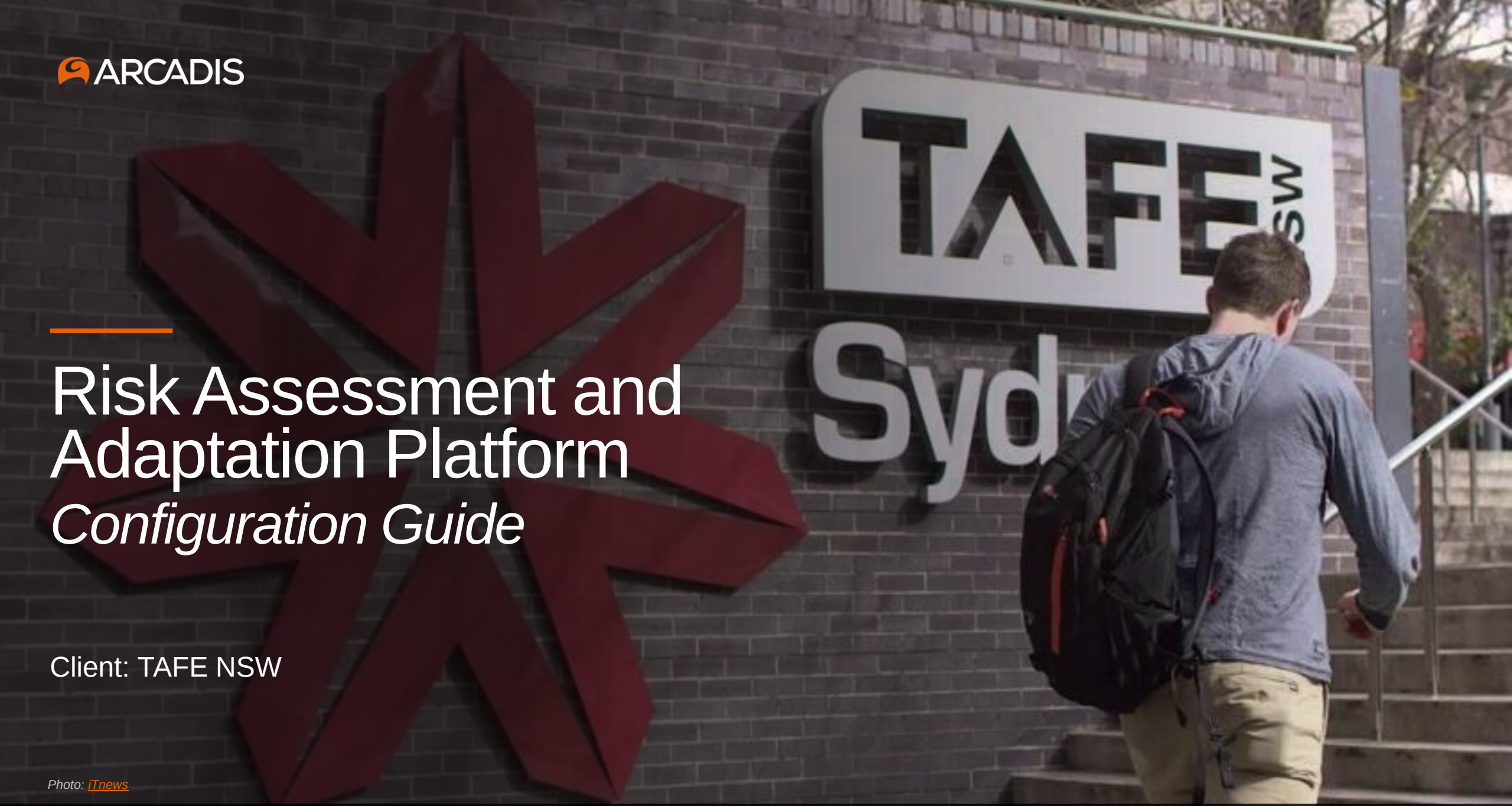
ARCADIS

Risk Assessment and Adaptation Platform

Configuration Guide

Client: TAFE NSW



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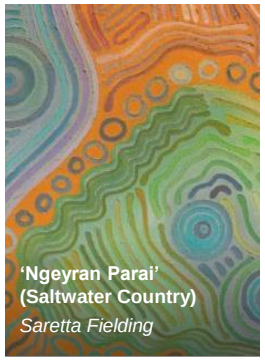


Arcadis acknowledges the Traditional Custodians of the land on which we work and live throughout Australia and recognize their continuing connection to Lands, Waters and Communities. We pay our respects to Aboriginal and Torres Strait Islander Cultures and to Elders past, present and emerging.

Arcadis is committed to driving inclusion and diversity across our business. This includes specific and actionable policies that aim to make a positive impact on Aboriginal and Torres Strait Islander employment, education and broader cultural change. Approved by Reconciliation Australia, Arcadis' Reconciliation Action Plan contains detailed and transparent strategies, targets and measurable actions. We continue to build respect, support education and create employment opportunities with Aboriginal and Torres Strait Islander employees within our business.

Further information is available here.

Introduction

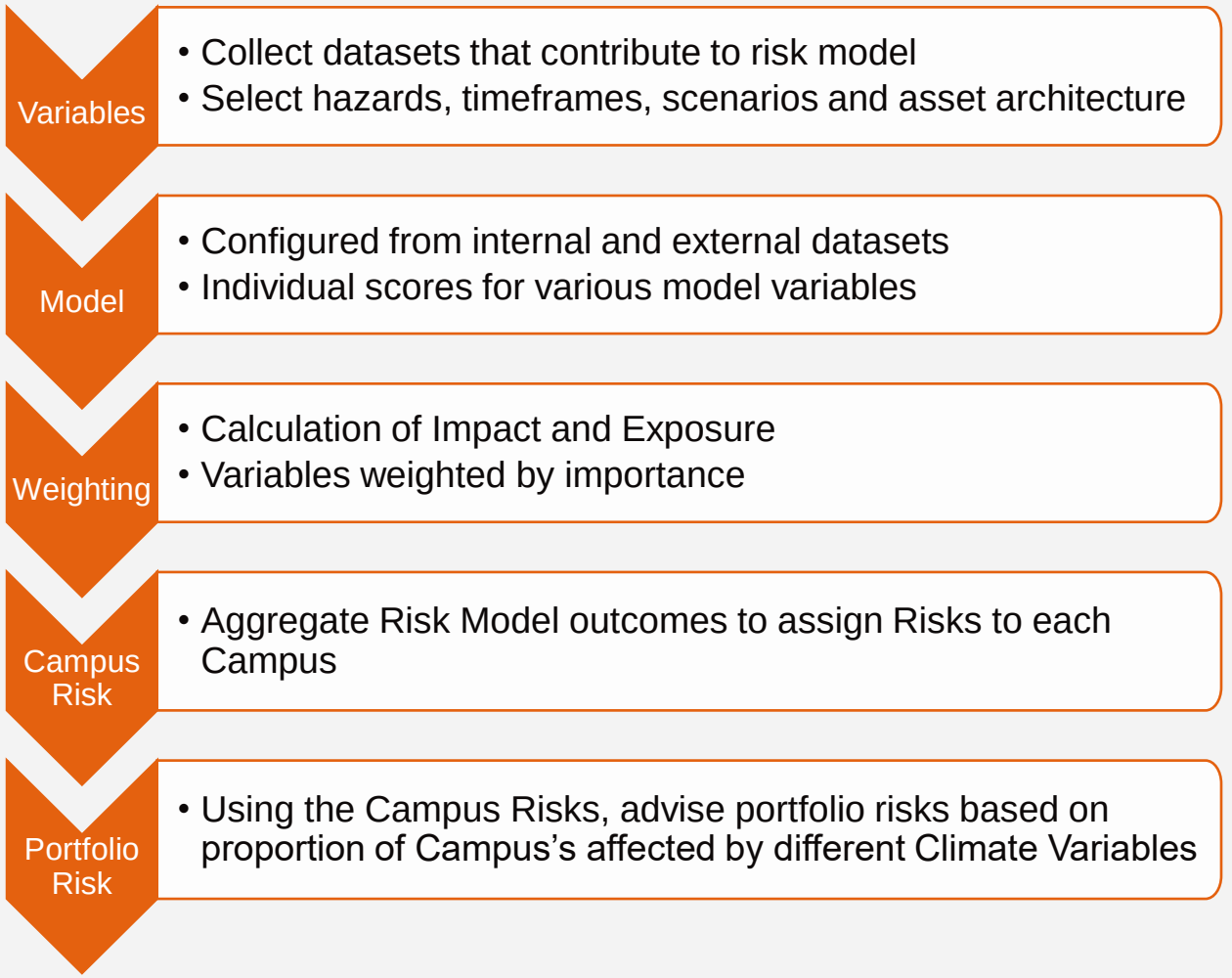
Introduction

Arcadis has adopted a data-driven approach to the climate risk assessment, emphasizing the collection and analysis of data to enhance the understanding of risks and inform adaptation measures. By focusing on data, Arcadis has been able to generate risks at a detailed level, specifically at the campus building asset component. This approach allows for a comprehensive summary of risks, considering a wider scope of assets.

The risk prioritisation process followed the steps outlined in the Figure to the right, ensuring a systematic and structured evaluation of the identified risks. This approach enables effective prioritization of risks based on their vulnerability and consequence, which has been created through the Model and Weightings applied.

This configuration guide aims to provide a comprehensive guide to understanding the tool and each of its components including:

- **Definitions:** Clear and concise definitions for key terms and concepts used throughout the tool. These definitions are crucial for ensuring a common understanding of the terminology within the context of risk assessment and adaptation.
- **Data Sources:** The data sources section outlines the origins of the information and data used by Arcadis on the RAAP. It describes the various databases and sources utilised to conduct the risk assessments.
- **Rules and Calculations:** These rules and calculations are critical for translating raw data into actionable insights, risk scores, and probabilistic forecasts.
- **Assumptions:** The assumptions section highlights the key assumptions made by Arcadis during the risk assessment process. Identifying and documenting these assumptions is essential for transparency and for assessing the robustness of the outputs.
- **Outputs:** Describes the way the results are presented for each of the component.



RAAP Risk prioritization process

About

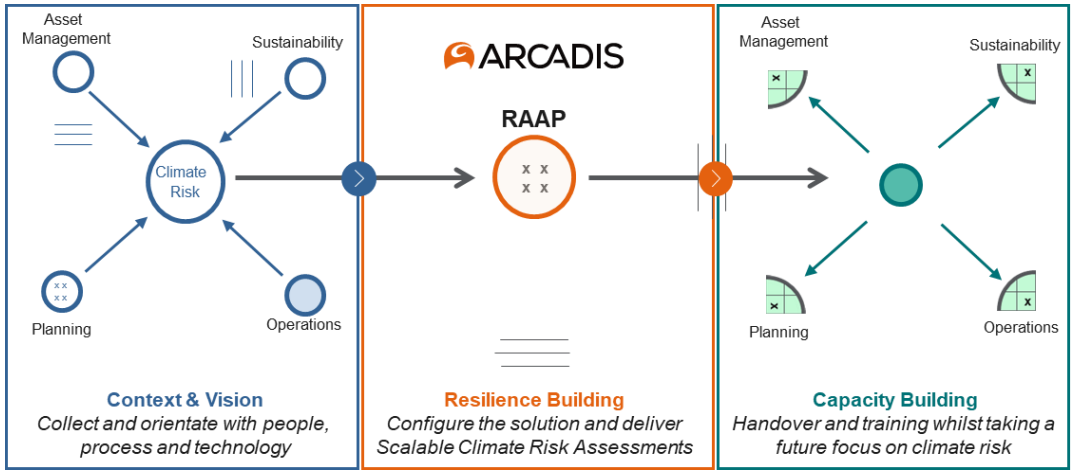
What is the Risk Assessment and Adaptation Platform?

The Risk Assessment and Adaptation Platform (RAAP), developed by Arcadis, is a tool designed to facilitate rapid, scalable climate change risk assessments across large portfolios of built environment assets. The RAAP generates site-specific preliminary risk profiles that form the starting point for detailed risk and adaptation assessments. By adopting a risk-based approach and providing a unified platform for identifying and mitigating priority risk issues, users of the RAAP can:

- Identify, understand and assess priority climate change risks at the asset and portfolio level;
- Develop adaptation strategies; and
- Consolidate climate risk assessment findings and insights for streamlined reporting.

What are the key features of the RAAP?

- **Communication of climate risk:** The RAAP provides an easy-to-navigate platform to support engagement into climate risks and potential adaptation actions at the portfolio, site and asset level.
- **Identification of climate risk:** The RAAP supports rapid identification and assessment of climate change risks at the asset level and is fully customizable to the organizational context.
- **Prioritisation of responses to climate change risk:** In alignment with key standards and guidelines, the RAAP supports focus on areas that require further investigation or investment, enabling effective resource allocation.
- **Seizing opportunities:** The RAAP enhances understanding and capacity to respond to climate-related opportunities, enabling proactive action.
- **Improving enterprise and campus-level oversight and management of climate risks:** The RAAP provides better visibility and management of climate risks at both the organisational and campus levels to increase resilience.
- **Embedding climate risk management:** The RAAP integrates climate risk management into existing frameworks and procedures, facilitating the ability to embed climate risk consideration in operational and strategic processes.
- **Adaptation and building climate resilience:** The RAAP informs and enables decisions regarding risk treatments to be implemented over time, supporting the development of climate resilience strategies.



The RAAP captures enterprise risk, asset management and best available climate change data to determine climate change risk profiles at the site level. The RAAP supports continual improvement and capacity building by providing a single source of truth for climate risk management that is tailored to the asset management approach and increases in value through broad uptake.

Methodology

RAAP configuration approach

The RAAP is a climate change risk assessment tool that is configured to an organization through a range of data inputs, including organizational enterprise risk management frameworks, TAFE NSW asset management data, publicly provided by TAFE NSW, publicly available climate change data. These inputs are processed in a risk model, which then configures site and portfolio-level risk registers. These preliminary risk assessments are tailored to the unique context of each location and provide a robust starting point for detailed risk assessment at the site level, as well as the consolidation of these findings to inform an overall portfolio level risk profile.

A visual representation of the assessment process is summarized below:

Organisational context

- Assessment configured for the Enterprise Risk Management framework.
- Climate and asset data availability, needs and expectations defined.
- Determine climate scenarios and time horizons in alignment with asset lifecycle.

Asset context

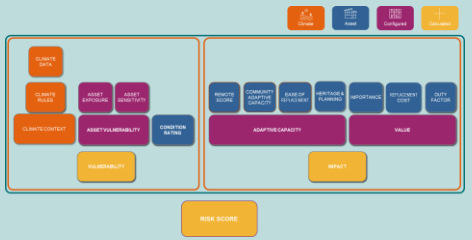
Asset context determined through accessing TAFE NSW's asset management database, allowing the development of a detailed picture of the potential risk profile for every building on every TAFE NSW campus

Climate context

Climate context data is drawn from a range of sources, grouped and scored to simply communicate local climate exposure context across a range of hazards for each location.

Risk model

The risk model collates organisational context, climate and asset data to provide an advanced dataset that calculates overall risk scores based on asset, climate and other data to determine the priority hazards and assets at the site and portfolio level.

