RMIT UNIVERSITY

Climate Change Adaption Plan

Summary document

January 2020

Acknowledgement

This Climate Change Adaptation Plan has been largely adapted from the RMIT Climate Change Adaptation Plan: Towards Climate Resilient Campuses (2016); developed by RMIT researchers Darryn McEvoy, Alexei Trundle, Niina Kautto, Benjamin McMenamin and Jane Mullet. The Operations Climate Change Adaptation Plan recommends actions to be implemented at an Operations Portfolio level to address risks identified in the 2016 plan.

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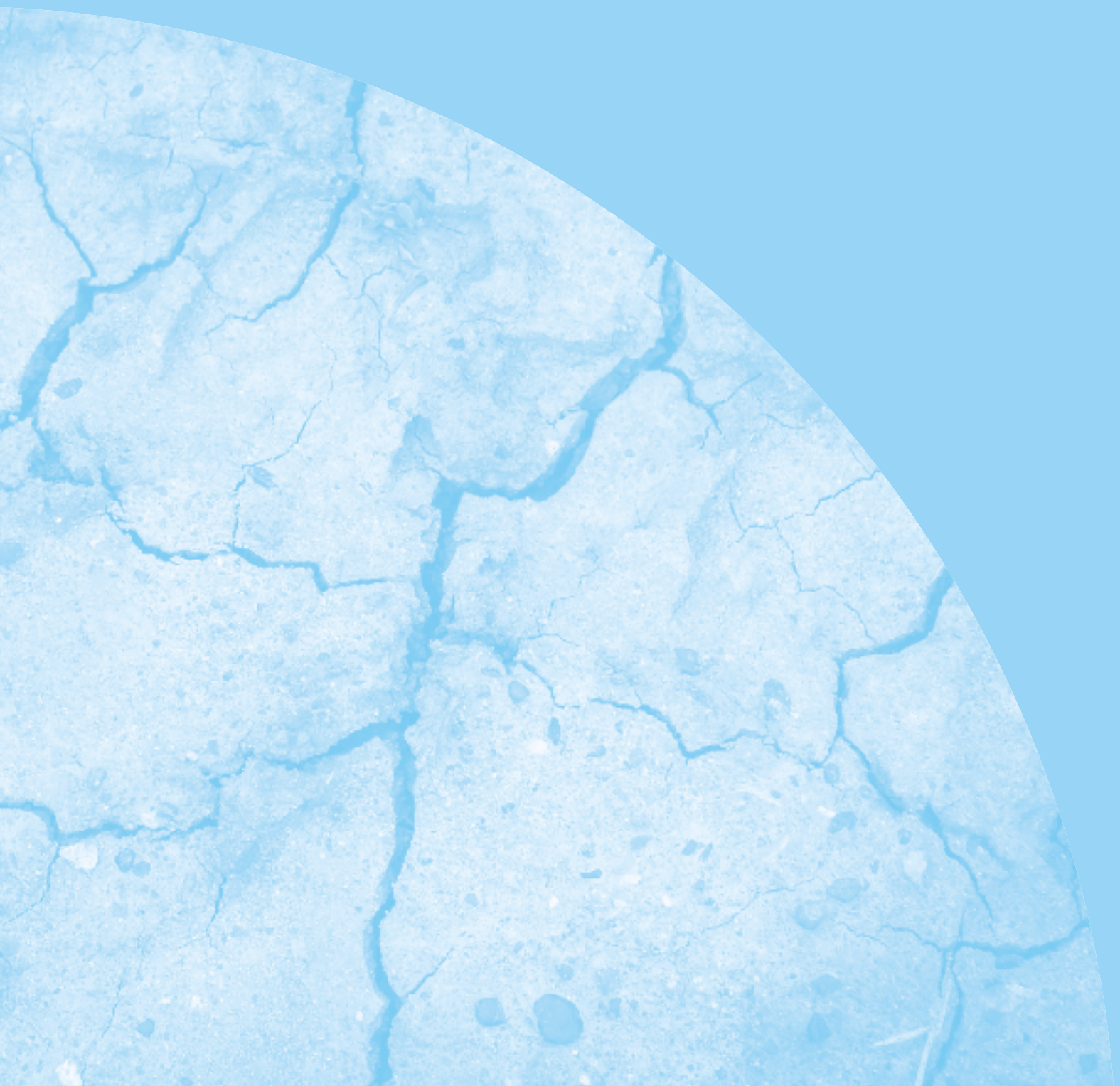


Executive Summary

Climate change and its impacts are posing a significant risk for our society today. In Australia, extreme weather events such as droughts, bushfires, cyclones and floods are expected to become more frequent and more severe. Universities such as RMIT, are important public organisations that have significant elements at risk from climate-related impacts; including buildings, infrastructure assets, and its community. It is therefore important that key climate risks are identified, and the necessary adaptation options implemented to increase resilience to future climate shocks and stresses.

To address the need for RMIT to become more resilient to the changing climate, the Sustainability Committee funded a Climate Change Adaptation Plan in 2016, which was the culmination of five years of research and assessment from the initial Climate Change Risk Assessment in 2012. This Climate Change Adaption Plan builds on the themes associated with the 2016 report, proposing implementation actions that can be undertaken by the Operations Portfolio to protect the University's buildings, assets and people.

