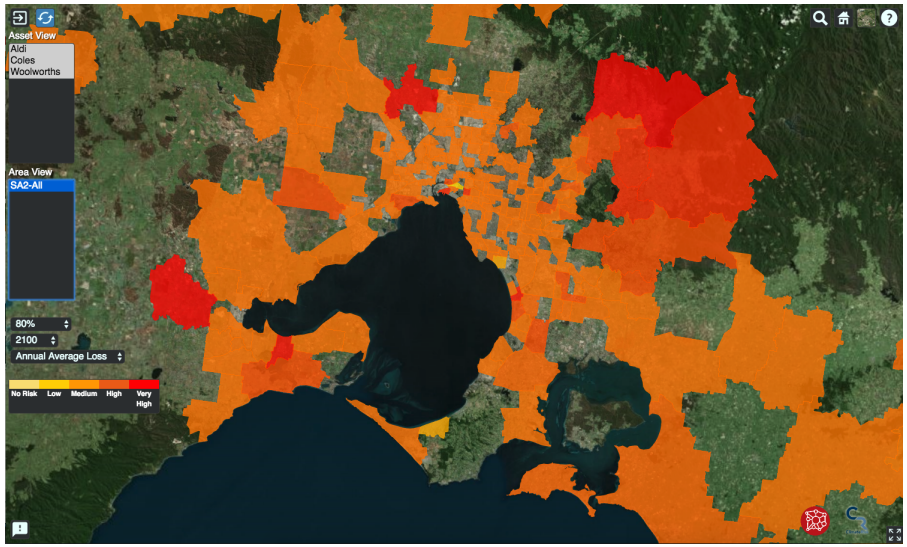
STATE OF ASSET RESILIENCE (SOAR) REPORT
Beta

Supermarket Sector Report - Coles, Version 1.0, FH 0.1, Created: Dec 05 2018 at 14:37:47



What's in your SOAR report?

Your Profile Overview
A closer look at your assets
Your Hazard Snapshot
Analysis of Key Performance Indicators

Your XDI Resilience Suite

XDI Globe | globe.xdi.systems
XDI Modelling | adaptinfrastructure.com
XDI SOAR | report.xdi.systems
XDI CR-Dashboard | rd.climaterisk.com.au

INTRODUCTION

The State of Asset Resilience (SOAR) report is designed to provide you with insights into the risks and resilience of your portfolio of assets with regard to extreme weather and climate change. The results are based on computationally testing the material and design specifications of your assets and their components against a range of extreme weather impacts such as flooding, heat, bushfire and storms. The results show you the changing probability with which your assets may (a) fail to operate, (b) be damaged, and (c) have consequences for the people who use your assets.

The results provide an insight into potential future outcomes based on the settings, scenarios and assumptions that have been used, which are set out in this SOAR report. The results do not represent predictions or projections, but provide quantitative insight into the scale of the risks both in terms of the number of assets affected and the potential financial, human and other costs involved. This SOAR is based on all of the asset, hazard and climate modelling data available at the time of the analysis. It can be updated as required if new data is added or new analysis is undertaken.

KEY HAZARD TERMINOLOGY

Hazard	Effect of climate change on hazard	Climate change impact
Inundation	Rising sea levels and higher incidence of extreme sea events.	Sea water flooding due to high tides, wind, low air pressure and waves can damage coastal land and property.
Soil Contraction	Changes in rainfall patterns and drought.	Soil contraction due to less rainfall can shift foundations and lead to buildings cracking.
Flood	Increased frequency in extreme rainfall leading to floods.	Riverine or other inland fresh water flooding can damage low-lying buildings or infrastructure assets.
Wind	Changes in wind regimes, sea surface temperature and wind speeds.	Extreme windstorms can damage buildings and facilitate water damage.
Bushfire	Increased incidence due to accelerated vegetation growth, higher temperatures, dryer conditions.	Burning vegetation can damage buildings and infrastructure by direct flame or intense heat.

YOUR PROFILE

Your profile is defined by the following assets, archetypes and analysis features.

Number of assets

809

Hazards used for your analysis

✓ Flood ✓ Inundation ✓ Heat ✓ Bushfire ✓ Wind ✓ Soil

Number of each archetype

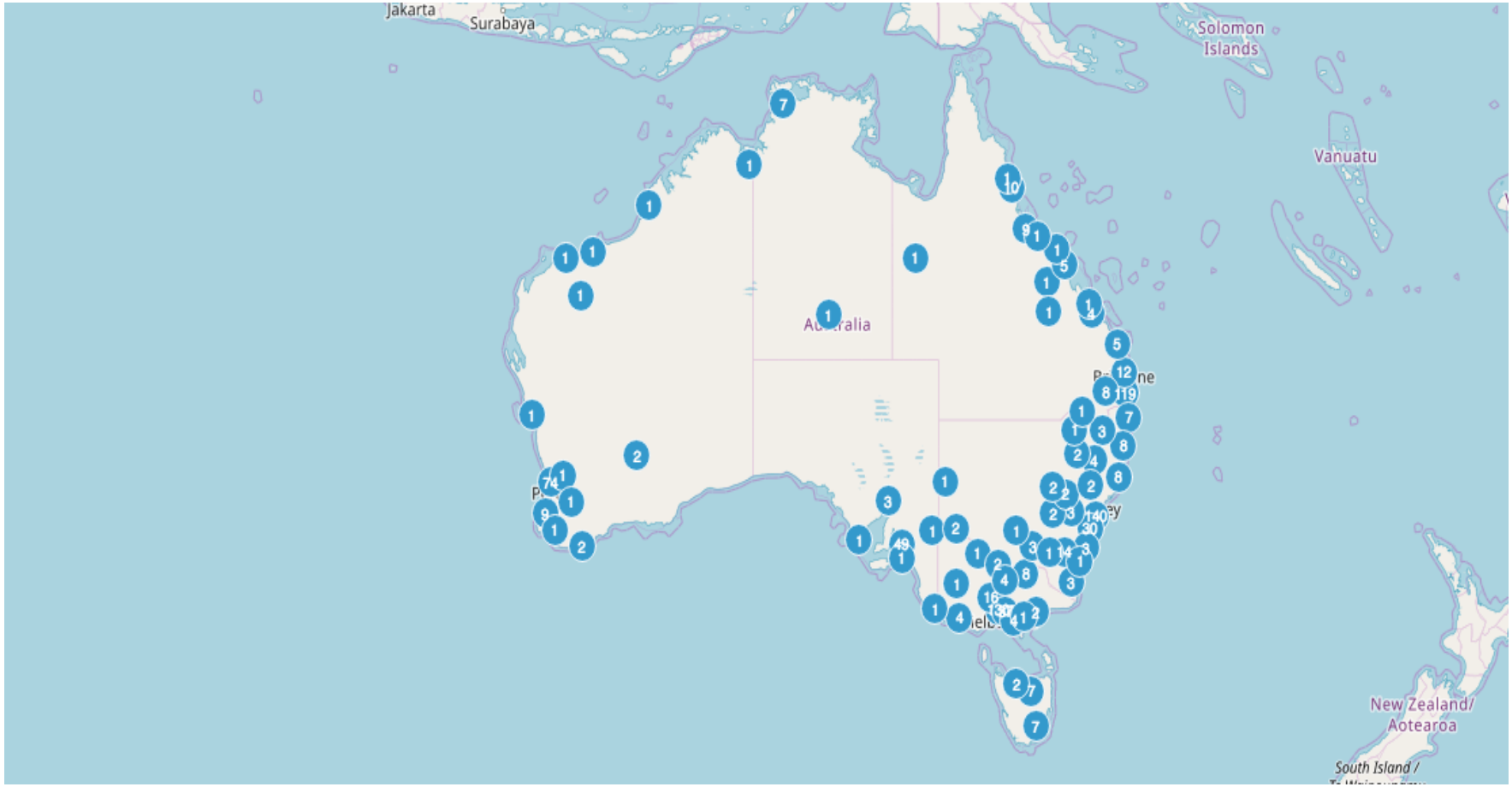
Coles	809

Key data sources used in your analysis

Geosciences Digital Elevation Modal
BOM National Weather Station Data
CANUTE Tidal Gauge Network
RFS Bushfire Spatial Mapping
Melbourne Water flood maps of Victoria
Australian National Soils Map

PHYSICAL DISTRIBUTION OF YOUR ASSETS

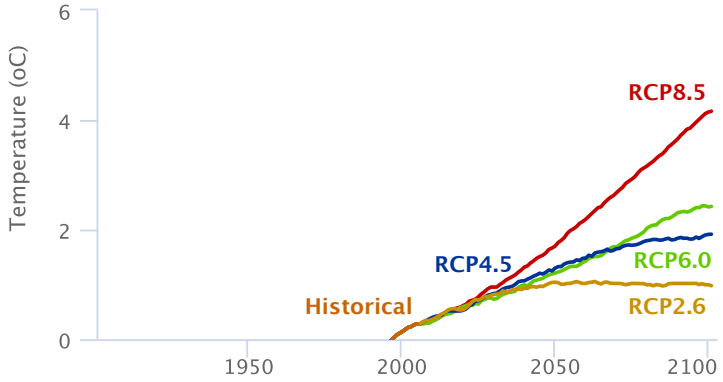
This map shows where all of your assets are located. Blue dots show clusters of assets.