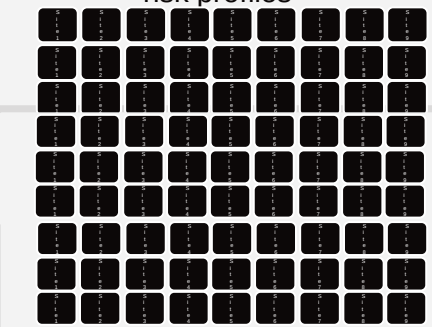


Preliminary risk profiles

The risk model configures a master list of key climate-related risks, providing both portfolio and campus-specific preliminary risk profiles

Portfolio

Campus-specific preliminary risk profiles



Methodology

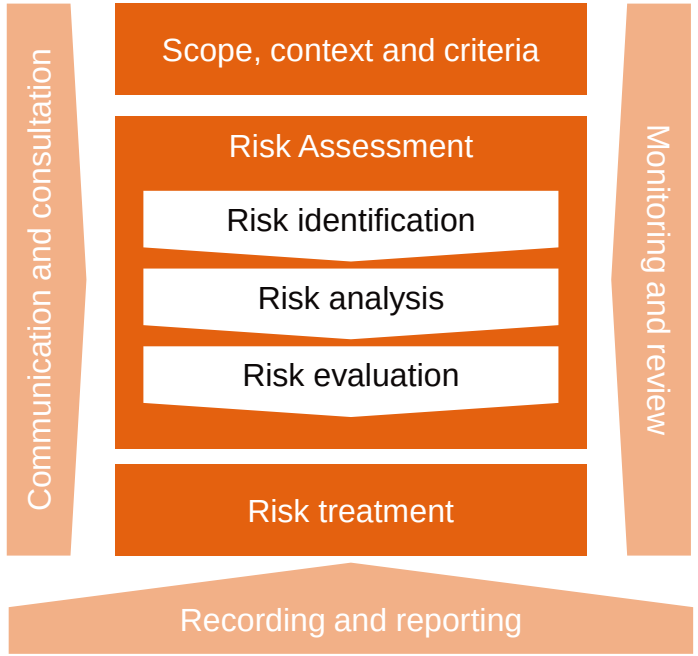
Standards and alignment

The RAAP was developed in alignment with recognized climate change risk assessment and adaptation standards and guidelines, including:

- Climate Risk Ready NSW Guide
- AS5334:2013 – Climate Change Risk Assessment for Settlements and Infrastructure – a risk-based approach
- ISO31000:2018 – Risk Management (refer to figure)

While the tool itself does not satisfy all requirements of these guidelines, it has been developed to support TAFE NSW to achieve key guideline requirements in a streamlined, consolidated approach.

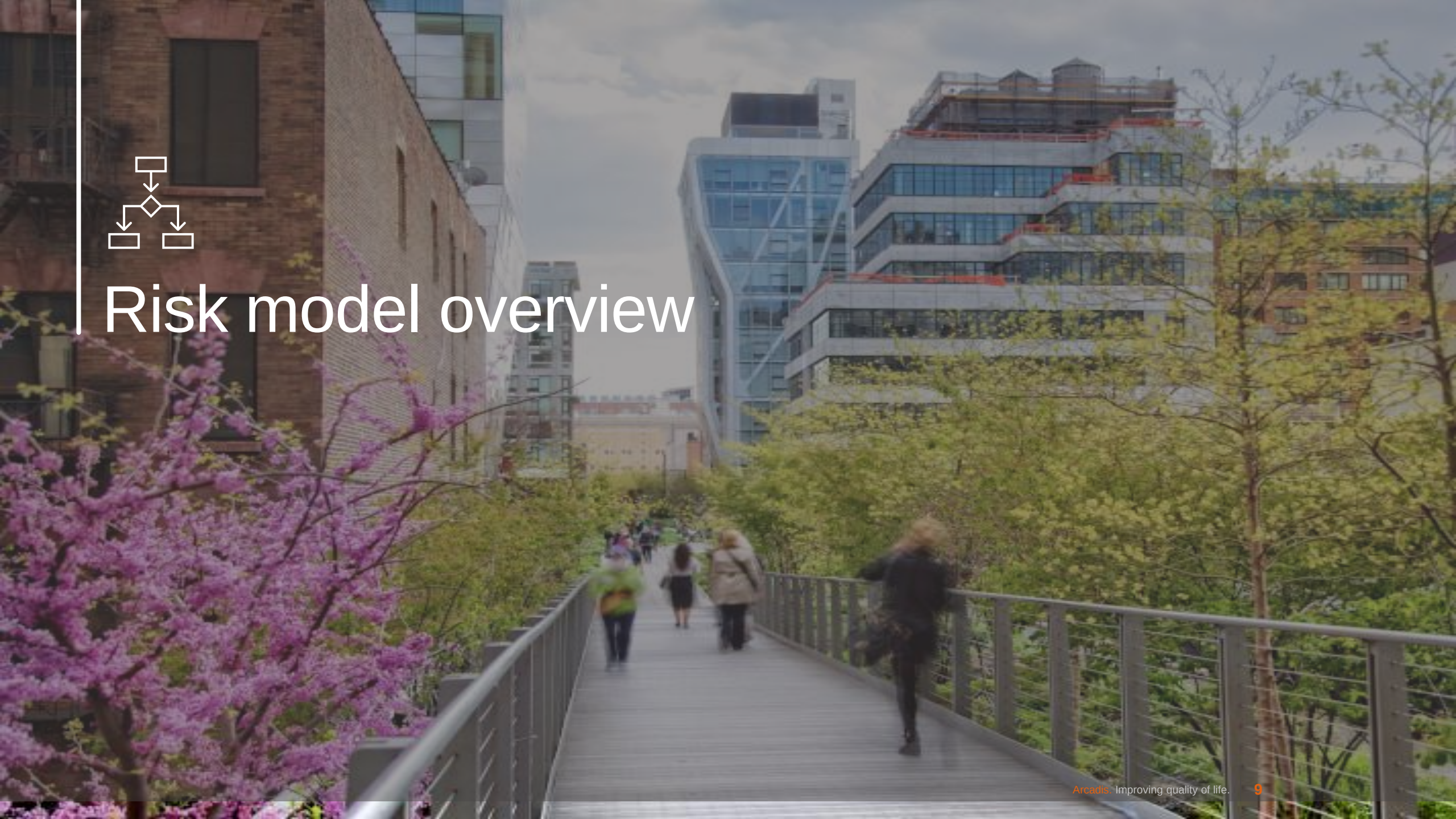
Disclaimer: This assessment has been undertaken based on the information provided by TAFE through documentation and information that was publicly available at the time of configuring the RAAP. While normal assessments of data reliability have been made, Arcadis assumes no responsibility or liability for errors in any data obtained from sources outside of Arcadis, or developments resulting from situations outside the scope of this project.



The RAAP supports alignment of TAFE NSW to key steps of the ISO31000:2018 Risk Management standard. The reporting dashboards support communication and reporting of assessment findings at both the campus and portfolio scale.

Glossary

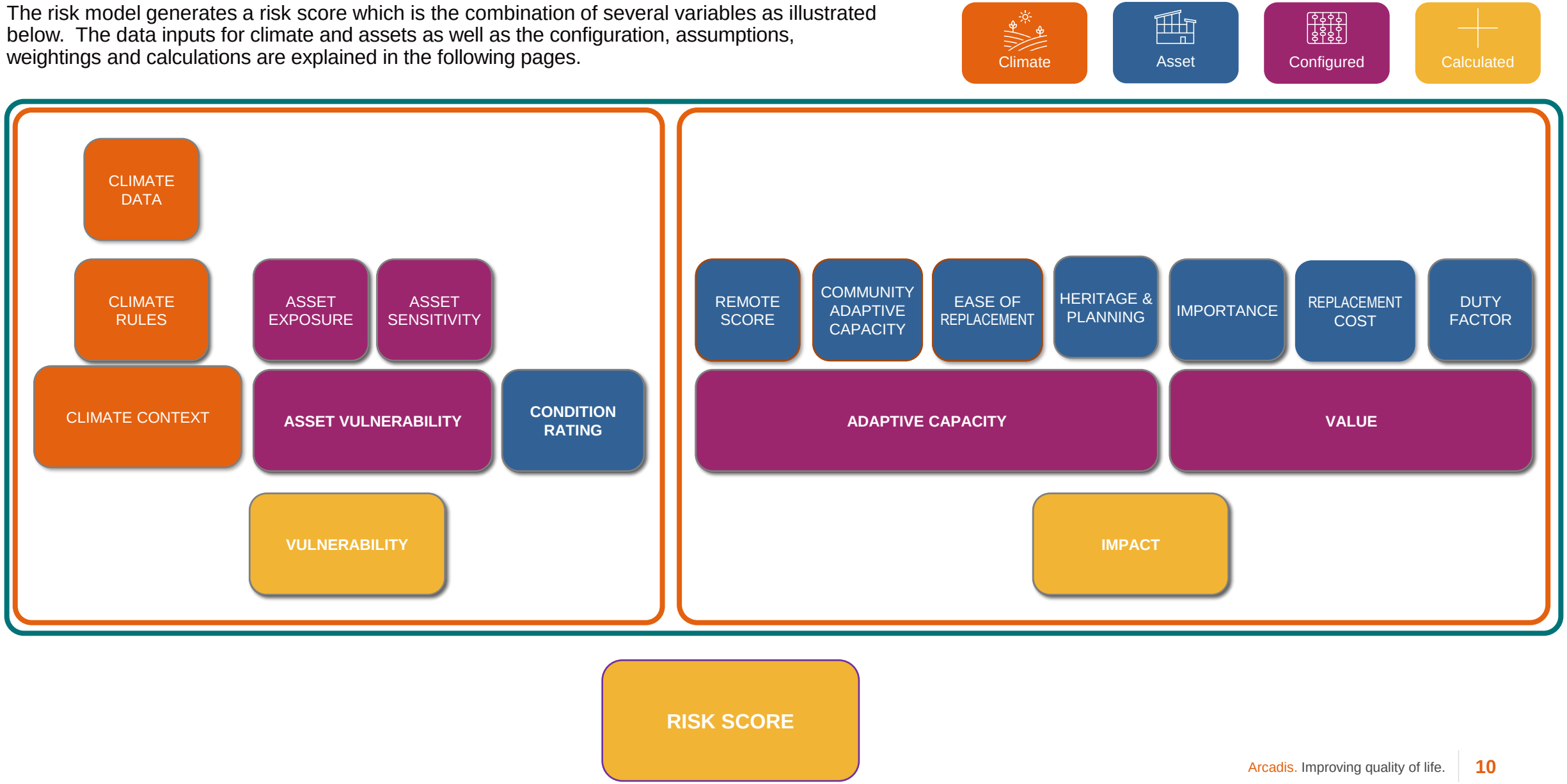
Adaptative Capacity	Adaptive capacity is the ability to reduce the likelihood of negative impacts of climate-related hazards. In the RAAP, adaptive capacity is calculated based on location remoteness, ease of replacement of an asset, its heritage status and the local community's adaptative capacity (determined via the Australian Disaster Resilience Index).
Asset	An item of property owned by a TAFE NSW, regarded as having value.
Climate Change	Any significant change in the measures of climate lasting for an extended period of time.
Climate Context	Refers to the climate variables that have an impact on TAFE NSW's assets at a particular location.
Climate Hazard	Weather-related, hydrometeorological events which can cause harm to humans, property, livelihoods, resources and the environment.
Community Adaptive Capacity	The ability of a community system to modify or change its characteristics and behaviours to cope with actual or anticipated stresses
Condition Rating	The evaluated state of an asset's overall condition with consideration of visual appearance, functional performance and extent of service support required.
Consequence	A ranking scale of 1-5 that represents the severity of the impact that would occur if a climate variable manifests. A higher ranking indicates a more severe consequence.
Data	Facts and statistics collected together for reference or analysis.
Duty Factor	Defined as an asset's level of work or utilisation over time.
Ease of Replacement	The ease of replacement of an asset refers to the level of difficulty of replacing an asset in the event of damage, loss or obsolescence due to climate change impacts.
Exposure	The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.
Heritage	Heritage listings are official places/buildings of historical, cultural, architectural, or social significance.
Impact	The force of impression of one thing on another : a significant or major effect. In the RAAP, the Impact score is a combination of Adaptative Capacity and Value
Importance	Importance, or criticality, is defined as how business critical an asset is towards continuous operation of a building and facility.
Likelihood	The chance of an event occurring.
Remote Score	The remote score is a geographic measure of an asset's remoteness, characterised by relative geographic access to services.
Replacement Cost	Replacement cost is the dollar cost ($AUD) that would be required to replace an asset or property with another one of similar value and utility.
Risk	The Risk score reflects the overall risk level as determined by the risk model, which is the product of Vulnerability and Impact. The risk score ranges from 1 to 25, where the higher scores suggest higher priority risks.
Risk Analysis	A systematic process to understand the nature and level of risk based on the consequence of an event and the likelihood of that consequence
Risk Evaluation	The process of comparing the level of risk identified in the risk analysis against risk criteria, to inform decisions about risk treatment
Sensitivity	Degree to which a system or species is affected, either adversely or beneficially by climate variability or change.
Value	The value of an asset is a weighted average of the cost and importance of an asset. Value contributes to the potential consequence of a climate event.
Vulnerability	The degree to which a system or element is susceptible to, and capable to cope with, adverse effects of climate change, including climate variability and extremes. The vulnerability score is a combination of the Climate Context, Asset Vulnerability and Condition Rating, where Asset Vulnerability is the combination of Exposure and Sensitivity.
Weighting	In the RAAP, weightings have been applied to elements of the risk model to increase or reduce the impact of certain elements. Weightings are adjustable to reflect organizational values.



Risk model overview

Risk Model

The risk model generates a risk score which is the combination of several variables as illustrated below. The data inputs for climate and assets as well as the configuration, assumptions, weightings and calculations are explained in the following pages.



Variables

The Configuration Guide offers a comprehensive explanation of each data variable utilised in the climate risk assessment. Below is a summary of the variables used, followed by a brief description of each variable in subsequent sections of this document.

Climate Data

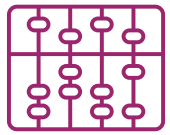
The climate data in the RAAP refers to the data related to climate variables that have an impact on different locations.

These climate variables are analysed and classified on a 1-5 scale based on their intensity.

Asset Data

The asset data in the RAAP refers to the data provided by TAFE NSW regarding their assets.

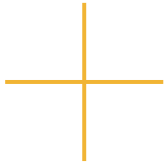
This data includes information about the various assets within TAFE NSW's portfolio.



Configuration Settings

To account for the impact of climate variables on assets, Arcadis has configured variables that are utilised in calculating the risk score.

These variables consider the relationship between the sub assets and external factors, taking into account knowledge and expertise rather than relying solely on data sources.



Calculated Fields

In the RAAP, calculated fields are generated by combining the other variables and weightings within the model.

These calculated fields serve the purpose of generating risk scores based on the various input variables.

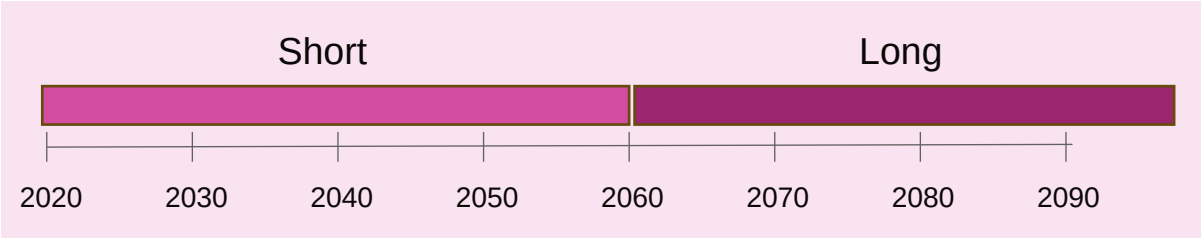
Climate Data

Variables

Variable Name	Description	Scale
Climate Variable	A climate variable refers to a specific factor or parameter within the category of climate hazards	N/A
Time Horizon	Time horizon describes the time range of data used for the Climate Context	N/A
Climate Context	Climate content describes the magnitude of the climate variable	1-5
Disaster Resilience	Capability to respond to disasters, this metric is sourced from Australian Disaster Resilience Index	1-5

Time Horizons

The change in climate has been considered over two time horizons:



Climate Hazards

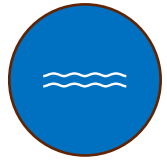
7 climate hazards have been selected for this analysis through consultation with TAFE NSW and local CRA literature. They are:

Intense Rainfall Events

Drought

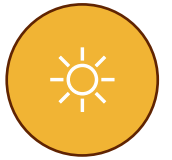
Bushfire

Severe Storms and Cyclones



Flooding

Sea Level Rise and Storm Surge



Heatwaves

Asset Data

Variables

Variable Name	Description	Scale
Region	1 of 5 Regions in NSW	N/A
Location	The TAFE NSW campus	N/A
Asset	'Item Type 1' within the TAFE NSW asset data	1-5
Sub Asset	'Item Type 2' within the TAFE NSW asset data	N/A
Condition Assessment	Average condition assessment as provided by TAFE NSW	1-5
Total Replacement	Total replacement cost of the sub assets as provided by TAFE NSW	1-5 and Dollar Amount
Heritage	Whether the Campus Building is Heritage listed	1-5
Ease of Replacement	as provided by TAFE NSW	1-5
Remote Score	Based on ABN data, the post code of campus have been linked to the level of remoteness that the ABN classifies it as	1-5
Importance	as provided by TAFE NSW	1-5

Aligned Asset Hierarchy

TAFE NSW's asset hierarchy has been adopted. The hierarchy is used in their asset registers and consists of **4 item types**. For the purposes of this assessment, we have considered **Item Type 2**.

