The mitigation exercise: A long term mitigation planning process, with a coastal flooding case study in Adelaide

Research Forum/ 2019

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@bnhcrc @bnhcrc

bushfire&natural HAZARDSCRC

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

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- Murray Townsend (DEW)
- Liz Connell (SA SES)
- Desiree Beekharry (BNHCRC)

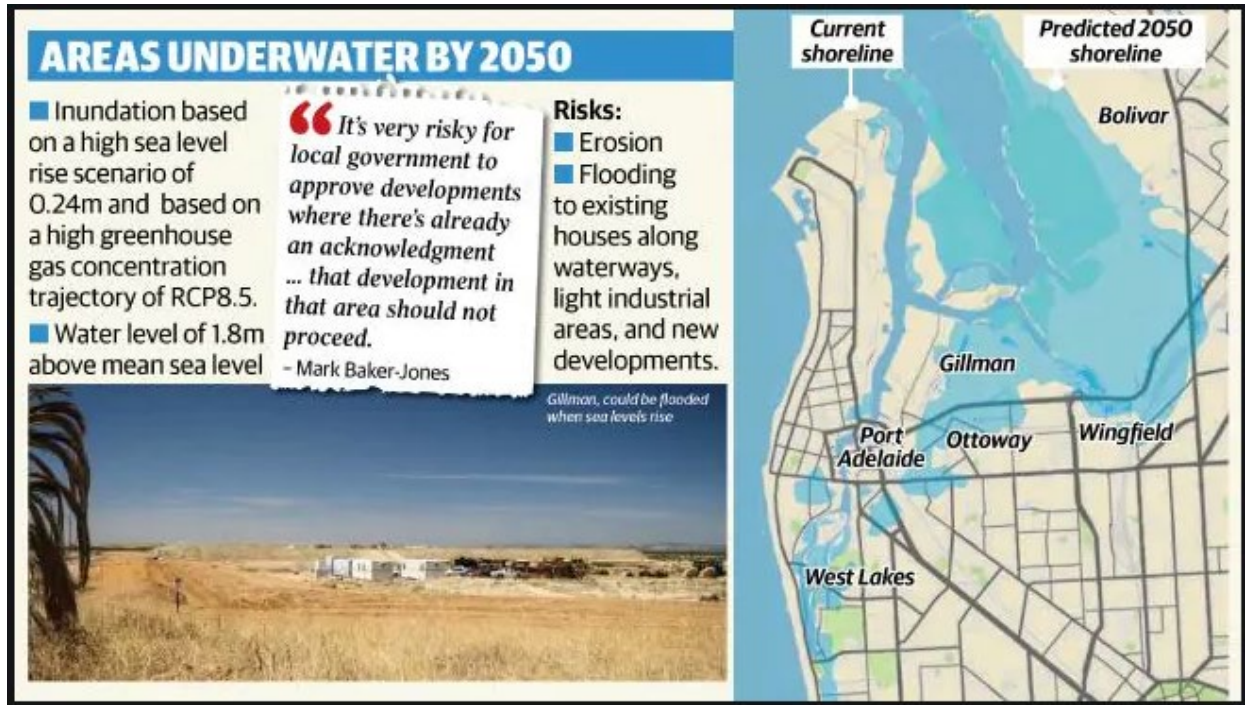
Exercise Forethought

UNHARMED Mitigation Exercise – Coastal flooding Port Adelaide, South Australia

Exercise Forethought

AIM:

- To gain a greater understanding of the current and future coastal flood risk in Port Adelaide.
- To explore coastal flood risk mitigation options for Port Adelaide.
- Provide basis for exploration of use of UNHaRMED in exercise setting



The Advertiser

Exercise Forethought

Development and trial of a State mitigation exercise is proposed as a means of utilising UNHaRMED projections of population, climate and infrastructure growth towards strategic disaster mitigation planning.

Part 1 – a Discussion Exercise using a future scenario of amplified hazards and consequences, with an expanded list of observers involved in land use planning, infrastructure etc. The scenario was selected to be port Adelaide's coastal flood risk

Part 2 - (informed by Part 1) An analysis of decisions, actions and trends forecast to contribute to the increased hazard or consequence in the future, and examining what can be done now and in the near future to mitigate them.

UNHaRMED

A tool for pro-active disaster risk assessment and adaptation planning

Two driving principles

Prevention is better than cure

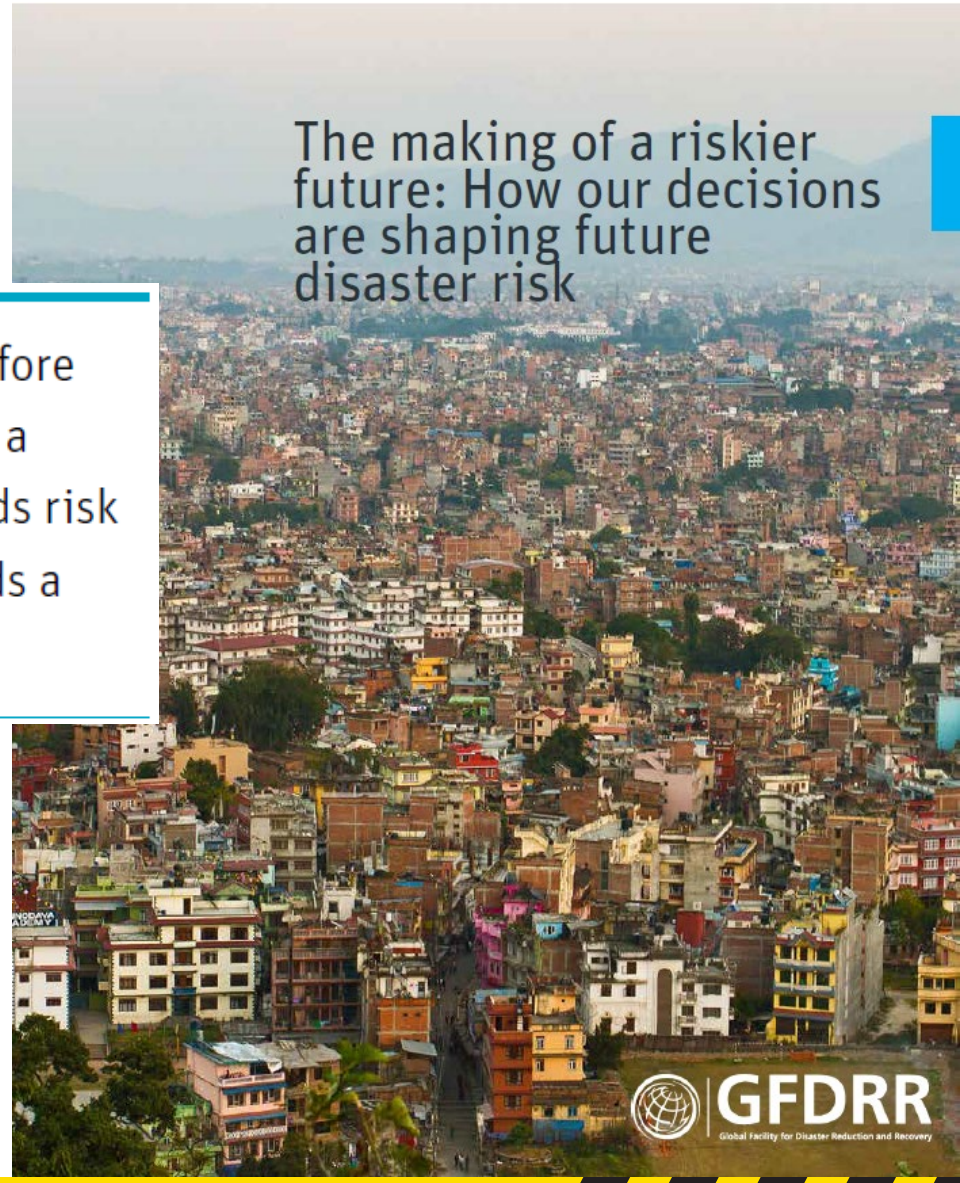
"Better to build a fence at the top of a cliff, than park an ambulance at the bottom"

