Guidance Note: Climate resilience

What is climate resilience?

Climate resilience refers to the degree to which the University (people, estate, operations etc) can withstand and recover from weather-related events. The University seeks to appropriately avoid, mitigate and manage short and long-term risks that weather events (and indirect weather-caused events) may have on things that are important to the University. These important things include:

- Campus experience (including health and wellbeing of students, staff, industry partners, visitors and animals under the University's care)
- Core business
    - Teaching
    - Research
    - Engagement
- Enablers
    - Reputation
    - Financial viability
    - University assets (including owned, leased, managed etc)
    - External assets (e.g. utilities, roads, public transport etc)
    - Ecosystem services (clear air, water etc)

The University has varying levels of control over the items above. Climate resilience activities include:

- Appropriate building, infrastructure and landscaping design and maintenance
- Insurance
- Emergency Management Plans
- Business Continuity Plans

There is an opportunity for building projects to reduce risks through their design and to support emergency management and recovery activities during and after events.

The University's commitments

The University has two commitments that set a context for climate resilience in the University's built environment:

- Risk Management Policy[1], which outlines the University's approach to risk management and the associated roles and responsibilities
- *Sustainability Plan 2017 – 2020*, in which the University committed to develop and implement climate adaptation plans for each campus by 2020

As further context, the University has released a Sustainable Investment Framework[2] which outlines the University's approach to sustainability, particularly climate change, in its investment portfolios and processes.

[1] http://policy.unimelb.edu.au/MPF1194
[2] https://ourcampus.unimelb.edu.au/sustainability-commitment/sustainable-investment-framework

Approaches for projects

Major refurbishment and new building projects, refurbishments that are business critical or involving high-value contents, and significant external works must adhere to AS 5334:2013 *Climate Change Adaptation for Settlements and Infrastructure*. The Standard follows AS/NZS ISO 31000:2009 *Risk management — principles and guidelines* and

guides projects through a qualitative risk assessment process, enabling projects to identify risks that need to be addressed or investigated further (see Detailed risk assessment).

At the time of writing this guidance note, the University has undertaken climate change risk assessments for the Parkville Campus, WEBS North Stage 1, Melbourne Conservatorium of Music, Melbourne Connect and the proposed Fishermans Bend Campus. The following recommendations regarding the process of climate resilience planning were developed based on lessons learnt from those assessments and are explained further in later sub-sections:

- Appropriately consider risks to people, animals, ecosystems and assets
- Consider how the project can increase the adaptive capacity (ability to cope) for people (and animals), including those beyond the project's immediate boundary[3]
- Define risks in ways that are meaningful for the University's risk management systems
- Clearly document risks, the design response and related operational requirements to those risks, and any residual risks that requires operational risk management
- Undertake detailed risk assessment where appropriate

Identifying risks to people, animals, ecosystems and assets

There was a tendency in early climate change adaption plans prepared for the University to be blinkered in some way, such as:

- **Focus on Assets** - Risk screening to identify which climate-related parameters (E.g. temperature, rainfall, wind, loss of utilities) are likely to have an impact on different asset types (buildings, gardens, waste management etc) is important, however, while this is a useful activity, it can, unless those undertaking the assessment are mindful, result in limited recognition of risks to people.
- **Focus on Staff** - Where risks to people were identified, they tended to be identified from a staff occupational health & safety perspective, failing to recognise that similar risks may exist for students or visitors.

Table 1 provides some examples of poorly defined risks from previous assessments.

Increasing adaptive capacity (ability to cope)

One way to guard against a blinkered risk assessment is to ask: *How can the project increase the adaptive capacity of people (and animals) that in the future will be within or near the project area?*

Asking this question promotes human-centred design and consideration of how the project can also improve the resilience of communities neighbouring the project[4].

[3] For example, projects on the east side of the Parkville campus may be able to reduce flood risk to the Melbourne CBD (Elizabeth Street Catchment).

[4] The University's Parkville campus helping to mitigate flooding of the Elizabeth Street Catchment is a good example of improving the resilience of communities.

Table 2~~Table 2~~ provides some examples of how adaptive capacity can be conceptualised and increased.