The overall assessment is delivered in the following structure:

TAFE NSW -> Region -> Site -> Item Type 1 -> Item Type 2

TAFE have 4x asset areas: (1) land & building, (2) fleet, (3) educational equipment and (4) ICT. This assessment looks at **(1) land & building** as the largest value and most susceptible to climate change.

Item Type 1	Item Type 2
Interiors	Interior Construction
	Interior Finishes
	Stairs
Related Sitework	Site Electrical Utilities
	Site Improvement
	Site Mechanical Utilities
Services	Conveying
	Electrical
	Fire Protection
	HVAC
	Plumbing
Shell	Exterior Enclosure
	Roofing
	Superstructure
Special Construction & Demolition	Selective Building Demolition
	Special Construction

Configured Settings

Variables

Variable Name	Description	Scale
Asset Sensitivity	Rates how reactive the sub asset is to the climate variable	1-5
Asset Exposure	Rates the probability the climate variable is to affect the sub asset	1-5
Asset Vulnerability	Calculated from the Sensitivity and Exposure score, to describe the resilience of the sub asset against the climate variable.	1-5
Adaptive Capacity	Quantification of difficulty of fixing/maintaining the sub asset based on the asset data	1-5
Value	The quantified priority that the sub asset is to TAFE NSW based on the asset data	1-5

Calculated Fields

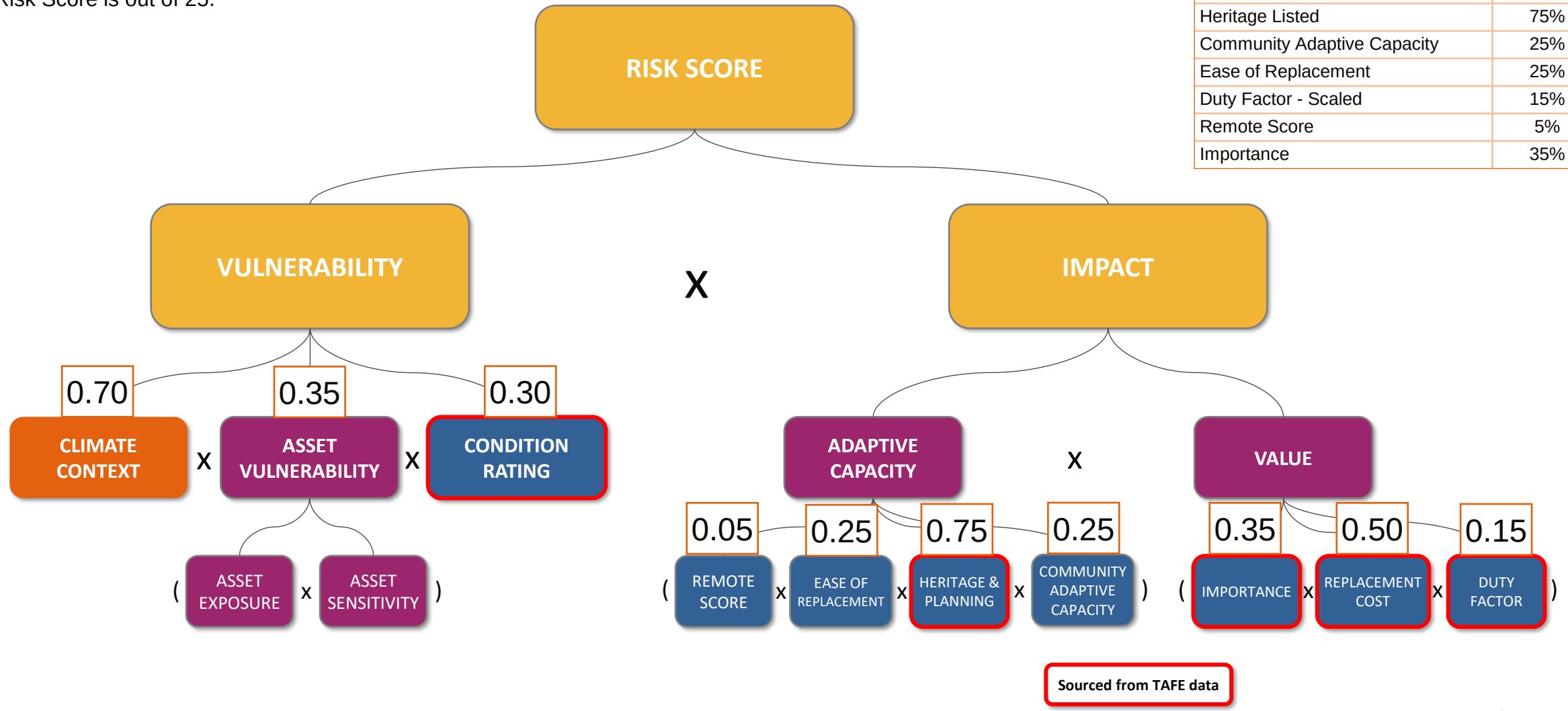
Variables

Variable Name	Description	Scale
Near Term Vulnerability / Long Term Vulnerability	Weighted calculation of the Asset Vulnerability, Climate Context and Asset Condition. This results in a rating of the sub asset's ability to withstand the climate variable it is impacted by.	1-5
Impact	Weighted calculation of the Adaptive Capacity and Value of the sub asset. This results in a rating of the consequence to TAFE NSW if the sub asset is impacted by.	1-5
Near Term Risk Score / Long Term Risk Score	Risk score is a result of the Vulnerability and Impact. It ranks the risk on a scale of 1-25 based on the risk that the climate variables context has on the sub asset.	1-25

Risk model weighting

- All values (except Risk Score) are normalised on a 1-5 scale (1 being positive outcome, 5 being negative outcome.
- Risk Score is out of 25.

Variables	Weights
Climate Context	70%
Asset Vulnerability	35%
Condition Rating	30%
Replacement Cost	50%
Heritage Listed	75%
Community Adaptive Capacity	25%
Ease of Replacement	25%
Duty Factor - Scaled	15%
Remote Score	5%
Importance	35%



Prioritisation – Risk registers

The Risk Model output produces a risk score for each Sub Asset at every location for every building. The number of risks identified at the sub asset level was not considered useful for the assessment. Therefore, Arcadis decided to aggregate the reporting of risks at a Location and Sub Asset category level for each Climate Variable. This approach provided a summary of the average risk for each type of sub asset at each location.

To identify high-risk areas, sub assets with a Risk Score exceeding 7 and Vulnerability over 3.5 were flagged as such, based on the advice of climate risk experts. Additionally, a preliminary risk register was compiled to document the risks posed to building assets. The Location Risk Summary and this Risk Register were then combined to create a comprehensive risk register that included all location and sub assets within the summary classified as potential high risks.

Location Risk Summary

Variable Name	Description	Scale
Location	The TAFE NSW campus	N/A
Sub Asset	'Item Type 2' within the TAFE NSW asset data	N/A
Climate Variable	A climate variable refers to a specific factor or parameter within the category of climate hazards	N/A
Near Term Vulnerability	The average of all vulnerability scores for the Sub Asset and Climate Variable at the Location	1-5
Near Term Risk Score	The average of all risk scores for the Sub Asset and Climate Variable at the Location	1-25
Long Term Risk Score	The average of all risk scores for the Sub Asset and Climate Variable at the Location	1-25
Risk Flag	Binary result of whether the Near- or Long-term risk is over 7 and vulnerability is over 3.5	0,1

Linked based on Sub Asset and Climate Variable

Risk Register

Variable Name	Description	Scale
Sub Asset	'Item Type 2' within the TAFE NSW asset data	N/A
Climate Variable	A climate variable refers to a specific factor or parameter within the category of climate hazards	N/A
Risk Statement	Description of risk provided by Arcadis	N/A
TAFE NSW Consequence area	Categorisation of risk based on the impact it would have on TAFE NSW. Options are; Customer, Financial, Probity, Reputation, Safety, Workforce	N/A
Assumed controls	Description of assume controls to prevent or control risk by Arcadis	N/A

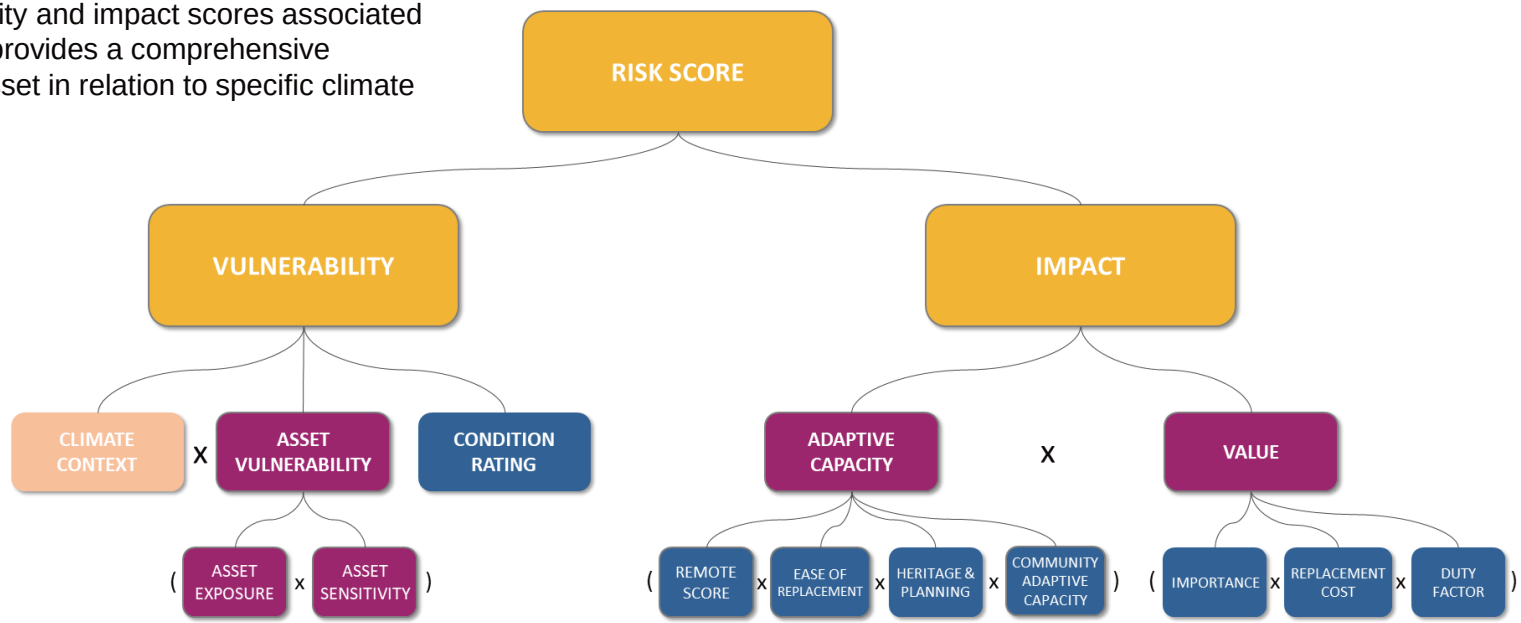
Asset data

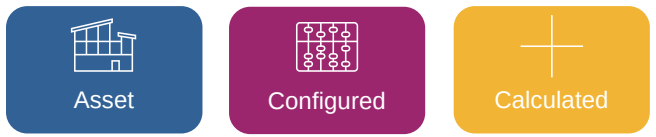
About

Asset data for the RAAP have been gathered primarily from TAFE NSW , which provided a comprehensive asset dataset for every campus, categorized down to the Sub Asset level for each campus block.

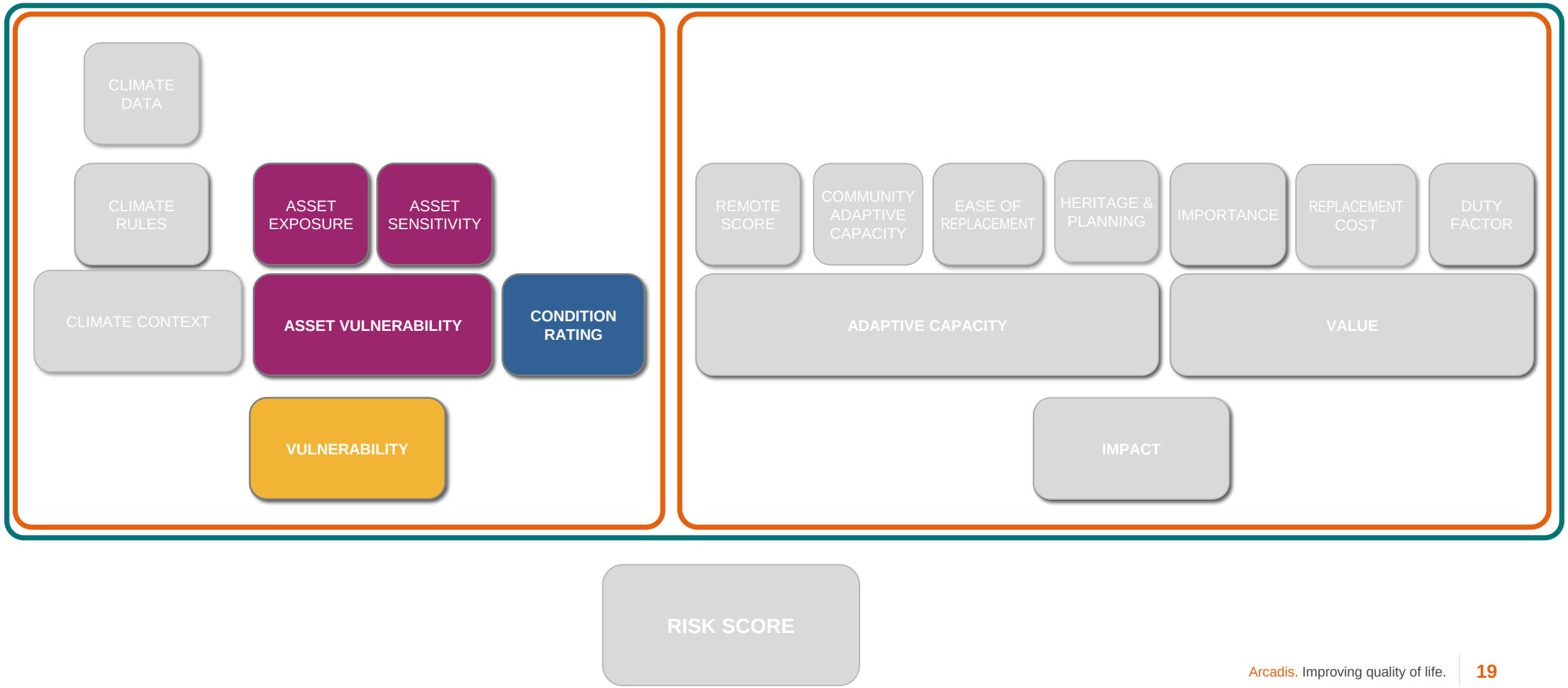
Asset data is employed in the Risk Model in the following ways:

- To determine the potential impact of climate hazards on different asset types, a **Vulnerability** score is assigned to each sub asset, based on how exposed that sub asset may be to a climate variable (*Asset Exposure*), its *Sensitivity* to the hazard if it does occur and its *Condition Rating*.
- An **Impact** score is associated with each sub asset and is determined through a combination of the of the campus and the **Adaptive Capacity (**including *Remoteness*, *Ease of Replacement*, *Heritage* and *Community adaptative capacity* and the **Value** of the asset (including *Importance Rating, Replacement Cost* and *Duty Factor)*
- The **Risk Score** is quantified by combining the vulnerability and impact scores associated with each sub asset per climate variable. The risk score provides a comprehensive evaluation of the potential risk level faced by each sub asset in relation to specific climate variables.