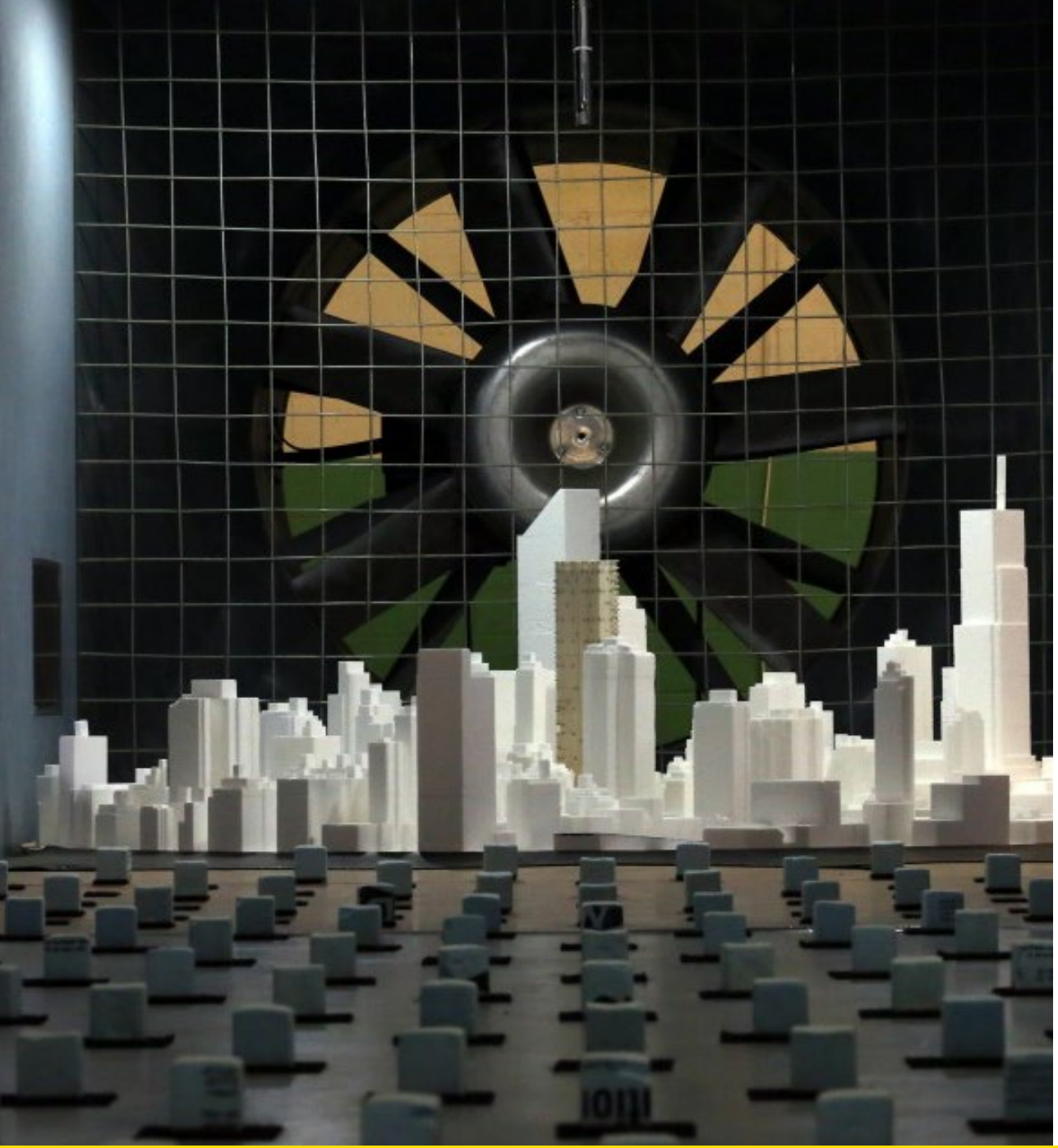
Helen Clark 2015 Sendai

Tomorrow's risk is built today

Tomorrow's risk is being built today. We must therefore move away from risk assessments that show risk at a single point in the present and move instead towards risk assessments that can guide decision makers towards a resilient future.

Global Facility for Disaster Reduction and Recovery (2016)

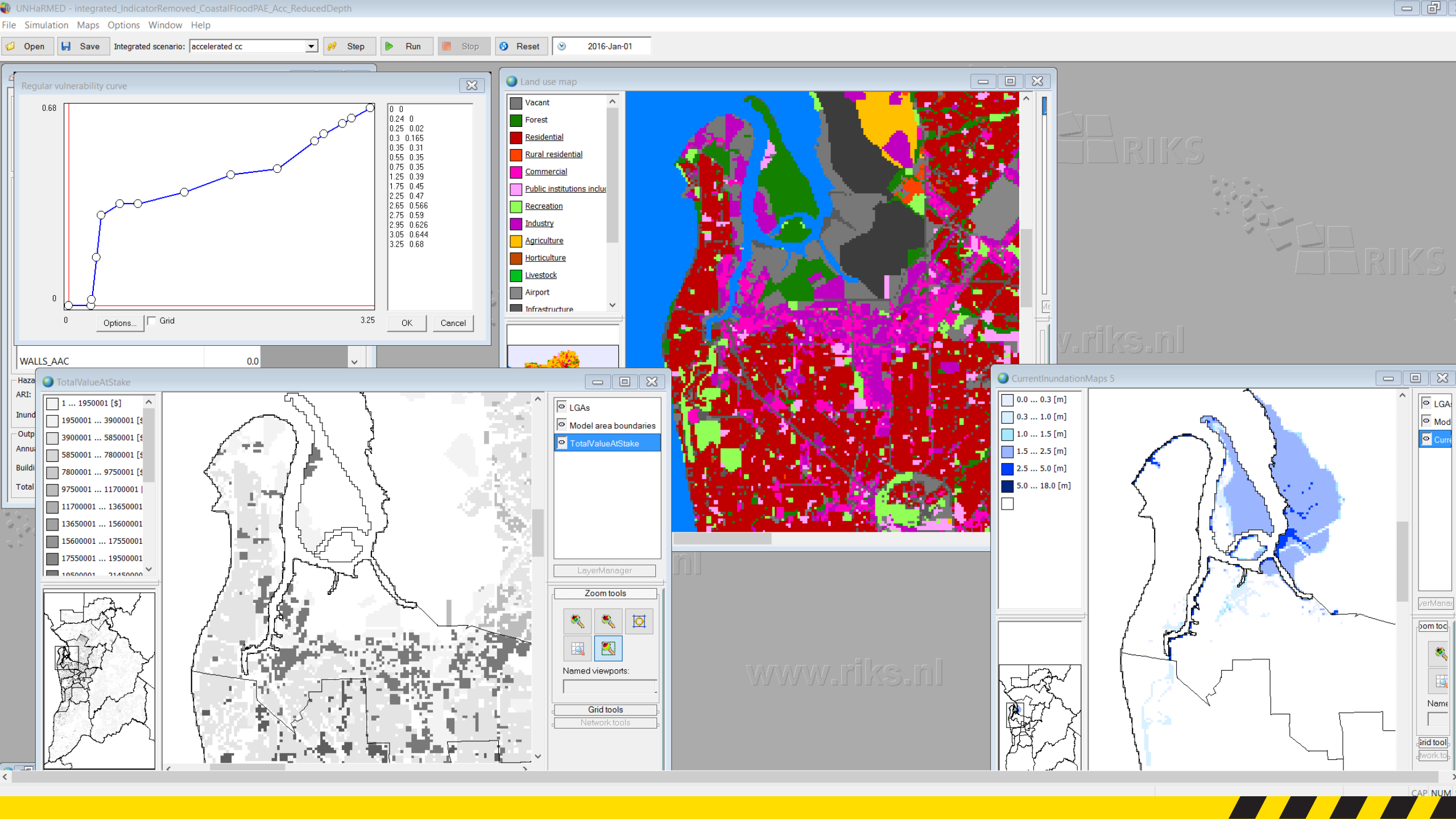




UNHaRMED

A tool for pro-active disaster risk assessment and adaptation planning

- Interactive modelling platform to assist decision making, investment choices and adaptation measures
- Aims:
  - Improve thinking about risk into the future;
  - Better manage and minimise risk;
  - Position organisations to best achieve this and lobby others.
- Considers long-term dynamics and uncertainties of hazard, exposure and vulnerabilities
- Integrated scenario analysis
- Multi-hazard
- Incorporated assessment of adaptation measures (structural, land use planning, building vulnerability)


UNHaRMED - integrated_IndicatorRemoved_CoastalFloodPAE_Acc_ReducedDepth
File Simulation Maps Options Window Help
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Regular vulnerability curve
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0.55 0.35
0.75 0.35
1.25 0.39
1.75 0.45
2.25 0.47
2.65 0.566
2.75 0.59
2.95 0.626
3.05 0.644
3.25 0.68
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Options...
Grid
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OK
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WALLS_AAC 0.0
Land use map
Vacant
Forest
Residential
Rural residential
Commercial
Public institutions inclu
Recreation
Industry
Agriculture
Horticulture
Livestock
Airport
Infrastructure
RIKS
www.riks.nl
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LGAs
Model area boundaries
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LayerManager
Zoom tools
Named viewports:
Grid tools
Network tools
CurrentInundationMaps 5
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1.0 ... 1.5 [m]
1.5 ... 2.5 [m]
2.5 ... 5.0 [m]
5.0 ... 18.0 [m]
www.riks.nl