YOUR CLIMATE SETTINGS

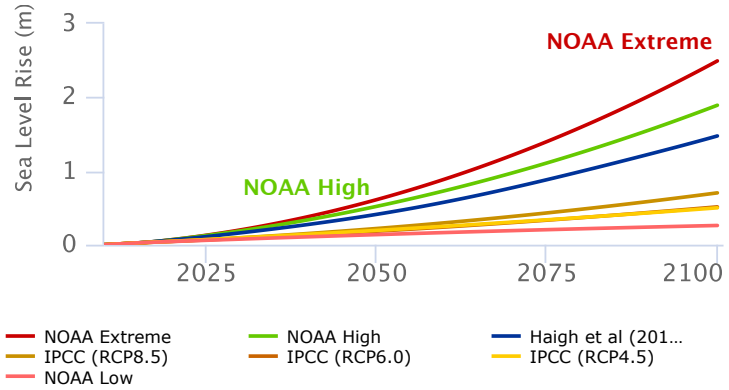
Intergovernmental Panel on Climate Change Climate Projections

The IPCC fifth assessment report (AR5), considers a number of Representation Concentration Pathways (RCP), representing future scenarios for annual carbon emissions, & the associated warming relative to pre-industrial times. RCP 8.5 is representative of a high emissions scenario & is broadly consistent with current trajectories, & temperature rises of 4°C by 2100.



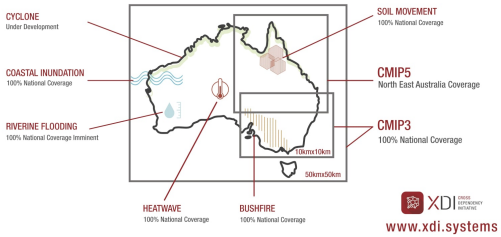
Sea Level Rise (SLR) Projections

One of the major consequences of climate change is rising sea levels. An increase in average global temperatures causes the thermal expansion of oceans & also causes ice-sheets & glaciers to melt adding to the water in the oceans. Currently the average global sea level is rising by 3.2mm per year. The IPCC has provided a series of SLR projections for different emissions pathways.



Australian Coverage:

CMIP - Coupled Model Intercomparison Project Phases



Your analysis uses:

RCP 8.5 for Global Climate Models (GCMs) & Regional Climate Models (RCMs).

RISK COST

Annual Average Cost of Damage (Risk Cost).

This section of the XDI SOAR report outlines the financial cost of damage and disruption caused by the impacts of extreme weather and climate change on your assets. Risk Cost is equivalent to an insurance premium pooled across all of the assets - not including a transaction fee or excess. You or the users of these assets may use commercial insurance or self-insure (you take the risk and pay for damage and repairs when they occur). Note that some of the risks are not covered under typical insurance policies (e.g. coastal inundation and soil contraction damage).

The direct costs arise from the probability of each hazard at a severity sufficient to cause damage to a component of the assets, multiplied by the value of each component that would need to be replaced by such an event. The Annual Average Cost of Damage also includes indirect costs, such as recompense for disruption to customers or fines for licence breaches.

The financial impacts are summed into an ‘Annual Average Cost of Damage’ also referred to as the Annual Risk Cost. They are expressed in today's dollars with no discounting unless otherwise specified.

THE RISK OUTLOOK

Risk Cost over time for the included assets.

This graph shows the Annual Average Risk Cost per asset ie: total Risk Cost across the whole portfolio divided by the number of assets.

Annual Average Risk Cost per asset per year.

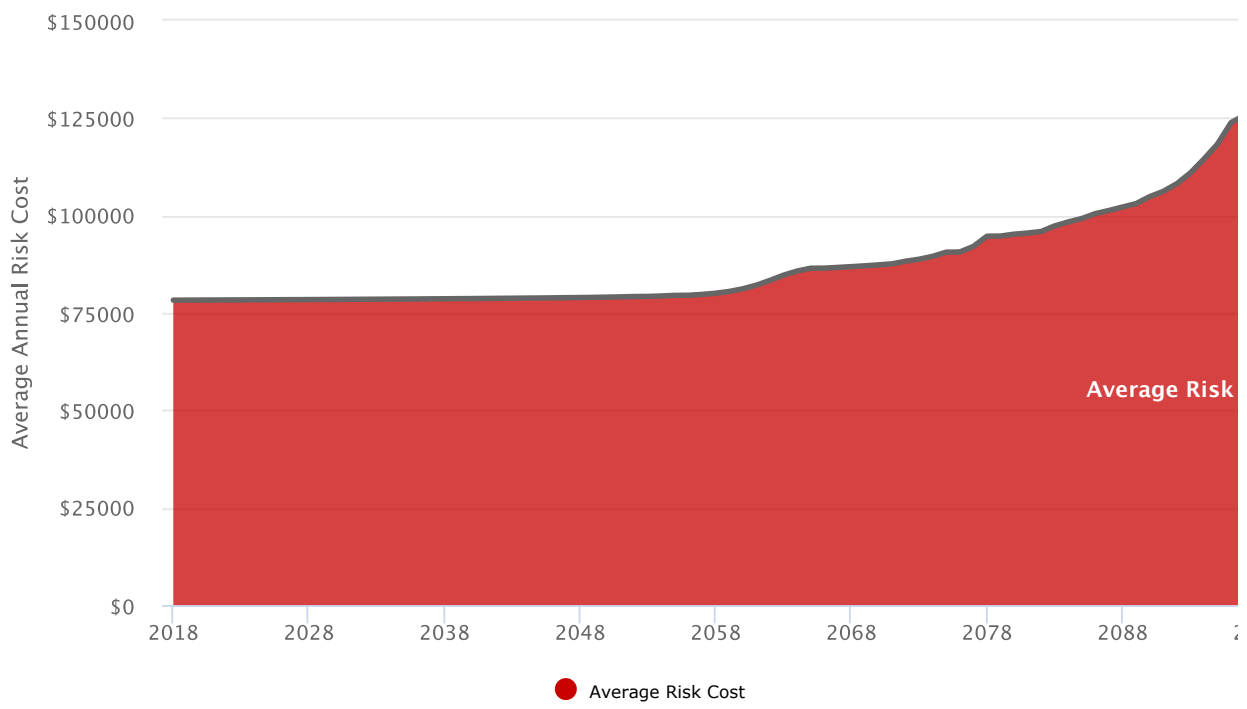
2020: $78,274

2030: $78,434

2040: $78,659

2050: $79,027

2100: $129,132

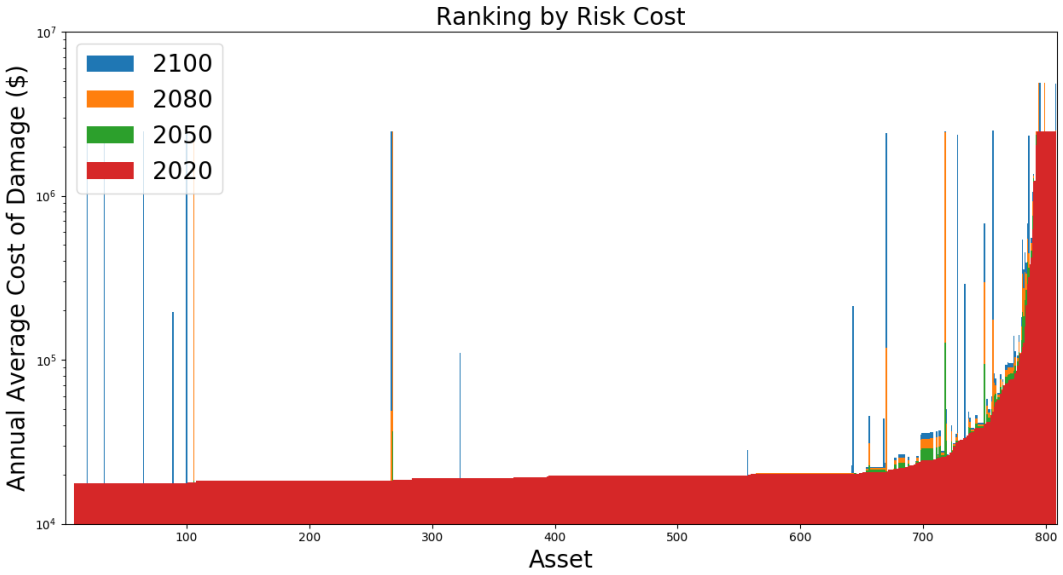


ASSETS RANKED BY RISK OF DAMAGE

Ranking by Annual Average Cost of Damage in 2020, 2050, 2080, 2100.

Ranking by Annual Average Cost of Damage: This chart ranks all of your assets according to the Annual Average Cost of Damage.
The assets are ranked from lowest on the left to highest on the right.
The x-axis shows the count of assets

Note: This is a logarithmic scale to make it easier to see the very small and very large results, so read the y-axis carefully.



IDENTIFYING YOUR AT-RISK ASSETS

In XDI Globe you can download a full database on the climate change impacts to each of your assets. Here is an example of the 5 most impacted assets for each of your archetypes, and an example of how the top 5 most impacted assets will change over time. Rank 1 has the highest risk.

Rank	Coles
1	Coles - Yamba
2	Coles - Pimpama City Shopping Centre
3	Coles - Labrador
4	Coles - Launceston (racecourse)
5	Coles - Runaway Bay

Rank	Year 2020	Year 2050	Year 2080	Year 2100
1	Coles - Launceston (racecourse)	Coles - Launceston (racecourse)	Coles - Yamba	Coles - Yamba
2	Coles - Rockhampton South	Coles - Rockhampton South	Coles - Labrador	Coles - Pimpama City Shopping Centre
3	Coles - Innisfail	Coles - Innisfail	Coles - Launceston (racecourse)	Coles - Labrador
4	Coles - Northam	Coles - Northam	Coles - Rockhampton South	Coles - Launceston (racecourse)
5	Coles - Echuca	Coles - Echuca	Coles - Innisfail	Coles - Runaway Bay

GEOGRAPHICAL DISTRIBUTION

Geographically displaying where there are concentrations of assets.