Asset Data - Vulnerability



Vulnerability

Explanation:

Vulnerability is a calculated metric that considers Climate Context, Condition Rating and Asset Vulnerability for a specific combination of Sub Asset and Climate Variable. It provides a measure of how likely the Sub Asset is to be adversely affected by a given Climate Variable.

Data Source(s):

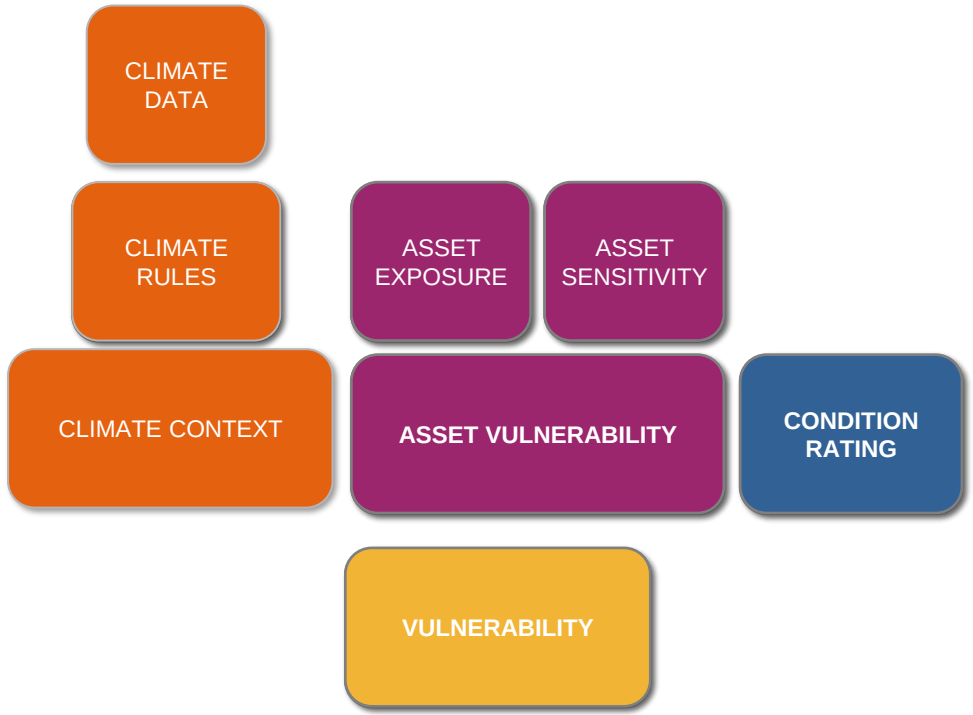
Vulnerability is calculated and derived from Climate Context, Condition Rating and Asset Vulnerability

Rules & Calculations:

Vulnerability is a weighted multiplication of Climate Context, Condition Rating and Asset Vulnerability

Model Outputs:

The output is a score between 1 and 5



Calculated

Asset Vulnerability

Explanation:

The vulnerability of an asset is a combination of the Exposure and Sensitivity. *ISO14090:2019* defines vulnerability as propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

Data Source(s):

Vulnerability is calculated and derived from Exposure and Sensitivity.

Rules & Calculations:

Vulnerability is calculated as the average (1-5) of Exposure and Sensitivity.

Model Outputs:

The output is a score between 1 and 5 aligned with the table to the right.

Configured

Rating	Vulnerability	Definition
1	Very Low	Very low sensitivity to climate impacts and can endure minor changes without significant adverse effects. It is situated in an area with very negligible exposure to climate-related hazards, minimizing the likelihood of being affected.
2	Low	Low sensitivity to climate impacts may lead to some negative effects, but its overall functionality and value remain relatively stable. It faces a low level of exposure to climate-related hazards, with a noticeable but not probable impact potential.
3	Medium	Moderate sensitivity to climate impacts may result in challenges in maintaining its current state or performance. It is located in an area with moderate exposure to climate-related hazards, leading to potential disruptions or performance degradation.
4	High	High sensitivity to climate impacts means that even minor changes can lead to substantial negative effects on its functionality, value, or performance. It is situated in a location with high exposure to climate-related hazards, resulting in significant potential damage, downtime, or loss of value.
5	Extreme	Extreme sensitivity to climate impacts makes it non-functional or significantly devalues it under changing climate conditions. It is placed in an area with an extremely high exposure to climate-related hazards, leading to unavoidable and severe impacts, potentially rendering it unusable or causing irreparable damage.

Asset Exposure

Explanation:

The exposure of an asset is a key contributor to its Vulnerability. ISO14090:2019 defines exposure as presence of people, livelihoods, species or ecosystems, environmental functions, services, resources, infrastructure, or economic, social or cultural assets in places and settings that could be affected.

Data Source(s):

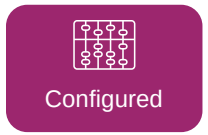
Exposure is preconfigured as a matrix for each asset class as exposed to each climate hazard.

Rules & Calculations:

The below matrix shows the configuration for TAFE NSW sub asset classes.

Model Outputs:

The output is a score between 1 and 5 aligned with the table to the right.



Item Type 2	Ave Temp Change	Bushfire	Drought	Extreme wind	Flooding	Heatwaves	Increased Rainfall Intensity	Sea level rise	Storms	Very hot days	Cyclone Wind region
Equipment	2	4	1	1	4	2	2	4	1	2	1
Furnishings	2	4	1	1	4	2	2	4	1	2	1
Interior Construction	2	4	1	1	4	2	2	4	1	2	1
Interior Finishes	2	4	1	1	4	2	2	4	1	2	1
Stairs	2	4	1	2	4	2	2	4	2	2	2
Site Electrical Utilities	4	5	1	4	4	4	4	4	4	4	4
Site Improvement	5	5	4	5	5	5	5	5	5	5	5
Site Mechanical Utilities	5	5	1	3	4	5	4	4	4	5	4
Conveying	2	3	1	1	2	2	2	2	1	2	1
Electrical	2	4	1	1	4	3	2	4	1	3	1
Fire Protection	3	4	1	3	3	3	2	4	3	3	3
HVAC	4	4	2	3	4	4	4	4	3	4	3
Plumbing	2	4	2	1	5	3	2	4	1	3	1
Exterior Enclosure	5	5	1	5	5	4	5	5	5	4	5
Roofing	5	5	1	5	1	4	5	1	5	4	5
Superstructure	5	5	1	4	3	4	3	4	4	4	4
Selective Building Demolition	3	4	1	3	3	3	3	3	3	3	3
Special Construction	4	5	1	4	4	4	4	4	4	4	4

Rating	Exposure	Definition
1	Very Low	Negligible exposure to climate impact. These assets are located where exposure to climate impact is extremely low. Their design and function remain largely unaffected, and the likelihood of experiencing disruptions or damages due to that specific climate impact is negligible.
2	Low	Low exposure to climate impact. They might encounter minor variations related to that specific climate impact, their design and construction are sufficiently resilient. Assets are not highly vulnerable to immediate or severe consequences stemming from that specific climate impact.
3	Medium	Moderate exposure to climate impact. They may experience occasional disruptions, damages, or operational challenges due to moderate shifts related to that specific climate impact.
4	High	Significantly exposed to climate impact. They face a substantial risk of experiencing disruptions, damages, or limitations in functionality due to the effects of that specific climate impact.
5	Extreme	Very high exposure to climate impact. They are at a critical risk of experiencing severe disruptions, damages, or even becoming inoperable due to direct exposure to hazard.

Asset Sensitivity

Explanation:

The sensitivity of an asset is a key contributor to its Vulnerability. ISO14090:2019 defines sensitivity as degree to which a system or species is affected, either adversely or beneficially, by climate change.

Data Source(s):

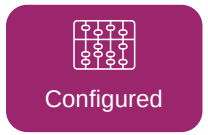
Sensitivity is preconfigured as a matrix for each asset class as exposed to each climate hazard.

Rules & Calculations:

The below matrix shows the configuration for TAFE NSW sub asset classes.

Model Outputs:

The output is a score between 1 and 5 aligned with the table to the right.



Item Type 2	Ave Temp Change	Bushfire	Drought	Extreme wind	Flooding	Heatwaves	Increased Rainfall Intensity	Sea level rise	Storms	Very hot days	Cyclone Wind region
Equipment	4	5	1	3	5	4	4	5	3	4	3
Furnishings	1	5	1	1	5	1	4	5	1	1	1
Interior Construction	2	5	1	1	3	2	3	4	1	2	1
Interior Finishes	2	5	1	1	5	2	4	5	1	2	1
Stairs	1	5	1	1	3	1	3	4	1	1	1
Site Electrical Utilities	3	5	1	3	4	3	3	5	4	3	4
Site Improvement	4	4	4	4	4	4	4	5	4	4	4
Site Mechanical Utilities	4	5	4	3	2	4	2	5	3	4	3
Conveying	3	5	1	1	4	3	4	5	2	3	2
Electrical	4	5	1	2	5	3	4	5	3	3	3
Fire Protection	3	4	3	3	4	3	3	5	3	3	3
HVAC	4	5	3	3	5	4	4	5	4	4	4
Plumbing	3	5	4	2	4	3	4	5	2	3	2
Exterior Enclosure	1	5	1	3	2	1	2	4	4	1	4
Roofing	2	5	1	4	3	2	3	4	5	2	5
Superstructure	2	4	1	3	3	2	3	5	4	2	4
Selective Building Demolition	2	5	1	2	3	2	3	4	3	2	3
Special Construction	2	5	1	3	4	2	4	4	4	2	4

Rating	Sensitivity	Definition
1	Very Low	Minimal sensitivity to a specific potential climate impact. Unlikely to be significantly affected by variations in the climate parameter. These assets are designed or located in a way that shields them from direct risks related to that specific climate impact.
2	Low	Minor sensitivity to climate impact. While they may experience some effects from changing climate impact, these impacts are generally limited in scope and severity. The design and location of these assets provide a degree of protection against potential risks.
3	Medium	More susceptible to climate impact. May experience moderate disruptions due to changing climatic conditions. The impacts can have a noticeable effect on functionality or performance.
4	High	Significantly affected by a specific potential climate impact. They face substantial risks associated with the considered climate impact that could significantly impair their functionality or structural integrity.
5	Extreme	Extremely sensitive to a specific potential climate impact. They are likely to experience severe disruptions or damage due to changing conditions related to climate impact.

Condition Rating

Explanation:

Condition rating is the evaluated state of an asset's overall condition with consideration of visual appearance, functional performance and extent of service support required. Condition rating contributes to the likelihood of a climate hazard impacting an asset.

Data Source(s):

Condition rating is sourced from a comprehensive assessment undertaken by TAFE NSW. The assessment included visual inspection and quantification of the number of issues with an asset.

Rules & Calculations:

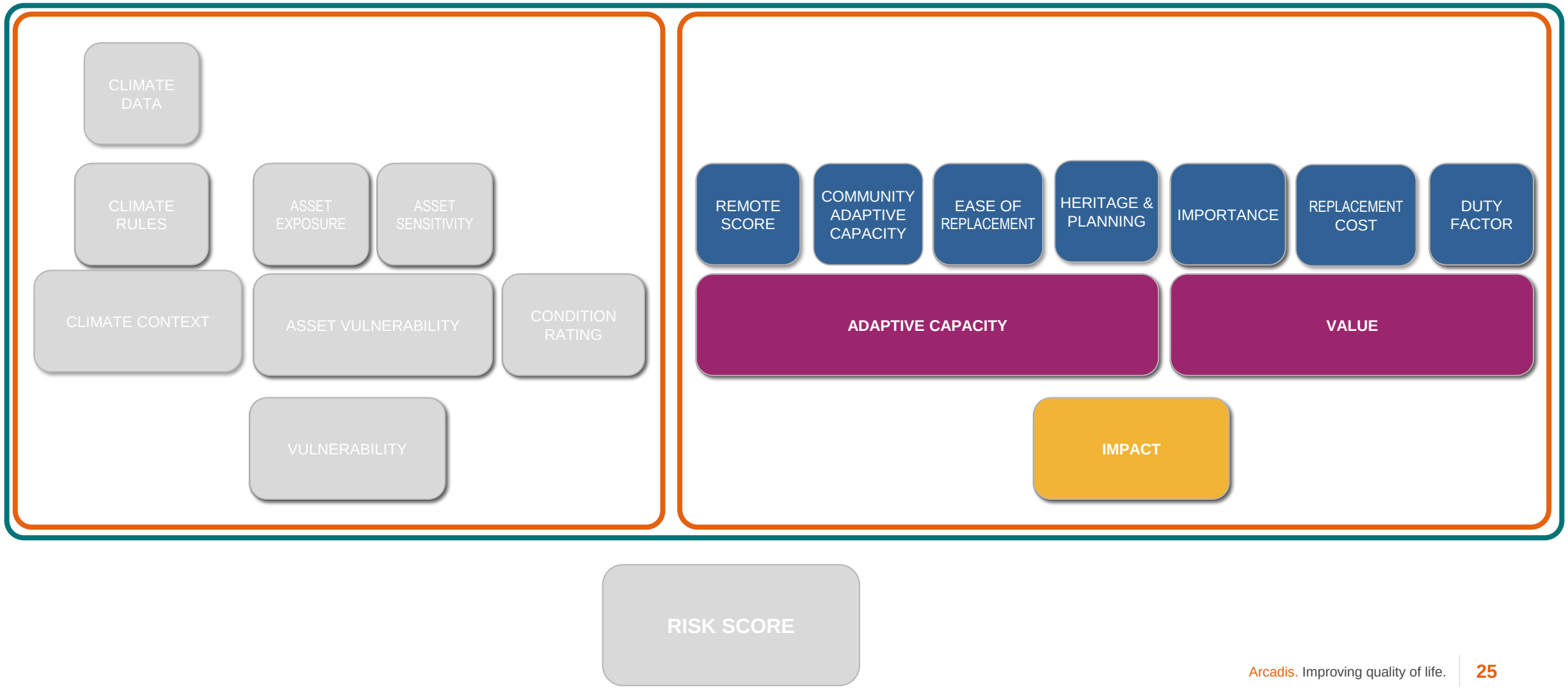
Condition ratings were provided by TAFE NSW on a scale of 1 to 10. The scores were then normalised to a scale of 1-5.
Condition rating contributes 30% to the likelihood score of a climate hazard.

Model Outputs:

The output is a score between 1 and 5 aligned with the table to the right. The rating scale is based on AssetFuture Asset Performance Parameters, dated June 2022.

Rating	General Building Comments	Visual Appearance	Functional Performance and Service Support
1 Excellent	Outside features – The asset, if new, may still be under defects liability. The outside features, finishes and fittings are in as-new condition. Inside features – All maintainable asset components are in as-new condition.	High standard with high quality materials and finishes, no blemishes or imperfections evident, clean.	Functional performance within 1% of specification, reliability & availability. No unscheduled service downtime per annum. Asset condition is able to support all intended service functions of the business. Meets all legal, health and safety/BCA requirements.
2 Good	Outside features – The majority of its outside features are in near new condition or, showing only superficial marks to less than 25% of its surfaces. Inside features – all main components are in near new condition, performing well within the requirements, with no failures reported to date.	Good standard, average / high quality materials and finishes, well maintained with only slight degradation of appearance to less than 20% of finishes, clean.	Functional performance within 3% of specification, reliability & availability. Unscheduled service downtime less than 2 occasions per annum. Asset condition is able to support all intended service functions of the business. Meets legal, health and safety/BCA requirements.
3 Average	Outside features – Between 15- 30% of the outside features and finishes require maintenance due to normal wear and tear. Inside features – Some of the inside features need to be renewed due to normal wear and tear.	Average standard with all functional finishes and materials, clean and bright, maintained with slight imperfections or minor problems evident on some surfaces.	Functional performance within 5% of specification, reliability & availability: unscheduled service downtime around 2 occasions per annum. Asset condition supports all intended service functions and has the potential to disrupt the business. Meets legal, health and safety /BCA requirements.
4 Poor	Outside features – 30-60% of its outside features and finishes need to be restored. The structure is still sound may require attention. Inside features – More than 50% of the minor items need to be restored, while the major items are in average to poor operating condition.	Functional finishes and materials clean and bright, no major damage but with imperfections and problems to most surfaces.	Functional performance within 10% of specification, reliability & availability unscheduled service downtime around 2- 5 occasions per annum. Some of the asset is unusable, causing disruption to the business. The condition may contravene legal, health and safety /BCA requirements.
5 Very Poor	Outside features – The asset outside features and structures show significant damage and require part demolition/reconstruction. Inside features – The internal services operate ineffectively and maintainable components in poor operating condition.	All asset areas are below acceptable standards; most surfaces require restoration or renovation.	Functional performance within 25% of specification, reliability & availability unscheduled service downtime over 5 occasions per annum. The majority of the asset is unusable, causing very significant disruption to asset users. The condition seriously contravenes health and safety /BCA requirements.