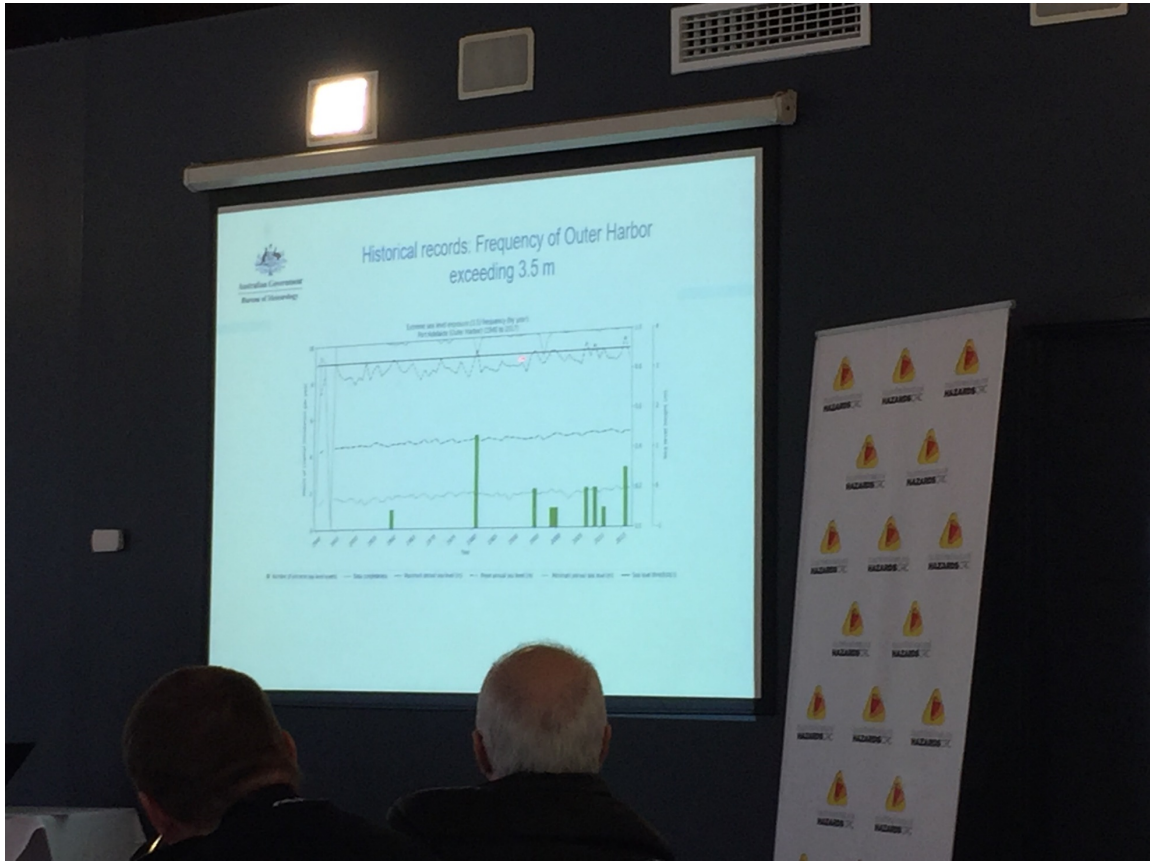
Part 1

Objectives

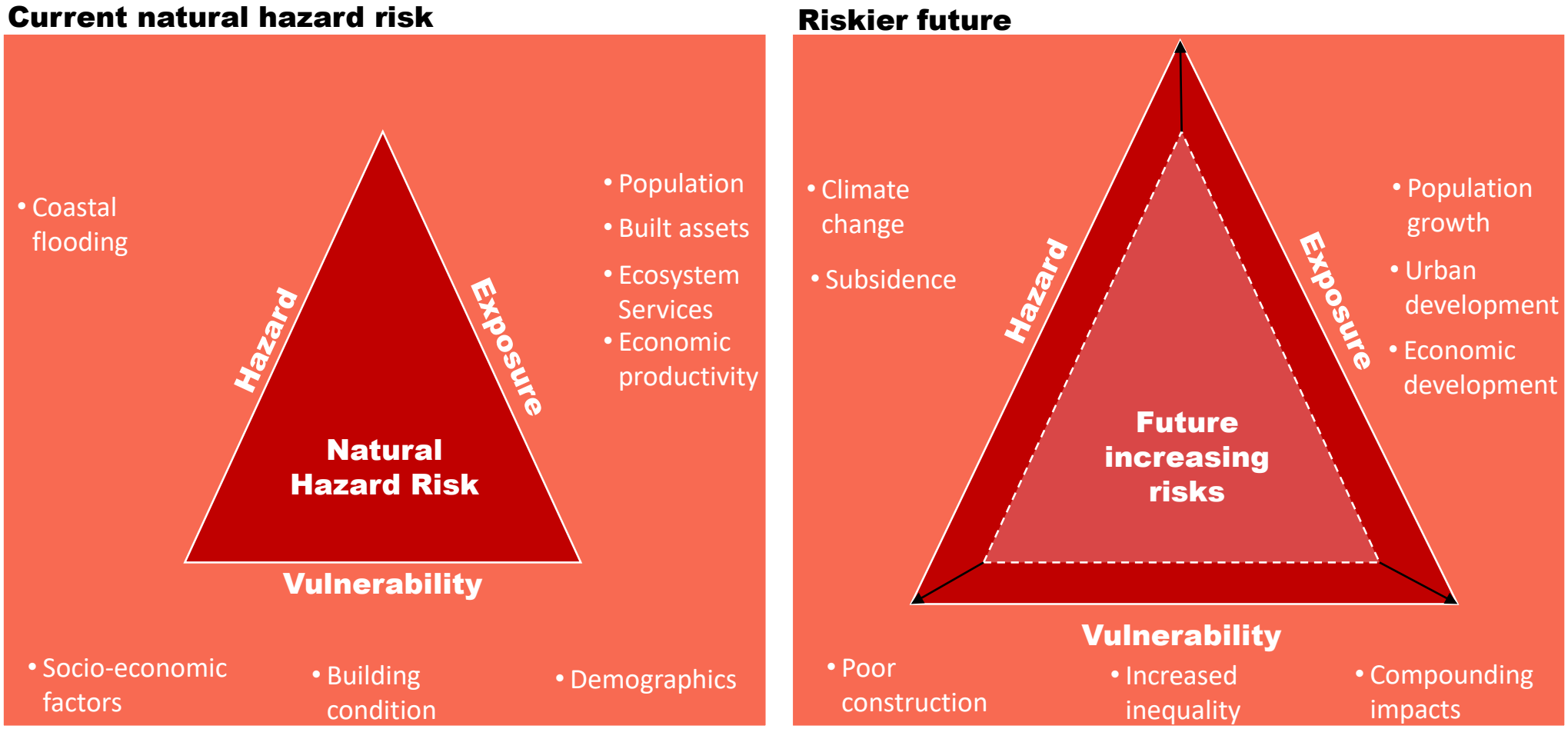
Increase our understanding of the conditions that contribute to the current and future likelihood of coastal flooding in Port Adelaide.

Increase our knowledge of the current and future consequences of coastal flooding in Port Adelaide.

Commence exploring risk mitigation options for future coastal flood risk scenarios.

