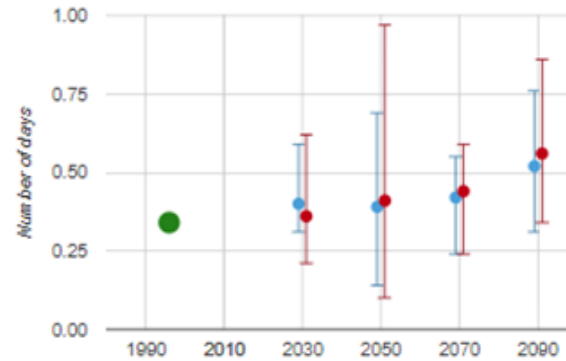


Very wet days:

Mean annual number of days when rainfall exceeds the observed 99.9th percentile



Climate change data for water modelling and decision making. What data are available and from where?

Dave Rissik

david.rissik@bmtglobal.com



Acknowledgements

- Fahim Tonmoy (BMT)
- John Clarke (CSIRO)
- Acacia Pepler (BoM)
- Ralph Trancoso (DES)
- Kathleen Beyer (NSW DPIE)



The Google logo is partially visible at the top of the page, showing the letters 'Google' in its characteristic multi-colored font.

Credible

Trusted

Authoritative

G

20

T

other explanations for climate change other than man-made CO₂ and here we look at some of the arguments put forward by those who believe that global warming is all a hoax.

International

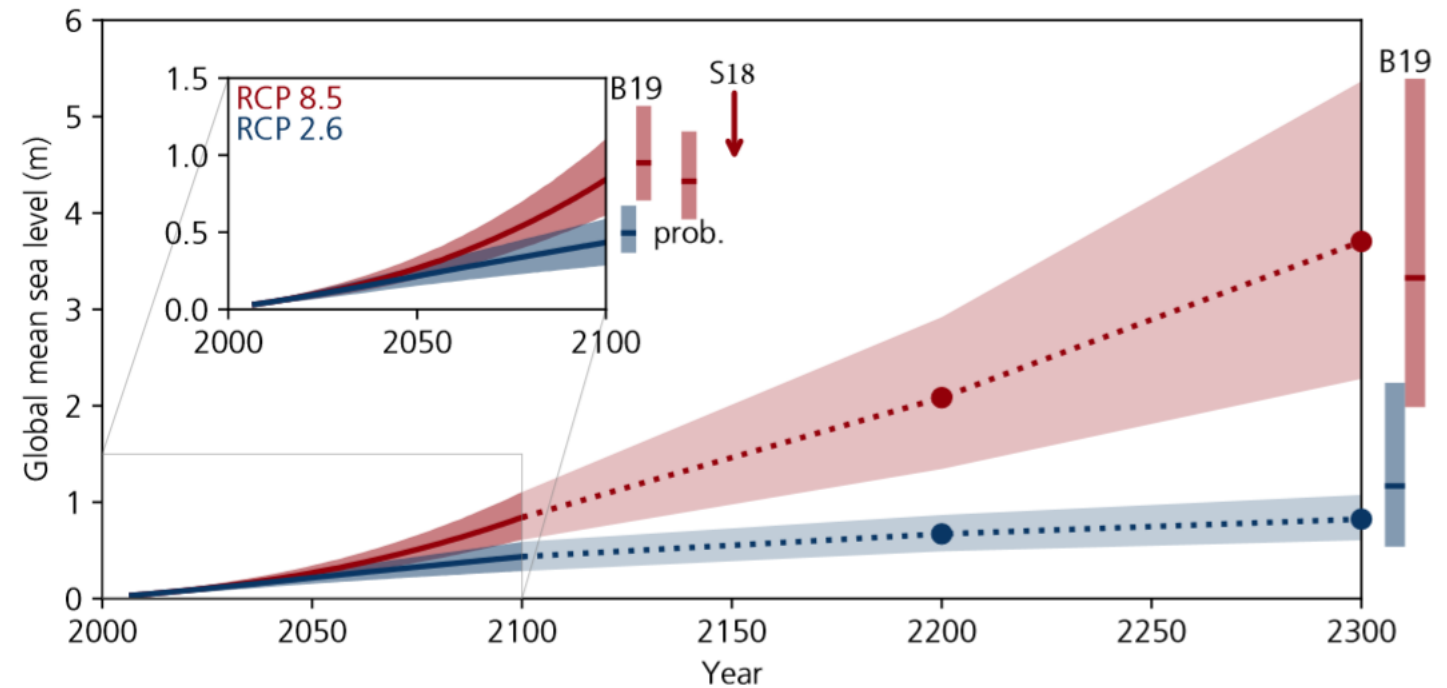
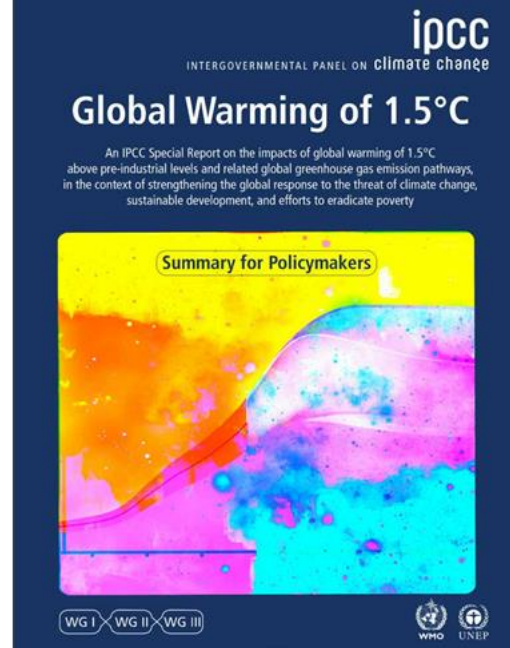
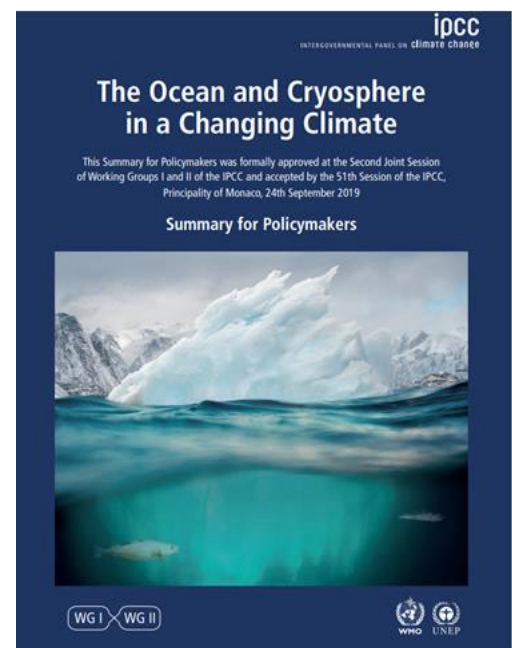


Figure 4.2: Projected sea-level rise until 2300. The inset shows an assessment of the *likely* range of the projections for RCP2.6 and RCP8.5 up to 2100 (*medium confidence*). Projections for longer time scales are highly uncertain but a range is provided (4.2.3.6). For context, results are shown from other estimation approaches in 2100. The two sets of two bars labelled B19 are from an expert elicitation for the Antarctic component (Bamber et al., 2019), and reflect the *likely* range for a 2 and 5°C temperature warming (*low confidence*; details section 4.2.3.3.1). The bar labelled “prob.” indicates the *likely* range of a set of probabilistic projections (4.2.3.2). The arrow indicated by S19 shows the result of an extensive sensitivity experiment with a numerical model for the Antarctic ice sheet combined, like the results from B19 and “prob.”, with results from Church et al. (2013) for the other components of sea level rise. S19 bars also show the *likely* range.

National data



State of the Climate 2018

- Report at a glance
- Australia's changing climate
- Oceans
- Cryosphere
- Greenhouse gases
- Future climate and further information
- References



Report at a glance

The Bureau of Meteorology and CSIRO play an important role in monitoring, analysing and communicating observed changes in Australia's climate.

This fifth, biennial State of the Climate report draws on the latest monitoring, science and projection information to describe variability and changes in Australia's climate. Observations and climate modelling paint a consistent picture of ongoing, long term climate change interacting with underlying natural variability.

These changes affect many Australians, particularly the changes associated with increases in the frequency or intensity of heat events, fire weather and drought. Australia will need to plan for and adapt to some level of climate change. This report is a synthesis of the science informing our understanding of climate in Australia and includes new information about Australia's climate of the past, present and future. The science underpinning this report will help inform a range of economic, environmental and social decision-making and local vulnerability assessments, by government, industry and communities.



