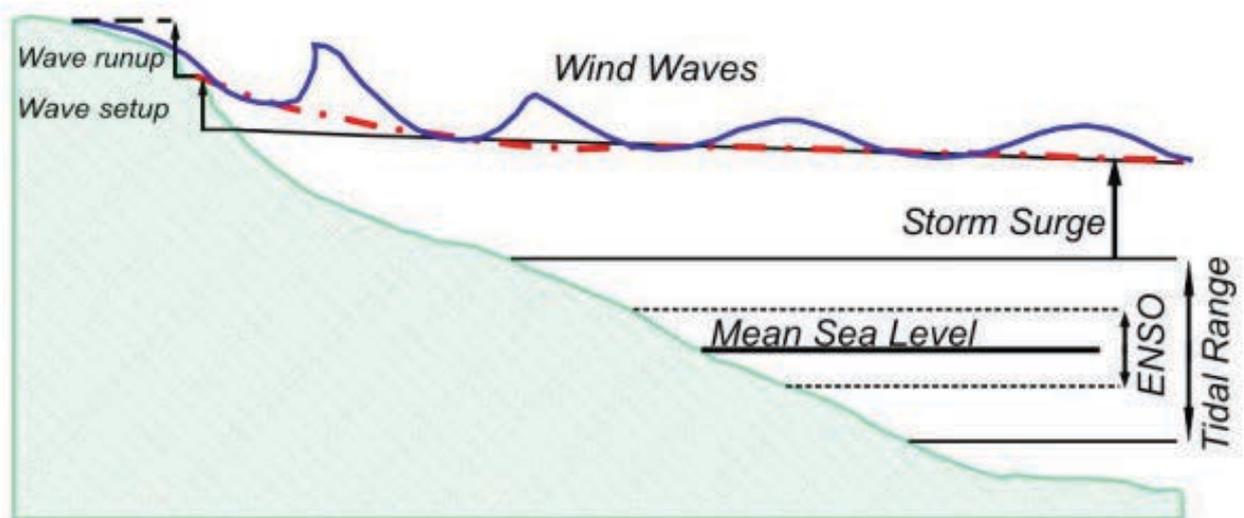


Figure 10: Storm surge and wind. Source: CSIRO Dec 2011



Figure 11: Mosman seawalls and marine structures

Parts of Council’s foreshore and open space recreational areas including beaches and coastal parks may be exposed to coastal inundation. This could affect the transport route through the Spit and heritage listed structures such as the Balmoral sea wall and Esplanade, the Balmoral Baths, Bathers Pavilion and Clifton Gardens Baths.

The shape of Sydney Harbour and Mosman’s position to Sydney Heads protects the majority of Mosman’s coastline from severe sea swell however areas such as the Spit, Balmoral and Chinamans Beach would likely be exposed. The current one in five-year storm surge event would likely become more frequent. The consequences of storm surge, especially when there is an East Coast low and high tide, would be greater causing shoreline recession and damage to coastal sandstone cliffs, beaches, parks and other public and private assets.

More frequent storm surge would also create regular and larger scale backwash onto land and into the stormwater drainage systems at Reid Park, Clifton Gardens, Balmoral, Rosherville Reserve and Sirius Cove.

Mosman Council joined with neighbouring Councils and is currently participating and contributing to the development of the Greater Sydney Harbour Coastal Management Program, (GSHCMP) with the aim to approach the coastal management issues in a holistic and integrated manner. This plan will examine coastal impacts and scenario’s and is scheduled for completion in the next five years.