The data is clustered by areas. The hazard risk is aggregated in each of the areas and can be displayed in a number of time steps to show the change in risk to the area and to help identify high risk regions.
SOAR is a snapshot of your assets resilience according to the settings entered in XDI Globe. Further, more detailed analysis (per asset, per hazard) can be accessed working in XDI Globe.

GEOGRAPHICAL DISTRIBUTION OF RISK COST

Annual Average Risk Cost Overview

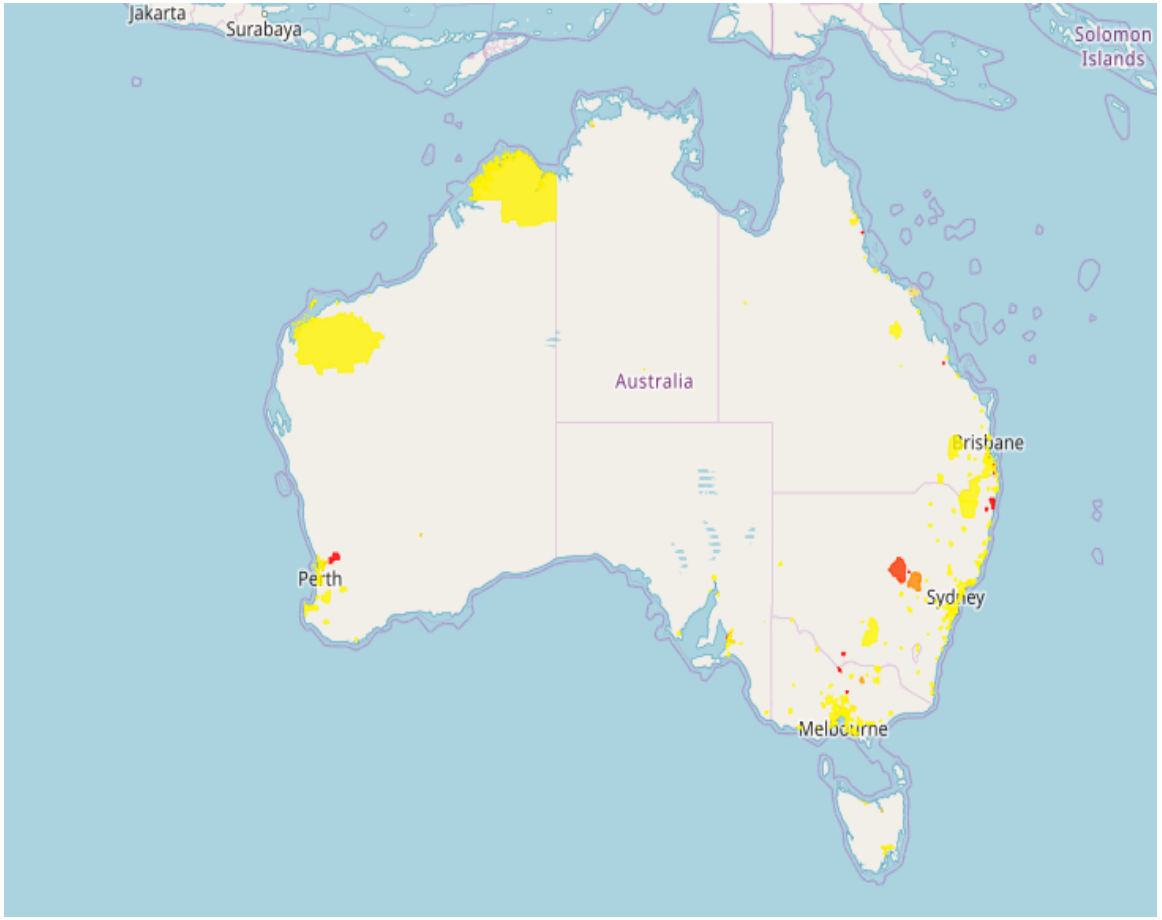
The Overview map shows the Annual Average Risk cost per area.

Working in XDI Globe allows dynamic exploration of the risk landscape, enabling more detailed views and different geographical angles

Legend

Risk Fraction: Annual Average Loss (AAL) as a fraction of total asset value, averaged across all the assets in the area.

No Risk	Low	Medium	High	Very High
0.00%	0.00% to 0.25%	0.25% to 0.50%	0.50% to 0.75%	0.75% or above

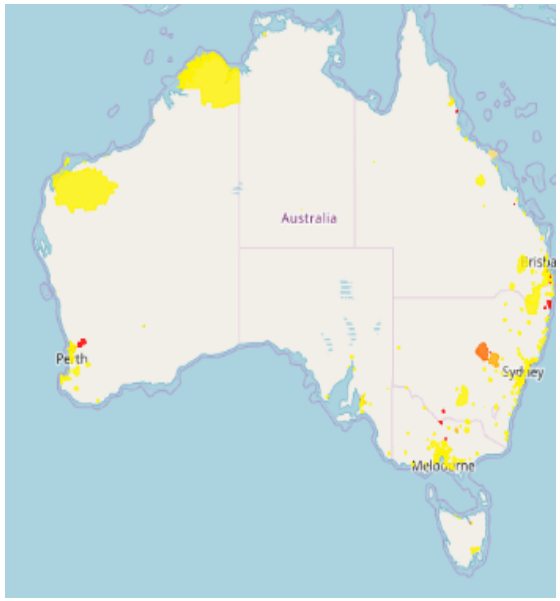


RISK DISTRIBUTION CHANGE

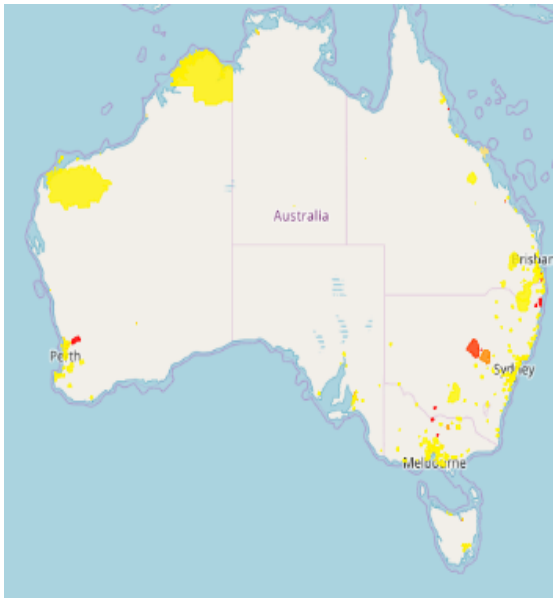
The Evolution of Risk Over Time

The Risk Fraction is the Annual Average Cost of Damage divided by the total replacement cost of an asset or assets.