Table 1 – Examples of poorly defined risks from previous climate change risk assessments at the University

Risk identified	Critique
Lower space utilisation due to higher / prolonged temperatures causing spaces to become uninhabitable for a period of time.	The risks themselves are reasonable. The weakness is that the health and safety risk to students, staff and visitors of having indoor and outdoor spaces that are potentially uninhabitable was not identified.
Decline in use of open spaces due to increased rainfall events creating flooding/inundation, extreme temperature events, and strong wind events.	
An increase in the number of extreme heat days will increase heat island effect with a subsequent effect on material wear and deterioration	The risks themselves are reasonable. The weakness is that no risks were identified regarding the potential health and safety risks to students, staff or visitors of the heat island effect or extreme heat days.
An increase in the number of extreme heat days could lead to: - higher summer cooling loads (may not achieve indoor temperature setpoints) - increased energy demand and usage (cost) - increased water demand and usage (cost)	
Increase in heat stress illness and injury of people working outdoors due to increase in extreme temperatures.	The risk itself is reasonable. The weakness is that an equivalent risk was not considered for non-workers (e.g. students and visitors).

Table 2 – Examples of increasing adaptive capacity

Types of adaptive capacity[5]	Description	Hypothetical examples relevant for the University
Resources	The resources (e.g. financial, technological, service) that people can access.	Provision of high-speed data connection, combined with AV facilities, enabling people to work remotely if their normal working location or their transport mode is impacted or under threat (e.g. from storm, flood, bushfire, extreme heat). Provide readily accessible water fountains or kitchenettes to help people stay hydrated during hot weather.
Flexibility	The ability for people to do things differently.	Work flexibility that enables working from home or other remote location. Using lecture-capture so that students can catch up on any lectures they miss due to extreme weather.
Social Organization	The ways in which society is organized to enable cooperation and knowledge sharing.	Co-ordinated plans (e.g. evacuation, emergency management, business continuity) between building occupants and Campus Services
Learning / Knowledge	Capacity to generate and understand new information about impacts and adaptation options.	Notifications[6] and warning systems[7] that alert people of a risk to their location such as a heatwave or thunderstorm asthma forecast. Capturing best practice adaptation in the University's building design standards and associated documents.
Agency	The ability of people (individuals and groups) to have free choice in responding to change.	Work/study flexibility that enables working/studying from home or other remote location AND being able to do so in response to a climate extreme.

[5] Adapted from: Cinner et al (2018) Building adaptive capacity to climate change in tropical coastal communities, Nature Climate Change, Vol 8

[6] www2.health.vic.gov.au/public-health/environmental-health/climate-weather-and-public-health/heatwaves-and-extreme-heat/heat-health-alerts

[7] www.emv.vic.gov.au/news/new-thunderstorm-asthma-forecasting-system and www.emv.vic.gov.au/news/vicemergency-app-warning-community-of-risks-in-real-time

University's risk management systems

When undertaking a climate risk assessment, risks should be defined in ways that:

- Are meaningful for the University (i.e. consider risk to things the University cares about)
- Enable easy reporting (e.g. as part of project risk register)
- Enable easy handover of residual / operational risks to University staff for ongoing management

Project teams should consult the University's project manager about the best way to define risk for their project.

At the time of writing, the University uses different risk frameworks, depending on the application:

- Project risk frameworks (may be relevant in terms of which impacts are important and how risk is reported)
  - Project Services
  - Major Projects
- Operational frameworks (may be relevant in terms of which impacts are important and for handover of residual risks)
  - Health and Safety
  - Enterprise Risk Management System (ERMS)

Project risk frameworks

At the time of writing, the University has two project risk frameworks, one used by Project Services and one used by Major Projects (see Figure 1 and Figure 2).

Figure 1 – Example of Project Services risk framework

Likelihood Measures

Rating	Descriptor	Description
5	Almost Certain	Expected to occur in most circumstances
4	Likely	Will probably occur
3	Possible	Might occur
2	Unlikely	Could occur
1	Rare	May occur only in exceptional circumstances

Consequence Measures

Rating	Descriptor	Impact		
		Cost	Time	Quality
5	Catastrophic	Over $5 mil	Delay over 5 years	Dysfunctional facilities
4	Major	Over $2 mil	Delay over 2 years	Significant disruption
3	Moderate	Over $500k	Delay over 6 months	Some disruption to operations
2	Minor	Over $200k	Delay over 3 months	Minor defects to be rectified
1	Insignificant	Less than $200k	Delay less than 3 months	Minor defects easily rectified

Risk Classification

Likelihood ⇓	Consequence ⇒ 0	Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
Rare	1	L	L	M	H	H
Unlikely	2	L	L	M	H	E
Possible	3	L	M	H	E	E
Likely	4	M	H	H	E	E
Almost Certain	5	H	H	E	E	E

Legend

E = Extreme Risk – Immediate action required
H = High Risk – Senior management attention need
M = Moderate Risk – Management responsibility must be specified
L = Low Risk – Management by routine procedures

Figure 2 – Example of Major Projects risk framework

Risk categories considered:

- Product & design risk
- Realisation risk
- Financial risk
- Reputational risk
- Schedule risk

Inherent Risk Ratings

Likelihood	Impact: Insignificant	Minor	Moderate	Major	Severe
Almost Certain	Moderate	Moderate	Significant	High	High
Likely	Moderate	Moderate	Significant	Significant	High
Possible	Low	Moderate	Moderate	Significant	Significant
Unlikely	Low	Low	Low	Moderate	Moderate
Rare	Low	Low	Low	Moderate	Moderate

Management Control Criteria

Rating	Description
Poor	Control is absent, control is not documented or in operation, control does not address risk.
Fair	Control partially addresses risk, documentation and operation of control could be improved.
Adequate	Control addresses risk, improvement could be made to documentation and/or operation, better review and monitoring.
Excellent	Control addresses risk, is officially documented and in operation, reviewed independently, consistently applied.

Residual Risk Ratings

Management Controls Rating	Inherent Risk Rating: Low	Moderate	Significant	High
Poor	Low	Moderate	Significant	High
Fair	Low	Moderate	Significant	High
Adequate	Low	Moderate	Moderate	Significant
Excellent	Low	Low	Moderate	Moderate

High and significant residual risk ratings require formal treatment plans to be implemented.

Although no formal treatment plans are required for the Moderate and Low rated risks, these should still be monitored regularly to ensure no changes in ratings have occurred.

Health and safety

The risk framework used for health and safety is shown below[8].

HEALTH & SAFETY – RISK MATRIX AND DEFINITIONS

		Consequence				
		Insignificant	Minor	Moderate	Major	Severe
Likelihood	Almost certain	Medium	High	High	Extreme	Extreme
	Likely	Medium	Medium	High	Extreme	Extreme
	Possible	Low	Medium	Medium	High	Extreme
	Unlikely	Low	Low	Medium	High	High
	Rare	Low	Low	Low	Medium	High

Likelihood
Almost certain – will occur in most circumstances when the activity is undertaken (greater than 90% chance of occurring)
Likely - will probably occur in most circumstances when the activity is undertaken (51 to 90% chance of occurring)
Possible – might occur when the activity is undertaken (21 to 50% chance of occurring)
Unlikely – could happen at some time when the activity is undertaken (1 to 20% chance of occurring)
Rare – may happen only in exceptional circumstances when the activity is undertaken (less than 1% chance of occurring)

Consequence
Insignificant –First aid treatment, minor injury, no time off work
Minor – Single occurrence of medical treatment, minor injury, no time off work
Moderate – Multiple medical treatments, non-permanent injury, less than 10 days off work
Major – Extensive injuries requiring medical treatment (e.g. surgery), serious or permanent injury/illness, greater than 10 days off work
Severe – Severe injury/illness requiring life support, actual or potential fatality, greater than 250 days off work

Risk Rating Priority for Action			
	Risk acceptance guide	Action	Recommended action time frame
Extreme	Not acceptable	Cease or isolate source of risk Implement further risk controls Monitor, review and document controls	Immediate Up to 1 month Ongoing
High	Generally (in most circumstances) not acceptable	Implement risk controls if reasonably practicable Monitor, review and document controls	1 to 3 months Ongoing
Medium	Generally (in most circumstances) acceptable	Implement risk controls if reasonably practicable Monitor, review and document controls	3 to 6 months Ongoing
Low	Acceptable	Monitor and review	Ongoing

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HEALTH & SAFETY: RISK ASSESSMENT METHODOLOGY 1

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Enterprise Risk Management System

The Enterprise Risk Management System (ERMS) is the online system that the University uses to record and manage operational and strategic risks. At the time of writing, the ERMS uses risk definitions related to the categories of policies in the University's policy library. The likelihood and consequence descriptions are shown on the following pages.

[8] https://safety.unimelb.edu.au/__data/assets/pdf_file/0007/1716712/health-and-safety-risk-assessment-methodology.pdf