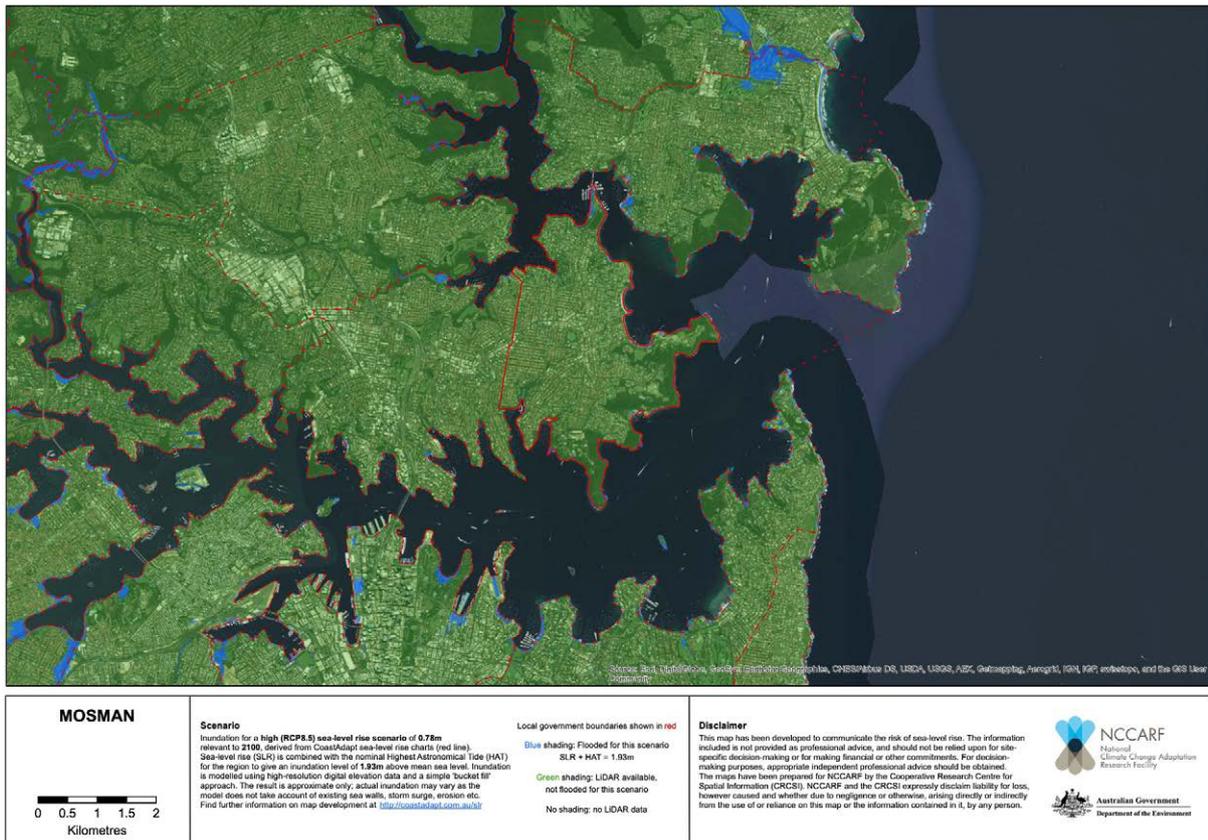


Figure 12: Map of projected coastal inundation for Mosman by 2100, based on RCP 8.5 and 0.78 m sea level rise. Source: CoastAdapt