Asset Data - Impact



Impact

Explanation:

Impact refers to the severity of a consequence resulting from a climate hazard. ISO14090:2019 defines impact as the effects of extreme weather and climate events and of climate change on natural and human systems.

Data Source(s):

Asset impact is calculated and derived from the following:

- Adaptive Capacity, encompassing remote score, community adaptive capacity / vulnerability, ease of replacement and heritage status.
- Value, encompassing importance, replacement cost and duty factor

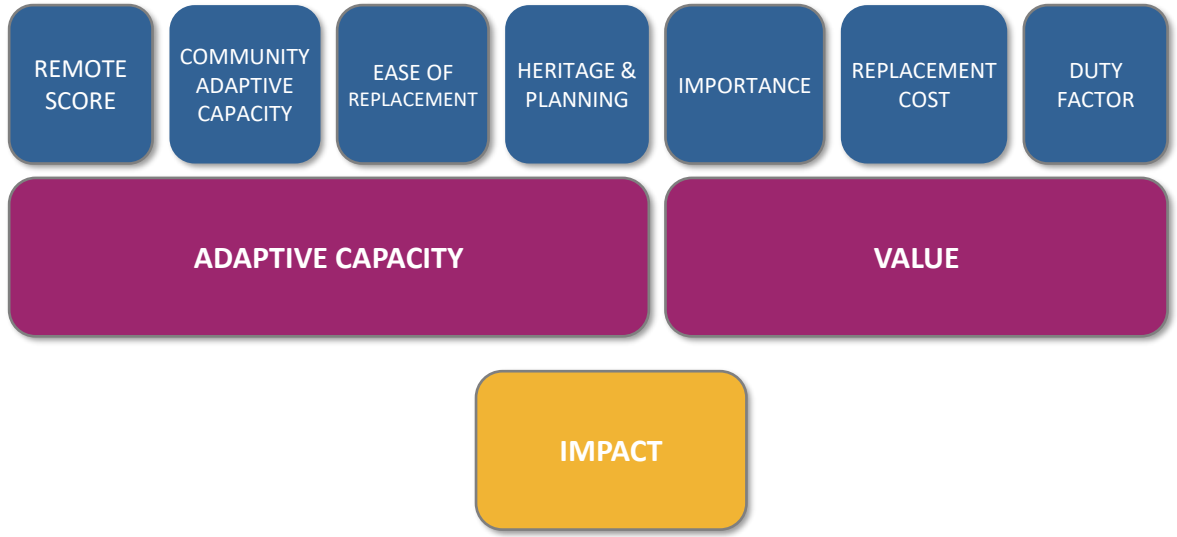
Rules & Calculations:

There are seven inputs used to calculate asset impact. The inputs are weighted as follows: remote score (5%), vulnerability (x %), ease of replacement (15%), heritage status (x%), importance (x%), replacement cost (x%), duty factor (15%).

Model Outputs:

The output is a score between 1 and 5 aligned with the table to the right and based on the definitions in the table shown in the table on the following slide. Impact levels are aligned with the TAFE NSW Enterprise Risk Management (ERM) Manual revision 2.0, dated 3 May 2023.

Calculated



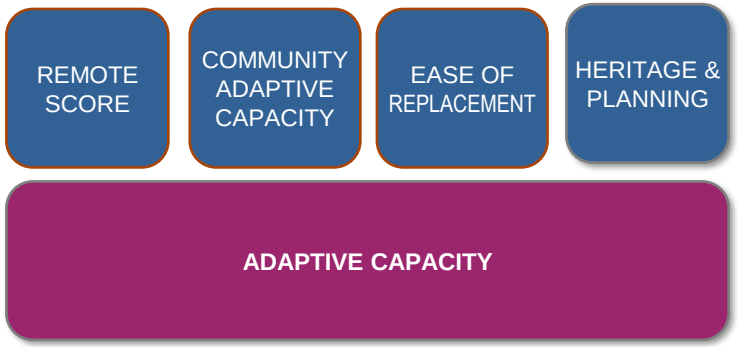
Rating	Impact
1	Negligible
2	Minor
3	Moderate
4	Major
5	Severe

Adaptative Capacity

Explanation:

ISO14091:2021 defines adaptive capacity as a systems ability to adjust to potential change, to take advantage of opportunities or to respond to consequences.

Within the data model, we have utilised both external and internal asset data to configure this value.



Data Source(s):

Adaptive Capacity is calculated and derived from the following: remote score, community adaptive capacity / vulnerability, ease of replacement and heritage status.

Rules & Calculations:

There are seven inputs used to calculate asset impact. The inputs are weighted as follows: remote score (5%), community adaptive capacity (25%), ease of replacement (25%), heritage status (75%)

Model Outputs:

The output is a score between 1 and 5

Configured

Remote Score

Explanation:

The remote score is a geographic measure of an asset's remoteness, characterised by relative geographic access to services. Remote score contributes to the potential consequence of a climate event.

Data Source(s):

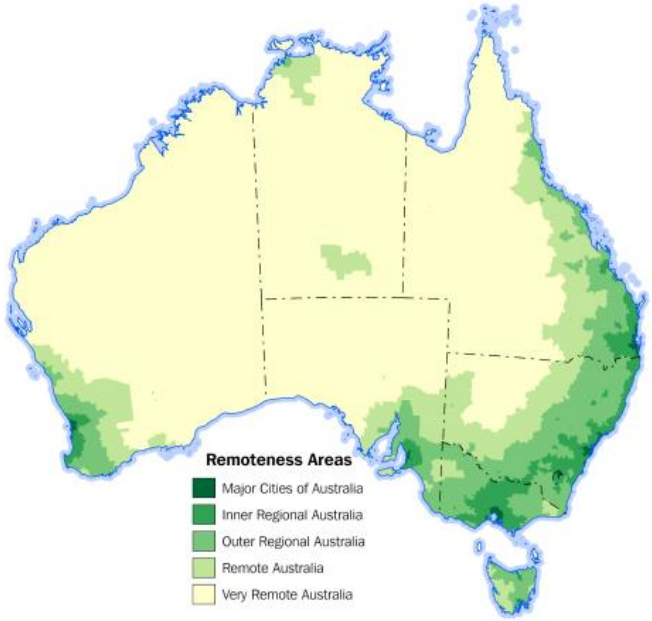
Remote score is based on the Australian Standard Geographical Classification (ASGC) system which uses the Accessibility / Remoteness Index of Australia Plus (ARIA+) database.

Rules & Calculations:

The remote score applied to an asset is based on the postcode of the campus it is located within.
Remote score contributes 5% to the consequence score of a climate event.

Model Outputs:

The output is a score between 1 and 5 aligned with the table to the right.



Rating	Remote Status	Definition
1	Major Cities of Australia	Campuses located in major metropolitan areas and urban centers. These areas generally have well-developed infrastructure, services, and access to resources, contributing to lower climate change risk exposure.
2	Inner Regional Australia	Campuses located in regions that are moderately populated and relatively close to major urban centers. While they may have some level of infrastructure and services, they could be more susceptible to certain climate change risks compared to major cities.
3	Outer Regional Australia	Campuses located further away from major urban centers, often in less densely populated regions. These areas might have limited access to certain resources and services, potentially leading to higher climate change vulnerabilities.
4	Remote Australia	Campuses located in areas with significant geographical isolation, limited infrastructure, and reduced access to various amenities. The climate change risks faced by these campuses could be substantial due to their unique location and limited support systems.
5	Very Remote Australia	Campuses located in extremely isolated and sparsely populated regions. These areas typically face severe challenges in terms of accessibility, infrastructure, and services, resulting in heightened climate change risks and vulnerabilities.

Asset

Community Adaptive Capacity

Explanation:

Community Adaptive Capacity is the ability of a community system to modify or change its characteristics and behaviours to cope with actual or anticipated stresses. These factors enable the adjustment of responses and behaviours through learning, adaptation and transformation.

Data Source(s):

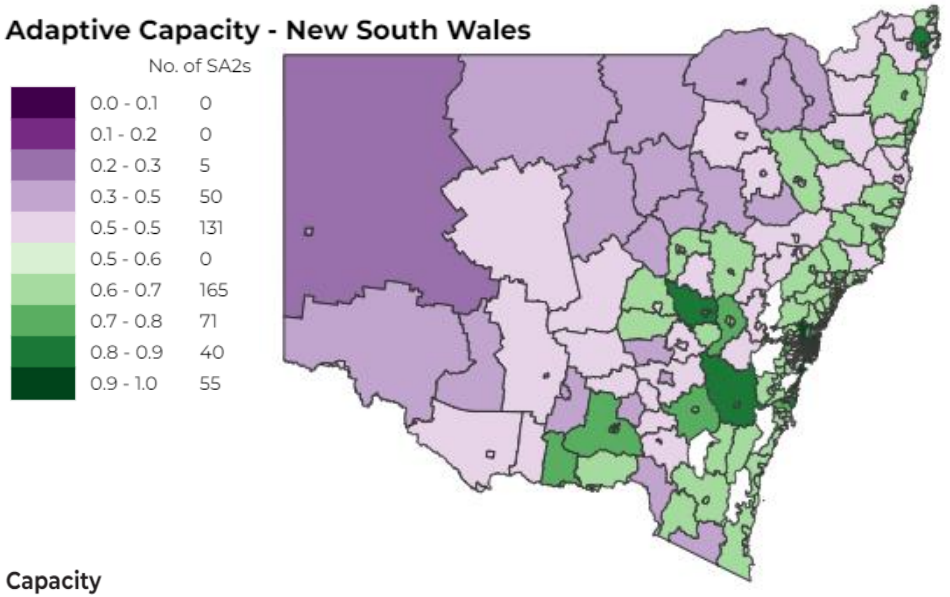
Community Adaptive Capacity data has been exported from the Australian Disaster Resilience Index > Maps and Data > Adaptive Capacity > NSW SA2 (Statistical Area 2).

Rules & Calculations:

Each asset has a preconfigured community adaptive capacity score of low, moderate or high, aligning with a score of between 0 and 1. Community Adaptive Capacity scores are defined in the table to the right. Adaptive capacity scores are then scaled to a score of between 1 and 5.

Model Outputs:

The output is a score between 0 and 1 aligned with the table to the right. The scaled adaptive capacity output is a score between 1 and 5.



Adaptive capacity hierarchical design of the Australian Natural Disaster Resilience Index

Asset

Ease of Replacement

Explanation:

The ease of replacement of an asset refers to the level of difficulty of replacing an asset in the event of damage, loss or obsolescence due to climate change impacts. Ease of replacement contributes to the potential consequence of a climate event.

Data Source(s):

Ease of replacement is preconfigured as a matrix for each asset type based on time required to replace an asset and the level of skills / effort required to replace and asset.

Rules & Calculations:

The below matrix shows the configuration for TAFE NSW sub asset (Item Type 2). Ease of replacement contributes 15% to the consequence score of a climate event.

Model Outputs:

The output is a score between 1 and 5 aligned with the table to the right.

Item Type 2	Score
Equipment	1
Furnishings	1
Interior Construction	2
Interior Finishes	2
Stairs	3
Site Electrical Utilities	3
Site Improvement	4
Site Mechanical Utilities	4
Conveying	3
Electrical	3
Fire Protection	3
HVAC	3
Plumbing	3
Exterior Enclosure	4
Roofing	3
Superstructure	4
Selective Building Demolition	3
Special Construction	2

Rating	Ease of Replacement	Time to Replace	Skills / Effort to Replace
1	Very Low	Replacement is swift, hours.	Replacing is straightforward and requires minimal effort from an unskilled individual.
2	Low	Replacement is relatively quick, days.	Replacing involves relatively simple skills and effort and can be replaced through routine skilled labour.
3	Medium	Replacement takes a moderate amount of time, weeks	Replacing requires some consideration, multiple qualified individuals or specialist skillsets.
4	High	Replacement takes a considerable amount of time, up to 2 months.	Replacing requires planning and some approvals and can be delivered by a number of specialist skilled individuals.
5	Very High	Replacement takes a significant amount of time, greater than 2 months.	Replacing requires advanced planning and approvals and a multidisciplinary team.

Heritage and Planning

Explanation:

Heritage listings are official places/buildings of historical, cultural, architectural, or social significance. Heritage listings are from Local Environmental Plan (LEP) managed by NSW local governments, and TAFE S170 register.

Data Source(s):

Data has been revised from the S170 Heritage List 2022 v1.

Rules & Calculations:

Lookup from Heritage List spreadsheet 1 or 0, “Yes” or “No” for whole site/block.

Model Outputs:

The output is a score of either 0 or 1 aligned with the table to the right.

Asset

TAFE NSW Heritage List

Count	Region	Site name	Buildings on register	No of Buildings	Listing
1	Sydney	Annandale	Sandstone boundary wall	0	LEP
2	West	Armidale College of TAFE	B (old bakery)	1	LEP - Archaeology only
3	North	Belmont Campus	AA, A, AE, B, D, F, Q, S	8	TAFE S170 only
4	West	Bourke Campus	B, C, D, E, F	5	TAFE S170 only
5	West	Broken Hill College of TAFE	A, B, C, R	4	LEP
6	West	Broken Hill College of TAFE (annex)	AN, S	2	LEP
7	Sydney	Eora College of TAFE	A	1	LEP
8	West	Coonabarabran College of TAFE	B	1	TAFE S170 only

Output	Heritage Listing	Listing Source
1	Yes	LEP – Local Environmental Plan TAFE S170 – TAFE Heritage List Register
0	No	NA

Value

Explanation:

The value of an asset is a weighted average of the cost, importance and duty factor of an asset. Value contributes to the potential consequence of a climate event.

Data Source(s):

Importance ratings were provided by TAFE NSW for each Item Type 4 (see configuration datasheet for ‘Importance’).

Replacement costs were provided by TAFE NSW for each Item Type 4 (see configuration datasheet for ‘Replacement Cost’).

Rules & Calculations:

Value ratings are a weighted average of replacement cost and importance on a scale of 1 to 100. Value ratings were normalised to a scale of 1-5 for this assessment by dividing the score by 20. Value rating contributes to 25% of the consequence score of a climate hazard.

Model Outputs:

The output is a calculated score between 1 and 5 aligned with the table to the right.

Value	Definition
1	Very low value
2	Low value
3	Moderate value
4	High value
5	Very high value

Configured

Importance

Explanation:

Importance, or criticality, is defined as how business critical an asset is towards continuous operation of a building and facility.

Data Source(s):

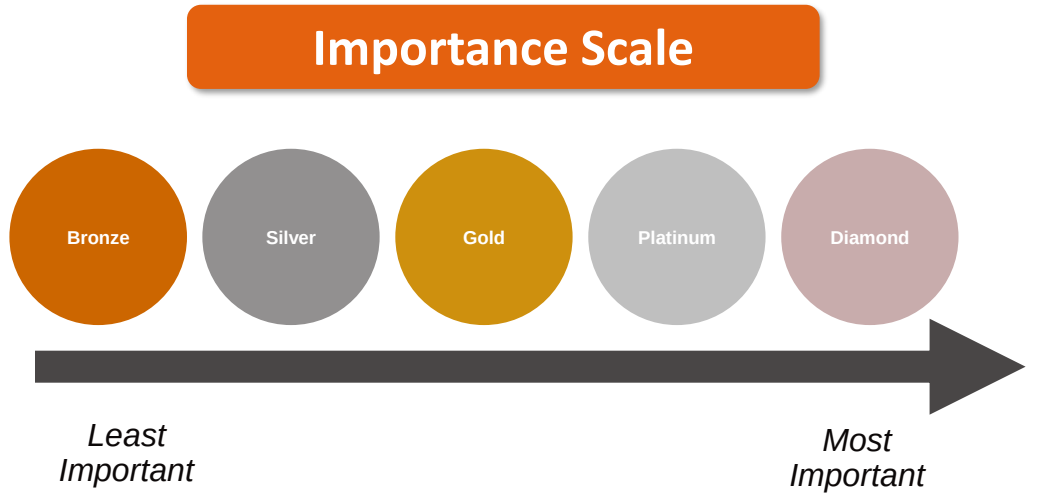
Importance ratings were provided by TAFE NSW for each Item Type 4 in the document '230623_TAFE_ItemsExtract_Full - excl. Equipment', column "AB" (Importance).
Importance is defined by the AssetFuture Asset Degradation Models (June 2022) and is shown in the matrix to the right.

