Australia's changing climate

Human activities are causing atmospheric concentrations of heat-trapping greenhouse gases to rise higher and faster than the past two million years. This is driving changes in the frequency, intensity, and duration of different weather events and patterns in Australia.

Australia's climate has warmed consistently since 1910. Rainfall is declining in the southeast, most notably in winter, with decreases in streamflow. Extreme fire weather has increased, particularly in southern Australia, and oceans are acidifying, warming and expanding. Sea level rise and more frequent extreme weather events are increasing the risk of inundation and damage to coastal infrastructure and communities.

The impact of intensifying natural hazards, under rising global greenhouse gas emissions, increases climate change risks to human health and wellbeing, ecosystems, infrastructure and services, and will significantly impact the economy through damage costs.

But while climate change is a global phenomenon, the impacts of climate change are experienced locally. Therefore, local communities are often best placed to observe, understand, and respond to local climate change impacts.

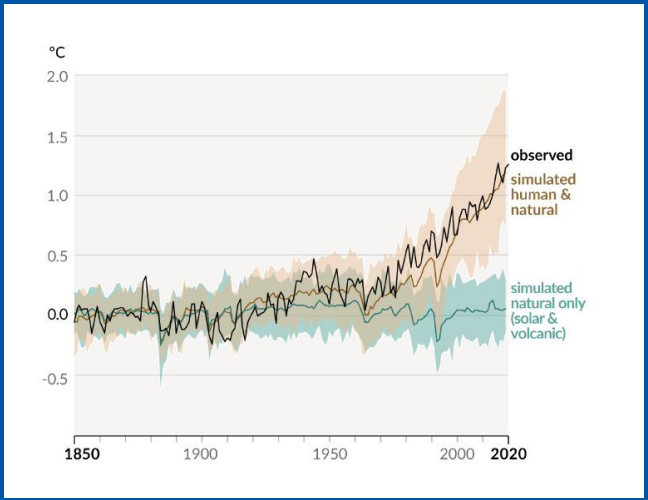

Figure 1 Change in global surface temperature IPCC 2021

WAVERLEY
COUNCIL

So, what's changing in Waverley?

Historically, Waverley has warm to hot summers and mild to cool winters. Seasonal variation is minimal due to our coastal location. Annual rainfall is ~1200mm with significant variability year on year (809mm-2165mm over the last 50 years).

Going forward Waverley can expect:

- Average temperatures to increase yearly
- More frequent extreme heat days (days above of 35°C)
- Extended drought periods
- Changing seasonality of rainfall and
- Intense rainfall events to increase (by 12% by 2070)
- Increased air quality risks associated with regional bushfire
- Shifting seasons with longer summers and shorter winters and a likelihood of increased storm activity in Summer & Autumn
- Increasing coastal risks especially when combined with storm surge conditions and longer-term sea level rise

How can we Plan and Respond?

It's important we plan to reduce vulnerabilities to climate risk now, as these risks are likely to increase in the future. For example, by greening areas lacking vegetation, we can minimise heat impacts related to urban heat.

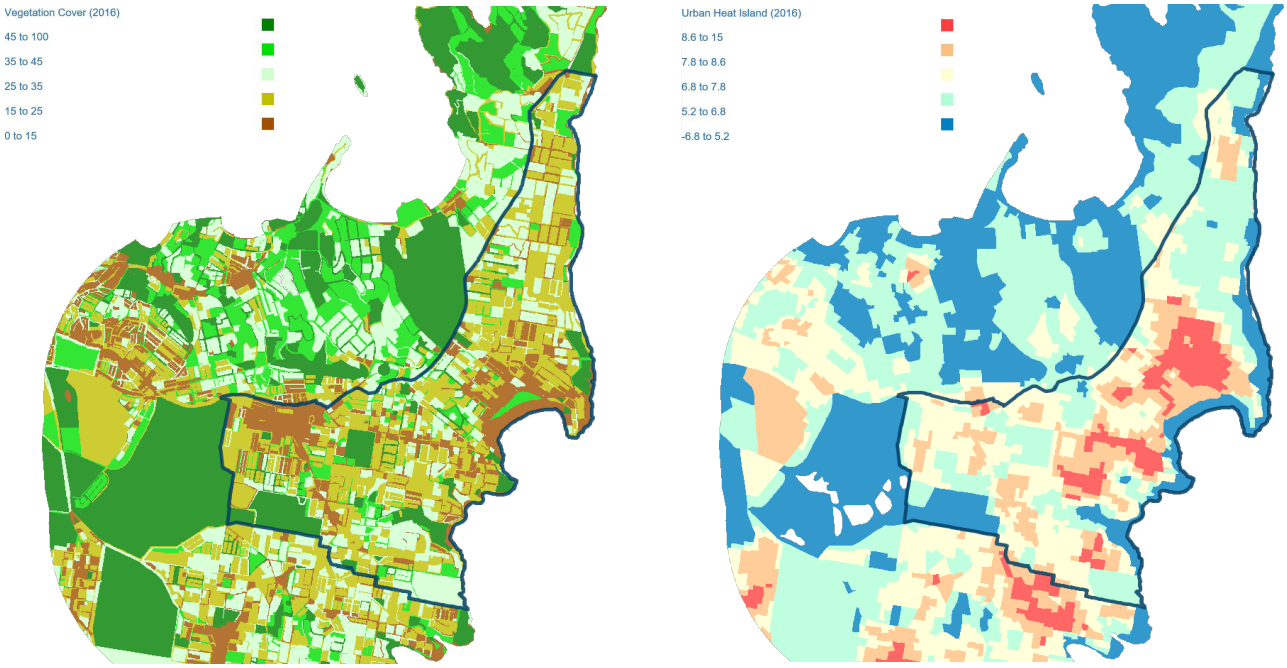

Figure 2 - Maps of Waverley Council showing the Vegetation Coverage and Urban Heat Island Effect, where colour represents degrees of temperature difference to a natural surface (vegetation) on a hot day.