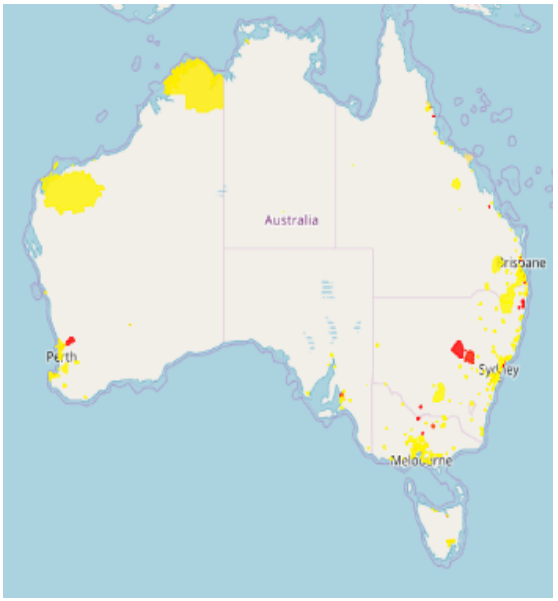
2020



2050



2100

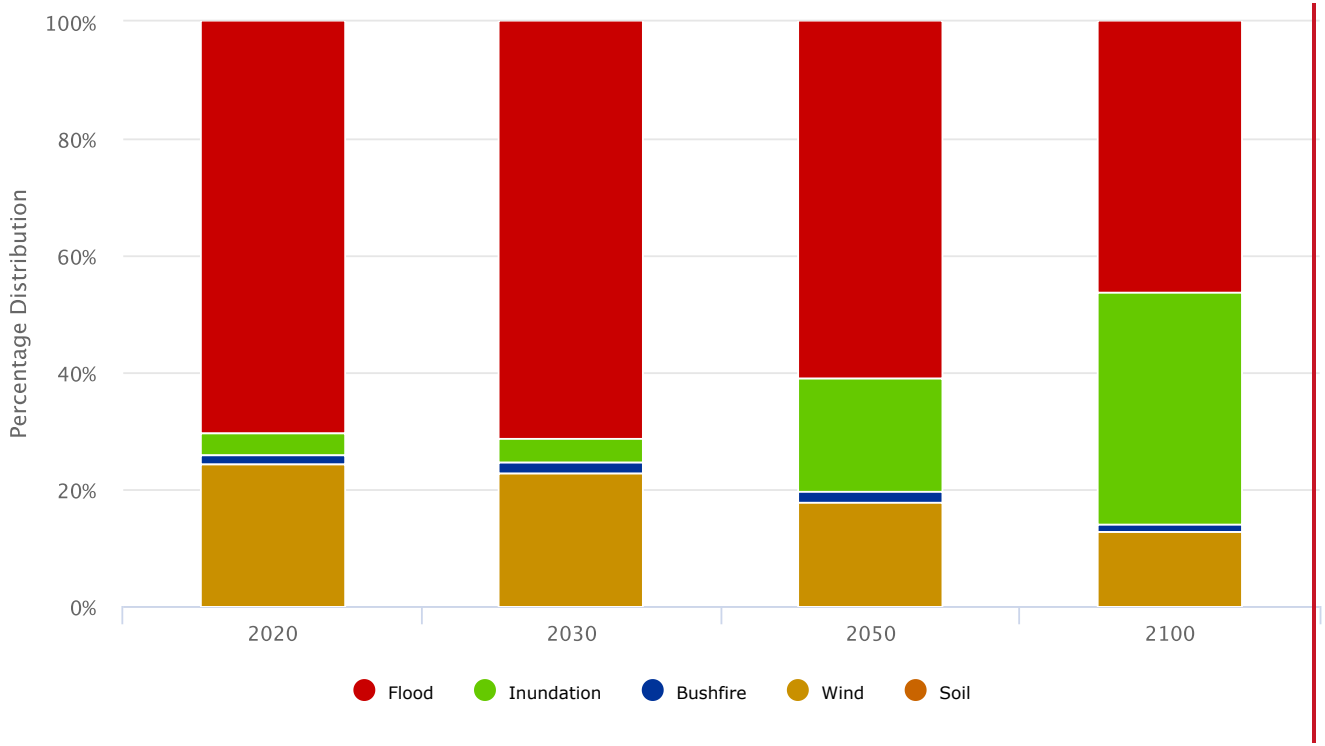


HAZARDS

The hazards driving risk affecting your assets.

This section considers which hazards - like flooding or heat extremes - are causing the risks to your assets and how these change with time. This helps to understand the hazards to which the asset portfolio is more or less vulnerable. The following information has been taken from globe.xdi.systems. There you can also diagnose which parts of the asset are being damaged or failing due to each hazard.

ANNUAL AVERAGE LOSS BY HAZARD



Annual 2050 Risk Cost Summary per hazard for portfolio

Flood
$1,424,371

Inundation
$80,482

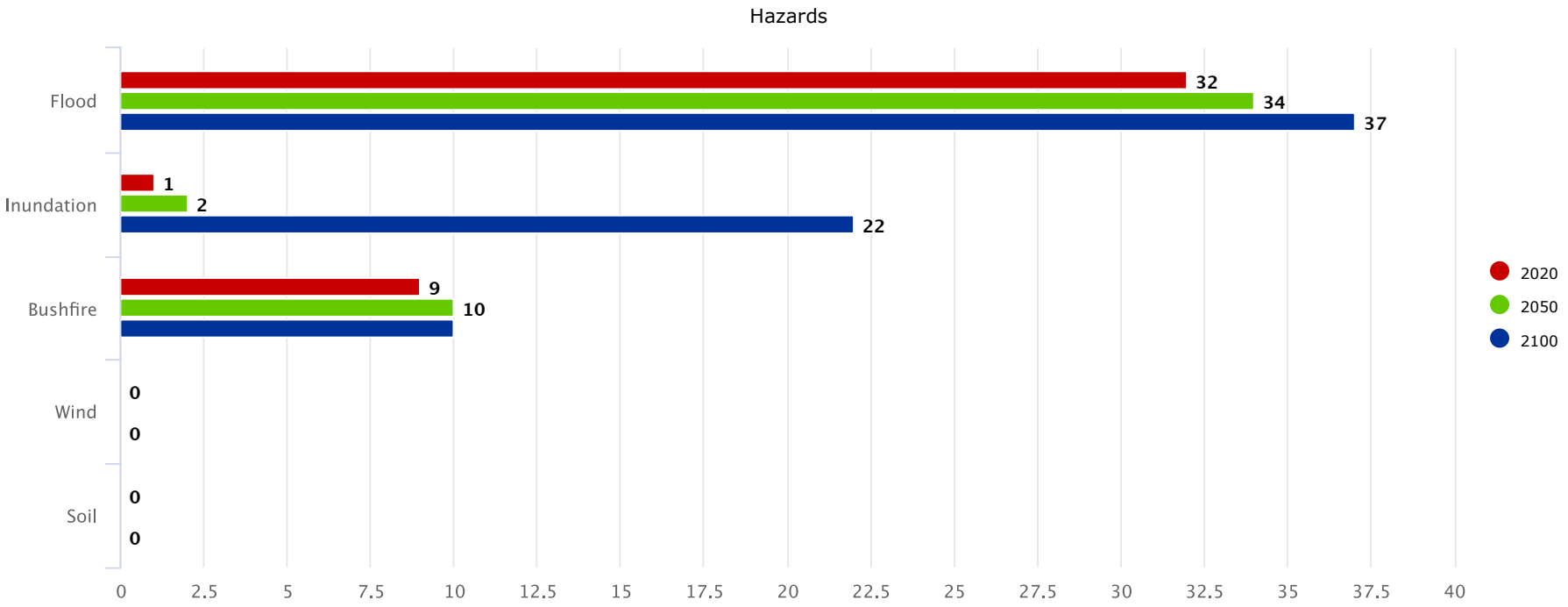
Bushfire
$37,958

Wind
$453,007

Soil
$2,091

YOUR HAZARD RISKS

The snapshot below shows an overall risk to different hazards. The bar chart shows the total count of assets exposed over 1% risk cost fraction in the years 2020, 2050 and 2100.



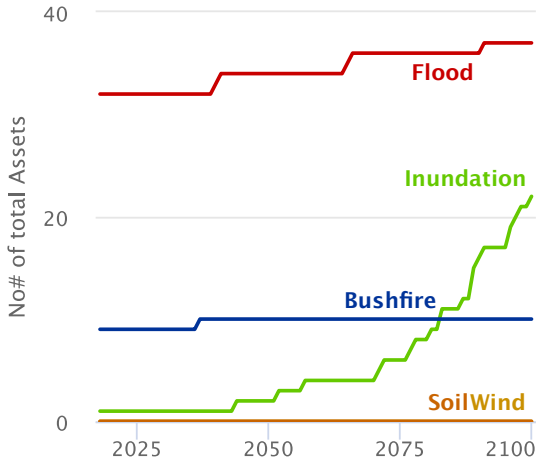
CHANGING NUMBER OF ASSET IMPACTS PER HAZARD

Thresholds of Risk

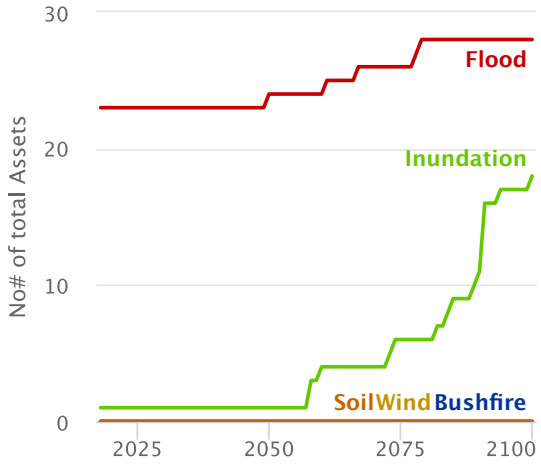
The thresholds are calculated by taking the Average Annual Risk Cost and dividing it by the Asset Value. This is referred to as the Risk Fraction, which can provide insight into the insurability of an asset. Beyond a Risk Fraction of ~1% insurance may become unaffordable or unavailable. In this section, the number of properties that have a Risk Fraction greater that 1%, 5% and 10% are shown, as well as how these numbers change over time. The Table shows the percentage of the porfolio assets that have risk above the Risk Thresholds.

Threshold (%)	Year 2020	Year 2050	Year 2080	Year 2100
1.0 %	6.30 %	6.67 %	7.29 %	8.78 %
5.0 %	2.97 %	3.09 %	3.96 %	5.07 %
10.0 %	2.47 %	2.47 %	3.09 %	4.45 %