Rules & Calculations

Since this assessment considered to Item Type 2, the average importance of all Item Type 4's within each Item Type 2 was calculated and used as an input for the assessment. Average value ratings for each Item Type 2 are shown in the document 'TAFE Risk Model' tab Data Export, Column H (Avg_imp).

Model Outputs:

The importance output is a score between 1-100 aligned with the table to the right.



Importance Range	Criticality	Description
1 – 20	Bronze	Not essential for facility operation, downtime will not cause delays
21 – 40	Silver	Somewhat important for facility operation, downtime will cause slight delays
41 – 60	Gold	Important for facility operation, downtime will cause delays
61 – 80	Platinum	Very important for facility operations, downtime will cause significant delays
81 – 100	Diamond	Core to facility operations, facility cannot function in downtime (eg. kitchen equipment in a restaurant)

Asset

Replacement Cost

Explanation:

Replacement cost is the dollar cost ($AUD) that would be required to replace an asset or property with another one of similar value and utility.

Data Source(s):

Replacement costs were provided by TAFE NSW for each Item Type 4 in the document '230623_TAFE_ItemsExtract_Full - excl. Equipment', column "AC" (Replacement Cost).

Rules & Calculations:

Since this assessment considered to Item Type 2, the total replacement cost of all Item Type 4's within each Item Type 2 was calculated and used as an input for the assessment. T

otal replacement costs for each Item Type 2 are shown in the document 'TAFE Risk Model' tab Data Export, Column J (total_replace).

Model Outputs:

The replacement cost is a dollar value in AUD.

	A	B	C	D	E	F	G	H	I	J
		Region	Location	Block	Item Type 1	Item Type 2	avg_duty	avg_imp	avg_cond	total_replace
0		North	Ballina	Building	Furnishings	Equipment	1.297769248	63.51115376	2.950085405	7851.6209
1		North	Ballina	Building	Interiors	Construction	1.329844557	62.84290462	3.305358969	44183.7778
2		North	Ballina	Building	Interiors	Interior Finishes	1.166538721	52.32706449	3.216097854	408264.1924
3		North	Ballina	Building	Interiors	Stairs	1.26440882	52.44236472	3.116197189	7898.5617
4		North	Ballina	Building	Related Sitework	Utilities	1.375	52	2.735	794.6862
5		North	Ballina	Building	Related Sitework	Site Improvement	1.139957408	59.16092294	4.146352818	123522.1155
6		North	Ballina	Building	Services	Electrical	1.095499816	67.73261658	2.563474213	106704.416
7		North	Ballina	Building	Services	Fire Protection	1.047116604	62.06171909	2.421077759	3095.4693
8		North	Ballina	Building	Services	HVAC	1.045835637	65.59567129	2.975854433	69963.5226
9		North	Ballina	Building	Services	Plumbing	1.440760563	58.29330471	3.008360361	24327.809
10		North	Ballina	Building	Shell	Exterior Enclosure	0.963565328	50.88532344	2.740356585	126531.0548
11		North	Ballina	Building	Shell	Roofing	0.75	52.5	3.116454491	182874.3365
12		North	Ballina	Building	Furnishings	Equipment	1	72.5	4.94	3230.2711
13		North	Ballina	Building	Interiors	Construction	1.277506526	65.78894819	3.128596728	37976.308
14		North	Ballina	Building	Interiors	Interior Finishes	1.149322111	54.43230285	2.65763266	235850.3837
15		North	Ballina	Building	Interiors	Stairs	1.25	52.5	2.25	2436.8513
16		North	Ballina	Building	Related Sitework	Site Improvement	1.10484269	67.5317088	4.643490436	24221.6978
17		North	Ballina	Building	Services	Electrical	1.046235475	69.1379781	2.492105293	51147.0773
18		North	Ballina	Building	Services	Fire Protection	0.843701788	65.81028224	4.001778746	1588.9398
19		North	Ballina	Building	Services	HVAC	1.015857959	68.83375323	3.227550353	19632.2738
20		North	Ballina	Building	Services	Plumbing	1.481989756	58.90994878	2.387874856	24570.1144
21		North	Ballina	Building	Shell	Exterior Enclosure	0.896608374	52.76456661	2.740173962	69471.9076
22		North	Ballina	Building	Shell	Roofing	0.75	52.5	2.916887322	87943.2994
23		North	Ballina	Building	Furnishings	Equipment	1.5	62.5	3.031138949	122060.9843
24		North	Ballina	Building	Furnishings	Furnishings	1.5	53	2.82	28507.5057
25		North	Ballina	Building	Interiors	Construction	1.183622917	63.03770529	3.097550177	13258.8224

Asset

Duty Factor

Explanation:

Duty Factor is defined as an asset's level of work or utilisation over time. When an asset is used frequently, it has a high duty factor, resulting in high degradation and a reduction in its lifespan.

Data Source(s):

Duty factor has been nominated by TAFE NSW for each Item Type 4 in the document '230623_TAFE_ItemsExtract_Full - excl. Equipment', column "N" (Duty Factor).

Rules & Calculations:

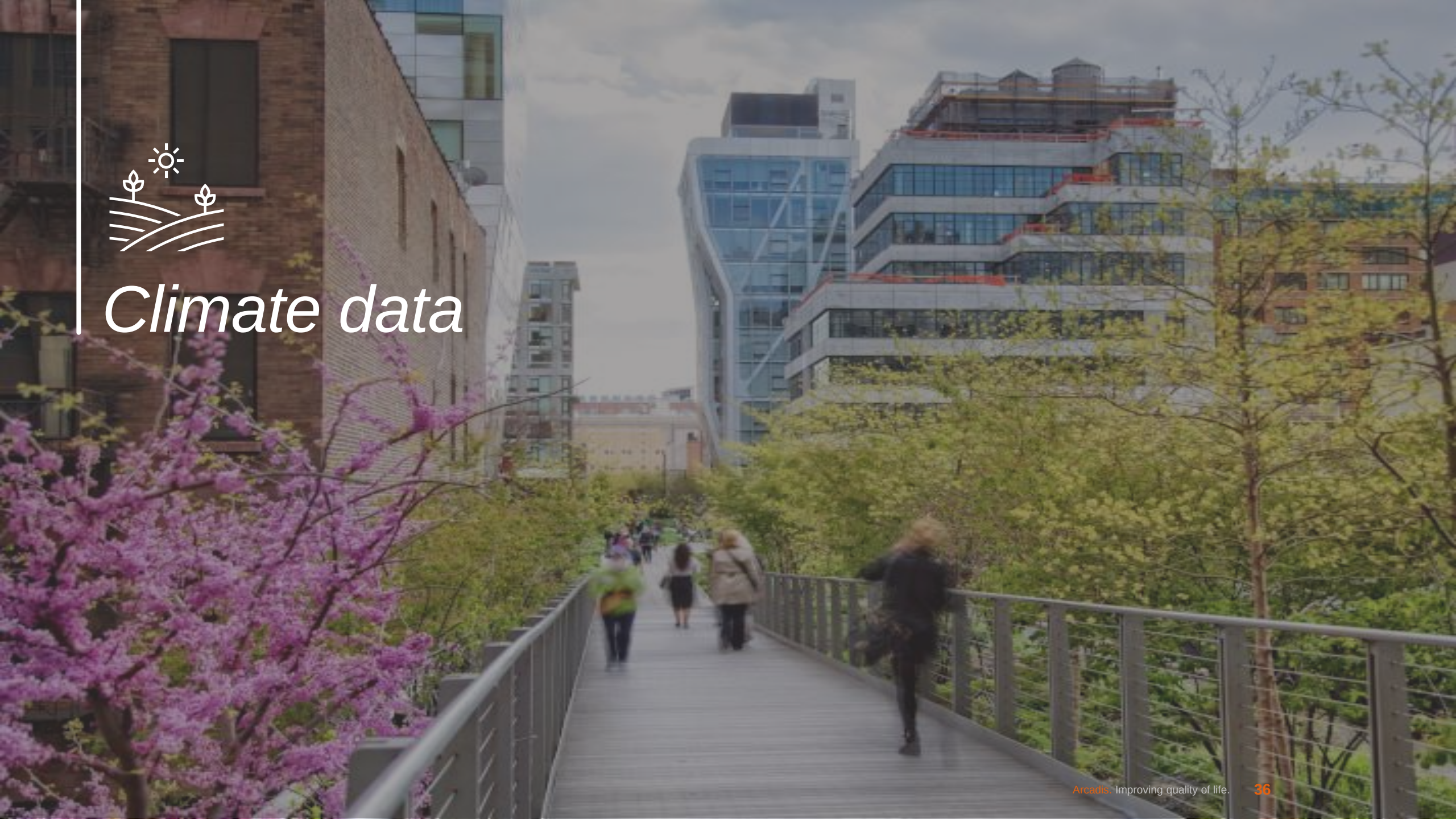
Since this assessment considered to Item Type 2, the average duty factor of all Item Type 4's within each Item Type 2 was calculated and used as an input for the assessment. Average value ratings for each Item Type 2 are shown in the document 'TAFE Risk Model' tab Data Export, Column G (Avg_duty).
Duty factor was then scaled to a score out of 5 using the following formula:
(Duty Factor-0.75)*(1/0.75)*4+1.
The scaled duty factor contributes 15% to the consequence score of a climate event.

Model Outputs:

Duty factor is a score of either 0.75, 1, 1.25 or 1.5 aligned with the table to the right.

Factor	Duty Factor	Definition
>1	High Duty	Operating close to design limits Within a severe work environment
=1	Average Duty	Operating as per design Within an acceptable work environment
<1	Low Duty	Operating under design Within a reduced work environment

Source: AssetFuture Asset Performance Parameters, June 2022



Climate data

About

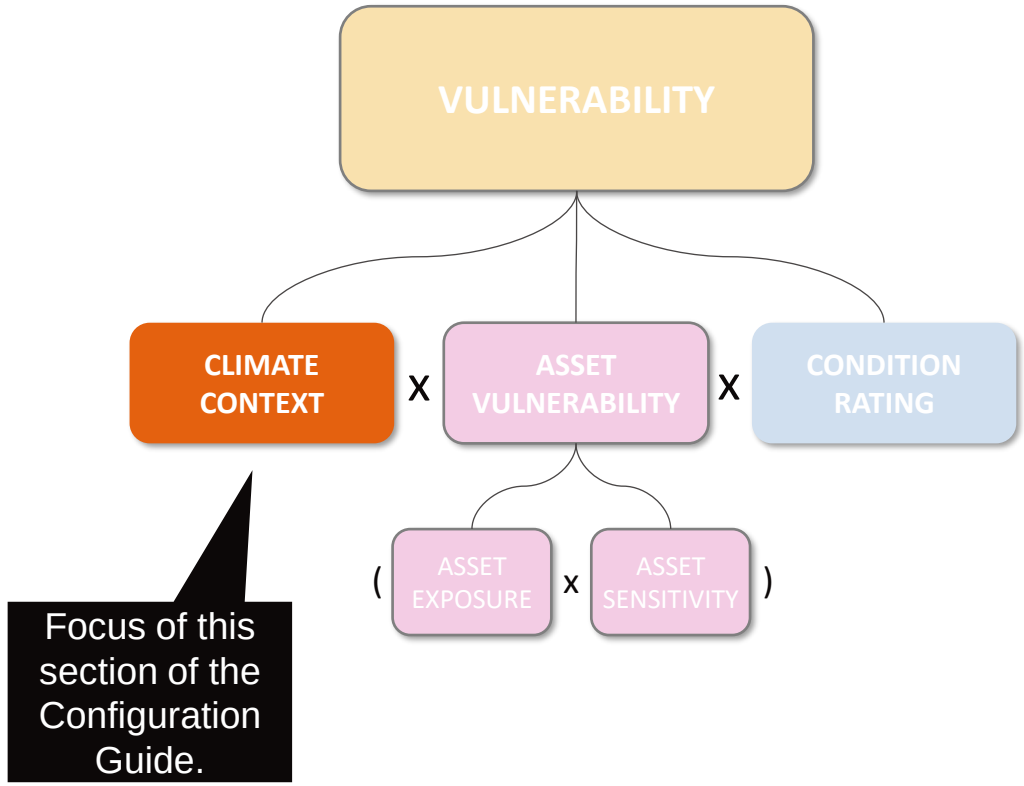
Climate data for the RAAP have been gathered from a range of sources to build an understanding of the projected climate change profile of the TAFE NSW campus portfolio. The following pages summarise the sources of climate data, as well as the scoring system employed to develop the short- and long-term climate context scores across each hazard.

Climate context values are computed on a per-hazard basis across two timescales (short and long-term) and contribute to the overall **Vulnerability** score according to the figure (right), as part of the broader risk model.

The following pages summarise the **climate hazards** employed in this assessment, including the variables, their units, source and time period, as well as the threshold values used to score each variable.

The final page of this section includes a Hazard calculation summary, which includes all calculations employed to develop both short and long-term scores for each climate hazard.

Hazard scores are always presented as values between 1 and 5.