The risk assessment process involved workshop sessions with key University stakeholders to assess each hazard in terms of current exposure, a 2030 climate scenario, and two 2070 climate scenarios. Each of these scenarios was assessed against seven core impact areas, which are aligned to RMIT risk management guidelines. This identified three priority climate hazards to RMIT Australian operations: (1) extreme heat, (2) severe storm and (3) prolonged drought.

The adaptation measures presented in this plan focus on the Operations Portfolio's ability to reduce vulnerability and increase the adaptive capacity of the University. These actions cover six key areas: emissions reduction, response planning, urban cooling, water management, tree management and communication & engagement. The actions focus on practical measures that the Operations Portfolio can implement, with both short term and long-term implementation timeframes.

1. Introduction

The increasing impacts of the changing climate such as droughts, flooding and extreme heat events on the community, economy and environment have prompted for climate change mitigation and adaptation to become recognised issues throughout the world, including Australia.

Universities, such as RMIT, are important public organisations that have significant elements at risk from climate-related impacts; including buildings, infrastructure assets, and large numbers of staff and students. To manage the changing climate, RMIT has taken the dual approach of both mitigation and adaptation. This document will only discuss RMIT's climate change adaptation strategy. However, to highlight the importance of climate change to the university, RMIT has committed to achieving Carbon Neutrality by 2030. Additionally, at the end of 2018 RMIT achieved a 45% reduction in greenhouse gas emissions based on a 2007 baseline. RMIT will endeavour to do what it can to address the challenges of climate change on a local level; while providing learning and teaching outcomes that reach across the globe.

For more information on our climate mitigation strategies see the RMIT Carbon Management Plan.

For the university, the main objective of the climate change adaptation strategy is to ensure that our community and infrastructure can continue to operate in a safe and sustainable manner in any climate or extreme weather event scenario. The climate change adaptation strategy consists of a climate risk assessment conducted in 2012 and was updated in a risk assessment workshop in 2016. Following this, the strategy has identified a range of actions that it can work toward to strengthen its ability to adapt to climate change impacts on its community and infrastructure.

1.1 RMIT Context

RMIT's Strategic Plan 2020 outlines managing our resources for long term value to improve environmental sustainability (Goal 4, Priority 4); which includes management of the impacts of climate change. The Sustainability Policy commits to enabling a transition to a low carbon future, whilst adapting the University to the impacts of climate change.

We are also committed to the objectives of the United Nations Sustainable Development Goals. The 17 Sustainable Development Goals are an urgent call for actions by all countries in a global partnership aimed at ending poverty, protecting the planet and prosperity for all. The United Nations 2030 Sustainable Development Agenda commits to 'taking urgent action to combat climate change and its impacts' (Sustainable Development Goal 13).

As a signatory to the UN Global Compact ten principles, RMIT support and promote the principles of the Sustainable Development Goals through the Sustainable Development Solutions Network. This agenda on climate change is more widely supported by the Paris Agreement; an agreement with the United Nations Framework Convention on Climate Change (UNFCCC) which Australia is ratified to, 'brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so'.

1.2 Local Context

The Australian Government released the National Climate Resilience and Adaptation Strategy in 2015. This document detailed a set of principles for effective adaptation practices and resilient buildings. The strategy covered a wide range of adaptation and resilience initiatives across many sectors such as coasts, cities and the built environment, agriculture, forestry and fisheries, water resources, natural ecosystems and many more.

In Victoria, the State Government released the Victoria's Climate Change Adaptation Plan 2017-2020 which provides 'a blueprint to prepare our state to meet the challenges of climate change and take action to secure our future'.

The City of Melbourne released the Climate Change Adaptation Strategy Refresh in 2017, which supports the Victorian Plan and builds upon this to detail how Melbourne will 'increase existing efforts and implement new actions to prosper and thrive and continue to be a global leader in climate change adaptation'. The refreshed strategy has five key goals to guide how the City of Melbourne will work to deliver, partner and advocate for effective climate change adaptation. As a major landholder in the Melbourne CBD, RMIT aims to support the delivery of this strategy.

1.3 Defining Adaptation

The term 'adaptation' used throughout this report uses the Australian Department of Climate Change and Energy Efficiency's definition of 'climate adaptation':

> Climate adaptation refers to the decisions that people, communities, businesses and governments take to prepare for and respond to a changing climate. It also refers to the actions they take to manage climate impacts. It is similar in many respects to other actions or decisions that individuals or governments take every day to manage external shocks such as natural disasters or financial sector volatility.

1.4 The Changing Climate

Prior to the industrial revolution, the Earth has been able to maintain a balanced greenhouse effect which has kept the Earth's temperature at approximately 15°C. Since the early 1900s, there has been a significant increase in human activities, in particular, the burning of fossil fuels, agriculture and land clearing, which has resulted in a significant increase in greenhouse gas emissions. Almost every major scientific body globally have supported that human activities have created an imbalanced greenhouse effect and thus an increase in the Earth's temperature.