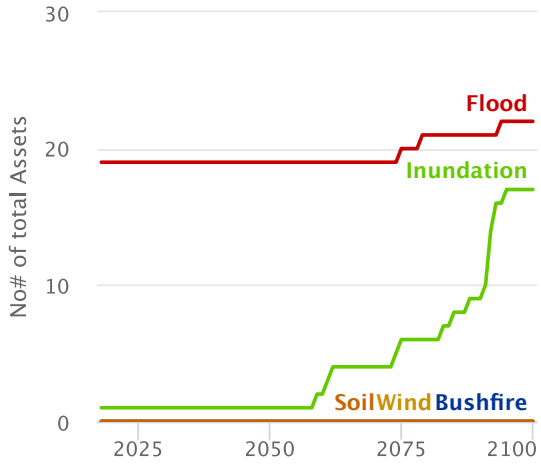
Number of assets over 1% Risk Fraction



Number of assets over 5% Risk Fraction



Number of assets over 10% Risk Fraction



BUSHFIRE

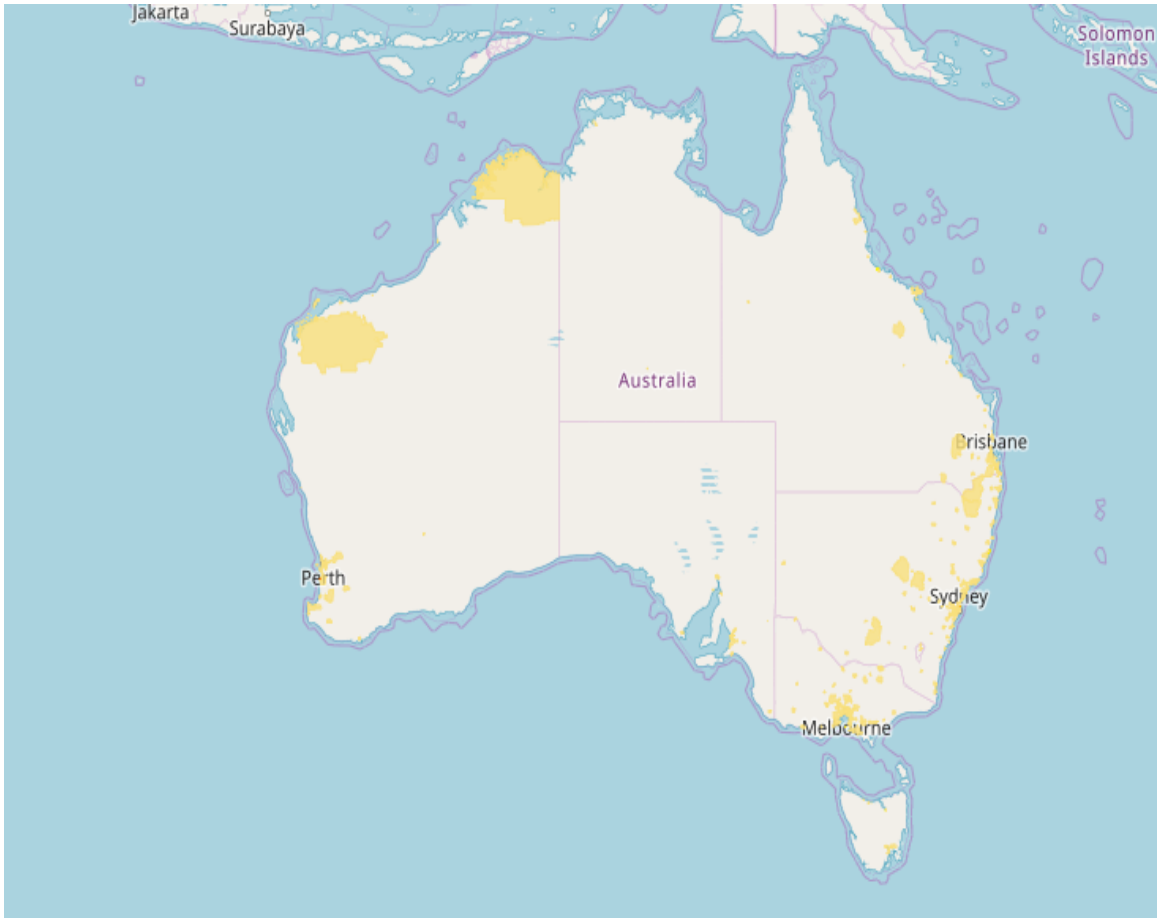
Bushfire Geographical Distribution of Risk Fraction

For Bushfire only: This map shows the impact of the hazard in each area. Each area is coloured by the Average Risk Fraction.

Legend

Risk Fraction: Annual Average Loss (AAL) as a fraction of total asset value, averaged across all the assets in the area.

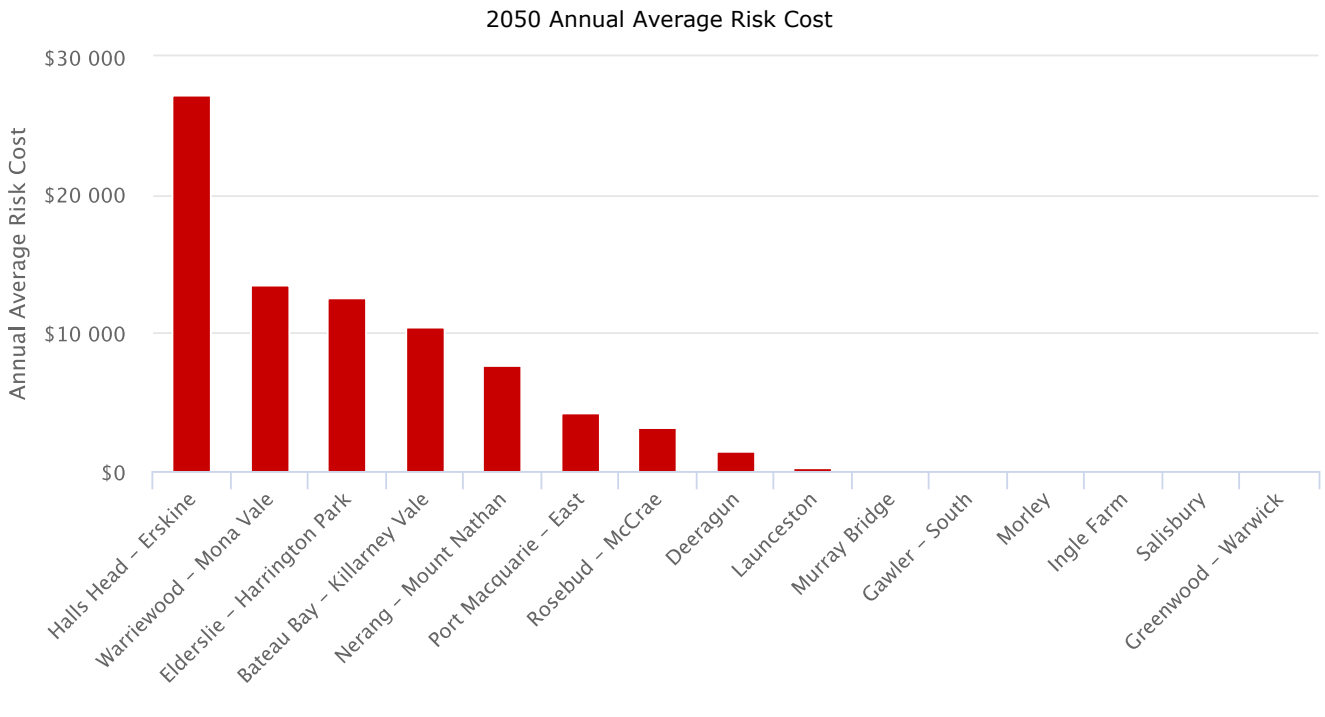
No Risk	Low	Medium	High	Very High
0.00%	0.00% to 0.25%	0.25% to 0.50%	0.50% to 0.75%	0.75% or above



RANKED BUSHFIRE RISK AREAS

Areas of High Risk

The chart ranks the top regions based on the assets with the highest Bushfire Annual Average Risk Cost in the year 2050.



FLOOD

Flood Geographical Distribution of Risk Fraction

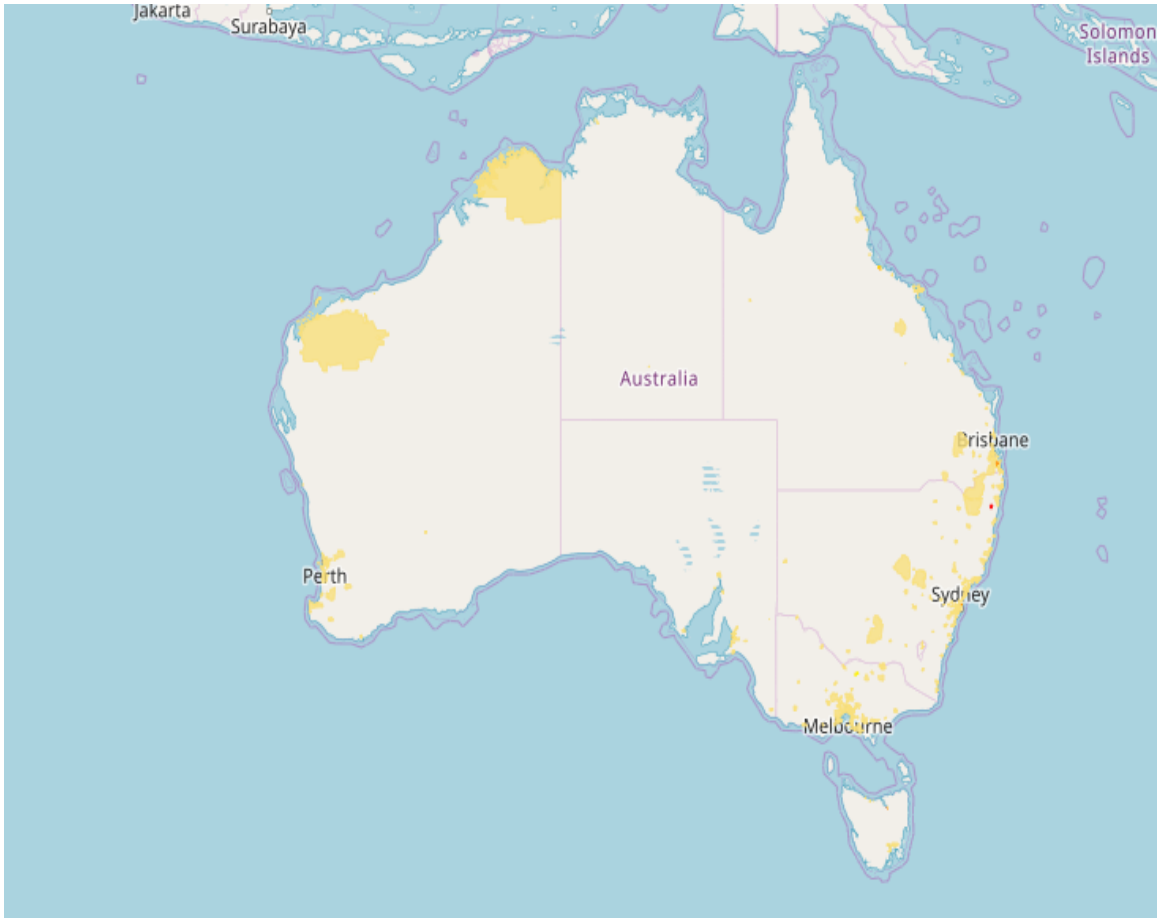
For Flood only: This map shows the impact of the hazard in each area. Each area is coloured by the Average Risk Fraction.