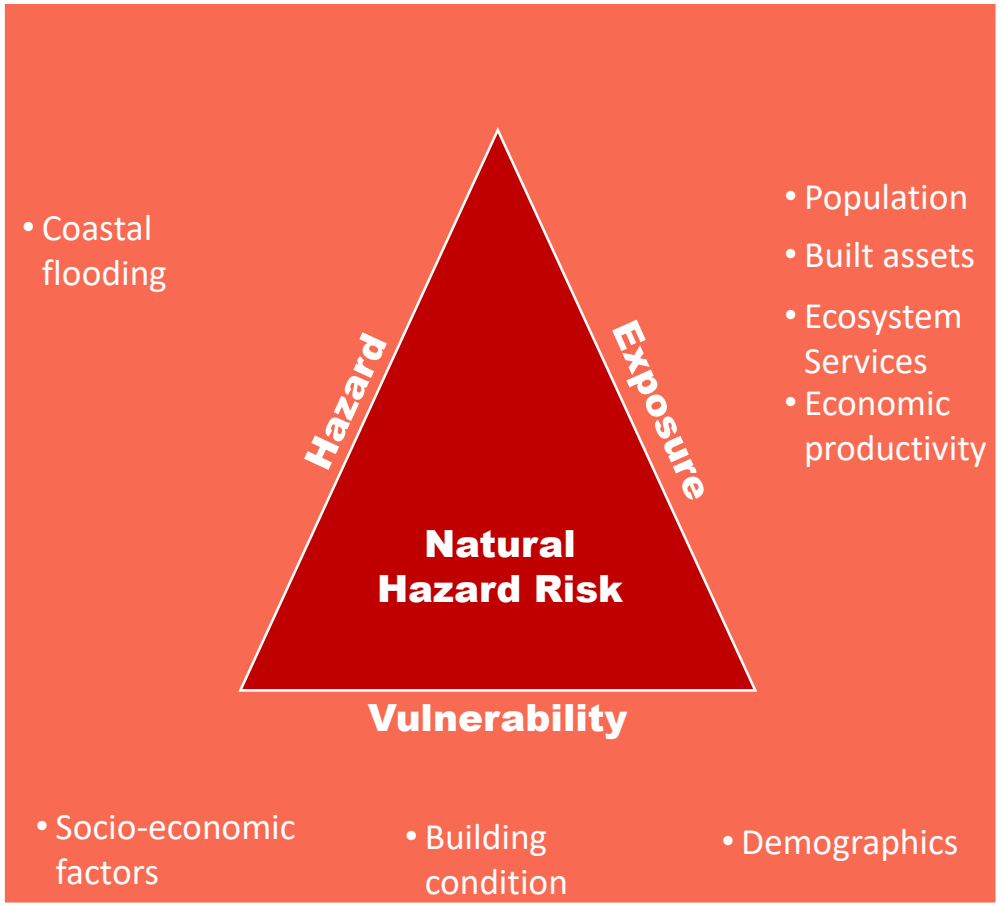


Coastal risk

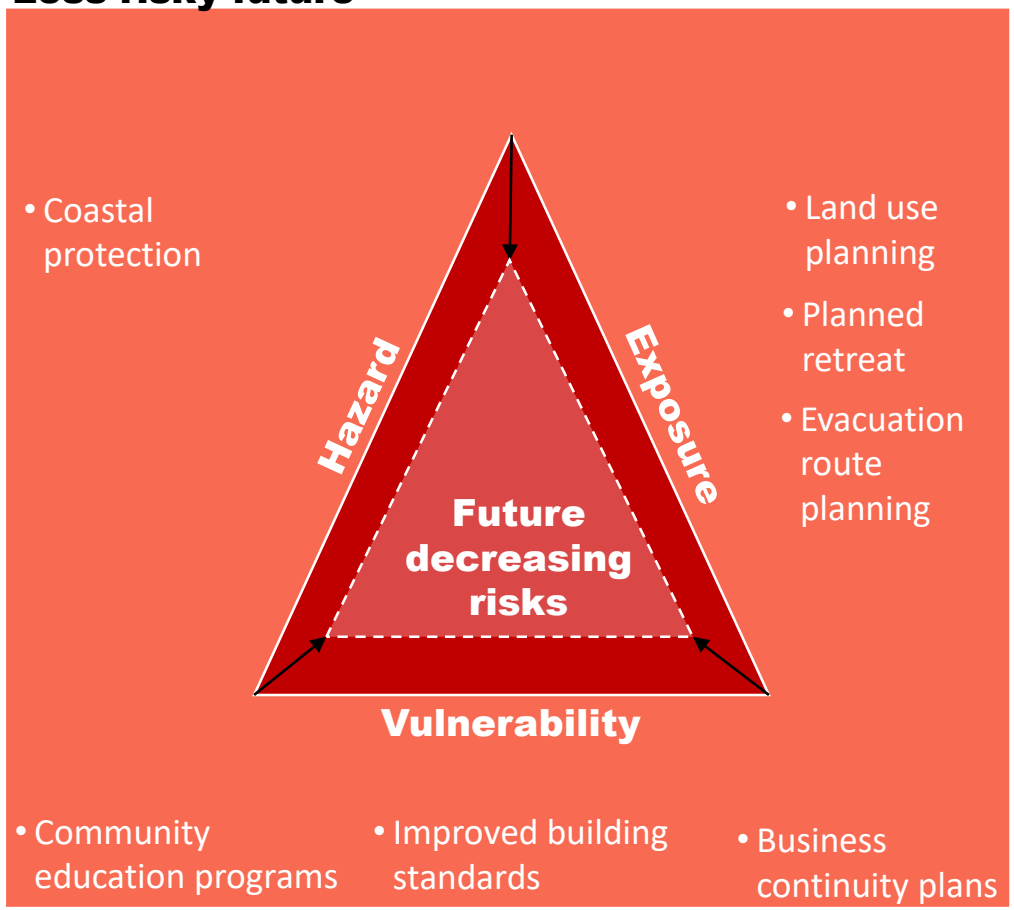


Coastal risk

Current natural hazard risk



Less risky future



The day

1. Challenge understanding
   - Current and future population of at risk area?
   - How much has sea-level already risen in last 20 years?
   - What sits in your house below 800mm?
2. Introduce background and context
   - The area, it's people, economy, culture (Councils)
   - What causes coastal flooding (BOM)
   - Historical events (Coastal Protection Board & State Heritage Office)
   - 2016 Flood – implications: response, relief and recovery
3. Current degree of flooding and its impacts
   - Hazard layers, current exposure
   - Risk – potential losses
4. Future scenario 1
   - Changing flood hazard, exposure and risk
5. Future scenario 2
   - Accelerated sea-level-rise