The warming of the Earth has contributed to changes in climate patterns which has resulted in more extreme and frequent weather events. Climate models provided by the Intergovernmental Panel for Climate Change (IPCC) has projected that climate patterns will continue to change when the Earth's temperature increase further to 1.5°C and 2°C. According to the Bureau of Meteorology, Australia's climate has warmed just over 1°C since 1910.The figure below provided by Climate Kic illustrates the probability of recent extreme events in Australia in natural, current, 1.5°C and 2°C scenarios.

How often is it likely to occur under each climate state?					
Event	Associated impacts	'Natural',ie no human-induced change	Current climate (global mean 0.9-1°C above 'natural'	1.5°C warmer than 'natural'	2°C warmer than 'natural'
Angry Summer 2012-13	Severe heatwaves; bushfires	3 times a century	Every 2-3 years	Every 2 years	Most years (7-8 out of 10)
Coral Sea heat Jan/Feb/Mar 2016	Worst coral bleaching event on record	Rarely, if ever	Every 3 to 5 years	2 out of every 3 years	Almost every year (8-9 out of 10)
High temperatures associated with SE Australia drought 2006	Water restrictions, reduced crop yield	Rarely, if ever	Every 3 years	Every 2 years	Most years (3 out of 4)

Figure 1: Climate Events in 1.5°C and 2°C Warming

The future climate change in Melbourne will likely mean:

- A decrease in the amount of rainfall
- An increase in rainfall intensity
- An increase in the number of days and intensity of heatwaves
- Longer and more frequent periods of drought

2. Methodology

2.1 Climate Risk Assessment (2012)

In 2012, RMIT's Global Cities Institute provided a Climate Risk Assessment for RMIT's Australian campuses. At the time of the 2012 climate risk assessment, only limited examples of climate adaptation planning and strategy development for tertiary institutions are publicly available. Therefore, a hybrid risk-vulnerability framework was developed, incorporating both RMIT University's quantitative data and qualitative experiences of RMIT University's staff.

Data sourced for this climate-risk assessment included:

1. Semi-structured interviews and online survey: 79 staff across all RMIT campuses including CBD Risk Champions, OH&S Representatives, Property Services staff as well as academic staff with expertise in risk, climate impacts and organisation operations.
2. Future scenario selection expert group: A session was held with members of RMIT's Operational Working Group to determine time horizons, emissions scenarios, as well as the wider context for RMIT University's operations in the future.
3. Advisory group: An advisory group of 16 staff members was formed to identify and assess the future risks presented by climate change impacts to the RMIT City Campus as well as potential adaptation strategies that could be implemented.

The hybrid risk-vulnerability framework was considered an innovative approach that blended a top-down climate risk process with a bottom-up vulnerability assessment. This methodology was underpinned by the standard 5-step risk assessment process advocated by ISO-31000 Risk Management. The key modification from the standard 5-step risk assessment process included the integration of significant primary data to determine 'vulnerability hotspots'. The assessment used the IPCC definition of 'vulnerability' which consists of three main elements:

1. Exposure to a hazard (the extent of which RMIT University is subjected to flooding, storms or heatwaves)
2. Sensitivity (the degree of negative impact on RMIT University's people, infrastructure and systems)
3. The adaptive capacity of RMIT's people, systems and infrastructure to manage the impacts.

Details of the hybrid risk-vulnerability framework for the 2012 climate-risk assessment is shown in Figure 2.