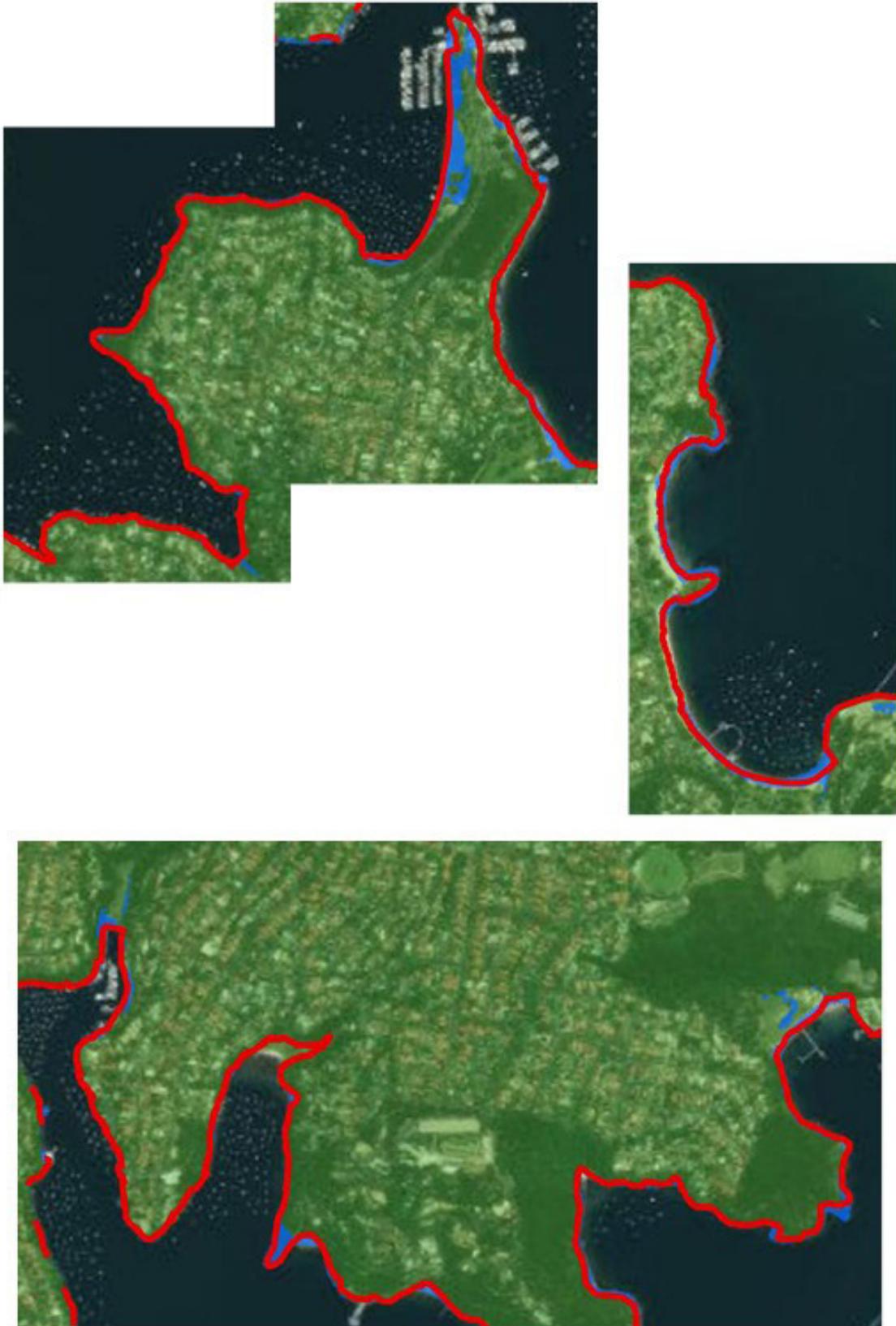


Figure 13: Enlarged map of projected coastal inundation for Mosman by 2100, based on RCP 8.5 and 0.78 m sea level rise. Source: CoastAdapt

Rainfall

| Community Actions | Council Actions | Council Action Status |
|--|---|-----------------------|
| Utilise Water sensitive urban design in developments | Encourage urban biodiversity regeneration through bushland, unmade roads and street tree planting works | Ongoing |
| Increase rainwater collection and re-use on private properties | Increase maintenance/ cleaning budget for SQIDs and stormwater system | Ongoing |
| Increase use of native plant species on private properties | Complete flood study and actions arising from study | In progress |
| Enhance flood controls on private properties | Explore further opportunities for stormwater harvesting/grey water use/bore water use/reuse systems | Ongoing |
| Reduce actions that contribute to Global Warming | Protect and enhance of natural riparian sites | Ongoing |
| Undertake actions in the Climate Action Plan – Mitigation Strategy | Review stormwater OSD policy/DA requirements to review discharge stormwater allowances | Not started |
| | Rainwater tanks/water reuse systems/BASIX/DA requirements | Ongoing |
| | Adapting gardens to endemic native species | Ongoing |

Table 6 – Rainfall Actions





RCP 8.5 predicts an increase of rainfall of 12% by 2060 and 22% by 2090, based on Climate Change Considerations discussed in Australian Rainfall & Runoff (2019) Book 1 Chapter 6.