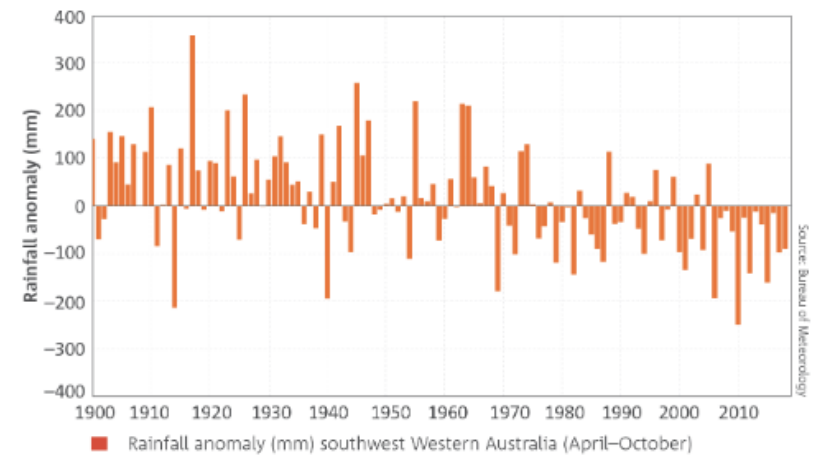
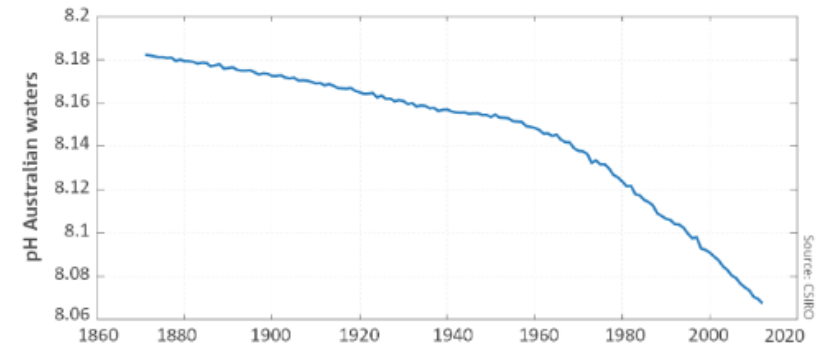
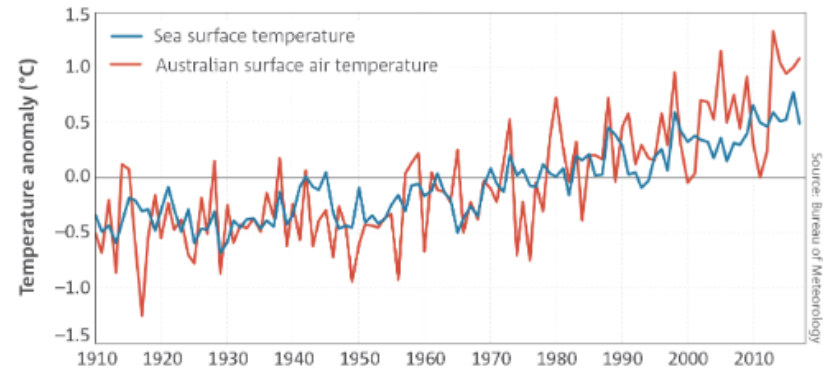
Key points



Key points

Australia

- Australia's climate has warmed just over 1 °C since 1910 leading to an increase in the frequency of extreme heat events.
- Oceans around Australia have warmed by around 1 °C since 1910, contributing to longer and more frequent marine heatwaves.
- Sea levels are rising around Australia, increasing the risk of inundation.
- The oceans around Australia are acidifying (the pH is decreasing).
- April to October rainfall has decreased in the southwest of Australia. Across the same region May–July rainfall has seen the largest decrease, by around 20 per cent since 1970.
- There has been a decline of around 11 per cent in April–October rainfall in the southeast of Australia since the late 1990s.
- Rainfall has increased across parts of northern Australia since the 1970s.
- Streamflow has decreased across southern Australia. Streamflow has increased in northern Australia where rainfall has increased.
- There has been a long-term increase in extreme fire weather, and in the length of the fire season, across large parts of Australia.



CLIMATE CHANGE IN AUSTRALIA



GETTING STARTED

Support and guidance for use of information and data.



CLIMATE CAMPUS

Learn about the underpinning science of climate change, modelling and projections.



PROJECTIONS AND DATA

Explore Australia's projected climate and access model data. Register for data access.



IMPACTS AND ADAPTATION

Learn about possible regional impacts on natural resources and management responses.



NEWS & UPDATES

Keep up to date on datasets, enhancements, and downtime.



HISTORIC CLIMATE CHANGE

Learn about observed climate change over Australia.



REGIONAL CLIMATE CHANGE EXPLORER

Summary of climate change projections for Australian regions.



PUBLICATIONS LIBRARY

Download technical and regional reports and other publications.



Australian Government
Department of the Environment
Bureau of Meteorology



TOOL RATINGS

The range of tools allow access to information of differing levels of complexity. Each tool is rated according to the complexity of the information provided and the level of climate science knowledge needed to fully understand the information and how best to use it. This is shown by the complexity icon displayed on each tool. The three ratings are described below:

BASIC



This is an entry-level tool requiring no prior understanding of climate projections science. However, a general familiarity with weather and climate terminology will assist understanding. This type of information can be found in the [climate campus](#) as well as on the [Bureau of Meteorology's](#) website.

INTERMEDIATE

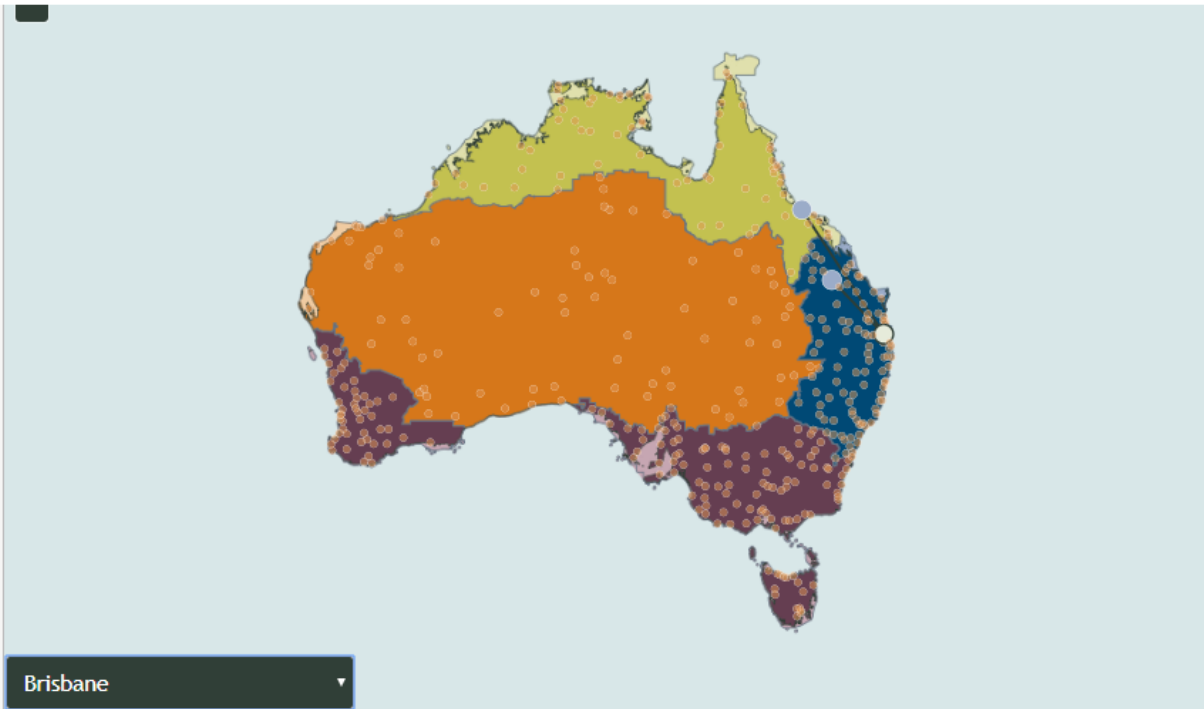


Intermediate tools are designed for users with a good fundamental understanding of climate and weather and some understanding of climate science. To get the maximum value from these tools, users are strongly encouraged to complete the [online training](#).

ADVANCED



Advanced tools are designed for users with a good understanding of climate science, particularly climate projections science. In particular, a working knowledge of the [Climate Futures Framework](#) and the 'key cases' approach to impact assessment is assumed. Much of this information is available from the climate campus and [online training](#). To make the most of Advanced tools however, face-to-face training is recommended.

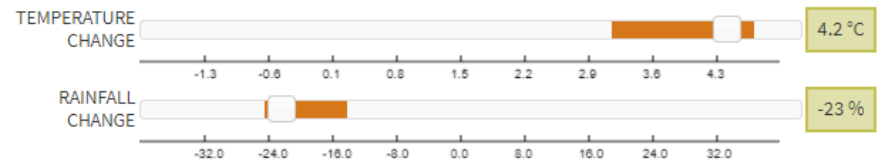


Brisbane ▾

Preset Scenarios

EMISSIONS SCENARIO	RCP 8.5 ▾	TIME PERIOD	2090 ▾
DESCRIPTION	Maximum Consensus ▾		

Configure Data



ANALOGUE TOWNS

Woorabinda, Home Hill,

EAST COAST CLIMATE FUTURES

[Go back](#)

Change scenario:

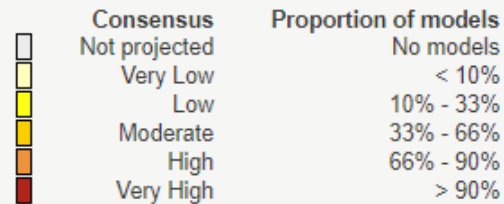
RCP 8.5

Change time period:

2090



		December - February (DJF) Maximum Daily Temperature (C)			
		Slightly Warmer < 0.50	Warmer 0.50 to 1.50	Hotter 1.50 to 3.00	Much Hotter > 3.00
December - February (DJF) Maximum Daily Temperature (C)	Much Hotter > 3.00				+ 53 of 67 (79%)
	Hotter 1.50 to 3.00			+ 14 of 67 (21%)	
	Warmer 0.50 to 1.50				
	Slightly Warmer < 0.50				





EARTH SYSTEMS AND CLIMATE RESEARCH TO INFORM DECISION MAKING AND POLICIES

LEARN MORE

NEWS



Nitrogen fertilisers are incredibly efficient, but they make climate change a lot worse



IPCC flags risks and response options for polar and ocean environments in latest report