Climate

Climate variable inputs: Drought

Dataset	Description	Units	Emissions scenario	Model	Time period	Source	Threshold scores									
							Very low (1)		Low (2)		Medium (3)		High (4)		Very high (5)	
Time spent in drought (2030)	Proportion of annual days where Standardized Precipitation Index (SPI) <1	%	RCP8.5	HadGEM2-ES	2030	CSIRO	0	20	20.01	49.9	50	69.9	70	84.9	85	100
Time spent in drought (2050)	Proportion of annual days where Standardized Precipitation Index (SPI) <1	%	RCP8.5	HadGEM2-ES	2050	CSIRO	0	20	20.01	49.9	50	69.9	70	84.9	85	100
Time spent in drought (2070)	Proportion of annual days where Standardized Precipitation Index (SPI) <1	%	RCP8.5	HadGEM2-ES	2070	CSIRO	0	20	20.01	49.9	50	69.9	70	84.9	85	100
Time spent in drought (2090)	Proportion of annual days where Standardized Precipitation Index (SPI) <1	%	RCP8.5	HadGEM2-ES	2090	CSIRO	0	20	20.01	49.9	50	69.9	70	84.9	85	100

Climate

Climate variable inputs: Heatwaves

Dataset	Description	Units	Emissions scenario	Model	Time period	Source	Threshold scores									
							Very low (1)		Low (2)		Medium (3)		High (4)		Very high (5)	
Annual number of days exceeding 35˚C (2000)	Number of annual average days above threshold	Days	NA	Model mean	Historic	BoM	0	5	5.01	10	10.1	19.9	20	39.9	40	200
Annual number of days exceeding 35˚C (2030)	Number of annual average days above threshold	Days	RCP8.5	Model mean	2030	NARCLiM	0	5	5.01	10	10.1	19.9	20	39.9	40	200
Annual number of days exceeding 35˚C (2050)	Number of annual average days above threshold	Days	RCP8.5	Model mean	2050	CSIRO	0	5	5.01	10	10.1	19.9	20	39.9	40	200
Annual number of days exceeding 35˚C (2070)	Number of annual average days above threshold	Days	RCP8.5	Model mean	2070	NARCLiM	0	5	5.01	10	10.1	19.9	20	39.9	40	200
Annual number of days exceeding 35˚C (2090)	Number of annual average days above threshold	Days	RCP8.5	Model mean	2090	CSIRO	0	5	5.01	10	10.1	19.9	20	39.9	40	200
Annual number of days exceeding 40˚C (2000)	Number of annual average days above threshold	Days	NA	NA	Historic	CSIRO	0	0	0	1	1.01	2	2.01	4	4.01	100
Annual number of days exceeding 40˚C (2030)	Number of annual average days above threshold	Days	RCP8.5	Model mean	2030	CSIRO	0	0	0	1	1.01	2	2.01	4	4.01	100
Annual number of days exceeding 40˚C (2050)	Number of annual average days above threshold	Days	RCP8.5	Model mean	2050	CSIRO	0	0	0	1	1.01	2	2.01	4	4.01	100
Annual number of days exceeding 40˚C (2070)	Number of annual average days above threshold	Days	RCP8.5	Model mean	2070	CSIRO	0	0	0	1	1.01	2	2.01	4	4.01	100
Annual number of days exceeding 40˚C (2090)	Number of annual average days above threshold	Days	RCP8.5	Model mean	2090	CSIRO	0	0	0	1	1.01	2	2.01	4	4.01	100
Historic maximum temperature	Maximum recorded temperature for given location	˚C	NA	NA	Historic	BoM	0	30	30.1	35	35.01	40	40.01	43	43.01	50
Maximum temperature (2030)	Projected maximum recorded temperature for given location	˚C	A1FI	Model mean	2030	BoM + NARCLiM	0	30	30.1	35	35.01	40	40.01	43	43.01	50
Maximum temperature (2070)	Projected maximum recorded temperature for given location	˚C	A1FI	Model mean	2070	BoM + NARCLiM	0	30	30.1	35	35.01	40	40.01	43	43.01	50

Climate variable inputs: Bushfires

Dataset	Description	Units	Emissions scenario	Model	Time period	Source	Threshold scores									
							Very low (1)		Low (2)		Medium (3)		High (4)		Very high (5)	
Bushfire Prone Land: Within Category 1/1 - 100m/1 - 250m/1 - 500m	Distance to bushfire prone land	km	NA	NA	Historic	SEED	Category 0	Category 0	Within Category 1 - 500m	Within Category 1 - 500m	Within Category 1 - 250m	Within Category 1 - 250m	Within Category 1 - 100m	Within Category 1 - 100m	Within Category 1	Within Category 1
Threshold Forest Fire Danger Index (FFDI) (2030)	Annual days above defined FFDI thresholds.	Days	RCP8.5	GFDL-ESM2M	2030	CSIRO	0	10	10.1	40	40.01	60	60.01	100	100.01	200
Threshold Forest Fire Danger Index (FFDI) (2050)	Annual days above defined FFDI thresholds.	Days	RCP8.5	GFDL-ESM2M	2050	CSIRO	0	10	10.1	40	40.01	60	60.01	100	100.01	200
Threshold Forest Fire Danger Index (FFDI) (2070)	Annual days above defined FFDI thresholds.	Days	RCP8.5	GFDL-ESM2M	2070	CSIRO	0	10	10.1	40	40.01	60	60.01	100	100.01	200
Threshold Forest Fire Danger Index (FFDI) (2090)	Annual days above defined FFDI thresholds.	Days	RCP8.5	GFDL-ESM2M	2090	CSIRO	0	10	10.1	40	40.01	60	60.01	100	100.01	200

Climate variable inputs: Flooding

Dataset	Description	Units	Emissions scenario	Model	Time period	Source	Threshold scores									
							Very low (1)		Low (2)		Medium (3)		High (4)		Very high (5)	
Flood Risk - Proximity to Major River/Creek	Proximity to Major Rivers and Creeks	km	NA	NA	Historic	NSW Gov - Water Theme (NamedWatercourse)	5	1.01	1	0.201	0.2	0.101	0.1	0.0501	0.05	0
Flood level exposure	Flood exposure (e.g. 1 in 100 ARI)	ARI	NA	NA	Historic	Steadfast			>500	>500	250	200	100	100	<50	0
Flood Risk - Flood Planning Area/Flood Zones		km	NA	NA	Historic	NSW Gov - Planning/Hazard (Flood Planning)	5	1.01	1	0.201	0.2	0.101	0.1	0.0501	0.05	0

Climate

Sea level rise

Dataset	Description	Units	Emissions scenario	Model	Time period	Source	Threshold scores									
							Very low (1)		Low (2)		Medium (3)		High (4)		Very high (5)	
Elevation (m)	Elevation / topogrpahic mapping	m	NA	NA	Historic	Elevation	1000	20.01	20	15.01	15	5.01	5	2.01	2	0
Proximity to sea or tidal waterway	Mapping of sea and tidal waterways for NSW	km	NA	NA	Historic	NSW Gov - Hydrography	5000	3	2.99	2	1.99	1	0.99	0.51	0.5	0
Sea level rise (2030)	Increase in mean sea level	m	RCP8.5	Model mean	2030	CSIRO	1000	20.01	20	15.01	15	5.01	5	2.01	2	0
Sea level rise (2050)	Increase in mean sea level	m	RCP8.5	Model mean	2050	CSIRO	1000	20.01	20	15.01	15	5.01	5	2.01	2	0
Sea level rise (2070)	Increase in mean sea level	m	RCP8.5	Model mean	2070	CSIRO	1000	20.01	20	15.01	15	5.01	5	2.01	2	0
Sea level rise (2090)	Increase in mean sea level	m	RCP8.5	Model mean	2090	CSIRO	1000	20.01	20	15.01	15	5.01	5	2.01	2	0
Coastal inundation	Risk level for coastal inundation	Rating	NA	NA	Historic	Steadfast			Low	Low	Moderate	Moderate	High	High	Very High	Very High

Climate variable inputs: Intense rainfall events

Dataset	Description	Units	Emissions scenario	Model	Time period	Source	Threshold scores									
							Very low (1)		Low (2)		Medium (3)		High (4)		Very high (5)	
Mean number of days of rain ≥ 25 mm (annual mean)	Mean annual days of rainf above 25 mm	Days	NA	NA	Historic	BoM	0	0	0.01	4	4.01	8	8.01	12	12.01	200
Greatest 24 hr rainfall	Highest 24 hr rainfall recorded	mm	NA	NA	Historic	BoM	0	50	50.01	100	100.01	150	150.01	200	200.01	1000
Rainfall intensity increase	% increase in rainfall intensity*	%	RCP8.5	Model mean	2030	NARCLiM	0	4	4.01	8	8.01	12	12.01	16	16.01	100
Rainfall intensity increase	% increase in rainfall intensity*	%	RCP8.5	Model mean	2070	NARCLiM	0	4	4.01	8	8.01	12	12.01	16	16.01	100

***Rainfall calculation**

Rainfall intensity projections have been calculated in accordance with the guidance provided in the Australian Rainfall and Runoff Guide, Book 1, Chapter 6 (2019) via the calculation below:

$$I_p = I_{\text{ARR}} \times 1.05^{T_m}$$

Where,

I_p = *Rainfall intensity for climate future*

I_{ARR} *=design rainfall intensity for current conditions*

1.05 = assumed temperature scaling based on the approximately exponential relationship between temperature and humidity

$T_{m=}$ *T*emperature at the midpoint (or median) of the selected class interval.

Climate

Climate variable inputs: Severe Storms & Cyclones

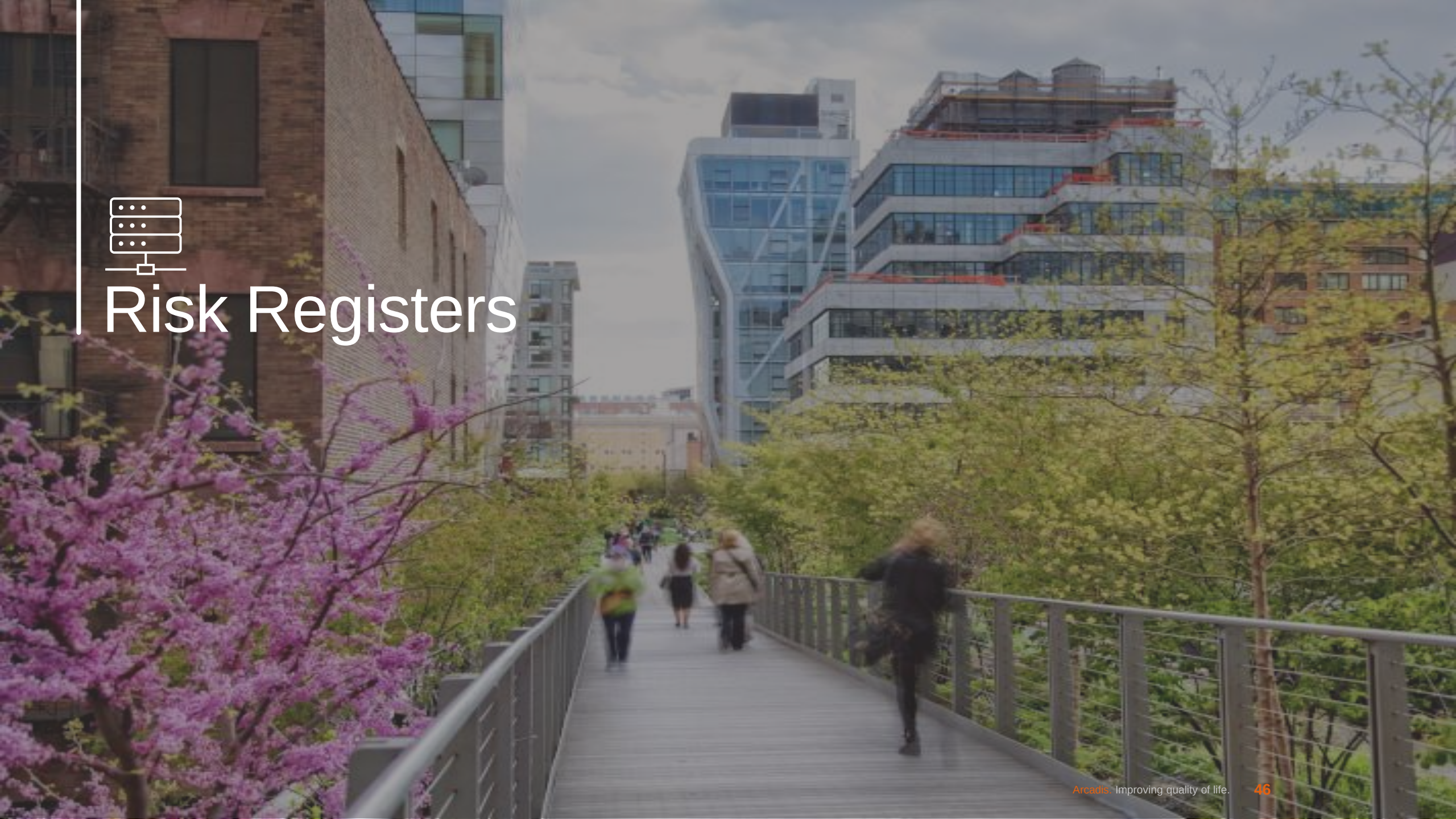
Dataset	Description	Units	Emissions scenario	Model	Time period	Source	Threshold scores									
							Very low (1)		Low (2)		Medium (3)		High (4)		Very high (5)	
Thunderstorm history	Average number of thunderstorm days per year	Count	NA	NA	Historic	BoM	0	1	1.01	5	5.01	15	15.01	25	25.01	50
Cyclone exposure region - Wind region	Wind region	Region type	NA	NA	Historic	AS/NZS 1170.2:2021			Region A	Region A			Region B	Region B		

Climate

Hazard calculation summary

Hazard	Time period	Final Calculation	Weighted
Drought	Short	@average(@Value(Threshold_Value_Perc_Time_Drought_2030_Score),@Value(Threshold_Value_Perc_Time_Drought_2050_Score)))	
	Long	@average(@Value(Threshold_Value_Perc_Time_Drought_2070_Score),@Value(Threshold_Value_Perc_Time_Drought_2090_Score)))	
Heatwaves	Short	@average(@Value(Threshold_Value_Historic_days_above_35C_Score),@Value(Threshold_Value_35C_2030_Score),@Value(Threshold_Value_40C_2030_Score),@Value(Threshold_Value_40C_2050_Score),@Value(Threshold_Value_Historic_Max_Temp_Score),@Value(Threshold_Annual_Max_Temp_2030_Score)))	
	Long	@average(@Value(Threshold_Value_35C_2070_Score),@Value(Threshold_Value_40C_2070_Score),@Value(Threshold_Value_40C_2090_Score),@Value(Threshold_Value_Historic_Max_Temp_Score),@Value(Threshold_Annual_Max_Temp_2070_Score)))	
Bushfire	Short	@average((@Value(Threshold_Value_Bushfire_Prone_Land_Score)*0.75),@Value(Threshold_Value_Annual_days_above_FFDI_2030_Score),@Value(Threshold_Value_Annual_days_above_FFDI_2050_Score)))	
	Long	@average((@Value(Threshold_Value_Bushfire_Prone_Land_Score)*0.75),@Value(Threshold_Value_Annual_days_above_FFDI_2070_Score),@Value(Threshold_Value_Annual_days_above_FFDI_2090_Score)))	
Severe storms & cyclones	Short	@Value(Threshold_Value_Wind_Category_Score)***0.6**+@Value(Threshold_Value_Annual_days_storms_Score)***0.4**)	Wind category 60%, Annual thunderstorm days 40%
	Long	@Value(Threshold_Value_Wind_Category_Score)***0.6**+@Value(Threshold_Value_Annual_days_storms_Score)***0.4**)	
Sea level rise	Short	IF Threshold_Sea_Level_Elevation_Risk >= 3 THEN @average(@Value(Threshold_Sea_Level_Risk_Score),@Value(Threshold_Value_Coastal_Inundation_Score),@Value(Threshold_Value_Sea_Level_Risk_2030_Score),@Value(Threshold_Value_Sea_Level_Risk_2050_Score)))	
	Long	IF Threshold_Sea_Level_Elevation_Risk >= 3 THEN @average(@Value(Threshold_Sea_Level_Risk_Score),@Value(Threshold_Value_Coastal_Inundation_Score),@Value(Threshold_Value_Sea_Level_Risk_2030_Score),@Value(Threshold_Value_Sea_Level_Risk_2050_Score)))	
Flood	Short	Average (@Value(Flood Planning Area, Flood level exposure (e.g. 1 in 100 ARI)),@value(rainfall intensity increase calculation where Ip=IARRx 1.05^(temperature midpoint 2030))	
	Long	Average (@Value(Flood Planning Area, Flood level exposure (e.g. 1 in 100 ARI)),@value(rainfall intensity increase calculation where Ip=IARRx 1.05^(temperature midpoint 2070))	
Intense rainfall events	Short	average(@Value(Threshold_Value_Mean_Above_25mm_rain_Score),@Value(Threshold_Value_Rainfall_Intensity_2030_Score),@Value(Threshold_Value_24hr_rain_max_Score)))	
	Long	average(@Value(Threshold_Value_Mean_Above_25mm_rain_Score),@Value(Threshold_Value_Rainfall_Intensity_2030_Score),@Value(Threshold_Value_24hr_rain_max_Score)))	