Climate change is also expected to cause variations to existing rainfall patterns. Given the uncertainty in rainfall projections and their considerable regional variability, an increase in rainfall (intensity or depth) of 5% per degree of local warming is recommended (Geoscience Australia 2019). Long periods of no rainfall are also likely.

Localised intense rainfall would expose parts of Mosman to increased risk of flooding. A 2014 study of Mosman's rainfall shows there were two rain events that exceeded the Annual Exceedance Probability (AEP) that year and two hours of light rain or 30 minutes of heavy rain saturated the catchments and storm water capacity for much of the Mosman LGA. Increased rain at lower volumes would not have a significant impact because the steep terrain in Mosman assists with rapid runoff into surrounding harbours, usually within one hour after a mild event. However a one in five-year event (20% AEP) would cause significant flowpaths and potential flooding. Areas with greater exposure include Brierley Street, Rangers Avenue, Cowles Road, Noble Street, Bay Street, Sirius Cove Road, Botanic Road and The Esplanade.

Most of the estuaries, wetlands and natural watercourses in Mosman have been developed over and replaced by stormwater infrastructure. Some on ground wetlands such as Rosherville Reserve appear under heavy rain events and there are some natural watercourses still in situ. Most coastal parklands are reclaimed land, including Reid Park, Balmoral Oval, Clifton Gardens and Sirius Cove, and flooding is regularly experienced in these areas.

Long periods of no or low rainfall causing drought are likely to compact and dehydrate soil. Once this occurs soil is unlikely to absorb sudden heavy rainfall, making flooding, pollution events and small-scale erosion more likely. The water table is difficult to replenish – limiting the soil's sponge-like ability to absorb rain, and exacerbating drier, harder, soil conditions. Parched soil is also less friable, supports less biodiversity and can lead to ecosystem degradation.

As the population ages capacity for cleaning up after storm or flood damage decreases. In most circumstances the aims of Ageing in Place are very successful but increased chronic and sudden events such as flooding and storms present challenges especially for the most vulnerable people in the community.

Mosman Council is currently finalising a Flood Study of the Mosman area. Council received and noted a report outlining the current status and projected timeline for completion of the Mosman Flood Study. In June 2023 Manly Hydraulics Laboratory was engaged to assist with the Flood Study project, including data collection and modelling of areas that will be flooded, together with options and a plan to reduce flood risk. It is proposed that a Flood Risk Management Committee also be established to assist with the project, together with a Technical Working Group. The project is due to be completed by early 2025, with community consultation to be undertaken in early 2024.

Bushfire

| Community Actions | Council Actions | Council Action Status |
|---|---|-----------------------|
| Ensure property is maintained and bushfire safe | Implement planning controls relating to bushfire prone properties | Ongoing |
| Prepare a bushfire plan | Continue risk assessment and treatment plan for bushland burns through the Mosman North Sydney Willoughby Bushfire Management Committee | Ongoing |
| | Hazard reduction activities through ecological burns and manual reduction fuel loads | Ongoing |
| | Continue proactive tree maintenance | Ongoing |
| | Make Council facilities available in Emergency | Ongoing |

Table 7 - Bushfire Actions

The large-scale Black Summer bushfires of 2019-2020 indicate how quickly severe bushfires can affect regional and urban areas. Fires of this scale start to produce their own ecosystem, as the sooty dry air exacerbates the pyrocirrius clouds and smoky atmosphere. The conditions exacerbate the generation of lightning and the risk of new fires. Statewide bushfire at the scale of the black summer of 2019 will become increasingly likely. The impact to Mosman would be air pollution, with increased bushfires respiratory issues.

Locally, Mosman has large bushland areas including national parks, Harbour Trust and naval bushlands dedicated to coastal and biodiversity protection. The changing weather patterns would cause a slight increase in bushfire risk and resulting smoke pollution causing a reduction in air quality.

Fortunately in Mosman only small sections of urban bushland interface areas exist. Mosman is urban enough that the direct spread and scale of bushfire is not likely although a spontaneous fire at North Head where a controlled burn jumped containment lines is a good example of how dry conditions and high fuel load in bushland is difficult to manage in small areas without risk.