WELCOME TO THE EARTH SYSTEMS AND CLIMATE CHANGE HUB

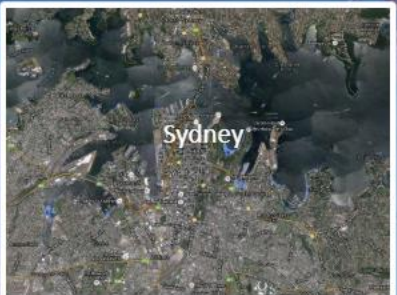
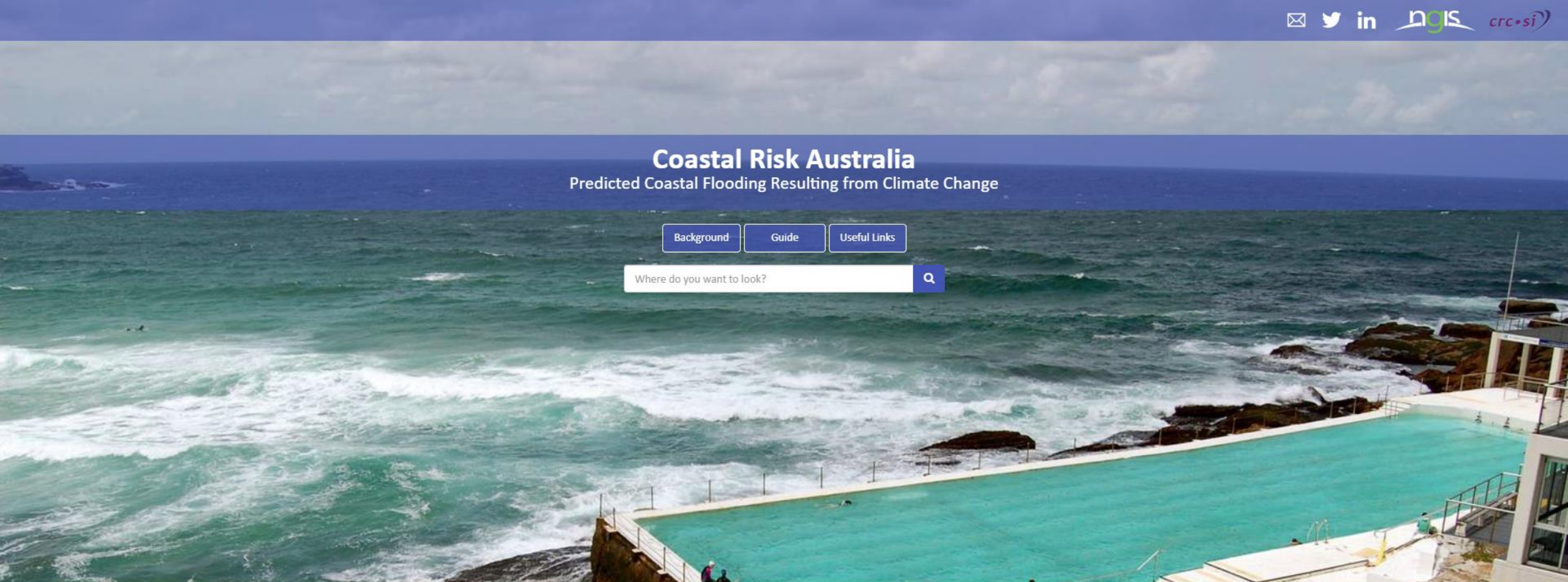
We're building our world-leading climate and Earth systems science capability and using our understanding of Australia's past, present and future climate to supply useful and accessible climate information for Australia.

Coastal Risk Australia

Predicted Coastal Flooding Resulting from Climate Change

- Background
- Guide
- Useful Links

Where do you want to look? 🔍



Coastal Risk Australia 2100

Place Search

Predicted Manual

Predicted Inundation Scenario

1.High

Current Day Highest Tide	2100 + 0.74m Highest Tide
--------------------------	-----------------------------

Virtual Tide Gauges

DEM

Background

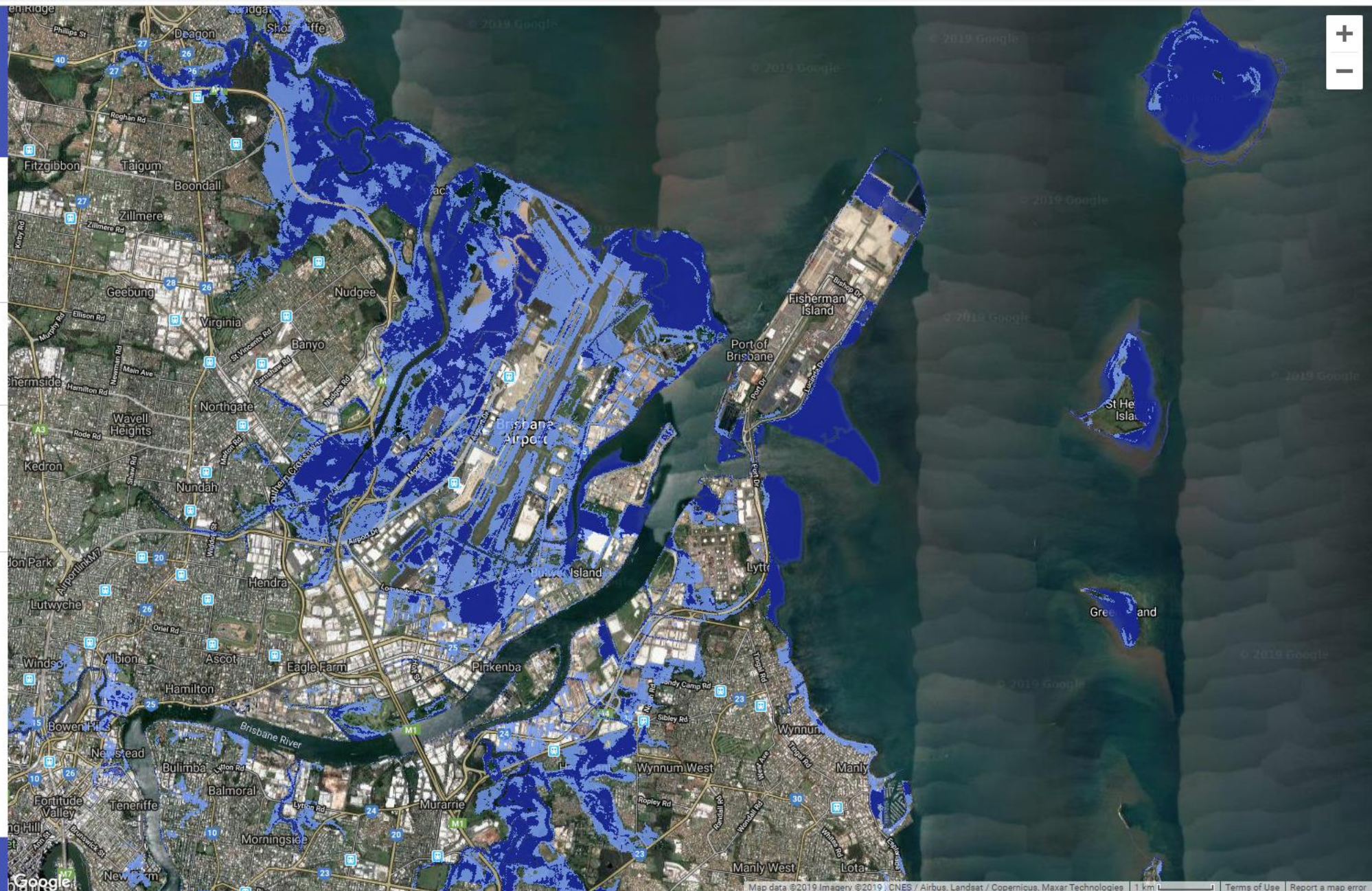
Guide

Useful Links

Send Feedback

Share via Twitter


Share via Linked In





A changing climate in coastal Australia: Build knowledge, take action

-  What is climate change?
-  Assess risks and impacts
-  Understand adaptation
-  Undertake adaptation
-  Connect with the adaptation community



Getting started
Not sure where to begin with CoastAdapt?



Sea-level rise and you
Select your local area to view future sea-level rise and climate extremes



Shoreline Explorer
Use an interactive map to discover more about your current coastline



Coastal Climate Adaptation Decision Support
Determine vulnerabilities



Sea-level rise and future climate information for coastal councils

Search for your Local Government Area by keyword or postcode to view sea-level rise information.

Print Save

[return to datasets page](#)

Brisbane, Qld

Sea-level rise

Inundation maps

Temperature

Rainfall

Select greenhouse gas scenarios

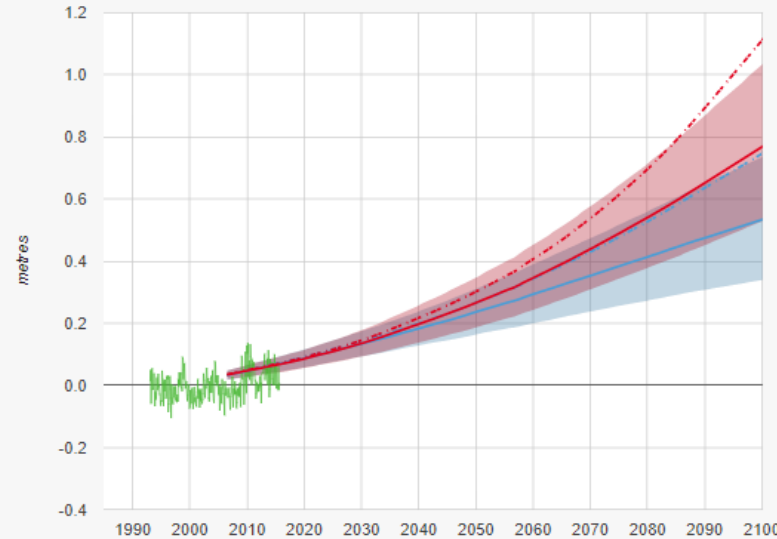
[What are RCP scenarios?](#)

Very low greenhouse gas scenario (RCP2.6)

Low greenhouse gas scenario (RCP4.5)

High greenhouse gas scenario (RCP6.0)

Very high greenhouse gas scenario (RCP8.5)



Observed data (Satellite)