Legend

Risk Fraction: Annual Average Loss (AAL) as a fraction of total asset value, averaged across all the assets in the area.

No Risk	Low	Medium	High	Very High
0.00%	0.00% to 0.25%	0.25% to 0.50%	0.50% to 0.75%	0.75% or above

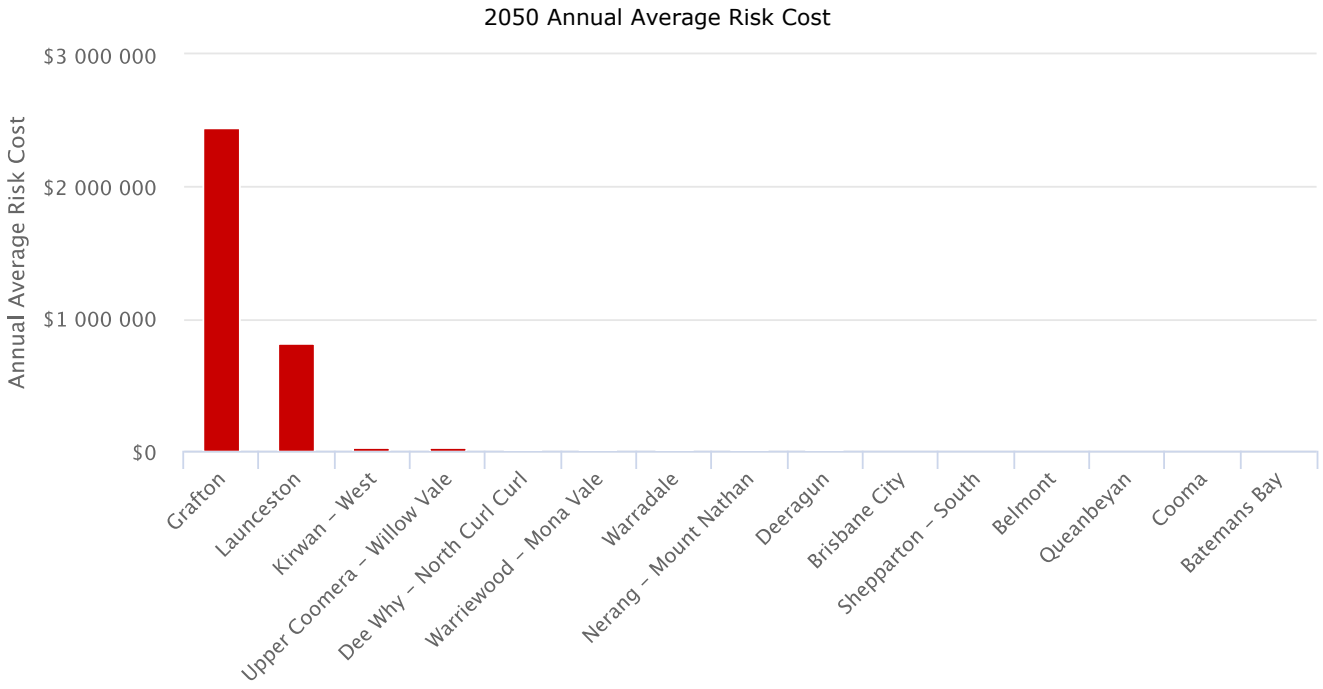
**Some areas may not have adequate flood input data to derive risk therefore this data may not represent the complete level of flood risk.



RANKED FLOOD RISK AREAS

Areas of High Risk

The chart ranks the top regions based on the assets with the highest Flood Annual Average Risk Cost in the year 2050.



INUNDATION

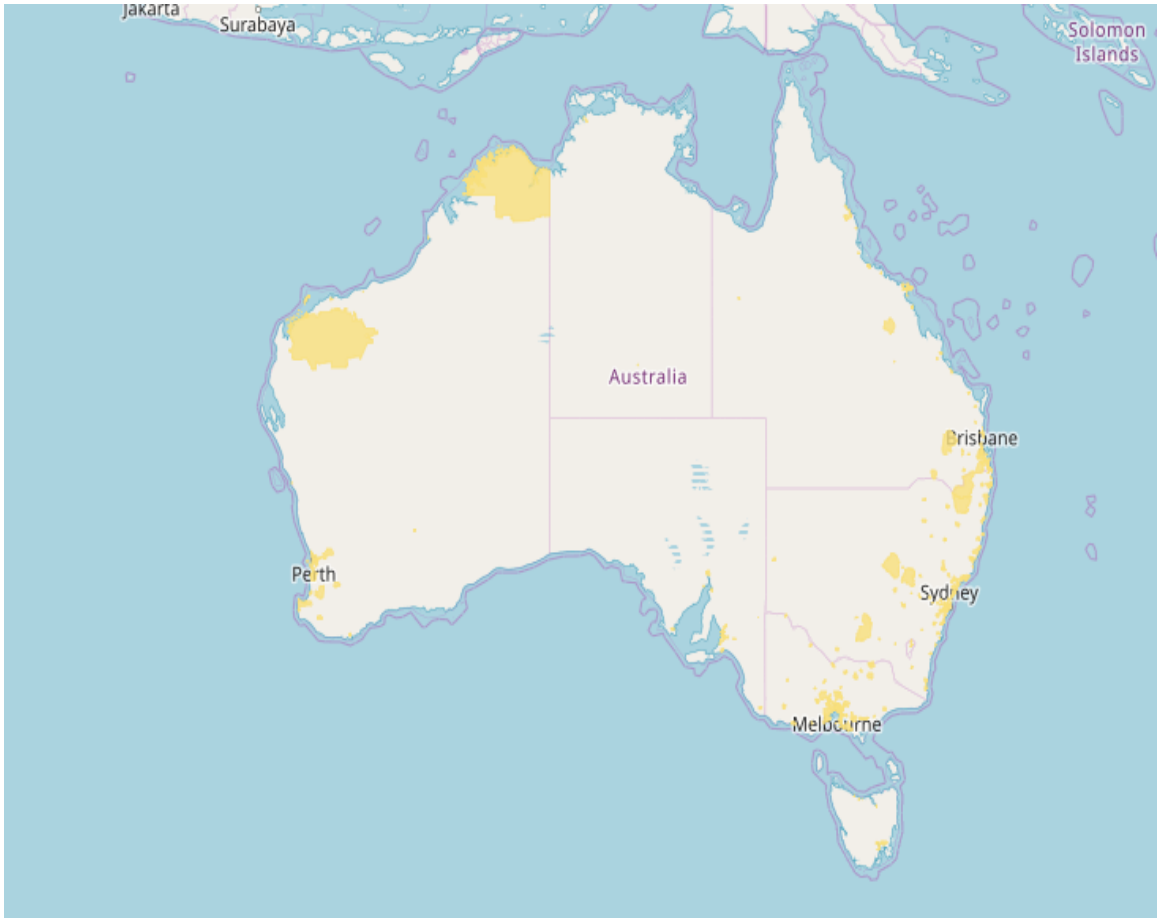
Inundation Geographical Distribution of Risk Fraction

For Inundation only: This map shows the impact of the hazard in each area. Each area is coloured by the Average Risk Fraction.

Legend

Risk Fraction: Annual Average Loss (AAL) as a fraction of total asset value, averaged across all the assets in the area.

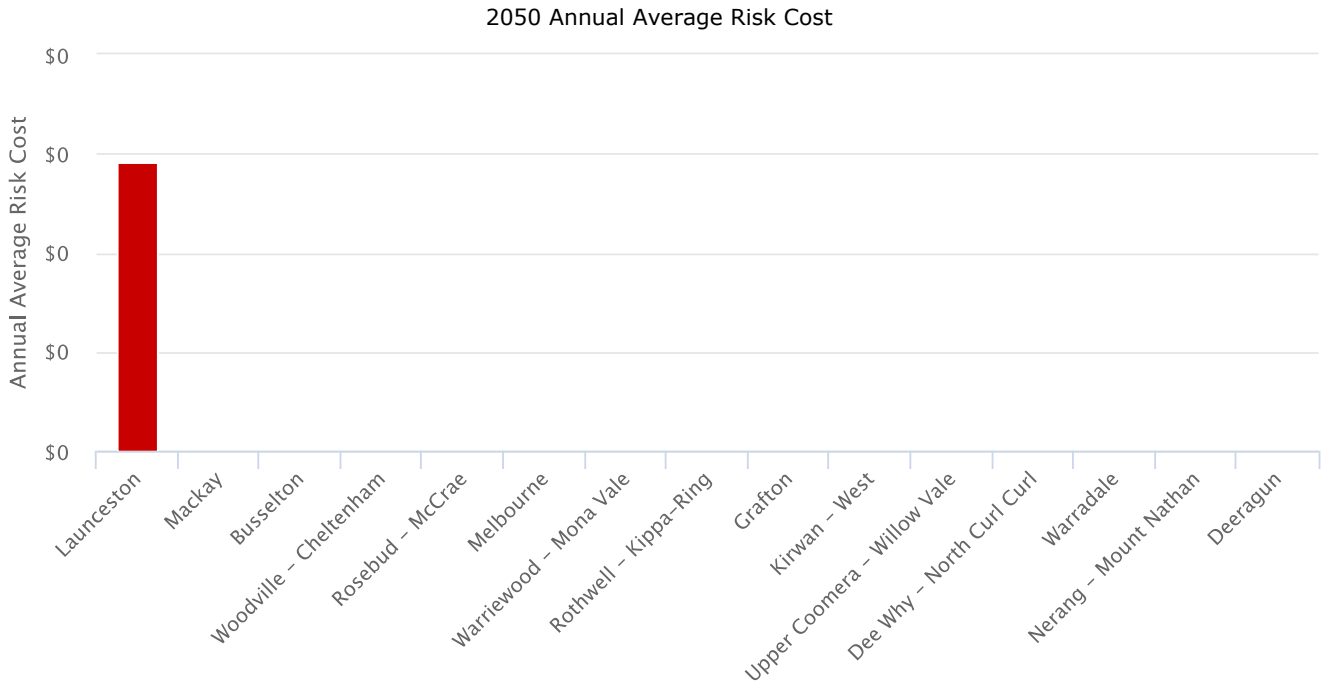
No Risk	Low	Medium	High	Very High
0.00%	0.00% to 0.25%	0.25% to 0.50%	0.50% to 0.75%	0.75% or above