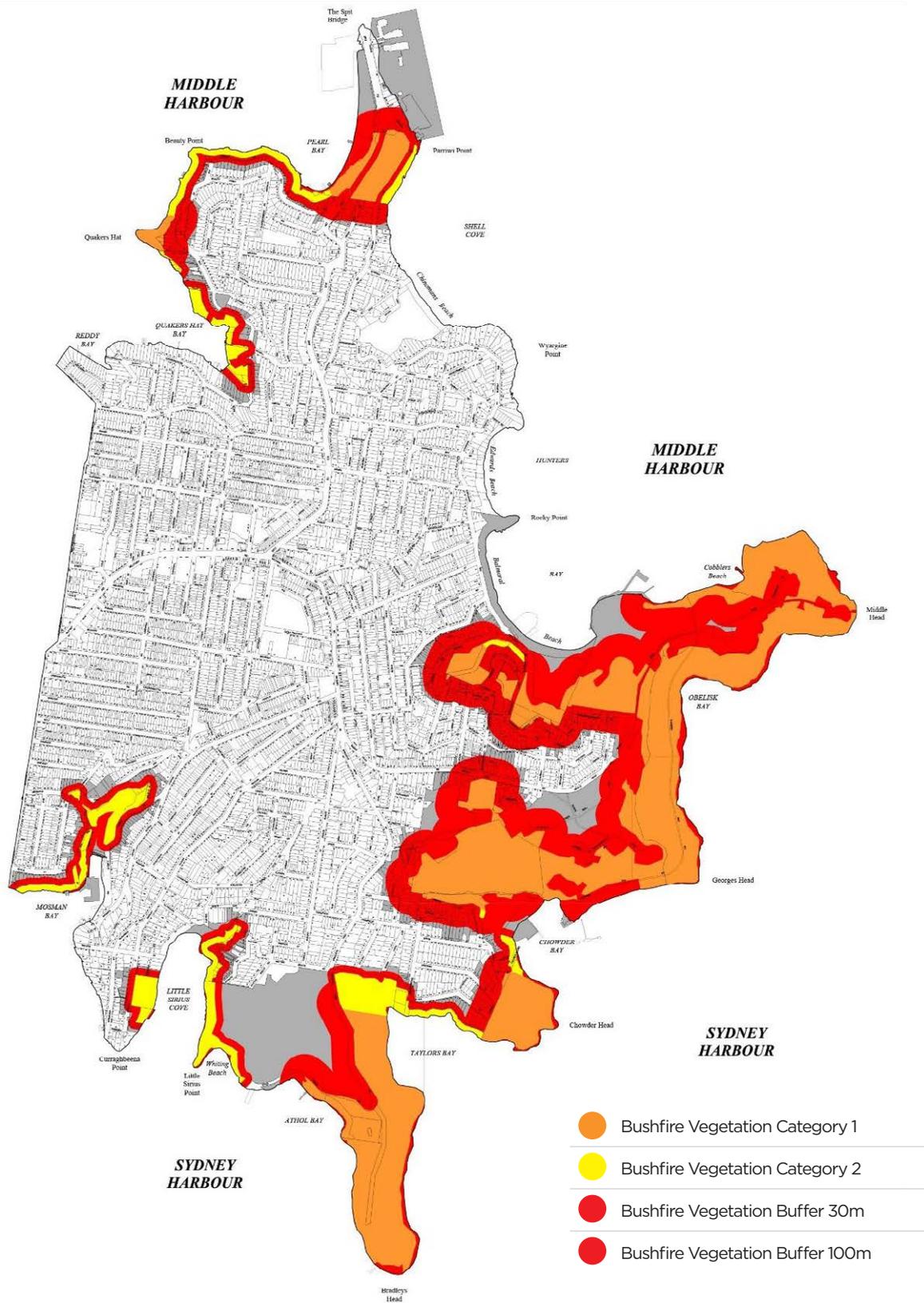


Figure 14: Map of bushfire prone areas in Mosman



Funding and Governance

Oversight and resourcing for the delivery of this plan will be provided by Mosman Council.