Risk Registers

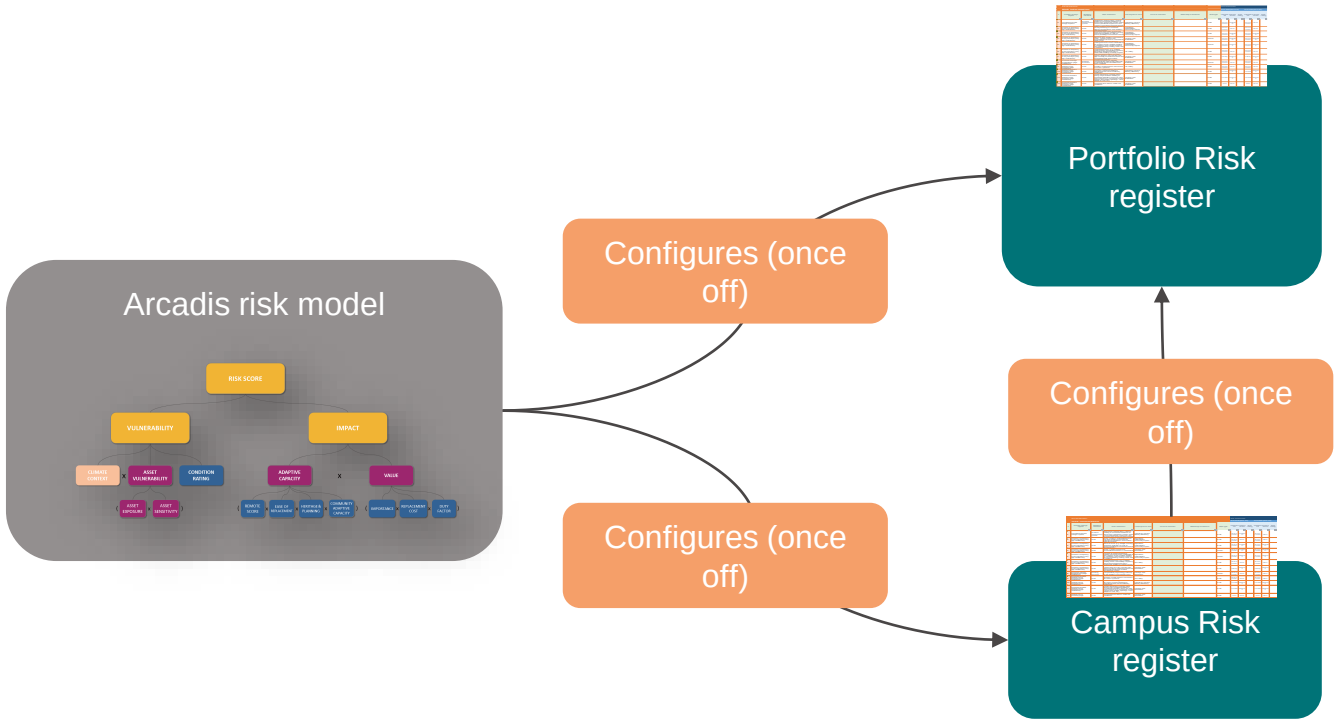


About

The RAAP tool contains risk registers to support risk identification, assessment and adaptation planning at the campus and portfolio level. Risk registers have been configured by the Risk Model, where output scores at asset and climate hazard levels activate known climate change related risks for a particular location. The risk register content forms a preliminary view of the potential risk profile of the campus, supporting more detailed review and refinement of risk statements, controls, adaptation actions and residual risk scores. Importantly, changes to the risk register data do not illicit changes in the Risk Model or its dashboards. Dedicated campus and portfolio level dashboards are to be developed that will provide high level insights from assessments.

The diagram below illustrates the configuration pathways employed to generate the campus- and portfolio level risk registers.

Risk register	Configuration approach
Campus	Preliminary risk profiles are determined by vulnerability and risk scores from the Risk Model, which activates risks from a master list of common climate risks to the campus context.
Portfolio	The portfolio risk profile is configured based on the campus level risk profiles and the frequency of risk issues across the portfolio, as well as via the risk model outputs.



Risk Register Inputs

The risk register inputs have been described below:

Variable Name	Description
ID	Unique identifier for the risk, formatted to be the location name and cumulative risk number recorded for the location
Location	The TAFE NSW campus
Sub Asset	'Item Type 2' within the TAFE NSW asset data
Climate Variable	A climate variable refers to a specific factor or parameter within the category of climate hazards
Risk Statement	Description of risk provided by Arcadis
TAFE NSW Consequence area	Consequence area is the specific consequence within a risk designation. It refers to the receptor of a risk impact (i.e., who or what is specifically impacted by a risk) and aligns to the TAFE NSW Enterprise Risk Management framework
Assumed controls	Description of assumed controls to prevent or control risk by Arcadis
Short Term Likelihood	Likelihood of the risk impacting the sub asset in the short term
Short Term Consequence	The severity of the impact on the sub asset in the short term
Risk Score (Short term)	Calculated based on the consequence and likelihood
Long Term Likelihood	Likelihood of the risk impacting the sub asset in the long term
Long Term Consequence	The severity of the impact on the sub asset in the long term
Risk Score (long term)	Calculated based on the consequence and likelihood

Risk Framework - Likelihood

The risk ratings and naming approach employed has been adapted from the TAFE NSW Enterprise Risk Management Manual (Version 2.0, 2023). The likelihood, consequence and risk matrix is provided in the following pages

Rating	Likelihood	Description	Qualification
5	Almost Certain	The event is expected to occur in normal circumstances.	Greater than 90% chance of happening.
4	Likely	The event will probably occur. Some recurring past event history.	Between 70% and 90% chance of happening.
3	Possible	The event may occur sometime. There has been past event history.	Between 30% and 70% chance of occurring.
2	Unlikely	The event could occur in some circumstances. Some past warning signs or previous event history.	Between 10% and 30% chance of occurring.
1	Rare	The event may occur but only in exceptional circumstances.	Less than 10% chance of occurring.

Risk Framework - Consequence

The risk ratings and naming approach employed has been adapted from the TAFE NSW Enterprise Risk Management Manual (Version 2.0, 2023). The likelihood, consequence and risk matrix is provided in the following pages

Risk Category	Consequences to be covered
Safety	Employee, contractor, student and visitor health and safety; wellbeing; mental and physical health; work health and safety systems; injury management and prevention
Regulatory	Compliance regime; legislation; RTO accreditation; regulator relationship; standards compliance; contractual compliance; insurance and risk management; preparation for new and/or amended legislation; lobbying of regulators; governance
Probity	Values development and implementation; fraud and corruption; ethical/unethical behaviour; public interest disclosures; gifts and benefits; misuse of resources; maladministration; cyber security; educational and academic integrity
Customer	Student and industry/employer customer experience; delivery of education and training program; design, development and implementation of business policies, processes, procedures, and technologies to support the administrative and customer experience and student-centred services; business continuity planning; disruption to service delivery; student completions
Financial	Revenue (sources, mix of sources, amount); cost/expenditure (amount, type), budget and financial performance reporting, grant management
Reputation	Stakeholder management; community engagement; community awareness; government relations; image of TAFE NSW; media management; brand management
Workforce	People; staff wellbeing; internal capability; external contractors; organisational culture; staff morale; change management; employee expectations; unplanned employee departures; loss of key staff; succession planning; workforce planning and capability development

Risk Framework – Consequence

Risk Categories	Risk Consequence				
	Negligible	Minor	Medium	Major	Severe
Safety	One-off event resulting in minor illness or injury not requiring first aid or other treatment.	Event resulting in minor short-term illness or injury treated by first aid. May involve medical or hospital treatment but not hospital admission. Near miss/near hit that identifies weakness of current controls.	Event causing serious illness or injury including lost time from work/study and hospital admission. Without permanent impact. Near miss/near hit that identifies significant failures or weaknesses in current controls.	Single or ongoing event(s) causing serious illness or injury with long-term or permanent impact.	Event involving death and/or 5+ serious illnesses or injuries with long-term or permanent impact.
	Negligible improvement in lead indicators or safety programs.	Minor improvement in lead indicators or safety programs.	Significant improvement in lead indicators or safety programs.	Major innovation delivering improvement in safety outcomes for employees, students and/or contractors.	Significant innovation delivering improvement in safety outcomes for employees, students and/or contractors. Greatly exceed stakeholders' expectations.
Regulatory	Minor complaint or compliance issue. Resolved locally. Little or no effect on operations.	Isolated regulatory breach, incident or legal issue. Resolved at Executive Director/General Counsel level.	Major regulatory breach. Significant incident, complaint, or legal action. Formal crisis management instigated.	Systemic regulatory breaches. Shutdown of a service or loss of RTO scope. One-off large fine. Ministerial inquiry.	Shutdown of multiple services or loss of RTO registration. Substantial fines. Prosecution of organisation or individual. Parliamentary scrutiny.
	Response submitted to correspondence from the regulator, little or no expected effect.	Process improvement identified and notified to regulator, may result in some action.	Significant process improvement identified and discussed with regulator, agreement on some level of action.	TAFE NSW is a key stakeholder in consultation around legislative review, and feedback incorporated into changes.	Minister influences parliament to resolve changes to regulatory framework.

Risk Categories	Risk Consequence				
	Negligible	Minor	Medium	Major	Severe
Probity	Negligible non-compliance with internal controls, little or no effect on operations.	Minor non-compliance with internal controls, problem investigated and solved at local level.	Systemic non-compliance with internal controls or a minor non-compliance in multiple branches, resulting in Internal Audit or Legal investigation.	Staff misconduct resulting in termination, internal findings of corruption and/or wrong-doing.	Significant systemic non-compliance with internal controls resulting in external investigation e.g., Police, NSW Audit Office and/or ICAC.
	Negligible improvement in internal controls, example of ethical behaviour, demonstration of TAFE NSW values.	Minor improvement in internal controls, ethical behaviour that is starting to exceed TAFE NSW standards and values.	Moderate improvement in internal controls, ethical behaviour that exceeds TAFE NSW standards and values.	Major, significant improvement in internal controls, ethical behaviour that greatly exceeds TAFE NSW standards and values.	Best practice improvement in internal controls, ethical behaviour that significantly exceeds TAFE NSW standards and values and is recognised by the Executive.
Customer	Education and training program outcome affected and resolved by routine operations.	Education and training program outcome compromised with minor impact and managed internally.	Delivery of academic or community/program outcomes compromised. Significant review or changes to programs required.	Outcome of a major program not achieved resulting in decline of enrolments/funding. Significant review of programs required.	Programs cannot be delivered resulting in significant decline in academic/community outcomes. Significant damage to reputation of vocational education. Ministerial enquiry.
	Negligible improvement in programs, customer outcomes or industry engagement, changes implemented by routine operations. <1% increase in student completion rates.	Minor improvement in programs, customer outcomes or industry engagement, minor improvement in efficiency or effectiveness. 1% - 5% increase in student completion rates.	Significant improvement in programs, customer outcomes or industry engagement, significant improvements to delivery or process efficiencies. 5% - 10% increase in student completion rates.	Major innovation delivering improvement in customer outcomes, industry engagement or major increase in customer satisfaction and participation rates.	Significant innovation delivering improvement in customer outcomes, industry engagement or major increase in customer satisfaction and participation rates. Greatly exceed customer expectations.

Risk Framework – Risk matrix

Risk Categories	Risk Consequence				
	Negligible	Minor	Medium	Major	Severe
Workforce	Localised minor wellbeing concerns. Resolved locally. Little or no effect on operations.	Short term, minor localised impact on employee workload, engagement or morale.	Loss of key local staff, major localised impact on employee workload, engagement or morale. Local industrial action.	Loss of multiple staff or key management. People morale issues in multiple locations. State-wide industrial action.	Organisation wide impact on employee workload, engagement or morale. Industrial action affecting state-wide service delivery.
	Variable cultures and quality of workforce incident reporting. Organisational health survey indicates 50% or above satisfaction rate.	Most areas with a good culture; most staff reporting incidents; many staff engaged, organisational health survey indicates 60% or above satisfaction rate.	Good culture across a Region/Branch; leaders setting clear expectations, staff proactively reporting incidents. Organisational health survey indicates 70% or above satisfaction rate.	Strong culture and leaders deal proactively with non-compliance and poor behaviours. Organisational health survey indicates 80% or above satisfaction rate.	Very strong culture, leadership and staff engagement. Focus on organisational continuous improvement. Organisational health survey indicates 90% or above satisfaction rate.
Financial	Loss, error or omission <1% of annual budget. No financial forecasting required.	Loss, error or omission of 1% – 5% of annual budget. Financial reforecasting required.	Loss, error or omission of 5% - 10% of annual budget. Urgent and material financial re-forecasting required.	Loss, error or omission of 10% - 15% of annual budget. Delayed payment to staff and creditors.	Loss, error or omission >15% of annual budget.
	Saving or benefit <1% of appropriate baseline amount e.g., program or annual budget or projected revenue.	Saving or benefit of 1% – 5% of appropriate baseline amount e.g., program or annual budget or projected revenue.	Saving or benefit of 5% - 10% of appropriate baseline amount e.g., program or annual budget or projected revenue.	Saving or benefit of 10% - 15% of appropriate baseline amount e.g., program or annual budget or projected revenue.	Saving or benefit >15% of appropriate baseline amount e.g., program or annual budget or projected revenue.
Reputation	Attention from minor stakeholders with little or no publicity. Resolved locally. Little or no effect on operations.	Local adverse publicity. Visible dissatisfaction from public or key stakeholder. Limited localised media or local member interest. Specific internal reporting. Quickly recoverable using existing budget / resources.	State-wide adverse publicity. Short term damage, public embarrassment, restricted negative publicity from local media. Internal inquiry. Confidence and trust are diminished, but recoverable with time, effort and/or additional funding.	Sustained state-wide adverse publicity. Regular mainstream media reports. Community dissatisfaction. Ministerial inquiries, questions in Parliament. Serious loss of credibility with clients, Minister's office and key stakeholders. Potential for long lasting damage,	. Broad public concern/outrage. Continuous adverse media coverage. Severe adverse findings from Parliamentary Inquiry/Independent Review. Critical long-term loss of credibility with clients, ministers and key stakeholders.
	Modest positive publicity in local area.	Local positive publicity with visible satisfaction expressed by the public and key stakeholders.	State-wide positive publicity with visible recognition from stakeholders.	Sustained state-wide positive publicity and subsequent increase in level of enquiry/ enrolments.	Recognised by multiple stakeholders as the leader in education. Continuous state-wide positive publicity, sustained increases in level of enquiry and subsequent enrolments.

Risk Framework – Risk matrix

Likelihood	Consequence				
	1 Negligible	2 Minor	3 Medium	4 Major	5 Severe
5 Almost Certain	Moderate	High	High	Very High	Very High
4 Likely	Low	Moderate	High	High	Very High
3 Possible	Low	Moderate	High	High	High
2 Unlikely	Very Low	Low	Moderate	Moderate	High
1 Rare	Very Low	Very Low	Low	Low	Moderate

Limitations and Assumptions

This assessment has been undertaken based on the information provided by TAFE through documentation and information that was publicly available at the time of configuring the RAAP. While normal assessments of data reliability have been made, Arcadis assumes no responsibility or liability for errors in any data obtained from sources outside of Arcadis, or developments resulting from situations outside the scope of this project. This assessment is subject to the limitations and assumptions provided below.

RAAP element	Limitation/Assumptions	Impact
Risk model	The risk model brings a range of data together in an equation to make an estimation about the risk profile of each TAFE NSW campus	Findings and outcomes of the risk model should be reviewed in detail and should not be the basis for investment or decision making
Risk model	All sites are weighted equally	All sites are weighted equally in the risk calculations
Risk model	All climate hazards are weighted equally	Both chronic and acute climate hazards are weighted equally in the risk model calculations
Risk model	Some risk model elements are weighted to reflect Arcadis' understanding of organisational priorities (refer to Risk model weighting, page 15 for more detail)	TAFE NSW stakeholders should review and confirm that the weightings set for risk model elements are appropriate
Asset data	Assets are described to an Item Type 2 level for each block.	Asset data provided by Tafe has been aggregated to conduct the assessment. As such the assets may have varying associated attributes like Replacement Cost, Importance and Duty Factor based on the items within the aggregation
Asset data	Replacement Cost has been considered a factor of risk	Replacement cost has been included in the risk scoring, as such larger replacement costs result in a higher influence on the overall risk score
Climate data	Several hazards do not have robust future projection data available (e.g., storms)	Historical data has been used as a proxy for projected climate
Climate data	Climate projections selected have employed high emissions scenarios (RCP8.5, A1FI) and are associated with a high degree of uncertainty	Actual climate futures may significantly differ from projection values
Climate data	Thresholds for each climate variable have been developed to score and aggregate climate hazards to facilitate consideration of climate in the risk model and for communication purposes. Actual hazard exposure thresholds may differ from those provided	TAFE NSW stakeholders should review and confirm that the thresholds set for each climate variable are appropriate
Risk registers	Risk registers in the RAAP and their content (including preliminary ratings) have been developed through the risk model configuration process and present a *starting point* for more detailed assessment of risk at the campus and portfolio level	Actual risks at the campus and portfolio level may significantly differ from those presented in the campus and portfolio risk registers. TAFE NSW should review and update campus-level risk registers to reflect known risk issues

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