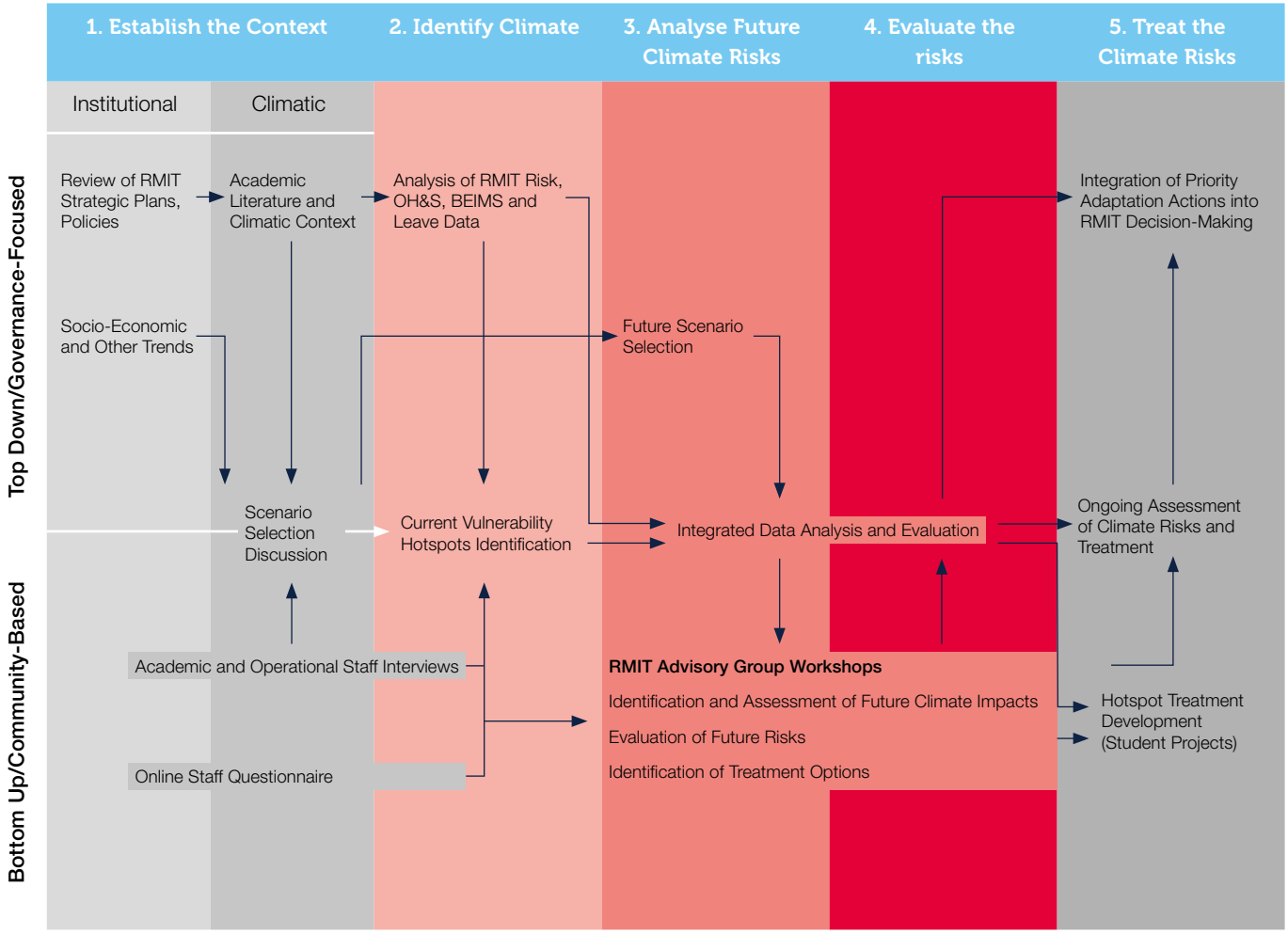


Figure 2: Hybrid risk-vulnerability framework

2.2 Climate Change Adaptation 2016

Building on from the 2012 climate risk assessment, the climate risks facing RMIT University's main campus were updated in a workshop held in Melbourne in February 2016. During the workshop, a new generation of scenarios were introduced to the participants specifically, Representative Concentration Pathways (RCPs), rather than the earlier IPCC SRES scenarios that were used in the 2012 assessment. The workshop examined the change under a 2030 warming scenario for the metropolitan region, as well as both 'higher' and 'lower' emissions scenarios for 2070. Each of these scenarios was assessed against seven core impact areas:

1. People, Health & Safety
2. Security
3. Stakeholders & Reputation
4. Finance & Funding
5. Environment & Heritage
6. Regulatory, Legislative & Commercial
7. Business Interruption & Capability

All seven impact areas were examined by each group, who – based on their expertise and understanding – estimated the possible worst-case consequences in each sector, their likelihood, and the confidence the group had in the levels that were determined. Consistent with both the 2012 assessment and the university's internal risk assessment process, a traditional risk matrix was used to depict the risk categories.

Workshop participants included a broad cross-section of RMIT staff familiar with operational risk and emergency planning; as well as academic, student, corporate and administrative stakeholders. External stakeholders were also invited to participate in the adaptation component of the workshop, in order to identify cross-boundary issues and explore partnership opportunities.

3. RMIT Adaptation Response

RMIT has three campuses in Melbourne – Melbourne CBD, Brunswick and Bundoora. RMIT is the largest landholder in the City of Melbourne, which positions the University to not only take a leading role in driving sustainable outcomes for the city but also to ensure that the city and its people are resilient in the face of the changing climate. The three significant climate impacts examined in the 2012 Climate Risk Assessment and 2016 workshop are:

1. Extreme heat event

2. Severe storm/flooding event

3. Prolonged drought event

The following sections discuss the observed accelerated changes of Melbourne's climate, how it will impact the university, and what will be done to ensure that our people, buildings and infrastructure are resilient towards any extreme climate scenario in the future.

There are a number of overarching actions which are being undertaken to adapt to extreme weather events and prolonged impacts of climate change, these include:

- Improve staff and student awareness of climate change and how RMIT is implementing climate change adaptation measures.
- Provide opportunities for students to be involved in Climate Change Adaptation at RMIT
- Develop strategies with the Central Communications team on how to effectively communicate an extreme weather event to staff and students.
- Review Property Services and ITS procedures to ensure there are appropriate strategies in place to mitigate the impacts of extreme weather events.
- Support RMIT Vietnam, and other international campuses in Climate Change Adaptation in their existing and future buildings and spaces.
- Support our Local Councils to deliver their climate adaptation plans.
- Revise and update the Climate Change Adaptation Strategy annually.
- Review the vulnerability of external datacentres and cloud-based services to ensure that appropriate measures are being taken to eliminate the likelihood of disruptions to RMIT activities.

3.1 Extreme Heat

According to the Bureau of Methodology, Australia's climate has warmed just over 1^{0}C since 1910, with most of the warming occurring after 1950, as demonstrated in Figure 3.