Performance against the plan will be measured via reports to Council in line with current MOSPLAN reporting. The Council will also be informed in regard to progress by the Mosman Climate Action Community Consultative Committee.

The plan will have links to other corporate documents including:

MOSPLAN – Mosman Community Strategic Plan
mosman.nsw.gov.au/council/plans/MOSPLAN

Climate Action Plan – Mitigation Strategy
mosman.nsw.gov.au/council/plans/climate-action-plan-mitigation-strategy

Mosman Local Strategic Planning Statement – Sustainability Directions 8,9 and 10
mosman.nsw.gov.au/planning-and-development/strategic-planning/local-strategic-planning-statement/

State of the Environment report –
mosman.nsw.gov.au/sites/default/files/2023-03/220234.001.SOE_Scorecard.LR_.pdf

Environmental Sustainability Policy –
mosman.nsw.gov.au/sites/default/files/2023-09/Environmental-Sustainability-Policy_0.pdf

Projects will be managed by various teams within Council. Building community resilience and cohesion will fall largely under the Community Services Team. Adaptation and physical change to address climate change will fall under the Engineering Team. The future management of private assets will fall under the Development Services Team. The management of public places and environment falls under the Environment and Open Space Team, which will also be responsible for oversight of the whole plan including updates and reporting outcomes to Council and the community.

Funding of projects will be subject to Council's annual budget process. This includes Council's review of projects against Council priorities and strategies at that time. Some projects will need to be prioritised so that Council can understand the full risk and exposure to public and private assets. This includes analysis of the Greater Sydney Harbour Coastal Management Program and commissioning a Flood Study for the LGA. Other works will be highlighted in Council's Draft 10-year Capital Works Program in the various Asset Management Plans. In addition, some works are already accounted for in Council's existing Operational Budget.

These 10-year programs are based on Council's Long Term Financial Plan which is regularly updated and should only be treated as a guide to funding allocations.

Some specific projects may be subject to a detailed cost benefit analysis. This would include a quadruple bottom line assessment evaluating economic, social, environmental, and governance impacts.

Personal Checklist

Anything that improves your wellbeing, connection, knowledge and security can potentially increase your resilience to a changing climate.

Build community connection

Check

Get to know your neighbours, local cafe and retailers

Be part of a local community or sport group

Volunteer for a local community organisation or service

Attend Council workshops and events

Make an emergency plan

Check

Use NSW SES's Get Ready NSW and Red Cross's resources and RediPlan to help prepare for an emergency including:

- Important and emergency contacts
- A plan for pets
- Important documents
- Survival/emergency kit
- First aid supplies and medications

ses.nsw.gov.au/get-involved/get-ready-nsw and redcross.org.au/prepare

Download the Red Cross Get Prepared app for iOS or Android

| Home resilience and adaptation | Check |
|---|--------------------------|
| Install awnings and blinds, especially on apertures facing the sun | <input type="checkbox"/> |
| Install double glazing to improve insulation, and keep the house cool in summer and warm in winter. | <input type="checkbox"/> |
| Use water efficient taps and shower heads | <input type="checkbox"/> |
| Protect large native and canopy trees to reduce heat and encourage biodiversity | <input type="checkbox"/> |
| Use renewable energy | <input type="checkbox"/> |
| Install LED lighting | <input type="checkbox"/> |
| Install rooftop solar | <input type="checkbox"/> |
| Install a heat pump | <input type="checkbox"/> |
| If renovating consider passive design principles - yourhome.gov.au | <input type="checkbox"/> |
| Install a rainwater tank | <input type="checkbox"/> |
| Consider water sensitive urban design e.g., in the garden consider permeable surfaces to help soils absorb rainwater and drainage to reduce flooding and soil runoff. | <input type="checkbox"/> |
| Consider installing a battery for power in the event of an outage | <input type="checkbox"/> |
| Use a composting bins and worm farm to improve soil nutrients and structure. | <input type="checkbox"/> |
| Be waterwise - waterwise.tips | <input type="checkbox"/> |

Resources

Emergency information and contacts

Ambulance, Police, Fire
Triple Zero (000)

NSW State Emergency Service (SES) City of Sydney
(flood and storm)

132 500

Twitter: twitter.com/cityofsydneyses

Facebook: facebook.com/nswsessayd

News

ABC is the official emergency broadcaster, to provide essential up to date information, advice from authorities and support available:

Radio - ABC Radio Sydney - 702 AM, ABC News radio - 630 AM and digital radio.