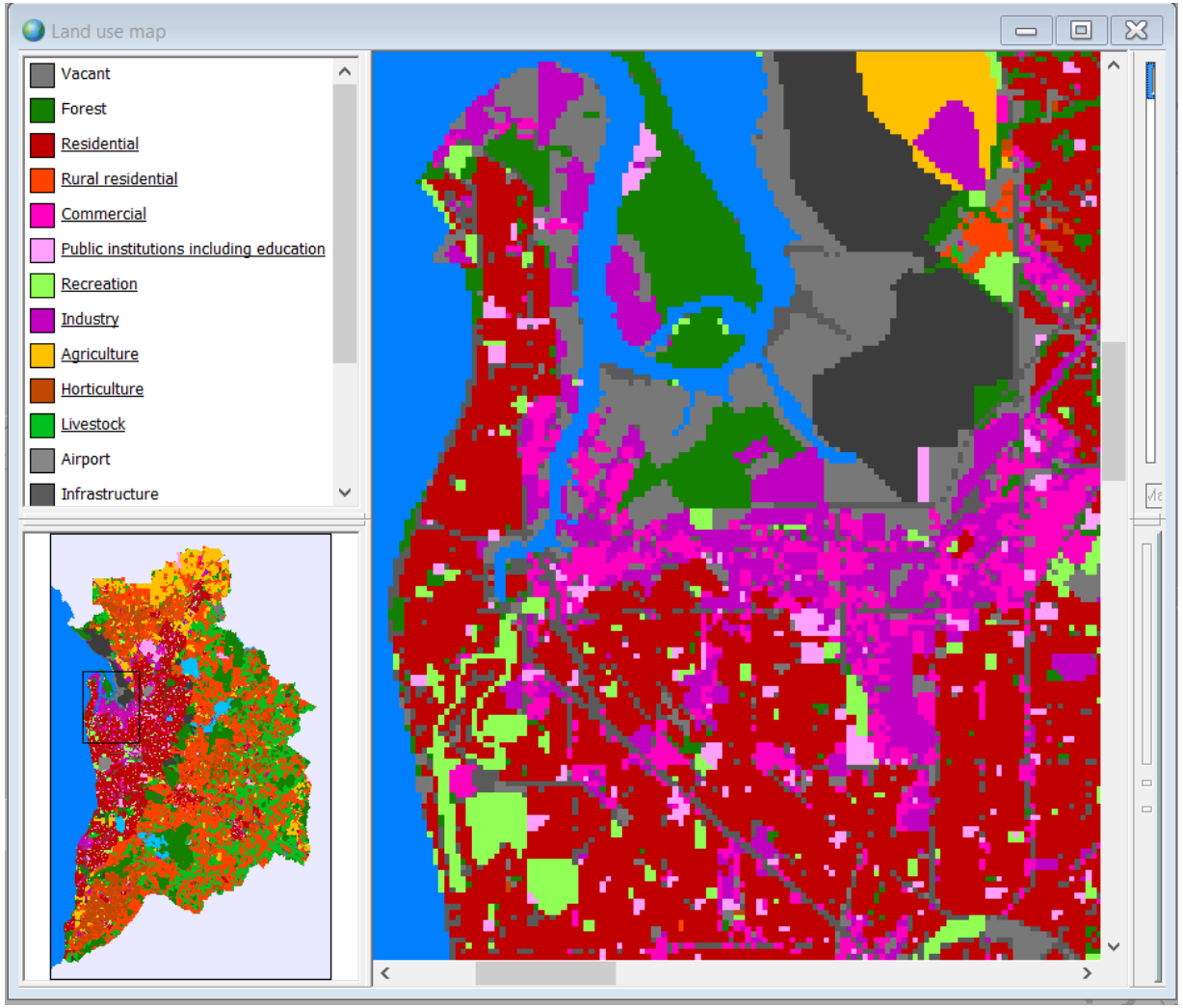
Current risks

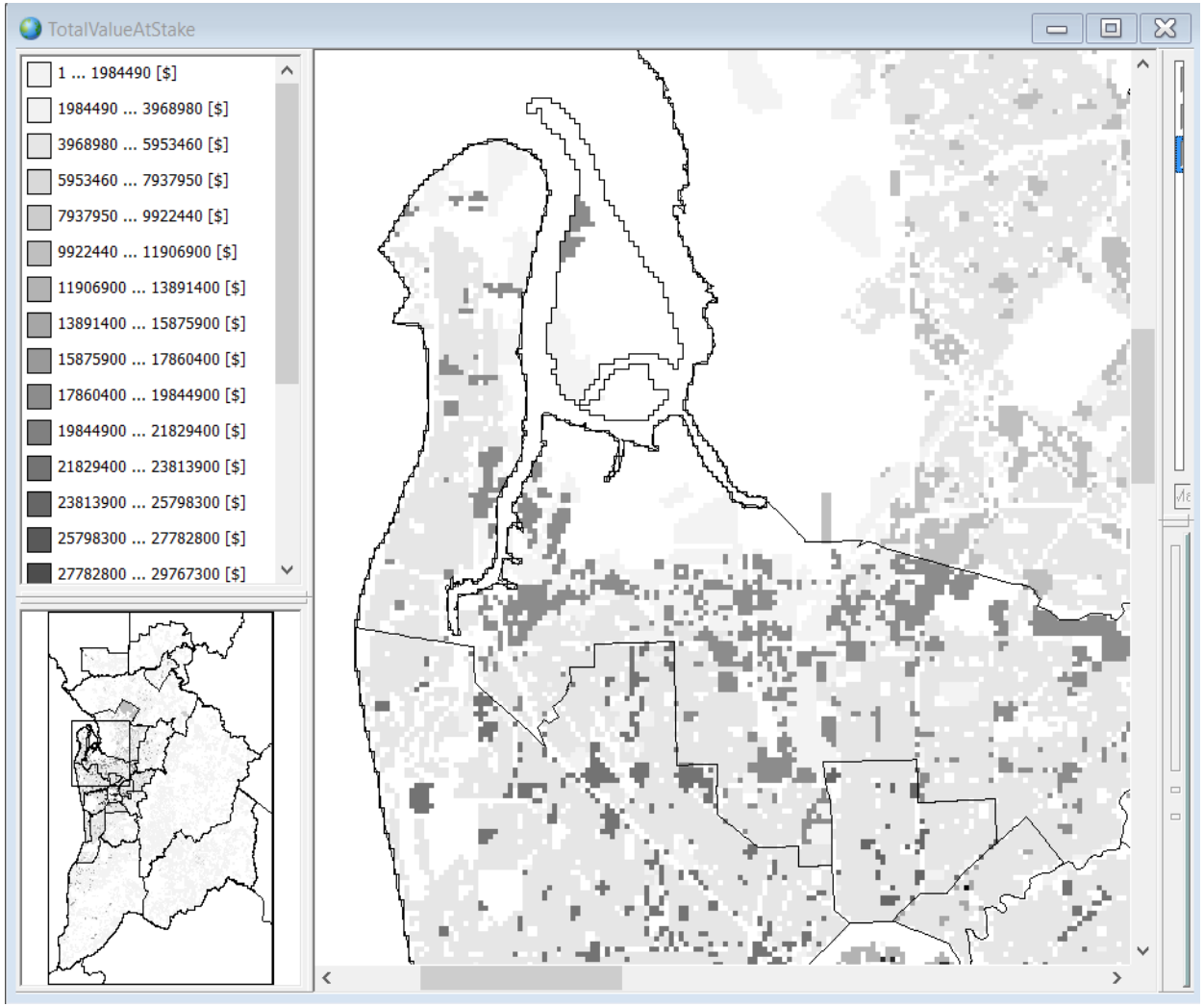
Coastal flooding in Port Adelaide

Current hazard

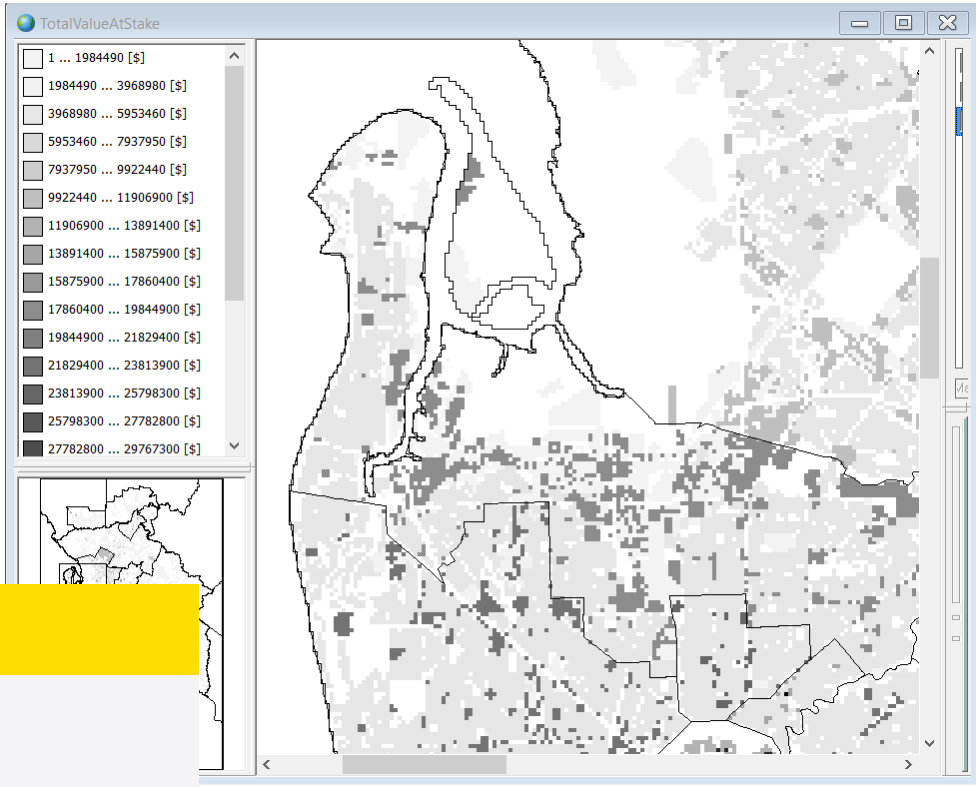
Depth

Current exposure





Current exposure

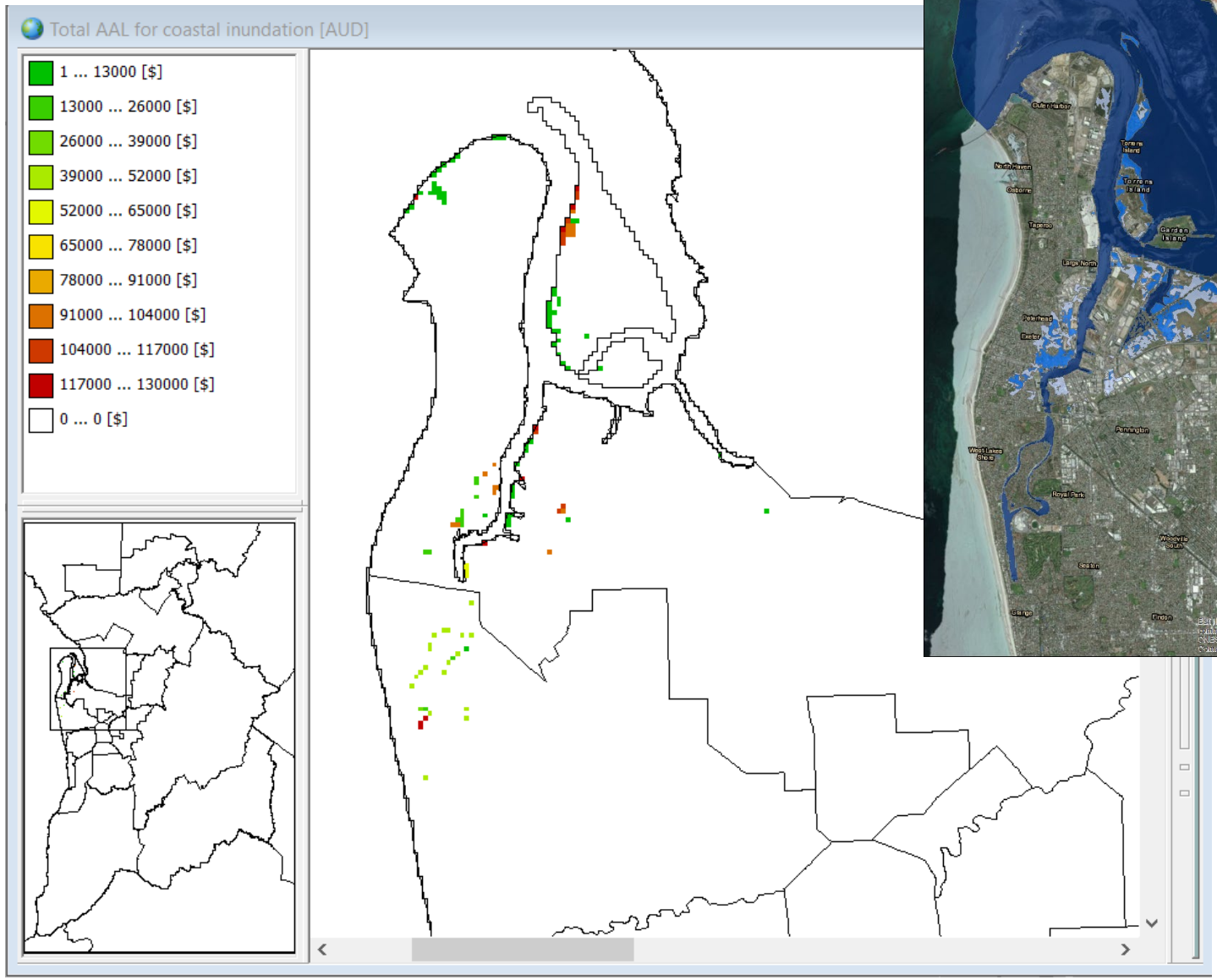


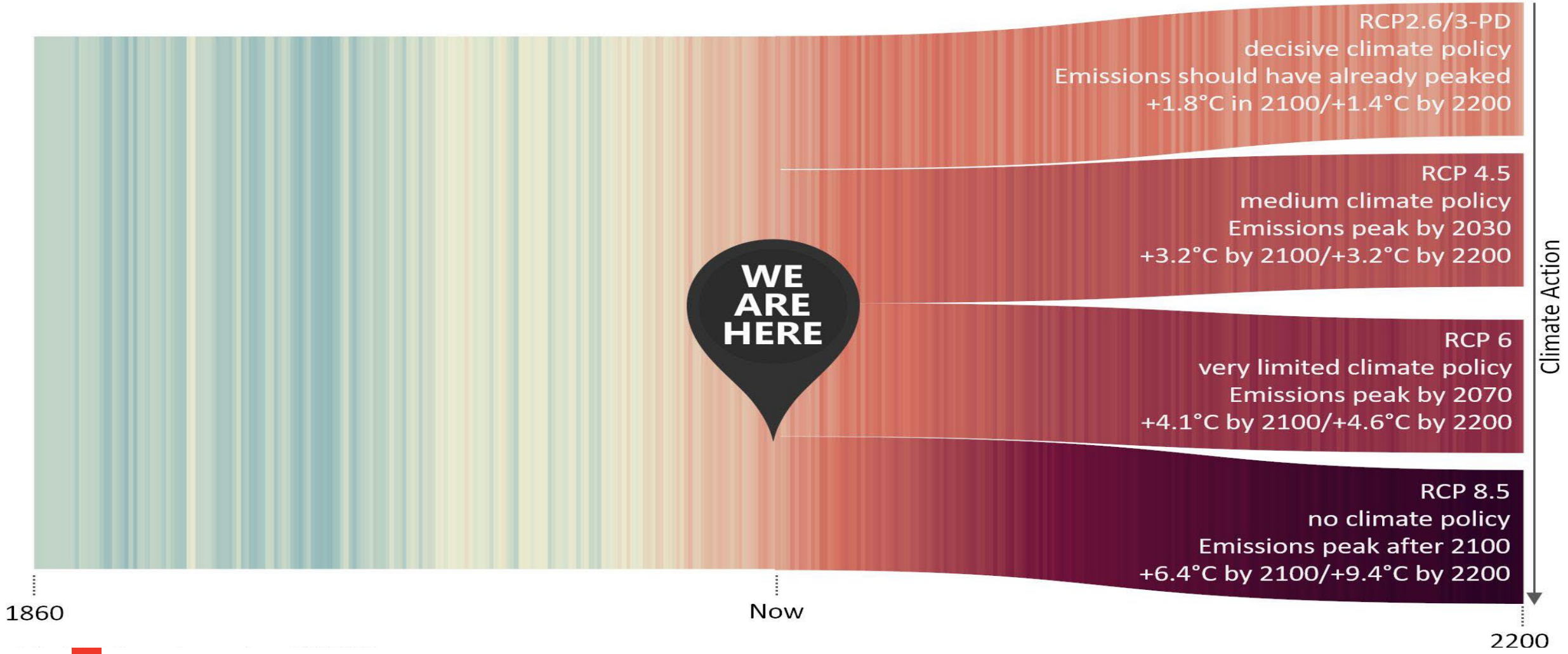
	0.01m – 0.3m	0.3m – 1m	1m +
Population	1811	1628	28
Dwellings	887	784	17
Residential Property Value ($)	$236,090,970	$219,970,000	-
Businesses	431	277	19
Commercial Property Value ($)	373,790,000	1,617,340,000	-
Industrial Property Value ($)	$37,600,000	$14,570,000	$14,740,000
Major , Arterial, Sub -Arterial Roads (km)	6	5	3