RANKED INUNDATION RISK AREAS

Areas of High Risk

The chart ranks the top regions based on the assets with the highest Inundation Annual Average Risk Cost in the year 2050.



SOIL CONTRACTION

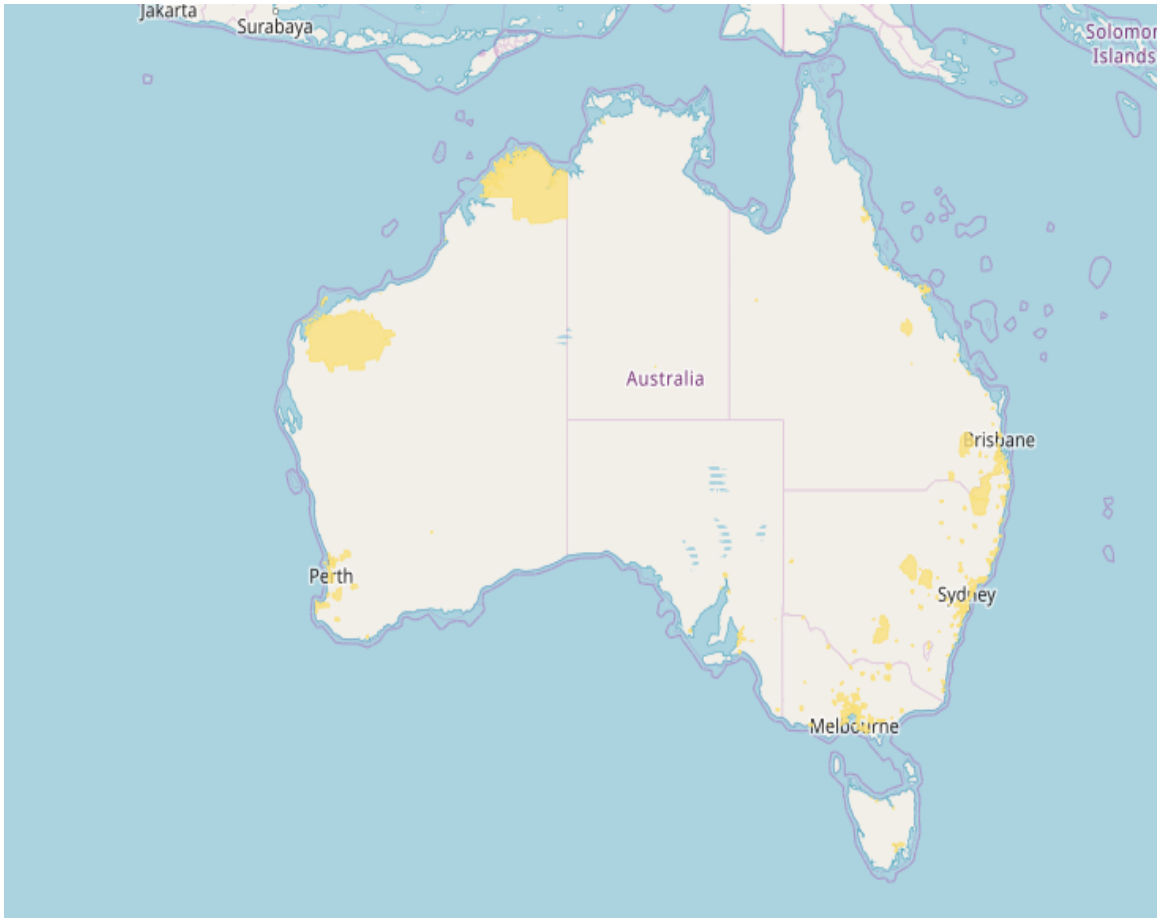
Soil Contraction Geographical Distribution of Risk Fraction

For Soil Contraction only: This map shows the impact of the hazard in each area. Each area is coloured by the Average Risk Fraction.

Legend

Risk Fraction: Annual Average Loss (AAL) as a fraction of total asset value, averaged across all the assets in the area.

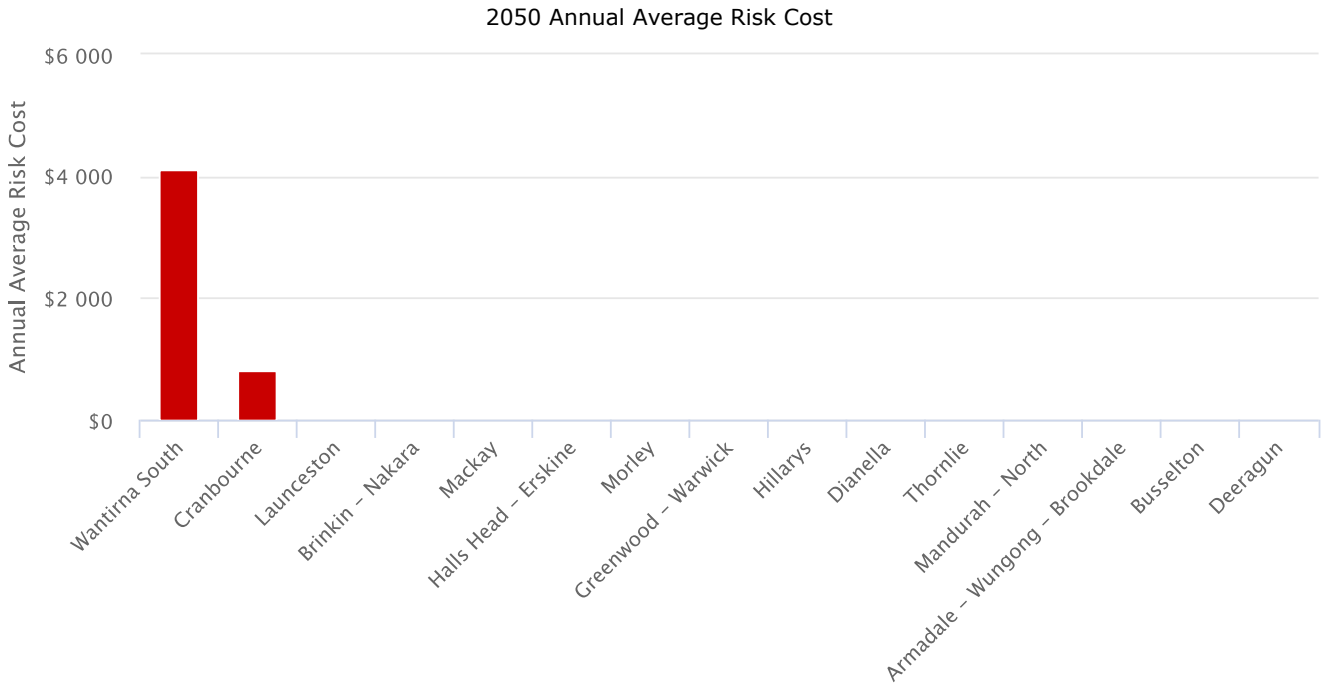
No Risk	Low	Medium	High	Very High
0.00%	0.00% to 0.25%	0.25% to 0.50%	0.50% to 0.75%	0.75% or above



RANKED SOIL CONTRACTION RISK AREAS

Areas of High Risk

The chart ranks the top regions based on the assets with the highest Soil Contraction Annual Average Risk Cost in the year 2050.