Solid lines show median sea-level rise relative to

Dashed lines show allowances for each

Shaded areas show the likely range for each

Brisbane, Qld

Sea-level rise

Inundation maps

Temperature

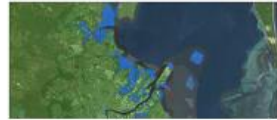
Rainfall

Map 1 of 2

Year 2050

Year 2100

Very high greenhouse gases



Satellite base map
Very high greenhouse gas scenario (RCP8.5 2050)



Topographic base map
Very high greenhouse gas scenario (RCP8.5 2050)



Low greenhouse gases



Satellite base map
Low greenhouse gas scenario (RCP4.5 2100)



Topographic base map
Low greenhouse gas scenario (RCP4.5 2100)



Very high greenhouse gases



Satellite base map
Very high greenhouse gas scenario (RCP8.5 2100)



Topographic base map
Very high greenhouse gas scenario (RCP8.5 2100)



Map 2 of 2

Year 2050

Year 2100

Very high greenhouse gases



Low greenhouse gases



Very high greenhouse gases



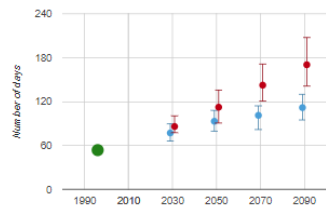
Brisbane, Qld

Sea-level rise Inundation maps **Temperature** Rainfall

● Observed average (1981-2010)
 ● Low greenhouse gas scenario (RCP4.5)
 ● Very high greenhouse gas scenario (RCP8.5)
 I Range between highest and lowest model estimates

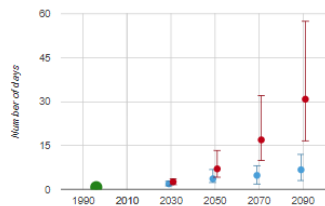
Hot days:

Mean annual number of days with maximum temperature greater than 30°C



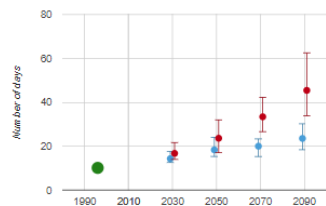
Warm nights:

Mean annual number of nights with minimum temperature greater than 25°C



Heatwaves:

Average of longest run of days in each year with maximum temperature greater than 30°C



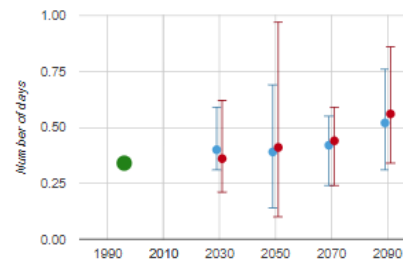
Brisbane, Qld

Sea-level rise Inundation maps Temperature **Rainfall**

● Observed average (1981-2010)
 ● Low greenhouse gas scenario (RCP4.5)
 ● Very high greenhouse gas scenario (RCP8.5)
 I Range between highest and lowest model estimates

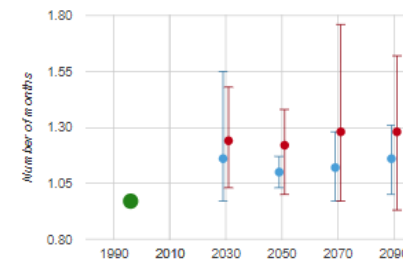
Very wet days:

Mean annual number of days when rainfall exceeds the observed 99.9th percentile



Dry conditions:

Mean annual (May to Apr) number of months when total rainfall is less than the historic 10th percentile



State data



Queensland Future Climate Dashboard

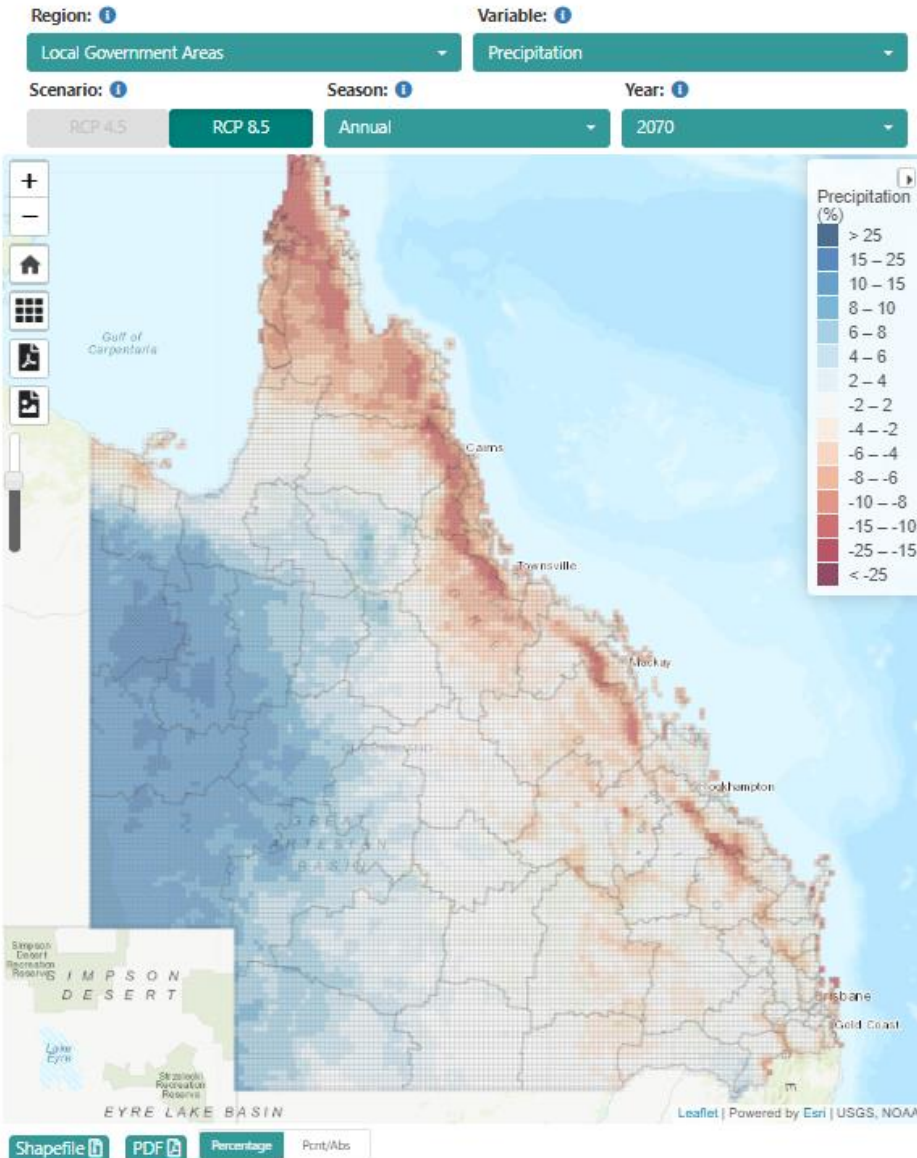
- Fully interactive online platform providing climate change simulations at regional scale;
- 6 climate themes;
- 32 variables;
- Calendar seasons as well as wet, dry and annual periods.

Queensland Future Climate Dashboard

More... >

[Mean Climate](#)
[Heatwaves](#)
[Extreme temperature indices](#)
[Extreme precipitation indices](#)
[SPI-drought indices](#)
[SPI-flood indices](#)

Queensland's climate is highly variable in space and time, ranging spatially from the wet tropics to savanna woodlands and arid deserts. The State is impacted with episodic droughts, floods and tropical cyclones. Droughts may persist for a number of years. Rainfall variability occurs at interannual, quasi-decadal, multi-decadal and centennial time scales. Understanding our climate variability and likely future climate change is crucial for adaptation and preparedness.

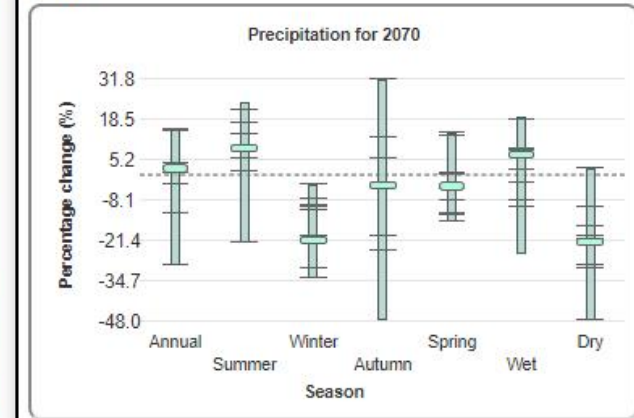


Local Government Areas Qld

[CN](#)
[Mean](#)
[CN](#)
[Range](#)
[CN](#)
[Models](#)

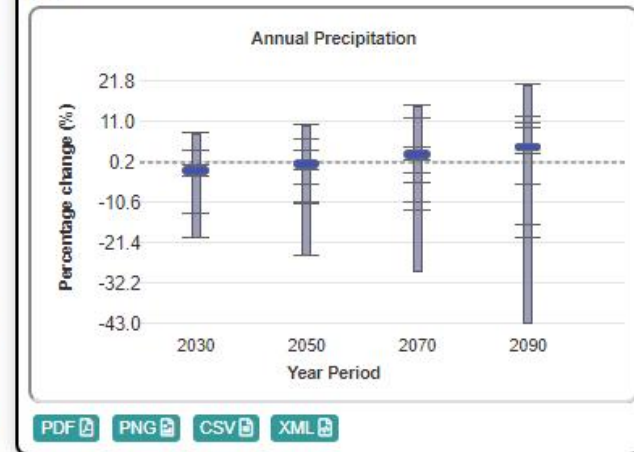
Changes across seasons for Queensland

Long-term state-wide changes in relation to reference period (1986-2005) across seasons