Current risk

Damage

$8 – 14m





Future risks

Coastal flooding in Port Adelaide

stylised global mean temperatures 1850-2200;
design by @alxrdk based on warming stripes from @ed_hawkins

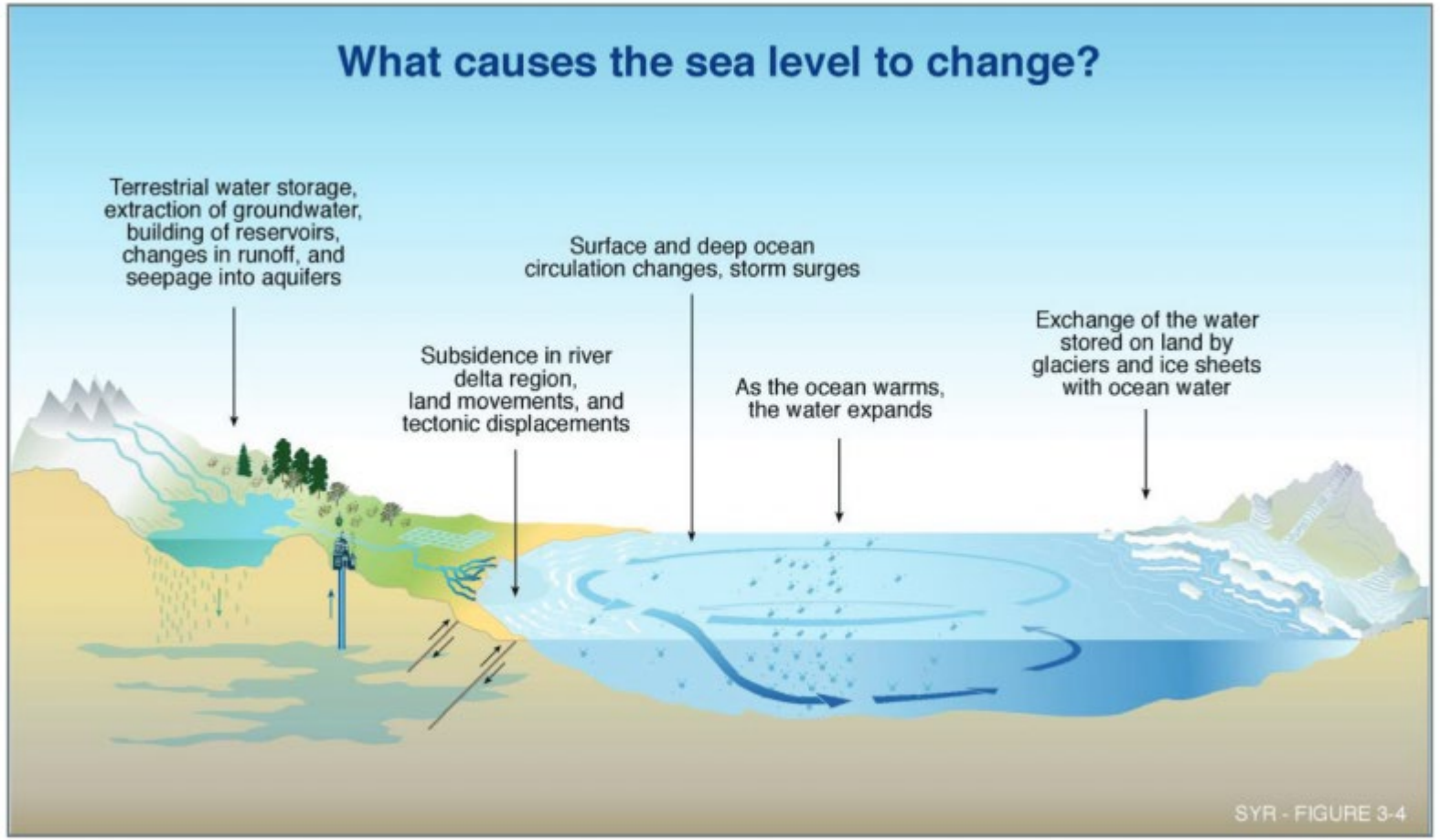
Future flooding

NEWS

Adelaide faces sea-le… catastrophe

BRAD CROUCH, Sunday Mail (SA)
October 15, 2006 12:00am

AN apocalyptic prophecy of an Australia under w…
the first places to disappear in a catastrophic sea…