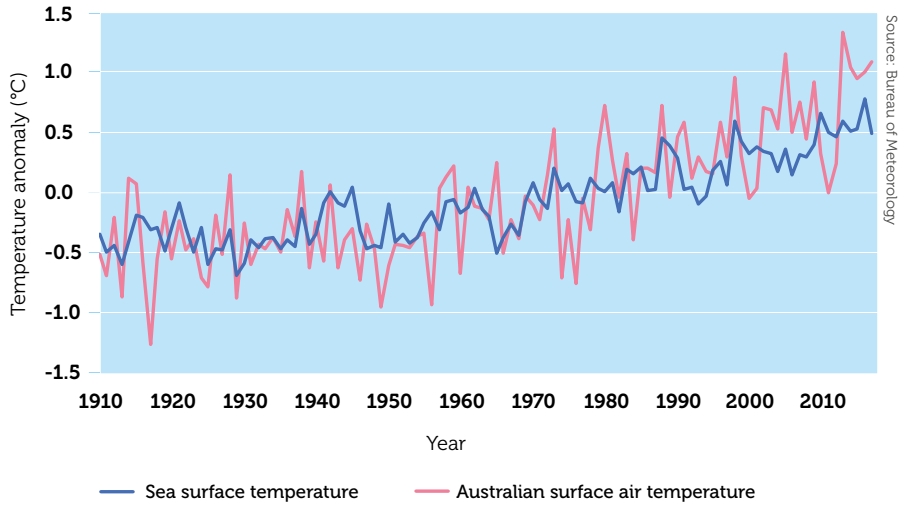


Figure 3: Australia Temperature Anomaly Since 1910

This phenomenon has resulted in an increase in the frequency of extreme heat events, as records have shown, eight out of ten of Australia's warmest years on record have occurred since 2005. Whilst in Victoria, the two worst heatwaves on record have happened in the last ten years, January 2009 and January 2014. Figure 4 demonstrates the number of days each year where the Australian area-averaged daily mean temperature is extreme. Where extreme days are defined as above the 95th percentile of each month from the years 1920-2017. As evident from Figure 4, the number of extreme heat events is increasing.

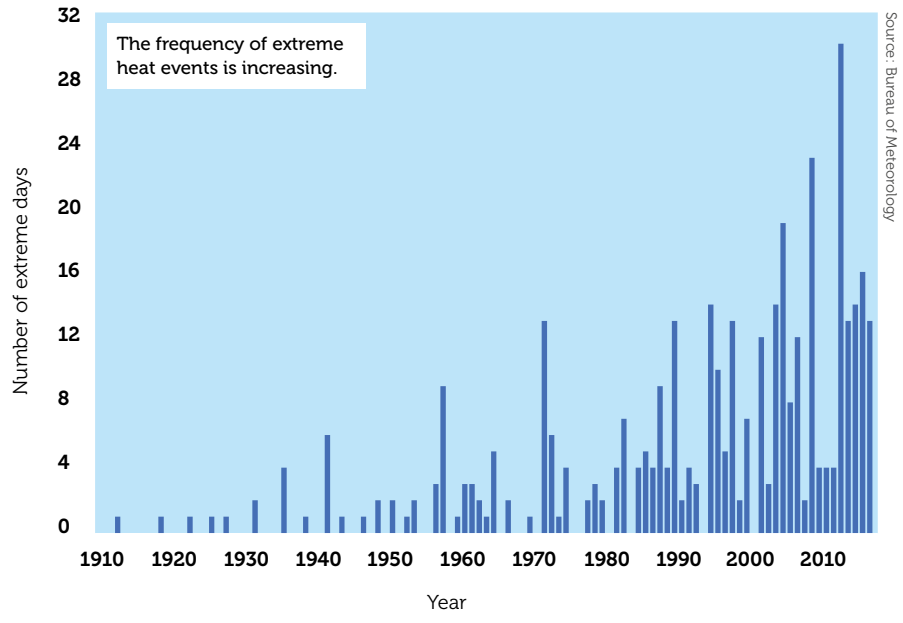


Figure 4: Number of Extreme Heat Days

What Does It Mean to RMIT?

Extreme heat events will increase the likelihood of failure or reduced capacity of infrastructure services such as electricity supply, and subsequently HVAC, lighting and ITS. Within RMIT, significant consequences associated with the failure or reduced capacity of these services are the health, safety and wellbeing of staff and students, as well as damage to assets. Further, given the interdependencies between RMIT campuses and surrounding public open spaces, the communities around RMIT campuses should also be considered in extreme heat events. Significant risks and consequences associated with extreme heat days have been determined to be:

- HVAC failure and/or capacity loss resulting in reduced thermal comfort to staff and students.
- Higher likelihoods of students and staff suffering from fatigue, heat stress, dehydration and other related illnesses.
- Students and vulnerable members of the community choosing to stay on campus during extreme heat events to stay cool. Increasing cooling demand for the central chillers and the number of people exposed to extreme heat if infrastructure services fail.
- Failure of critical infrastructure resulting in disruption of student and staff activities.
- Blackouts as a result of significant strain on the electricity network, resulting in disruption of student and staff activities, reduced productivity and an increased likelihood of staff and students' being exposed to extreme heat.
- Transport disruptions, such as buckling of train/tram tracks increasing the number of staff and students stuck on campus, and subsequently, increasing the cooling demand on central chillers.