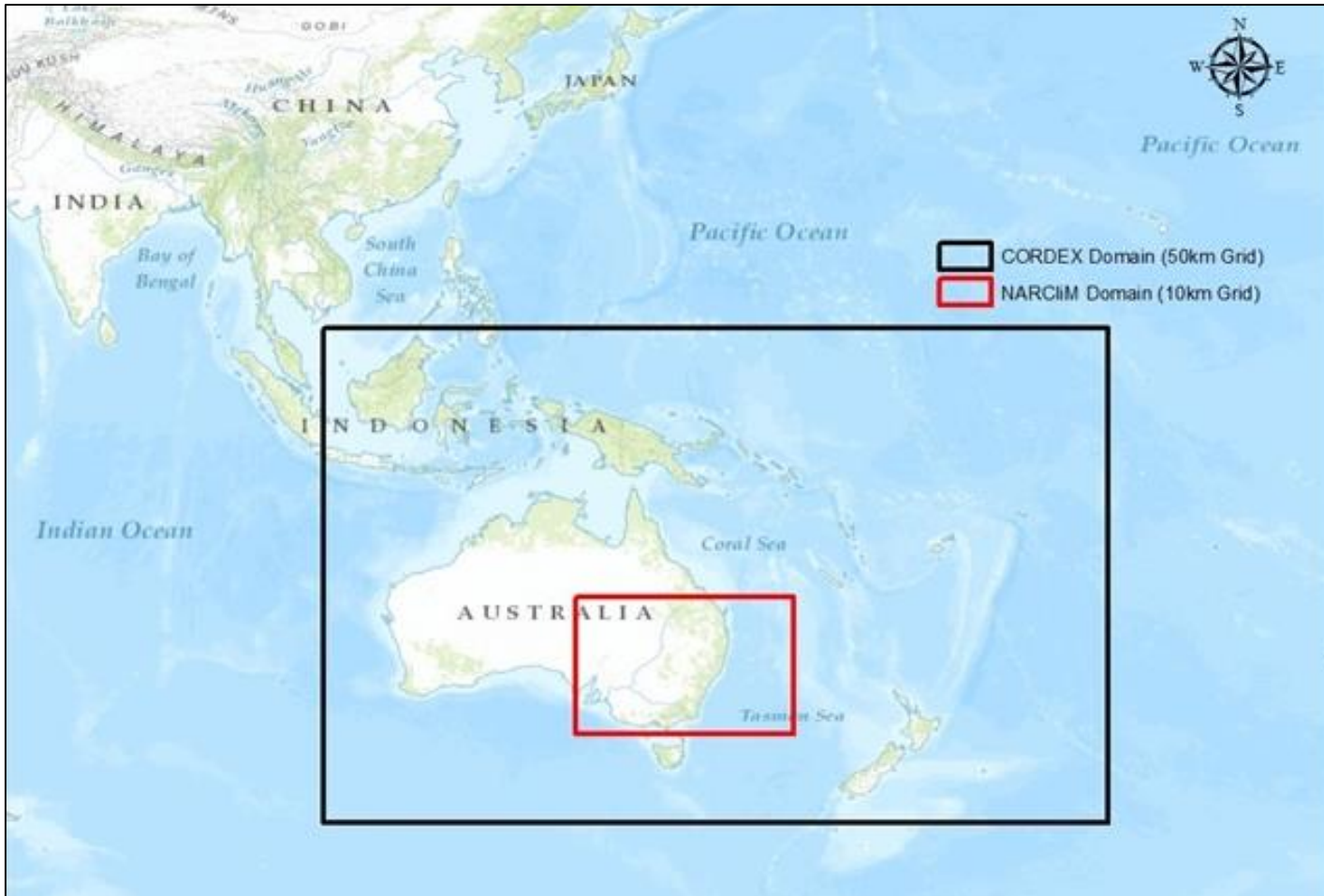


Changes over time for Queensland

Long-term state-wide changes in relation to reference period (1986-2005) over time



NSW/ACT Regional Climate Modelling: NARClIM 1.0 (2014)



- 10 km dynamically downscaled projections
- 12 regional climate models
- 3 x 20-year periods: 1990-2009, 2020-2039, 2060-2079
- 60 year NCEP reanalysis forced 3 RCMs (1950-2009)
- SRES A2 “BAU” future scenario
- Climate information on temperature, rainfall, evaporation, winds, humidity, snow, radiative heat fluxes, and more

- Climate projections for NSW

Interactive map

+ Climate projections for your region

Need some help on where to start?

+ About NARClIM

- Download datasets

Guidance on NARClIM Models

What can you download

About the Software

Terms and Conditions



Information and ability to download the datasets on the data portal

Data available from the Climate Data Portal

Users of the Climate Data Portal are able to construct and submit data requests to extract Regional Climate Model (RCM) data for the simulations, locations, time periods and climate variables that are of interest to them. Additional Information is provided for the data sets.

[Please contact us](#) if you need further advice on how to use the Climate Data Portal or the data available from it.

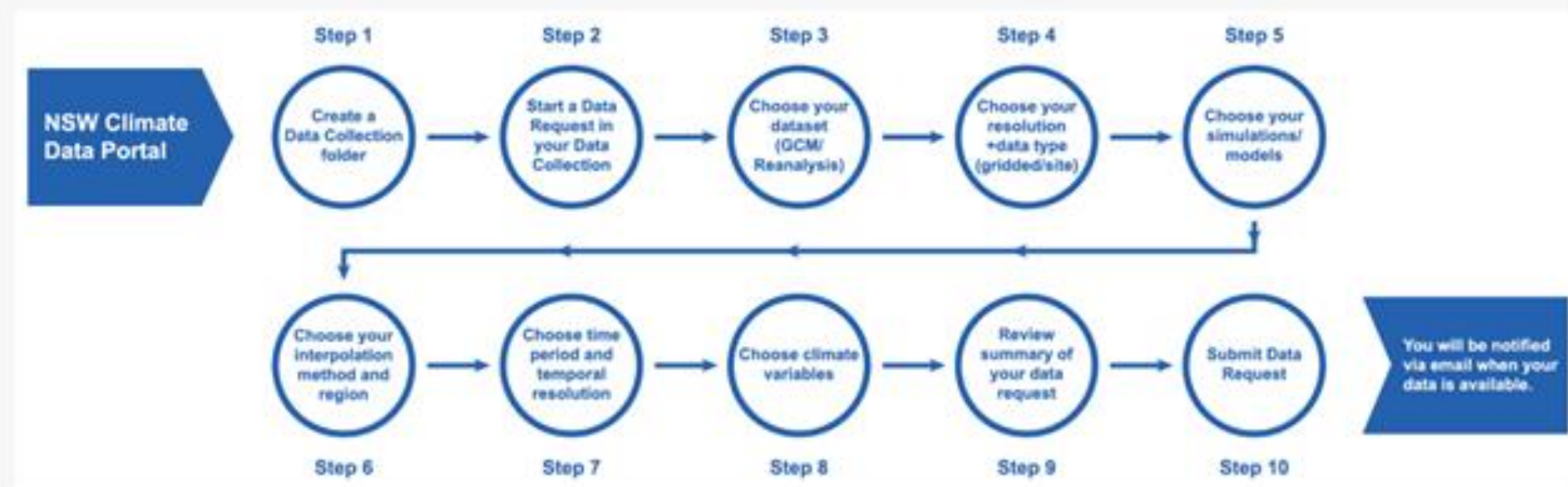
Domain and resolution

All of the data available from the Climate Data Portal is available over two domains and at two resolutions. The NARClIM domain covers southeast Australia at a horizontal resolution of ~10 kilometres. The Coordinated Regional Climate Downscaling Experiment (CORDEX) domain covers Australia and surrounds at a resolution of ~50 kilometres (See [About NARClIM](#)).

Welcome to the NSW Climate Data Portal

By following the sequence shown below, you can use the portal to access output from Regional Climate Model (RCM) simulations performed as part of the NSW and ACT Regional Climate Modelling (NARClIM) project. If you need help in choosing your models read the [Guidance on Model Selection](#) information.

You will first need to **Login** to access data. If you wish to log in but do not have a password, you will first need to **Register**.



Local government data



Using the interactive flood awareness map

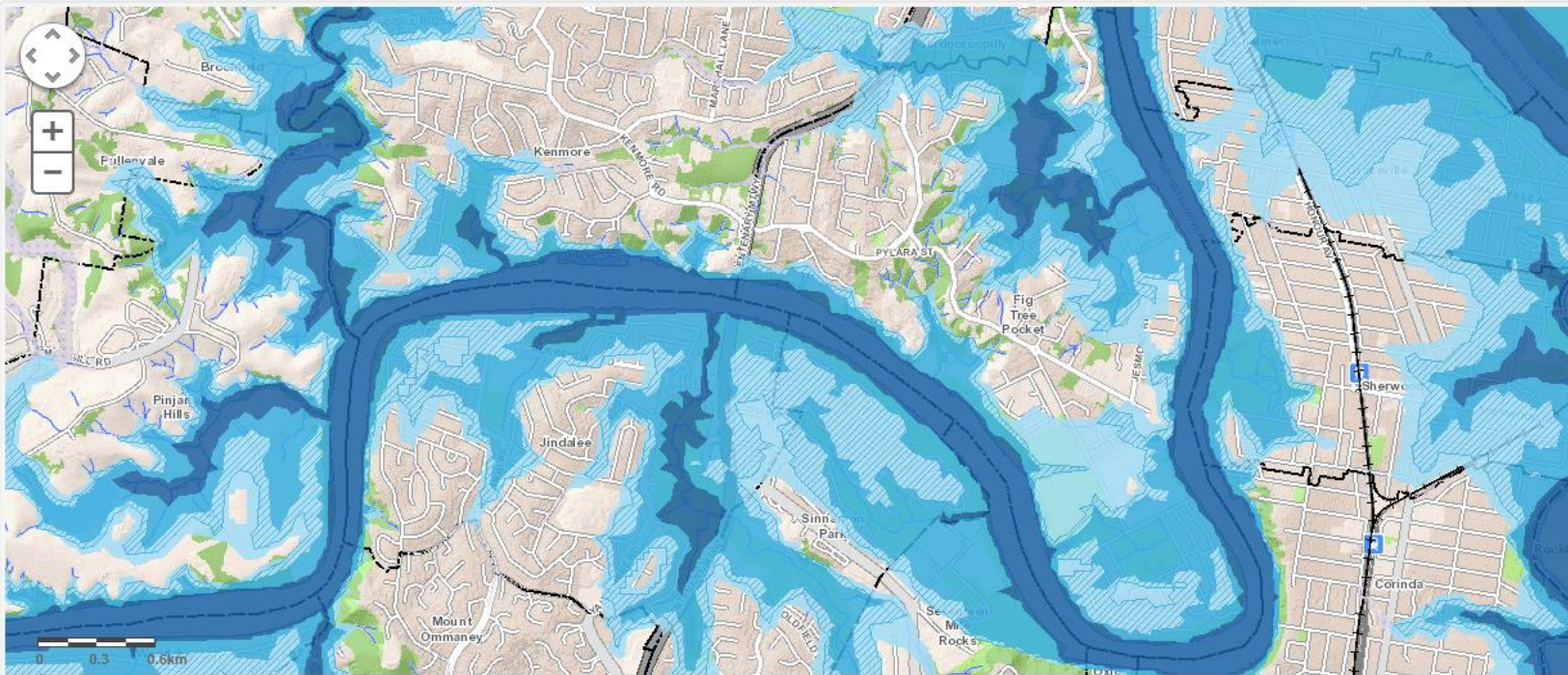
The Flood Awareness Map has been updated with data from the 2017 Citywide Creek and Overland Flow Path Flood Study.