Source: IPCC Third Assessment Report, Climate Change 2001 Synthesis Figure 3-4

Future hazard

Subsidence in Port Adelaide – estimated* 2.1mm / year

From 2000 to 2050: **10.5cm subsidence**

* Gillman ranges between 2.1 and 10mm/year

Sea level rise by 2050*: **30cm**

Total: **40.5cm**

*Moderate rate of SLR

Fu

Subsidence

From 2000

* Gillman ra

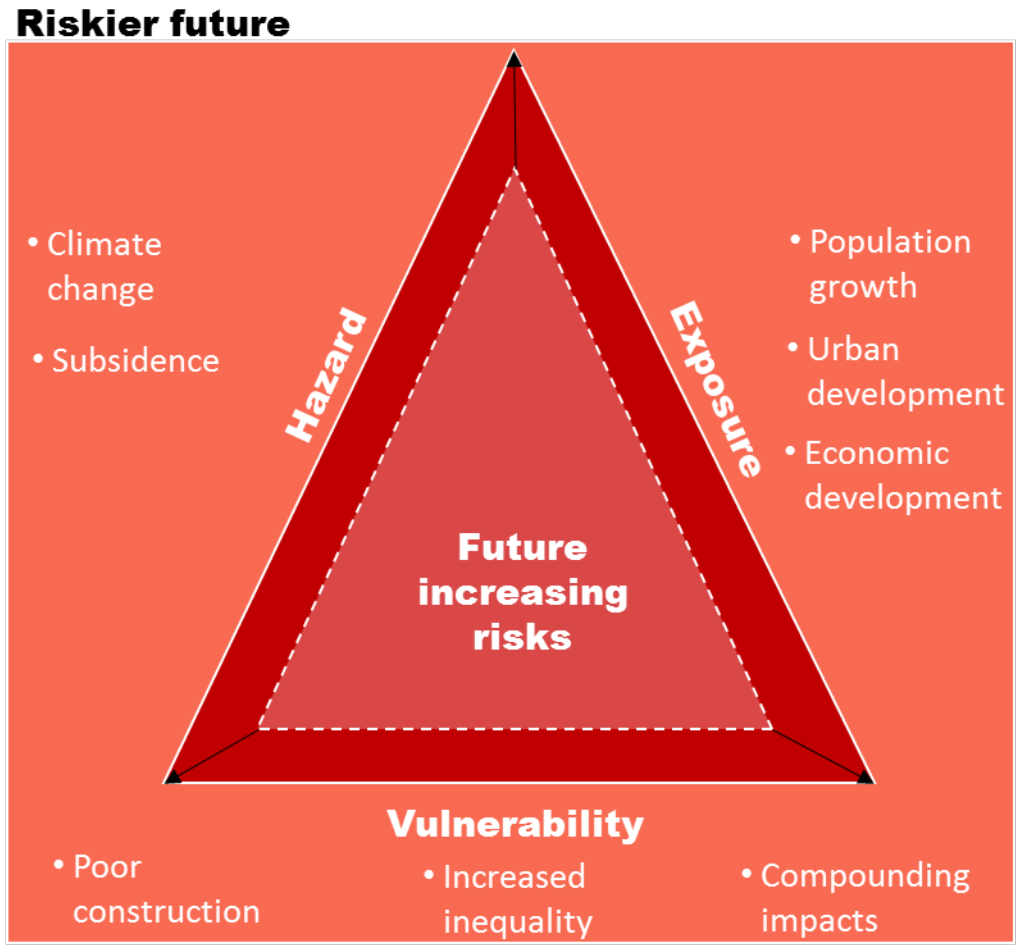
Sea level ris

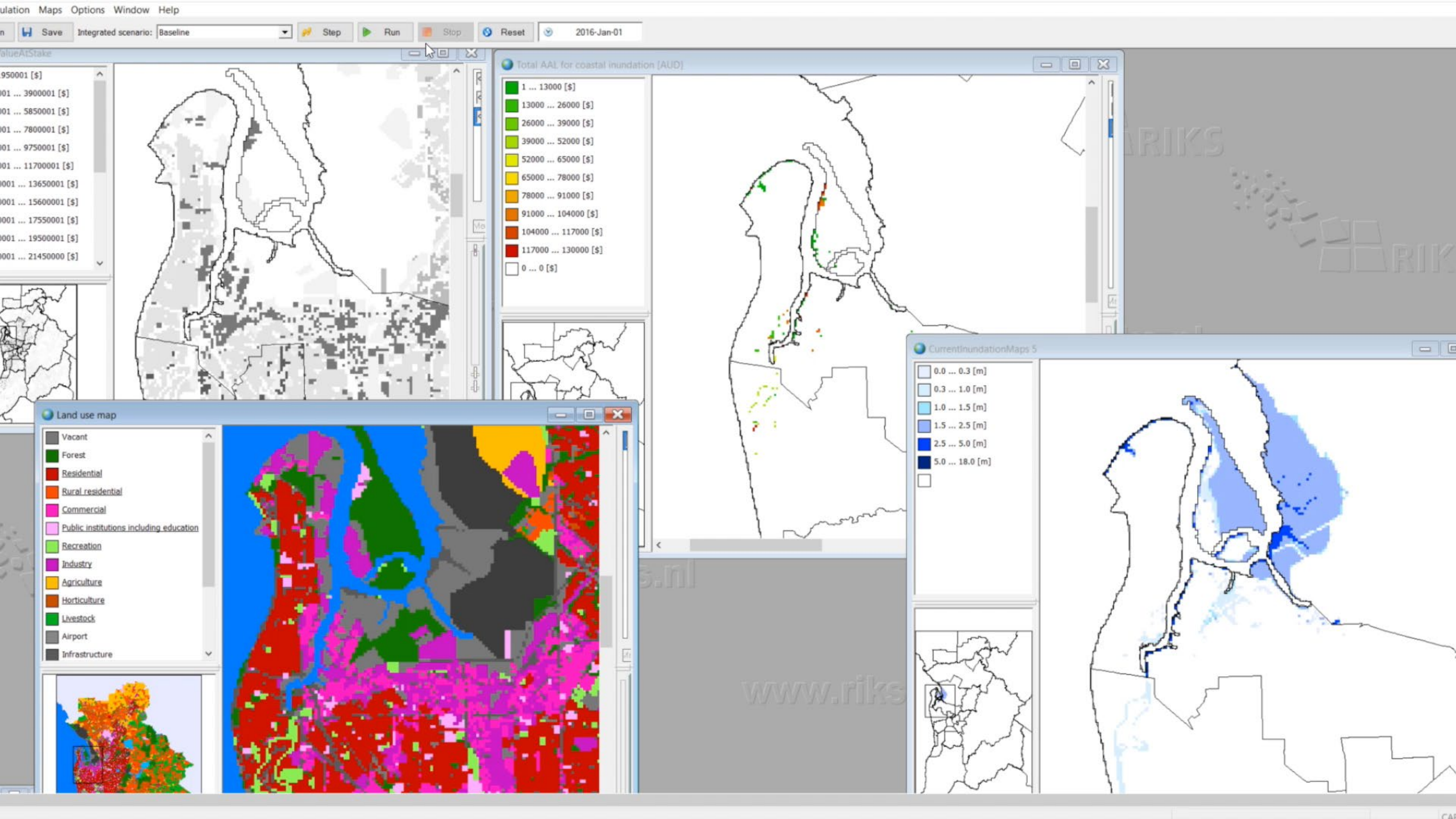
Total: **40.5c**

*Moderate

Depth

Future risk


Riskier future
• Climate change
• Subsidence
Hazard
Exposure
• Population growth
• Urban development
• Economic development
Future increasing risks
Vulnerability
• Poor construction
• Increased inequality
• Compounding impacts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2016-Jan-01
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Total AAL for coastal inundation [AUD]
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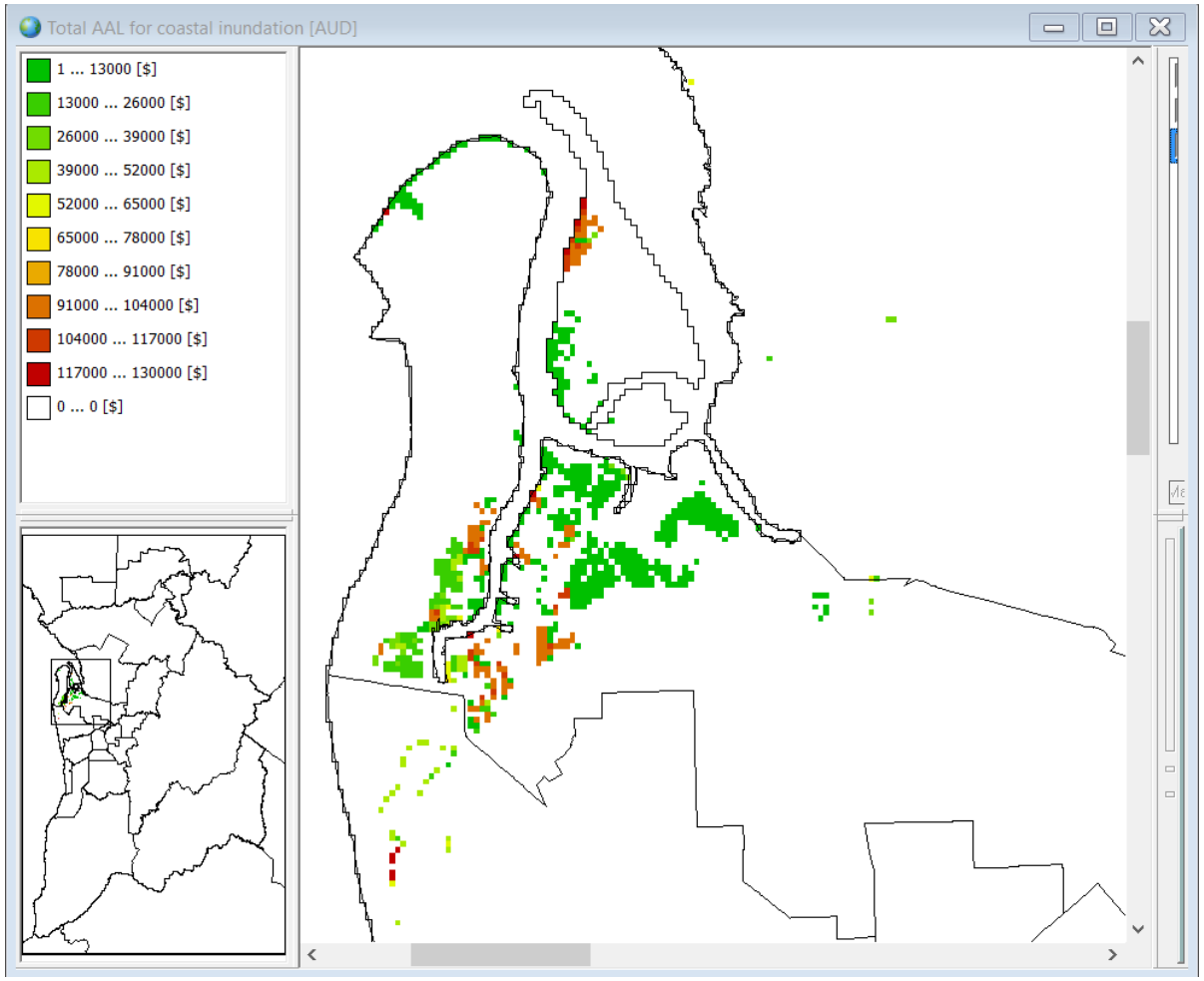
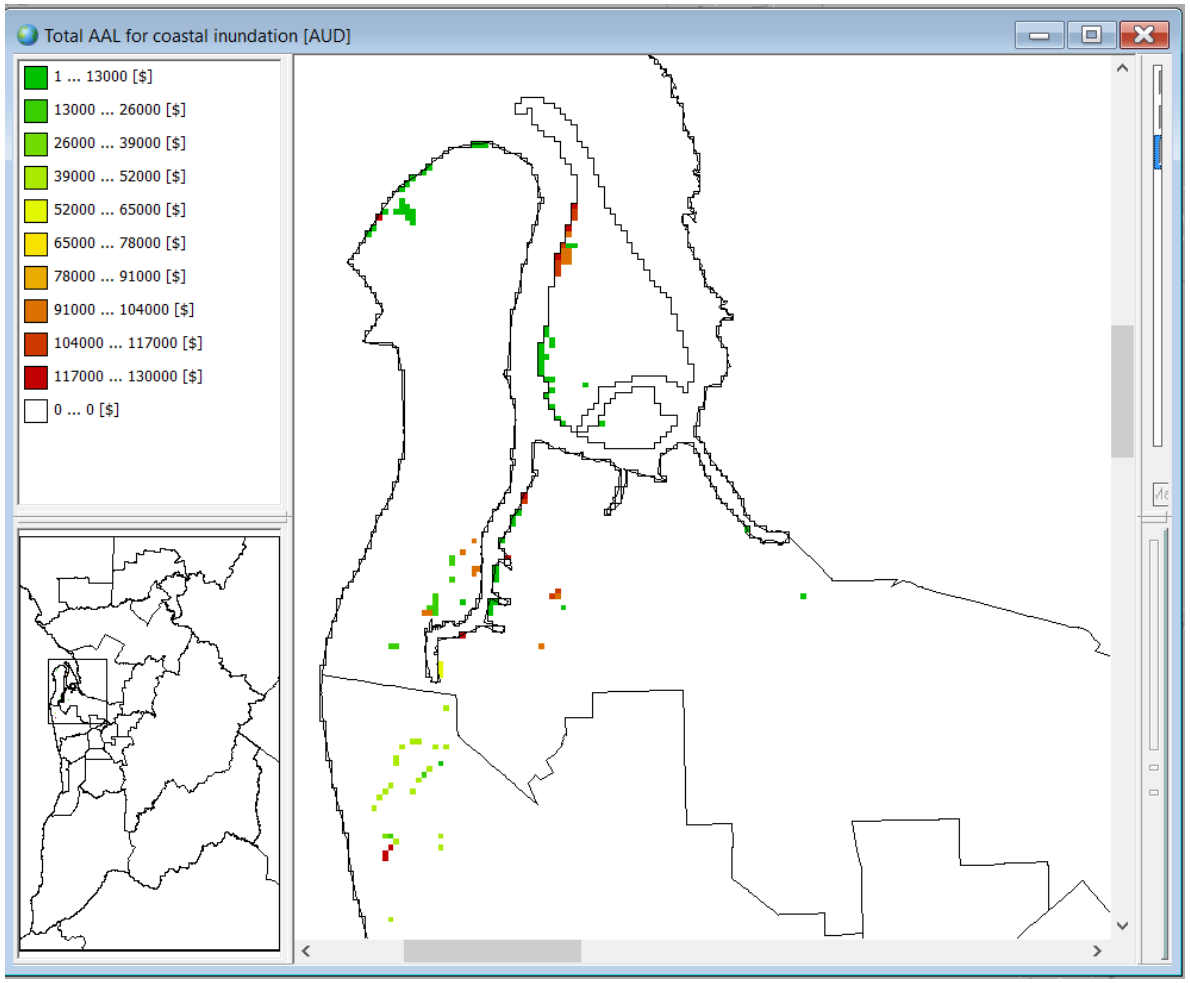
1.0 ... 1.5 [m]
1.5 ... 2.5 [m]
2.5 ... 5.0 [m]
5.0 ... 18.0 [m]
Land use map
Vacant
Forest
Residential
Rural residential
Commercial
Public institutions including education
Recreation
Industry
Agriculture
Horticulture
Livestock
Airport
Infrastructure