	Insignificant	Minor	Moderate	Major	Severe
	Consequence				
Employment	No impact on recruitment or retention	Minor impact on employee morale Minor impact on recruitment and retention	Employee industrial action Moderate impact on employee morale Compliance breach (may attract regulatory penalty/intervention)	Major breach of EBA (requires legal intervention) Employee industrial action Serious employee misconduct (e.g. Fraud) Compliance breach which may attract civil penalties Major impact on employee morale	Wide scale breach of EBA agreements (e.g. class action lawsuit, significant payout to employees)
Engagement	Direct complaint to University about University activities/programs by member of public, student or alumni. No negative external media attention No impact on University access to Federal or State government	Minor disrepute with short term impact (e.g. 1-2 weeks) Negative publicity via social media (including media attention in non-mainstream outlets (NMO)) Student/staff protest against University activities with minimal media attention (including NMO)	Moderate disrepute with impact (e.g. 3-4 months) Moderate level of media attention by state/national media (mainstream/social media) coverage < 1 week Negative publicity by person of profile Protests with local to State level media attention	Significant damage (e.g. 1-3 yrs) to brand/relationships (donor/alumni) Negative publicity in state, national or overseas media/social media, coverage 1-4 wks Limit government access (e.g.3-6 mths) High profile protest/ national media attention	Long term damage (e.g. >3 years) to brand/relations (donor/alumni) Negative media/social media attention in State, national or overseas, coverage > 4 weeks. Damage to relationship or government access > 6 months (eg. ministerial interventions etc.)
Facilities	Assets receive minimal damage or are temporarily available. Less than 1 hour outage	A number of assets unusable but can be replaced within acceptable timeframes 1 to 4 hour outage	A range of significant and critical assets are unusable for 24 hours Non-critical community infrastructure assets are destroyed 4 hours to 24 hours outage	A range of significant and critical assets are unusable for 24 hours Non-critical community infrastructure assets are destroyed 24 hours to 1 week outage	Significant or critical community infrastructure assets are destroyed Significant or critical infrastructure assets are unusable for multiple weeks Outage beyond 1 week
Finance and Procurement	Overall university net margin impact of less than 0.25% Loss on investments which does not impact the University's financial performance	Overall university net margin impact between 0.25% - 0.5% Loss on investments which does not impact the University's financial performance	Overall university net margin impact between 0.5% - 0.75% Loss on investments which does not impact University reserves Key service *contracts not* renewed Non-performance of key contracts (impact on service delivery)	Overall university net margin impact between 0.75% - 1.5% Loss on investments depletes University's reserves and requires recovery period of 2-3 years Legal action taken by University on contractors and vice versa	Overall university net margin impact of > 1.5% Loss on investments depleting University reserves, unable to meet operational costs & requires >3 year recovery period >=10% decline in research grants revenue/domesti load or efficiency targets.
Governance and Management	Occasional non compliance with internal policy Oversight on reporting activity that is under control. No penalties incurred	More than one instance of non-compliance with policy and procedures which are not regulated or legislated Minimal non-compliance to relevant legislation/Breach. Internal Penalty may be incurred	Non-compliance with legislation requiring self-reporting Closure or possible closure of operations High probability of penalty / imprisonment / ministerial intervention Scrutiny required by Council or committees or Auditor General's Office	Non-compliance and/or breach of legislation Closure / possible closure of non-core operations. High probability of penalty / imprisonment / ministerial intervention Scrutiny required by Council, Committees Auditor General's Office or inquest etc	Non-compliance affecting closure of core operation(s) or key business activities. Large penalties financials / imprisonment / government intervention Statutory intervention due to breach of legislation / regulations
Health and Safety	No medical or first aid treatment required	Minor injury or first aid treatment required	Non-life threatening injuries with medical treatment required (hospitalisation or multiple medical treatments)	Single death or permanent disability, life threatening injury or multiple serious injuries requiring hospitalisation	Multiple deaths or multiple life threatening injuries