This map displays the estimated likelihood or impact of flooding occurring from one or more flooding sources: creek, river, overland flow and storm tide. It does not provide information about the estimated depth or speed of flood water.

Please click this link for an explanation of the technical terms. For advice on how to plan and prepare for flooding, please click links for Flooding in Brisbane - a guide for residents or Flooding in Brisbane - a guide for businesses.

Flood Awareness Flood Sources Historic Floods

River Creek Storm Tide Overland Flow



Click a Flood Source

Select a flood source by clicking the different flood source buttons to the left. Then click the map legend buttons which will appear below to explore the flood source in more detail.

The high likelihood button will always be turned on. You can also choose to turn on the medium, low and very low flood likelihood buttons.

Information about the flood likelihood area will appear in this box when you click on each button. Click here for an explanation of flood likelihood.

Map legend

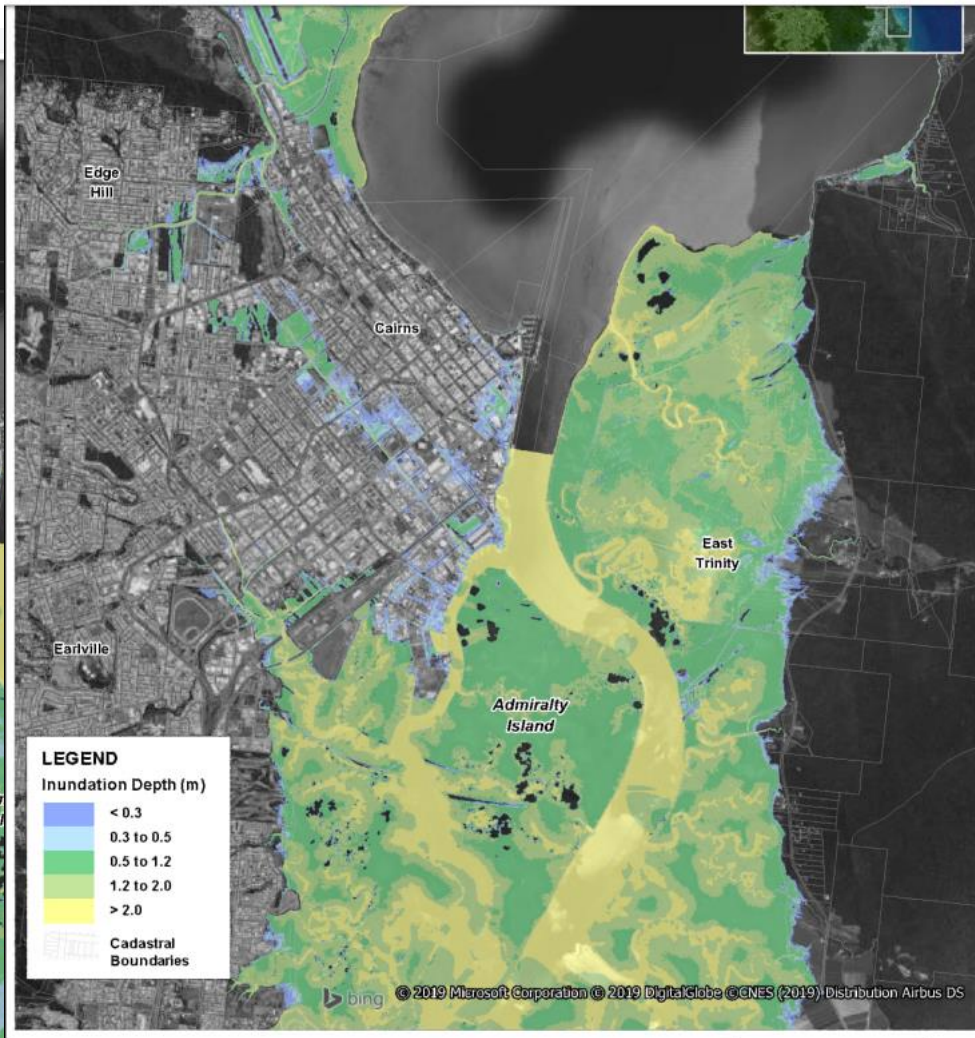
- High likelihood (5.0% Annual Chance)
- Medium likelihood (1.0% Annual Chance)
- Low likelihood (0.2% Annual Chance)
- Very low likelihood (0.05% Annual Chance)
- Estimated area subject to flooding



Title:
Sea Level Rise Inundation Hazard in 2020

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

Filepath: I:\B22585_I_GML_ErosionProneArea_MPBDRGICOA_006_190612_SLR_2020_CairnsCity.wor

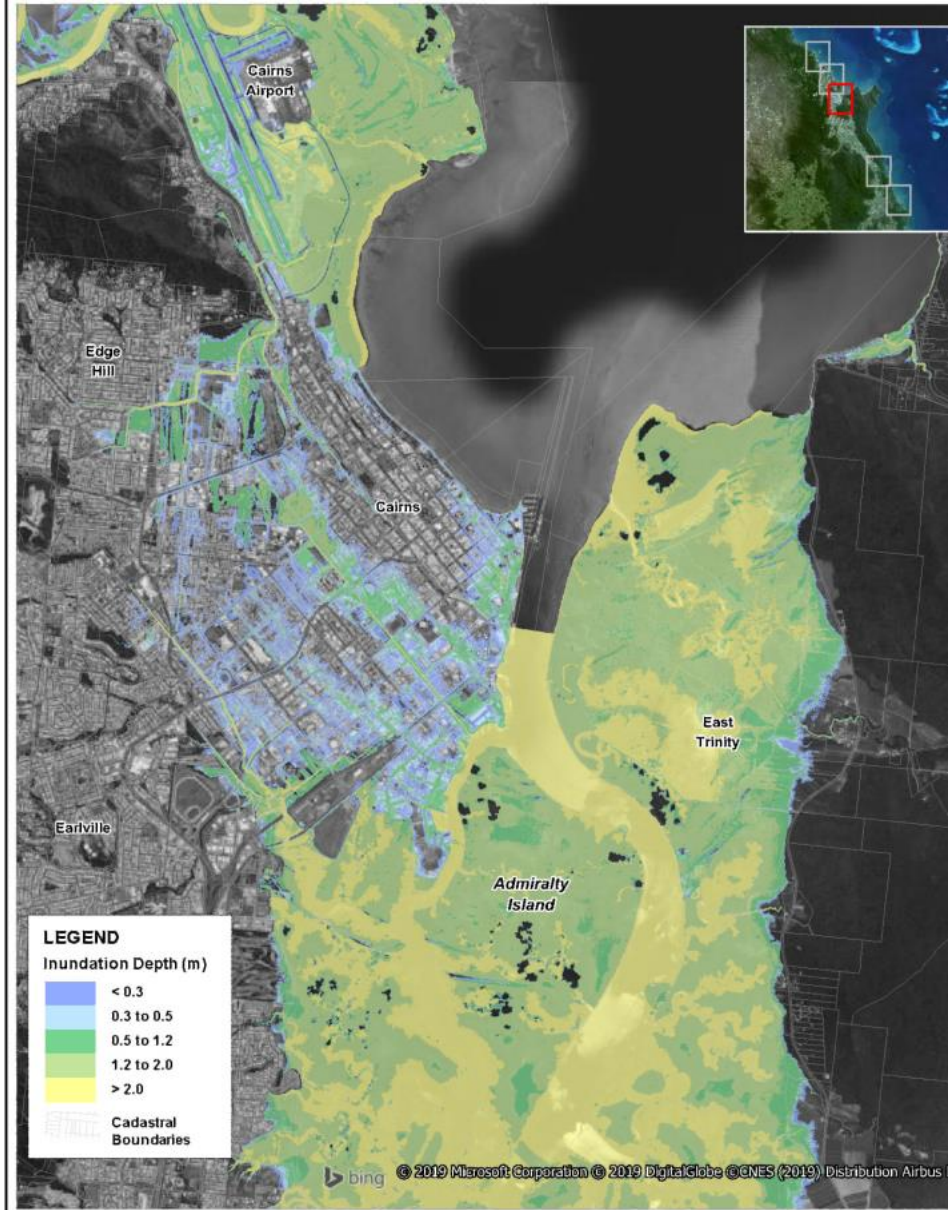


Title:
**Sea Level Rise Inundation Hazard in 2060
Trinity Inlet Embayment - Cairns City**