It is recognised that risks and consequences associated with extreme heat events are often interconnected and can result in a series of cascading impacts. Such as HVAC failure resulting in ITS services and communications failures, causing disruptions to staff and student activities, and higher likelihoods of students and staff suffering from fatigue, heat stress, dehydration and other related illnesses.

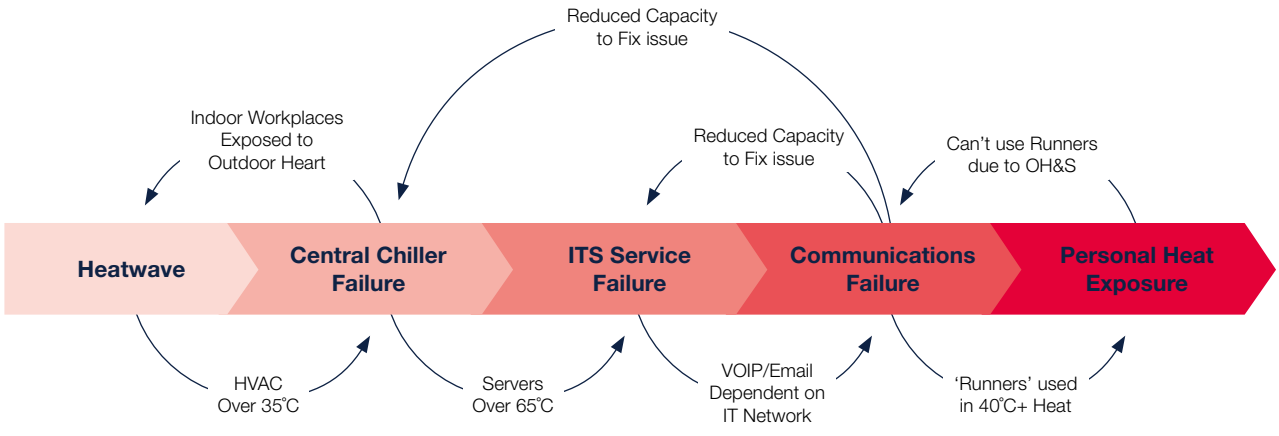


Figure 5: Cascading Impacts of Extreme Heat Event

A visual depiction of the risks associated with extreme heat events and the consequences on the university's people, building and infrastructure are shown in Figure 6.

Figure 6: Risks and Consequences for Extreme Heat Events.

Adaptation Actions

- RMIT Design Standards will continue to be updated on an annual basis to ensure appropriate adaptation and resilience measures are built into the design of RMIT's buildings and infrastructures, such that, all new external materials such as paving, roof, outdoor furniture installed to have high solar reflectance index to avoid urban heat island effect.
- Landscaping to be incorporated in RMIT Design Standards and to include considerations of vegetation that provide ample shading, awnings/shades to cover pathways, light coloured permeable pavements.
- Monitor the provision of drinking water fountains in prominent, easily accessible locations for staff and students.
- Sustainability and Facilities & Asset Management Teams to conduct reviews on existing building stock and its capabilities to assist in indirectly reducing extremely hot temperatures including, shading windows with blinds to reduce solar heat gain, improving fabric insulation and upgrading windows to double-glazed systems.
- Annual life cycle asset replacement programs in place to ensure that all chillers between 20-25 years old are replaced to avoid chiller failures in extreme heat events, and for new chillers selected to be able to withstand scenarios where there will be an increase in intensity and frequency of extreme heat events.
- Regularly update the RMIT Tree Management Plan to ensure that at-risk species are appropriately maintained and replace if required.
- Develop an emergency preparedness communications strategy to communicate to staff and students about resilience during an extreme heat event (utilising various channels such as digital screens, Yammer and RMIT's website).
- Work with local partner organisations to assess risks and vulnerabilities to extreme weather events.
- Work in partnership with other large organisations in the Melbourne CBD to identify and support vulnerable members of the community during extreme heat events.

3.2 Prolonged Drought

Australian rainfall is highly variable and strongly influenced on the El Nino, La Nina and the Indian Ocean Dipole phenomena. Despite the variability, the Bureau of Meteorology has reported that in the past twenty years there has been a shift towards drier conditions across South-eastern Australia from April to October. In the last 17 of 20 'April to October' periods from 1999, the Southern Australian regions have had below-average rainfall.

What does it mean to RMIT?

Prolonged drought places pressure on RMIT's vegetation, open public spaces, and building infrastructure due to water shortages (water restrictions) and lack of moisture in the air over a long period of time. Significant consequences associated with prolonged drought have been determined to be:

- Water restrictions resulting in limited watering capabilities of landscaped areas
- Severe health decline of large non-drought resistant tree species and planted areas.
- A decline in the health of the university's highly significant remnant and mature River Red Gums.
- Drying of soils around building foundations, leading to structural issues and cracking.
- Lowered staff and students' morale, with additional pressures on regional students and staff.
- An increase in energy consumption and associated greenhouse gas emissions due to increased cooling demands.

A visual depiction of the risks associated with prolonged drought and the consequences on the university's people, building and infrastructure is shown in Figure 7.