WIND

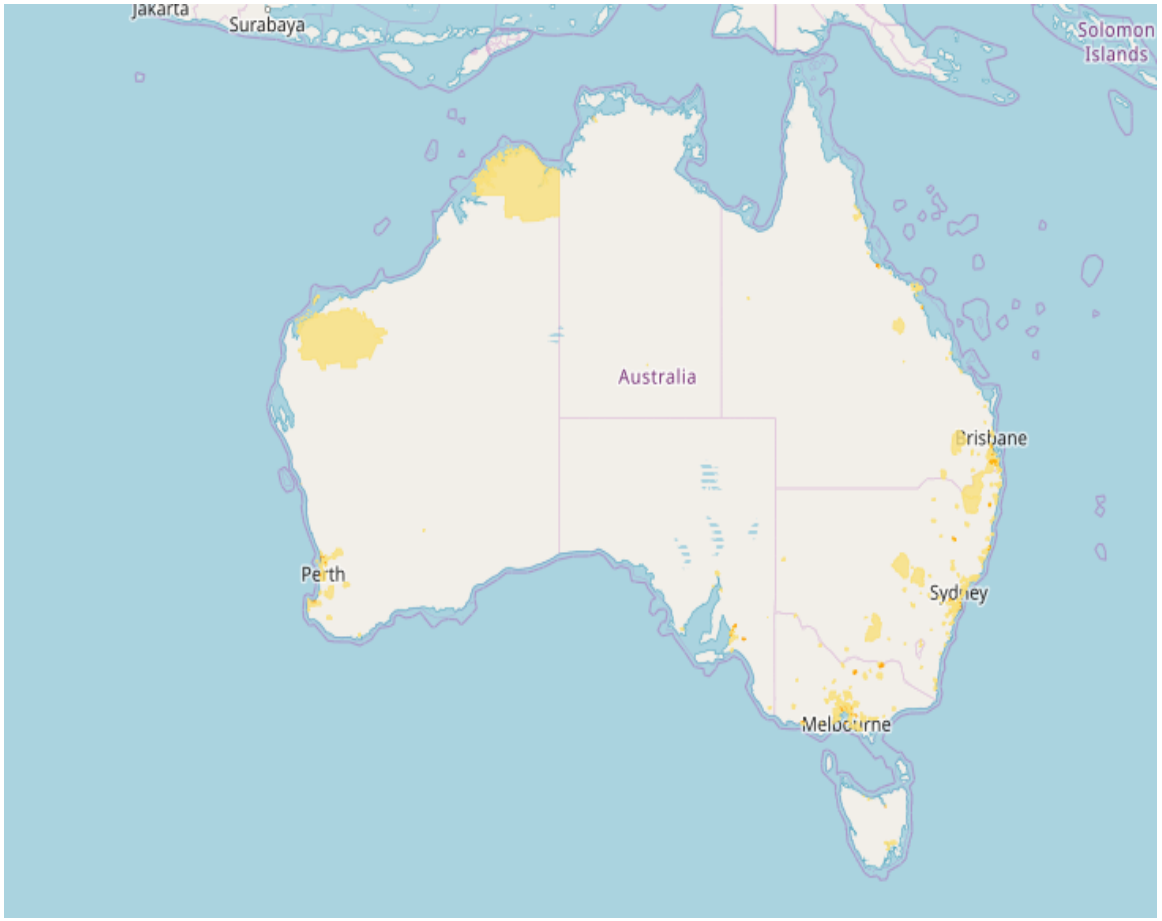
Wind Geographical Distribution of Risk Fraction

For Wind only: This map shows the impact of the hazard in each area. Each area is coloured by the Average Risk Fraction.

Legend

Risk Fraction: Annual Average Loss (AAL) as a fraction of total asset value, averaged across all the assets in the area.

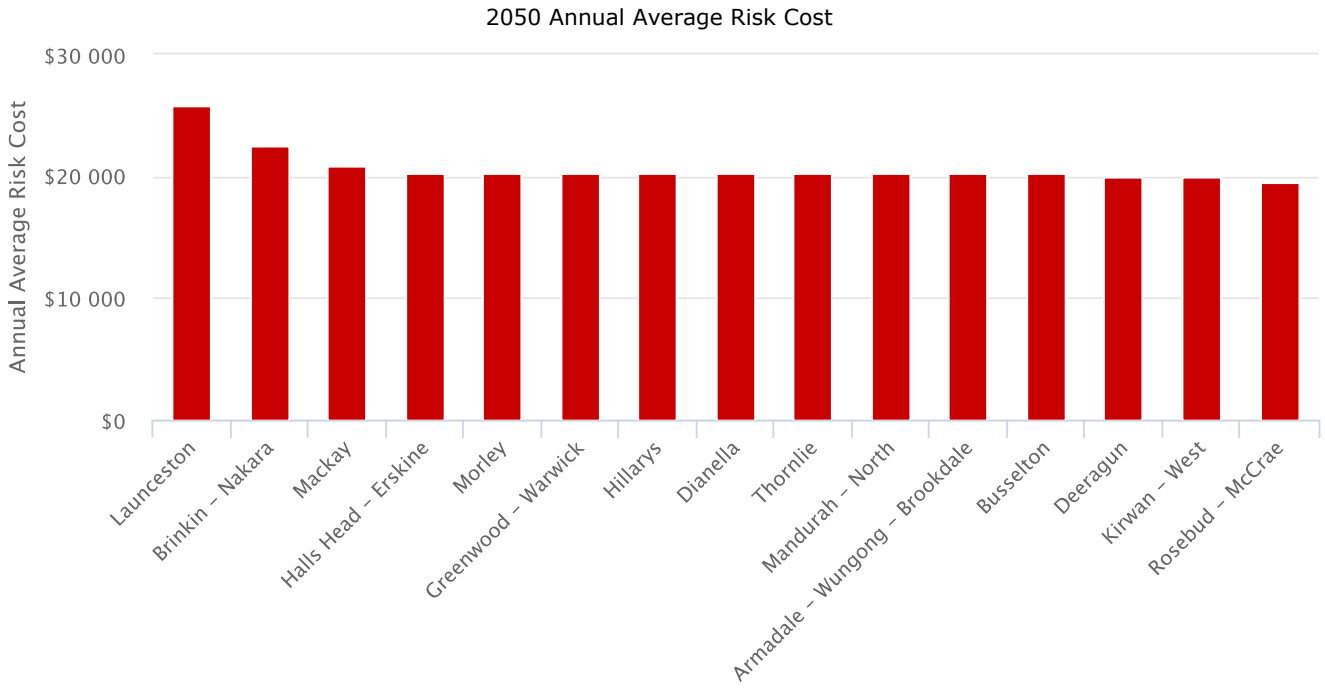
No Risk	Low	Medium	High	Very High
0.00%	0.00% to 0.25%	0.25% to 0.50%	0.50% to 0.75%	0.75% or above



RANKED WIND RISK AREAS

Areas of High Risk

The chart ranks the top regions based on the assets with the highest Wind Annual Average Risk Cost in the year 2050.



PEOPLE

The people affected by the impacts of extreme weather and climate change on the assets.

If there are people who depend on your assets, this section identifies the number of people impacted by extreme event disruptions in the future, and how different cohorts may be affected within that population.

KEY PERFORMANCE INDICATORS

Heat Stress

The graph shows the increase in Heat Stress events from now until 2100, using the Discomfort Index (DI).

The DI is used to infer the impact of heat and humidity on a person. Heat Stress can occur when the DI is above 28 for sustained periods. If external temperatures and humidity are high, a poorly insulated home with little thermal mass will allow the DI inside the home to rise more quickly and stay high for longer, increasing the risk of heat stress.

Withheld From This Report

KEY PERFORMANCE INDICATORS

Vulnerable People Impacts

Assets often provide a service; homes protect the occupants from the elements, transformers provide electricity, and reservoirs provide water. If an asset provides services to a defined or estimated number of people, the impacts on those people can be calculated. This chart indicates the number of people who would be affected by the failure or compromising of services provided by your assets each year. The impacts have been analysed according to the vulnerable groups below.

Seniors:Those aged over 65 are referred to here as seniors.
Physically Disabled: This represents people who have reduced physical capability and general mobility.
Mentally Disabled: This includes people who have a significant mental illness that impairs judgement, mobility or communication.
Children: Children younger than 5 years old are known to be at heightened risk from a range of climate change related hazards.

Withheld From This Report

ASSET VALUES

The Climate Adjusted Value of the assets and portfolio.

An asset which is expensive to fix or insure can be expected to have a lower value than an equivalent asset with low risk or impacts. This section uses the reduced ability to finance a property due to increased annual insurance payments as a means to estimate the changing value of an asset over time.

REDUCTION IN INDIVIDUAL ASSET VALUE

Assets ranked by Reduction in Value

Average asset value reduction as a percentage of original asset value. The assets are ranked from lowest on the left to highest on the right. The x-axis breaks the assets in 10% blocks. Also shown is a line indicating the average for all assets.

WARNING: This is a logarithmic scale to make it easier to see the very small and very large results, so read the y-axis carefully.

Withheld From This Report

OTHER RESOURCES

Other data sets, interfaces and tools that complement this SOAR report.

While the SOAR report provides an overview of the portfolio as it currently stands, there are other resources available to you that can provide a deeper insight into the effects of climate change and extreme weather on the assets.

OTHER RESOURCES

Your XDI Resilience Suite

This report is supported by a range of resources which can help you access the information in different ways and drill deeper into the data. There are also Modelling tools that you can use to test the effectiveness of adaptation options, calculate the net present value of investments and develop business cases.

XDI Globe
globe.xdi.systems

XDI Modelling
adaptinfrastructure.com

XDI SOAR
report.xdi.systems

XDI CR-Dashboard
rd.climaterisk.com.au

KEY TERMS

Legend for Area Maps

Risk Fraction: Annual Average Loss (AAL) as a fraction of total asset value, averaged across all the assets in the area.
The area maps combine each assets AAL. This value is multiplied by 10,000 in order to distinguish change between time periods.

No Risk

The area contains no material risk.

Low

The area contains AAL between 0.00%-0.25%.

Medium

The area contains AAL between 0.25%-0.50%.

High

The area contains AAL between 0.50%-0.75%.

Very High

The area contains AAL greater than 0.75%.

CAVEATS

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