Figure: **B-13** Rev: **A**

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

Filepath: I:\B22585_I_GML_ErosionProneArea_MPBDRGICOA_008_190612_SLR_2060_CairnsCity.wor

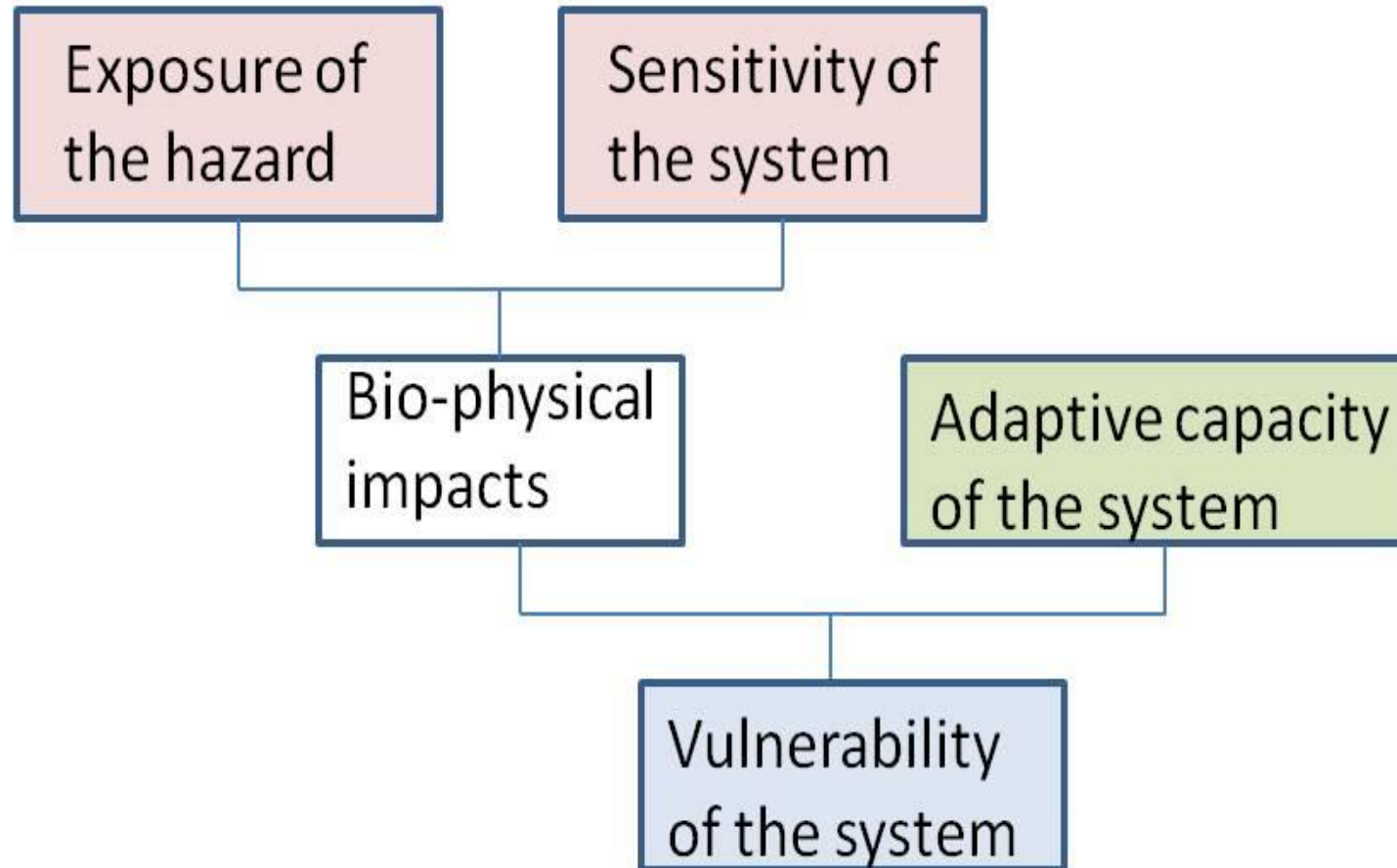


Title: Figure: Rev:

Using climate data in decision making

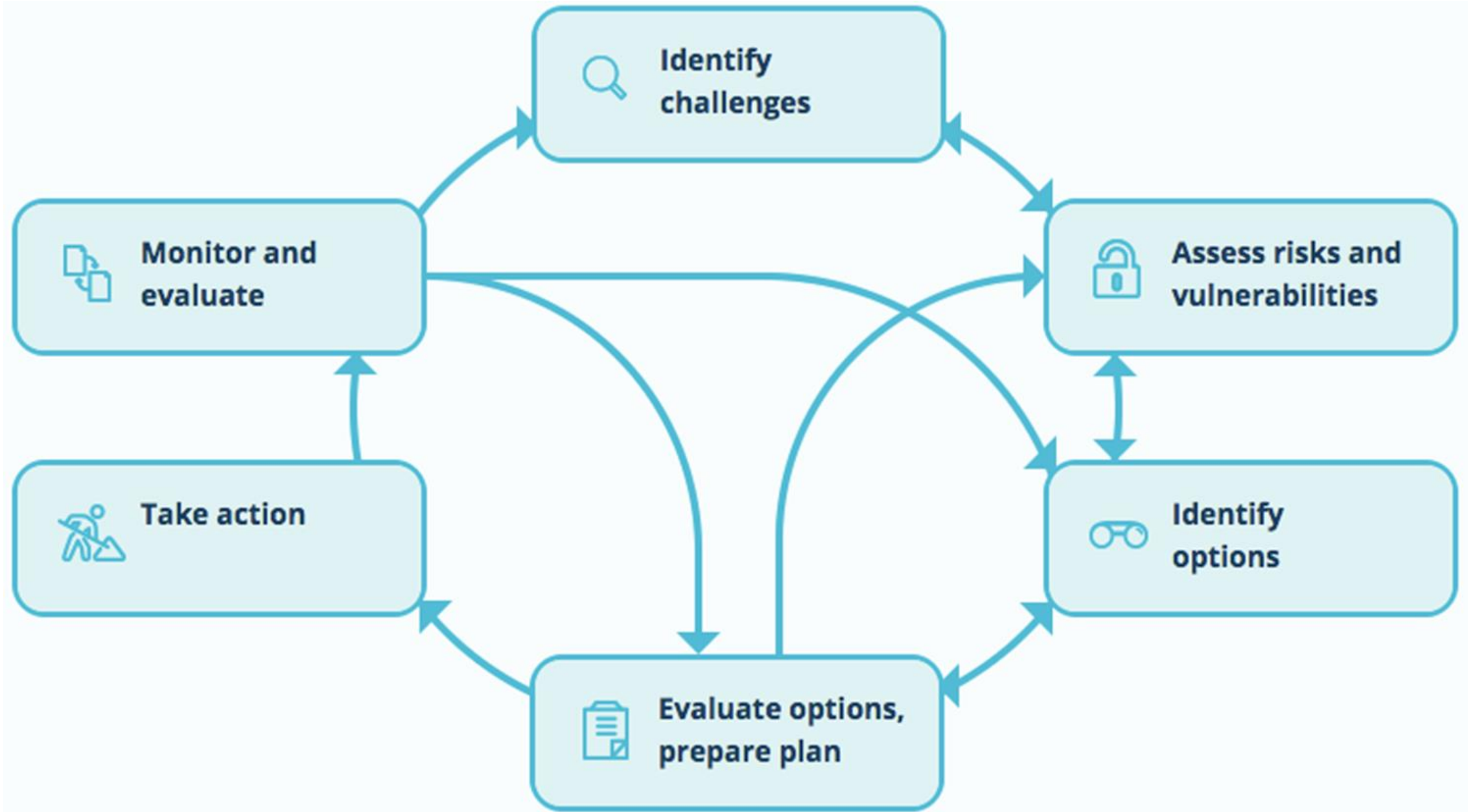


Concept of vulnerability

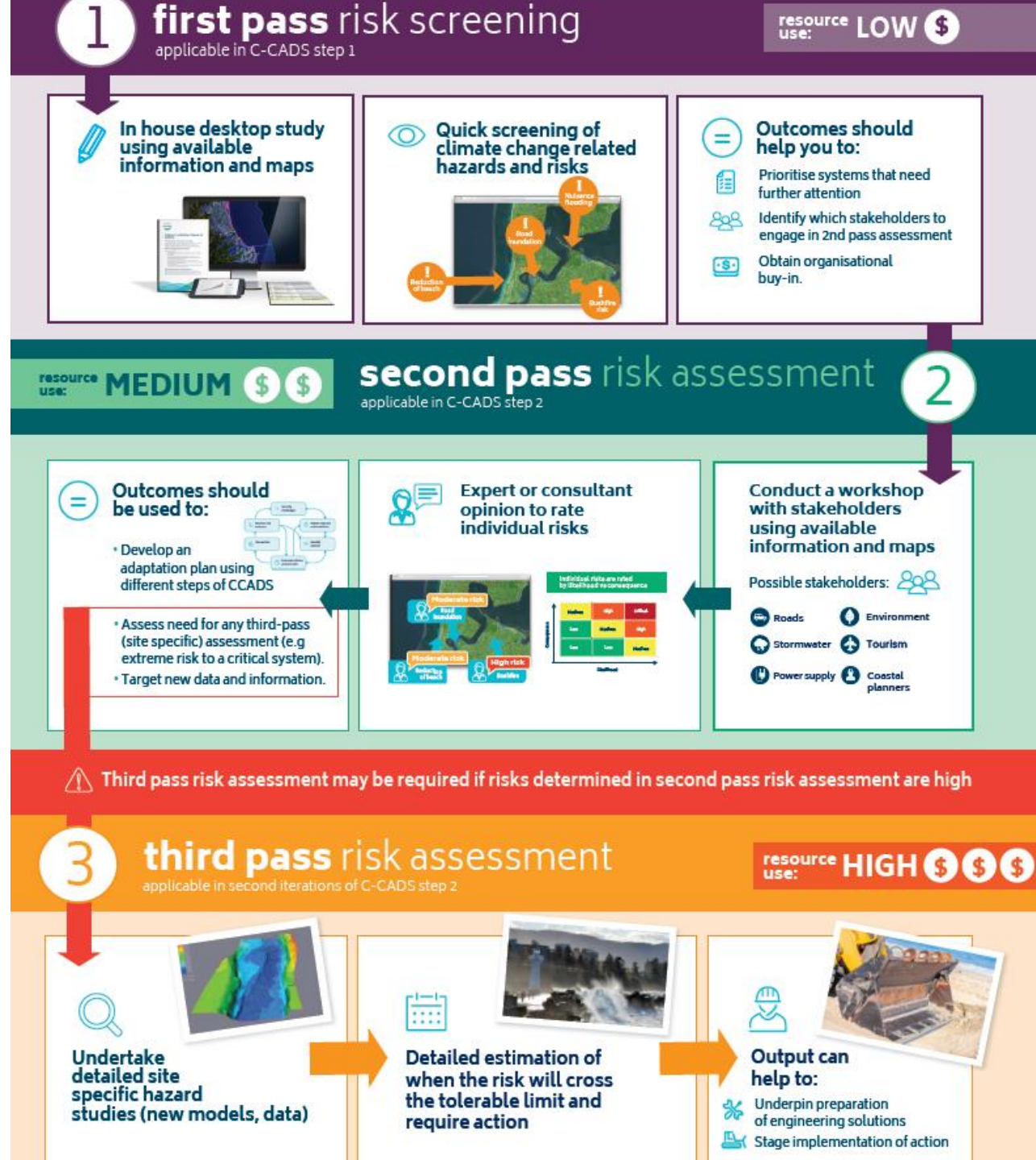


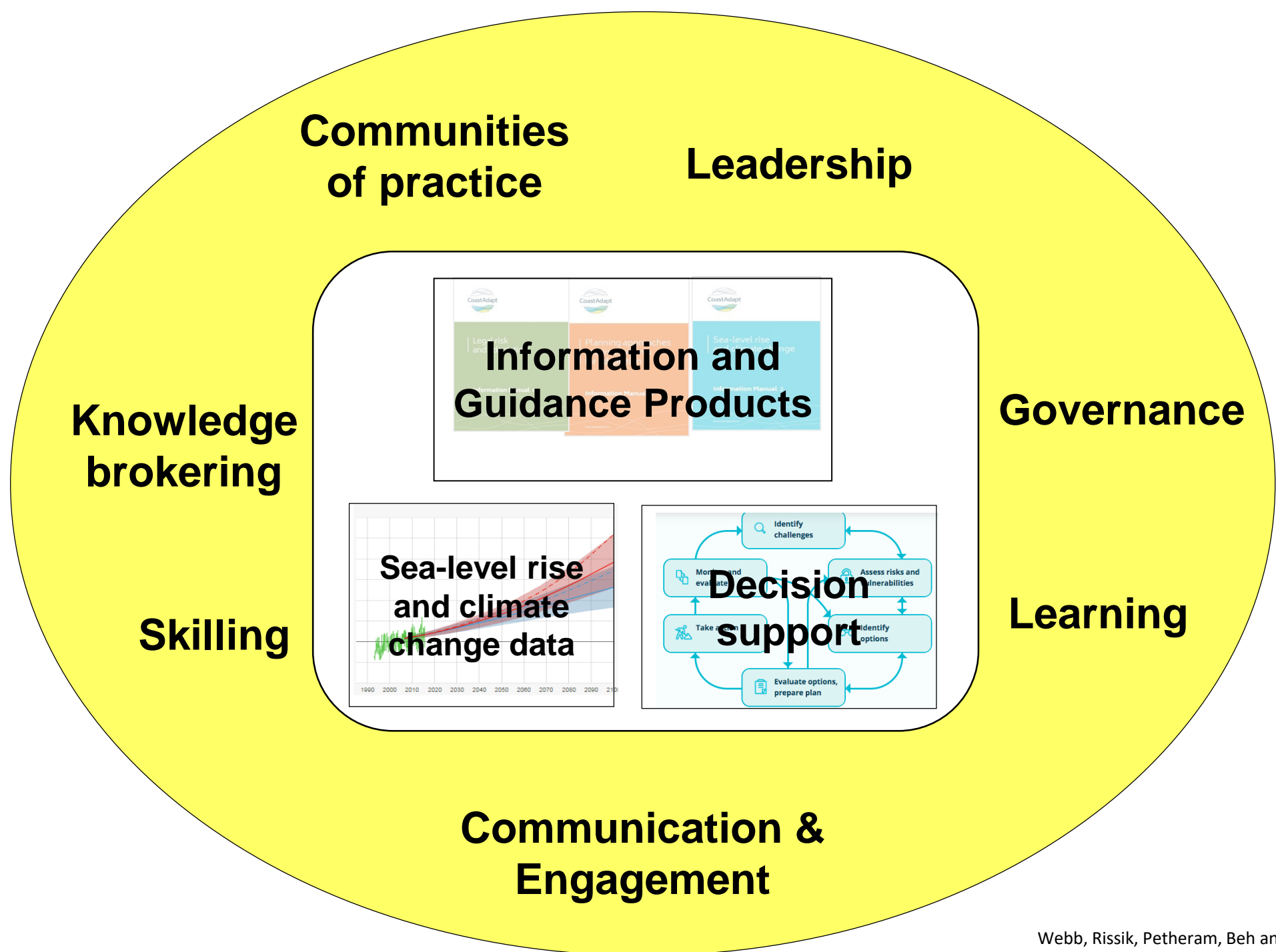
$$V_i = f(E_i, S_i, AC_i)$$

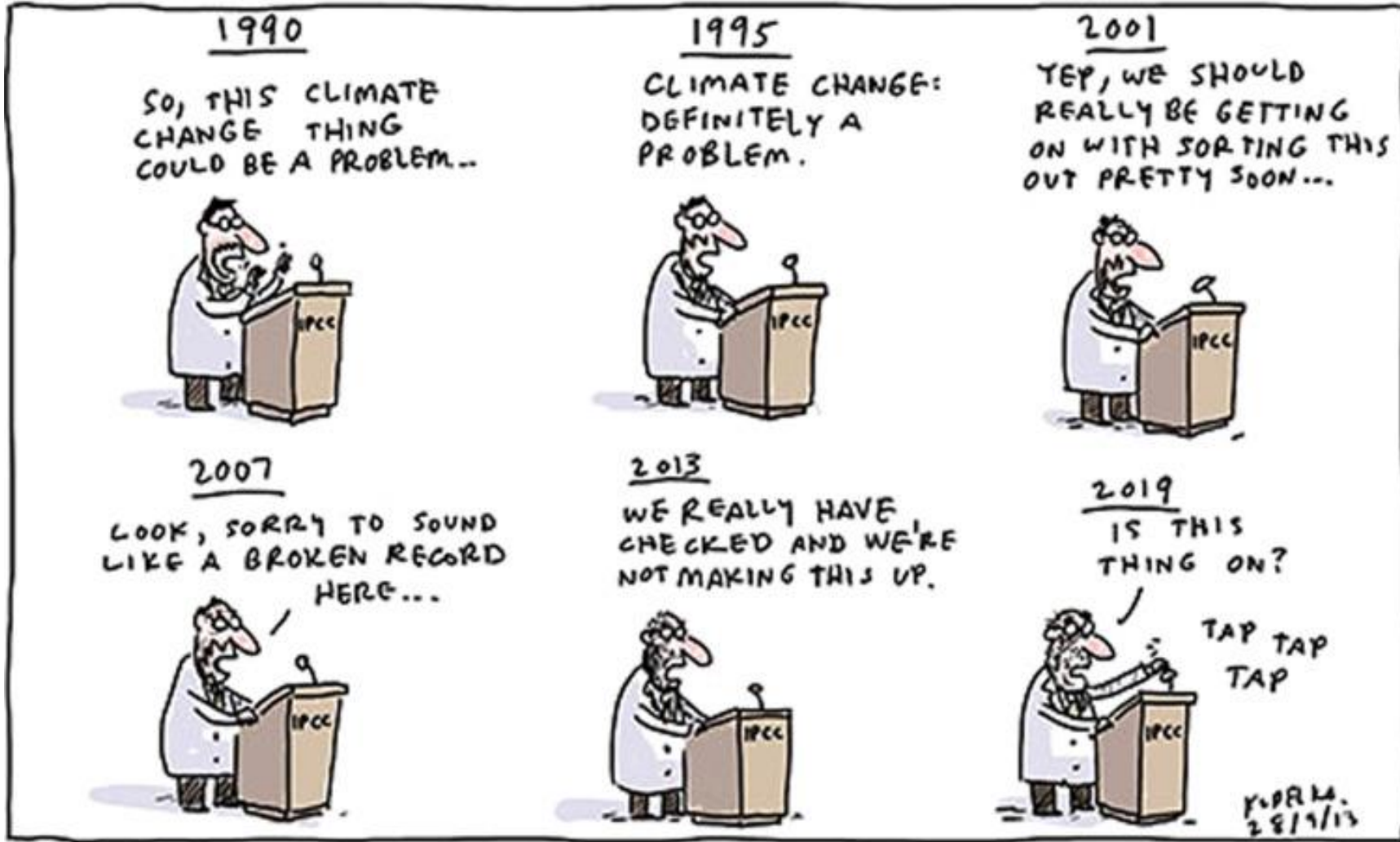
C-CADS Framework (Coastadapt.com.au)



Three phase risk assessment process







Thankyou