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Interagency Risk	Issues identified and corrected immediately, no impact to objectives	Issues identified early and mitigated appropriately, no amendment to contracts between agencies necessary	Issues identified unable to be corrected or mitigated effectively, contractual obligations under constant scrutiny	Complex contractural arrangements, multiple agencies, contractual obligations may only be met with the use/implementation of additional resources or significant amendment to original contracts	Complex contractural arrangements, multiple agencies, contractual obligations unable to be met
IT	Assets receive minimal damage or are temporarily available. Less than 1 hour outage	A number of assets unusable but can be replaced within acceptable timeframes 1 to 4 hour outage	A range of significant and critical assets are unusable for 24 hours Non-critical community infrastructure assets are destroyed 4 hours to 24 hours outage	A range of significant and critical assets are unusable for 24 hours Non-critical community infrastructure assets are destroyed 24 hours to 1 week outage	Significant or critical community infrastructure assets are destroyed Significant or critical infrastructure assets are unusable for multiple weeks Outage beyond 1 week
Research and Research Training	Breach of duty of care results in reportable events to internal/external committees and/or Head of Department. No corrective action required.	Breach of duty of care results in reportable events to internal/external committees and/or Head of Department. Corrective action required	Malpractice or compliance breach impacting credibility of research activity (e.g. breach of containment or audit findings requiring corrective action/reporting to external body) Event causing loss or significant delay in research activity/output	Mismanagement of research funding, integrity, bio risk, ethics and regulatory compliance resulting in loss to research funding or approvals.	"Enduring impact on research operations Significant mismanagement of research activities (i.e.. integrity, funding, bio risk, ethics or compliance) impacting eligibility to research funding or loss of research approvals Criminal conviction to staff
Student Management and Support	Delays to student facing processes of 1-2 days Event causing negative impact on individual students	Delay to student facing process affecting small number of students (<100). Remedied by staff intervention or temporary variation of process	Delay or interruption to student facing process that inconveniences multiple students (e.g. >100) causing academic or financial penalty for individual	Disruption to student facing process that interrupts but does not prevent admission, enrolment, student academic progress or completion	Wide scale delay to student facing process preventing admission, enrolment, student academic progress or completions
Teaching and Learning	Minor/individual instances of complaints about course delivery or quality	Minor disruption to a discipline Assessment by regulator with minor issues (easily rectified) Minor reduction in teaching and student course satisfaction	"Moderate disruption to faculty (e.g 25% course not delivered) Regulatory non-compliance with significant ramifications impacting university Academic integrity issues or partial accreditation (require corrective actions) 50-60% course satisfaction	Major disruption to faculty (e.g. non delivery of large proportion of courses) Threat of loss of professional course accreditation (immediate corrective action required) 40-50% student course satisfaction	Loss of professional course accreditation Less than 50% student course satisfaction
	Insignificant	**Minor**	**Moderate**	**Major**	**Severe**

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Date: January 2019

Likelihood		Insignificant	Minor	Moderate	Major	Severe
ERM: Will occur monthly or more frequently. OHS:Greater than 90% chance of occurring	Almost Certain	Low	Medium	High	Extreme	Extreme
ERM: Has occurred, once every six months. OHS: Weekly or 51% to 90% chance of occurring	Likely	Low	Medium	High	Extreme	Extreme
ERM: Might occur annually to once in a 10 year period. OHS: Annually or 21% to 50% chance of occurring	Possible	Low	Medium	High	Extreme	Extreme
ERM: Could occur once in a 10 to 20 year period. OHS: Once every 5 years or 1% to 20% chance of occurring	Unlikely	Low	Medium	Medium	High	Extreme
ERM: May occur once in a 20 to 100 year period. OHS: Once every 10 years or less than 1% chance of occurring	Rare	Low	Low	Medium	High	Extreme

Documenting risks

In general, the previous climate adaptation plans undertaken for the University were poor at:

- Documenting the operational implications of proposed mitigation actions in design. For example, a back-up generator to mitigate loss of power requires fuel and maintenance; similarly an automated flood barrier to mitigate flood risk requires scheduled maintenance.
- Handing-over any residual risk that cannot be managed through the project's design or construction. For example, how materials or plants may respond to extreme weather over time may be unknown and require regular inspections.

Responsibility for any operational activities must be allocated to, *and accepted by,* a specific team or role within the University. Generic terms such as "UoM facility manager" are not appropriate.

Detailed risk assessment

The qualitative risk assessment may reveal risks that require more detailed assessment because, for example, their acceptability is unclear, they are complex, or the adaptation options require testing. Project teams must appropriately investigate and respond to these risks.

Table 3~~Table 3~~ provides some examples of when this might occur.

Table 3 – Examples of detailed risk assessment and stress-testing

Example	Description
Air-conditioning and natural ventilation design	If a space (e.g. office or dwelling) is designed to be naturally ventilated, then the project team may need to "stress-test" the space to answer questions such as: • For how many hours per year are internal temperatures likely to cause discomfort? • Will the internal temperatures become a health risk, e.g. during a heat wave or extreme day? Note that the annual weather data for Melbourne typically used for energy and thermal comfort modelling has a peak temperature of 39°C. It therefore is therefore inadequate for stress-testing a design under current and future temperatures[9].
Flooding	Available flood maps from government, water authorities, research, and insurers may be inconsistent (e.g. use different assumptions, suggest different levels of risk for the same location). Detailed review or modelling may be required to understand the actual risk at the project location and the impact of proposed mitigation strategies on neighbours.

[9] Future temperatures can be approximated by using a future climate file for the project location (e.g. www.weather-shift.com/), an extreme weather file for the project location (e.g. www.airah.org.au/Content_Files/Conferences/2017/Building-simulation/Presentations/ABSC2017_RogerCladingboel.pdf) or a climate analogue for the project location (e.g. www.climatechangeinaustralia.gov.au/en/climate-projections/climate-analogues/about-analogues/)