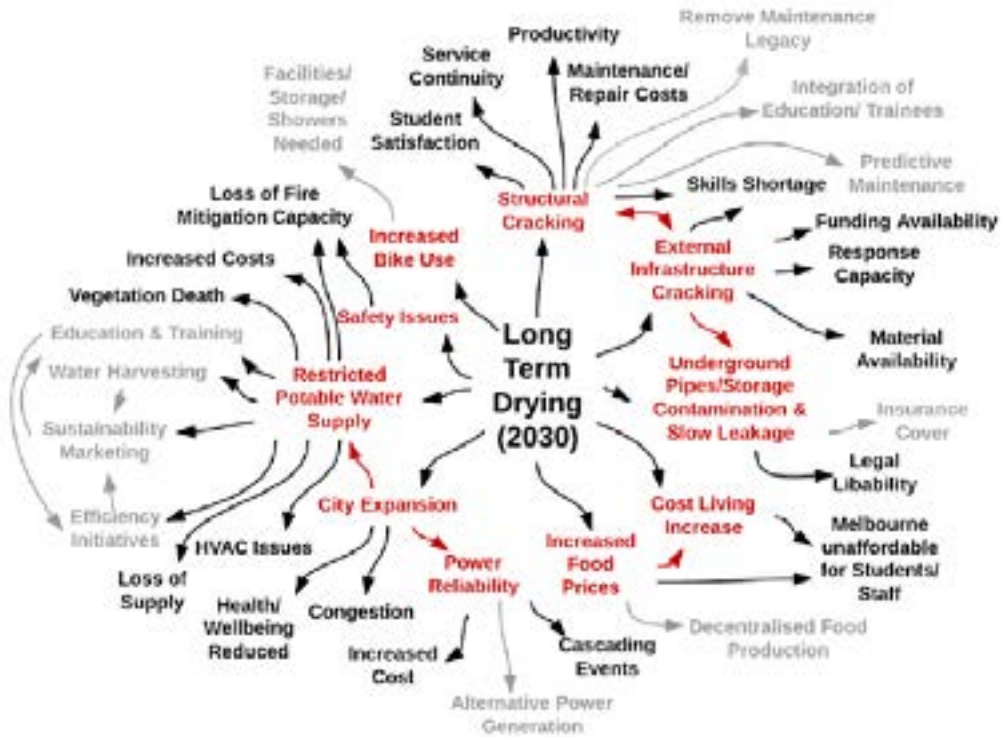
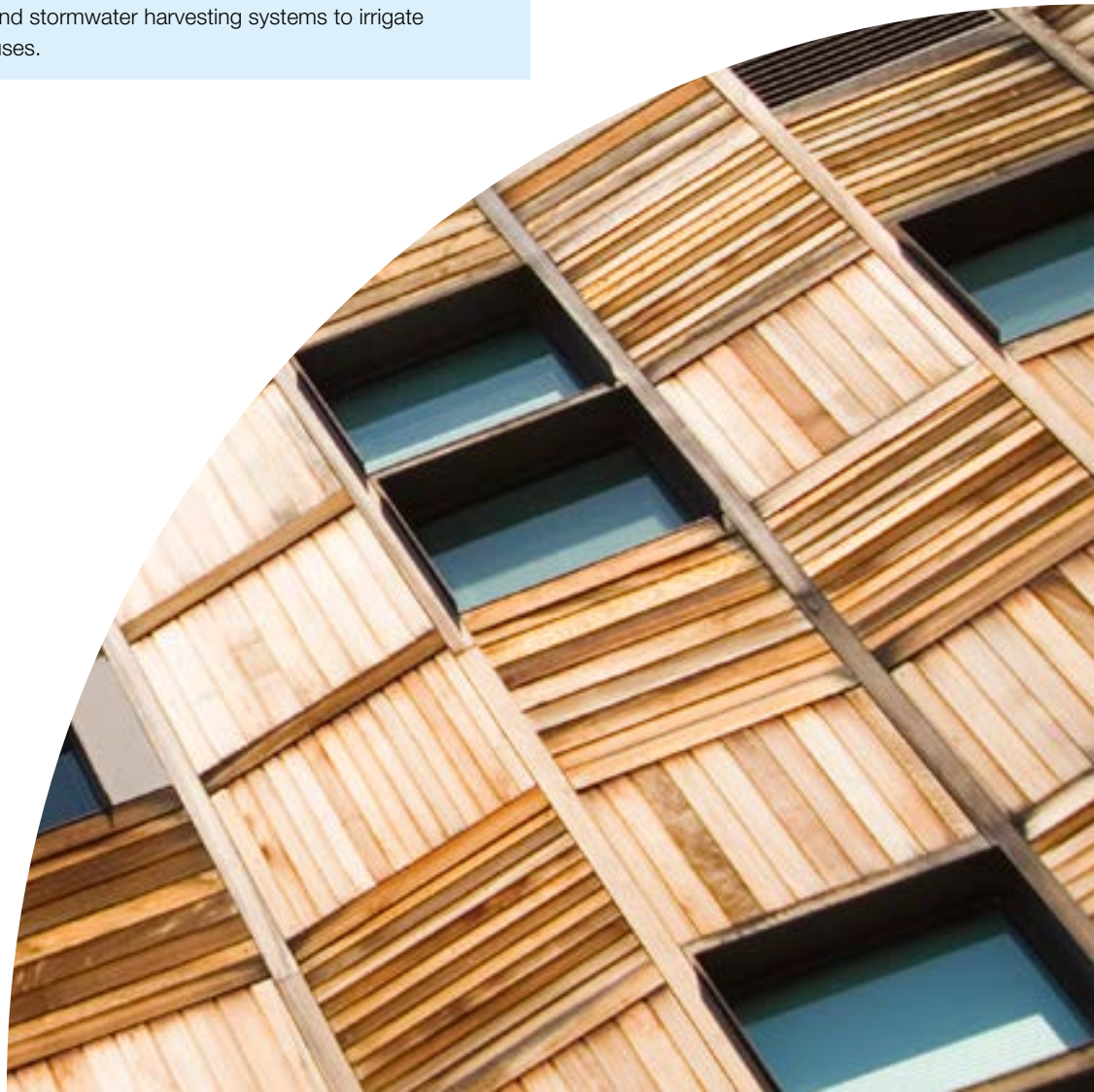