Twitter: twitter.com/ABCemergency

Facebook: facebook.com/ABCemergency

Live Traffic NSW

livetraffic.com

NSW Fire & Rescue

9265 2999

Twitter: twitter.com/FRNSW

Facebook: facebook.com/frnsw

Bureau of Meteorology

bom.gov.au

National Emergency Management Agency

nema.gov.au

Red Cross

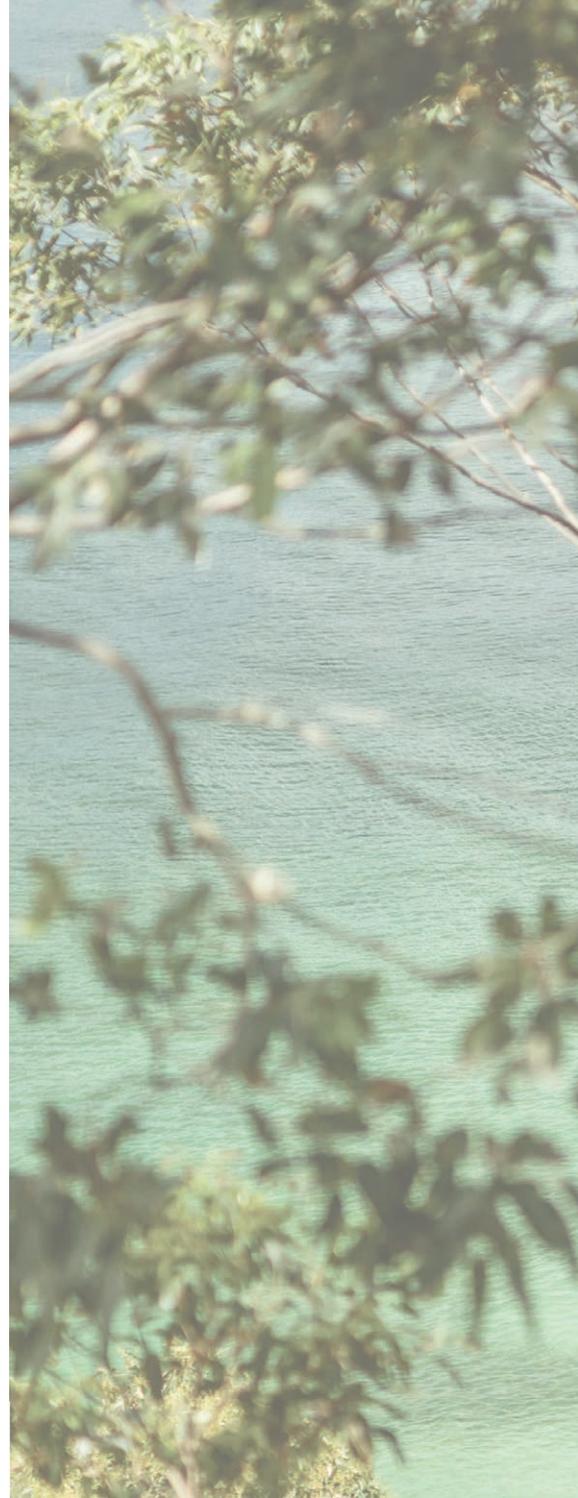
Redcross.org.au/prepare

Get Ready NSW

nsw.gov.au/emergency/get-ready

NSW Health

health.nsw.gov.au/beattheheat





Mosman
COUNCIL

CLIMATE
ACTION PLAN
RESILIENCE AND
ADAPTATION STRATEGY

Mosman
COUNCIL