Planning and responding to changes in climate can involve adaptation to practices, policies, designs and materials. There is no single solution, but by working together across community, business and government we can increase our resilience to climate change impacts.

Some ways to address climate risks include to:

- Increase and protect urban vegetation to provide cooling and health and wellbeing benefits
- Engage with communities to prepare for emergencies resulting from extreme weather
- Ensure appropriate design of new buildings to respond to changing seasonality (e.g. shaded north-and west-facing windows, insulation and effective ventilation).
- Review asset management strategies to increase the resilience of essential services at risk from climate hazards (e.g. transport, telecommunications and water infrastructure).
- Identify thresholds for unacceptable change into natural areas.
- Incorporate sea level rise risk into coastal infrastructure planning.
- Explore partnership opportunities to enhance sectoral sustainability and climate resilience.
- Develop community led responses to build household resilience to climate change.

Projected climate changes

Temperature

Daily Max: Coastal locations will experience average daily maximum of 22.8°C by 2070, compared with 23.3°C for Waverley Park and 23.5°C for Bondi Junction. Modelling has shown that energy for heating will gradually decrease over time, whereas energy required for cooling will increase .

Hot Days: There are currently around 27 days each that the temperature exceeds 30°C. By 2030 it is likely there will be 33 hot days per year and by 2070 up to 44 hot days per year. That means by 2030 internal cooling will be needed for an extra month each year.

Very Hot Days: Extreme heat days, which can have significant impacts on both infrastructure and communities, are projected to increase to 8 by 2030 and 12 by 2070.

Projected climate changes

Rainfall, Storms and Flooding

Average rainfall: It is projected that annual average rainfall will increase to 1330mm by 2070, with more rainfall in Summer/Autumn and less in Spring/Winter. Increased average and maximum temperatures are likely to drive an increase in the length and intensity of dry periods.

Heavy rainfall: It is likely we will see more heavy rainfall days (over 30mm), particularly short duration extreme rainfall events, in the near and far future. Currently there are 8 days with heavy rainfall per year, which is expected to increase to 10 by 2070. More days of heavy rainfall will increase the flooding risks.

Air Quality

Bushfire risk in Waverley is negligible due to the absence of fuel load compared with other areas in Sydney. However, as risk of intense and prolonged bushfires in the Sydney Basin increase, so does likelihood of poor air quality events as was experienced in the summer of 2019-20.

Coastal Environment

Wind: although the average wind speed is not expected to change much in the near and far future, the number of days with winds greater than 60km/h are expected to increase slightly. Wind direction predictions indicate some seasonal shifts; from the NW towards the N in Spring and from the S to the SSE in Autumn).

Sea level rise: Global sea level rise is a gradual process due to thermal expansion of the oceans and melting of sea ice. Under current emissions rates, Sydney's mean sea levels are projected to rise 15cm by 2030 and 50cm by 2070, but storms and wave setup can also increase local water levels. In combination with other coastal processes, parts of Waverley are at risk of coastal inundation including beaches, seawalls, stormwater assets and amenities.

References

BMT Commercial Australia (2021) Draft Eastern Beaches: Regional Sea Level Rise Hazard Assessment (Ref: R.A11159.02.01)

Commonwealth of Australia (2021) Climate Data Online *http://www.bom.gov.au/climate/averages/tables/cw_066037.shtml*

Commonwealth Scientific and Industrial Research Organisation (CSIRO) (2021) Predictive weather files for building energy modelling. Retrieved 01/10/ 2021, from *https://acds.csiro.au/future-climate-predictive-weather*

Commonwealth of Australia (2020) State of the Climate 2020. *https://www.csiro.au/en/research/environmental-impacts/climate-change/state-of-the-climate*

Intergovernmental Panel on Climate Change (2021) Summary for Policymakers. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [MassonDelmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

NSW Office of Environment & Heritage (2014) Metropolitan Sydney Climate Change Snapshot *https://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/Metro-Sydney-Climate-Change-Downloads*

NSW Department of Planning, Industry and NARCliM1.0 Climate Change Projections for Waverley, Environment, accessed May 2021.

NSW Department of Planning, Industry and Environment (2019) NSW Urban Heat Island to Modified Mesh Block 2016 NSW Urban Vegetation Cover to modified Mesh Block 2016 *https://www.planningportal.nsw.gov.au/opendata/dataset/nsw-urban-heat-island-to-modified-mesh-block-2016*

WSP (2021) Future Proofing Residential Development to Climate Change-Stage 1 Report https://www.waverley.nsw.gov.au/__data/assets/pdf_file/0006/181788/Future_Proofing_Residential_Development_to_Climate_Change_Final_Report_January_2021.pdf

Outdoor thermal comfort conditions (using hourly temperature and humidity) portrayed by the current NatHERS climate file for Mascot which represents an average climate of 1967 - 2004 and Outdoor thermal comfort conditions (using hourly temperature and humidity) portrayed by the CSIRO future climate file for Mascot 2030 (RCP 8.5) (Source: Dr Anir Upadhyay, UNSW)