Figure 7: Risks and Consequences for Prolonged Drought

Adaptation Actions

- RMIT Design Standards will continue to be updated annually to ensure appropriate adaptation and resilience measures are built into the design of RMIT's buildings and infrastructures.
- Landscape standards to be developed and incorporated within Design Standards that follow the City of Melbourne's Urban Nature Planting Guide to ensure biodiversity enhancement and drought tolerance are priority considerations when designing new external spaces.
- Facilities & Asset Management Team to conduct building inspections of roofs and facades using drone capabilities to identify structural/cracking issues.
- Use the annual Tree Management Plans to actively monitor the University's vulnerable highly significant remnant and mature River Red Gums during prolonged droughts.
- Continue to develop rainwater and stormwater harvesting systems to irrigate landscape areas in RMIT campuses.



3.3 Severe Rainfall / Storm

The Bureau of Meteorology has stated that there is evidence that heavy rainfall in Melbourne is expected to become more intense. The total rainfall on heavy-rain days is expected to increase by 7% per degree of warming. For short-duration and extreme rainfall events, recent observations have shown higher than 7% increase of rainfall, and often associated with flash flooding.

What Does This Mean to RMIT?

Melbourne CBD has a number of areas that are particularly prone to flooding. For example, Elizabeth Street is built on top of a natural creek and is the lowest point of Melbourne CBD. Some of Melbourne's major floods have occurred in the past 15 years, namely 2005, 2010 and 2018 floods. Severe rainfall and flooding has the potential to severely damage the university's building and infrastructure, and subsequently disrupt the students and staff operations. Significant risks and consequences associated with severe rainfall and flooding have been determined to be:

- Localised flooding to significant areas such as switchboard and comms rooms resulting in ITS failure and disruption to students and staff operations.
- Localised flooding to buildings resulting in water damaged spaces, restricted space use and increase in cleaning costs.
- Network power outages due to storms impacting infrastructure.
- Damage to exterior and interior of buildings resulting in financial loss, potential reputational damage and disruption to students and staff operations.
- Staff and students not being able to travel around campus during severe rainfall/storm.
- Delays or cancellations of public transport systems resulting in more students and staff stuck on campus.
- Significant maintenance and cleaning costs for the aftermath of the severe rainfall or flooding event.

A visual depiction of the risks associated with increasing rain and storm events and the consequences on the university's people, building and infrastructure is shown in Figure 8.

Figure 8: Risks and Consequences for Increased Rainfall and Flooding

Adaptation Actions

- RMIT to develop flood risk maps and identify areas where flooding should be an important consideration for existing building infrastructure, as well as in development planning and emergency planning.
- All new developments to demonstrate that Stormwater Peak Discharge calculations have been completed at the early design stage demonstrating that 5-year ARI peak event stormwater discharge from the site does not exceed the pre-development peak event stormwater discharge.
- Facilities & Asset Management team to continue to implement and improve on responses and actions related to heavy rainfall/emergency planning actions prior to extreme rainfall or storm event to minimise or eliminate potential damage to RMIT properties, infrastructure and assets.
- Sustainability and Safety teams to collaborate and develop emergency preparedness communications strategy to communicate to contractors working on RMIT sites prior to a heavy rainfall/storm event.

4. Conclusion

The Sustainability Team will continue to work collaboratively across RMIT Operations Portfolio to ensure that policies and actions are in place to implement the Climate Change Adaptation Plan. It is also fundamental that the Climate Change Adaptation Plan be continually monitored and evaluated for the plan to be based on the latest climate findings and data. Therefore, the plan will be revisited and updated regularly to incorporate latest climate data and then incorporated into the annual capital development plan and relevant portfolio plans.

4.1 Reference

The following resources have been used to inform the development of this Climate Change Adaptation Plan.

Internal

- RMIT Campus Climate Risk and Resilience – Workshop Report 2016
- RMIT University CBD Campus: Towards a Climate Adaptation Plan 2014
- RMIT University Climate Risk Assessment – 2012

External

- City of Sydney Adapting for Climate Change A Long Term Strategy for the City of Sydney
- City of Melbourne Climate Change Adaptation Refresh 2017
- Australian Government National Climate Resilience and Adaptation Strategy 2015
- Australian Government Bureau of Meteorology State of the Climate 2018
- IPCC Special Report: Global Warming of 1.5°C

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