Future risks

2050



2016



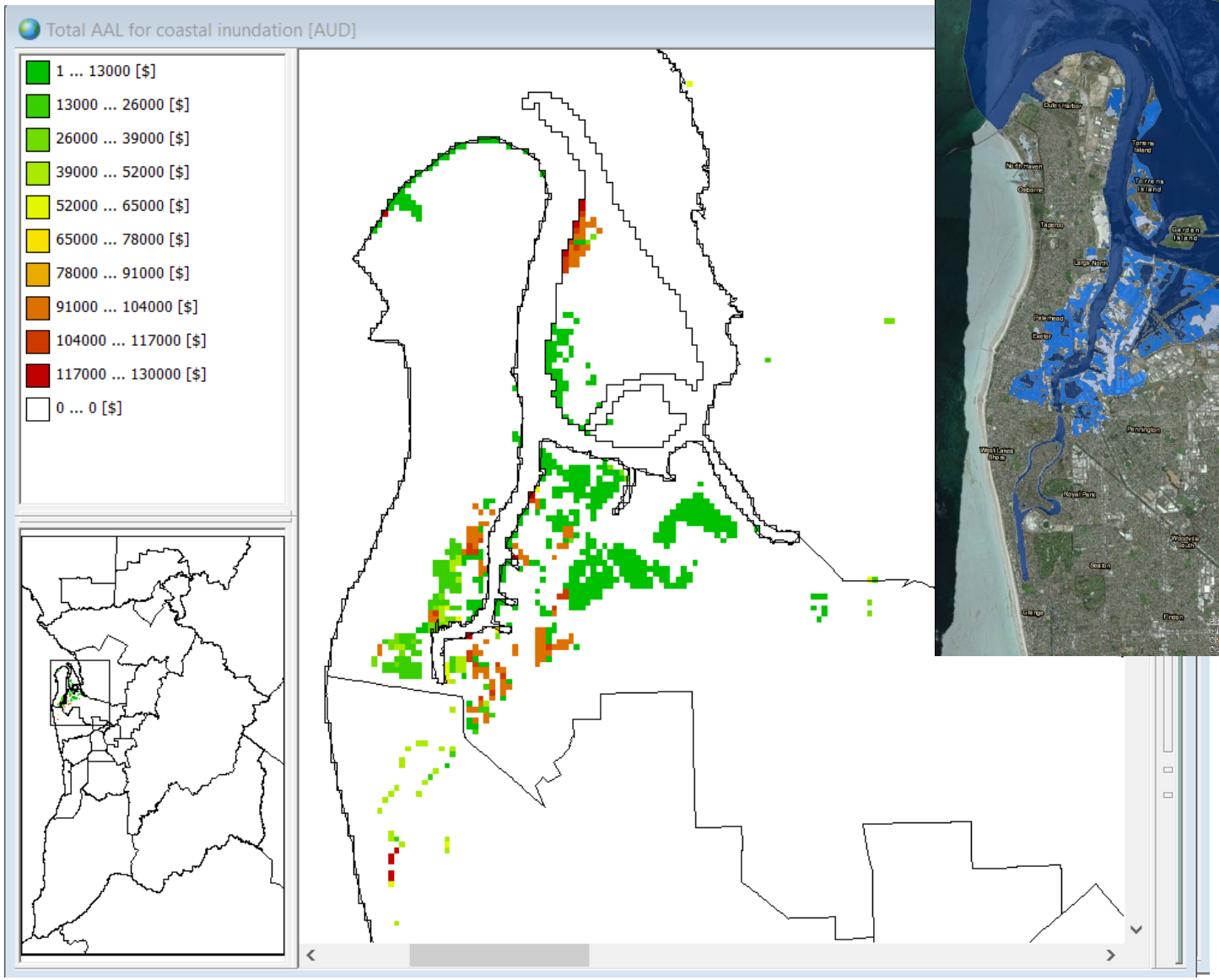
Future risks

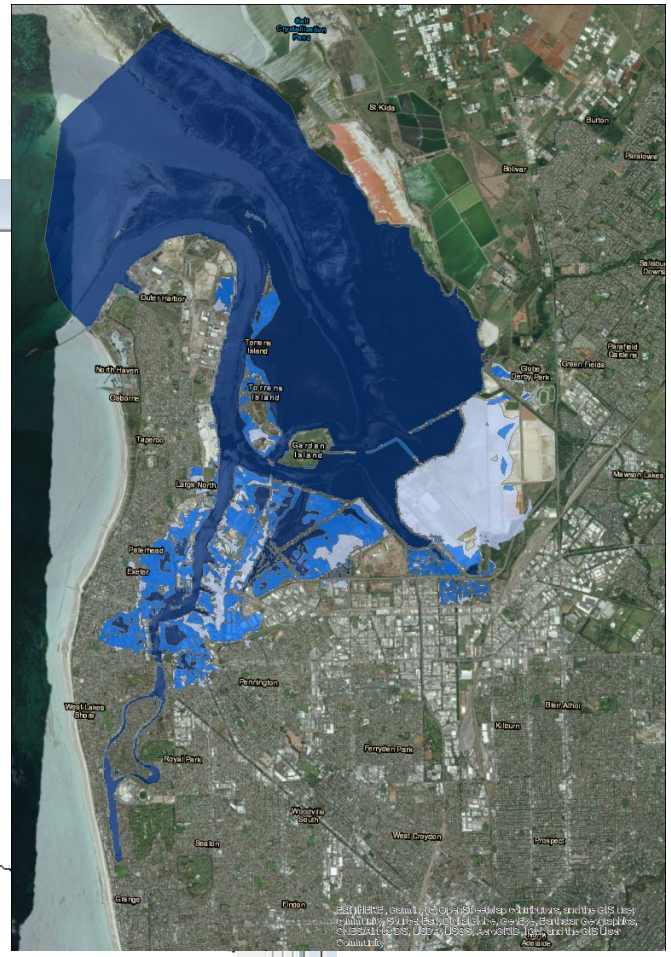
	2016			2050 – climate change			2050 – total change		
	0.01m – 0.3m	0.3m – 1m	1m +	0.01m – 0.3m	0.3m – 1m	1m +	0.01m – 0.3m	0.3m – 1m	1m +
Population	1811	1628	28	1593	5284	1301	2031	6275	1584
Dwellings	887	784	17	784	2596	667	1000	3083	812
Residential Property Value ($)	236,090,970	219,970,000	-	204,270,000	689,660,000	171,400,000	260,444,250	818,971,250	208,660,870
Businesses	431	277	19	432	1529	299	957	3995	577
Commercial Property Value ($)	373,790,000	1,617,340,000	-	3,150,,280,000	4,197,010,000	668,080,000	3,227,116,098	4,371,885,417	873,643,077
Industrial Property Value ($)	37,600,000	14,570,000	14,740,000	142,610,000	208,010,000	24,350,000	437,837,719	892,131,778	51,531,395
Major , Arterial, Sub - Arterial Roads (km)	6	5	3	9	19	6	9	19	6

Future risk

Damage

$280 – 340 m





Discussion

Q1: Implications for response and recovery – would we be able to deal with it? How is it different to today?

Q2: How can we mitigate – what options could be tested? Positive, negatives? What other information do we need?

Feedback

Did you gain a greater understanding of the conditions that will contribute to the likelihood of coastal flooding in Port Adelaide now and in the future?

Y: 26 / N: 2

Did you gain a greater understanding of the consequences of coastal flooding in Port Adelaide now and in the future?

Y: 27 / N: 1

Did the exercise assist you in starting to explore coastal flood risk mitigation and resilience approaches?

Y: 25 / N: 3

Did you gain a greater understanding of the potential for the UNHaRMED platform to assist agencies to predict the consequences from future disasters, and help to mitigate them?

Y: 25 / N: 2

Part 2

September 18 in Adelaide

Dive in deeper to mitigation

- What is possible?
- Testing with UNHaRMED
- Experts in design and implementation

Providing background context for the “now”, but also predictions as to population and impact from climate change helpful. Predictions as to impacts very useful.

The consequences extend a lot further than the affected area, will take a combined effort to recover.

The elephant in the room is how to deal with the politics. The technical side is simple in comparison.

Thank you

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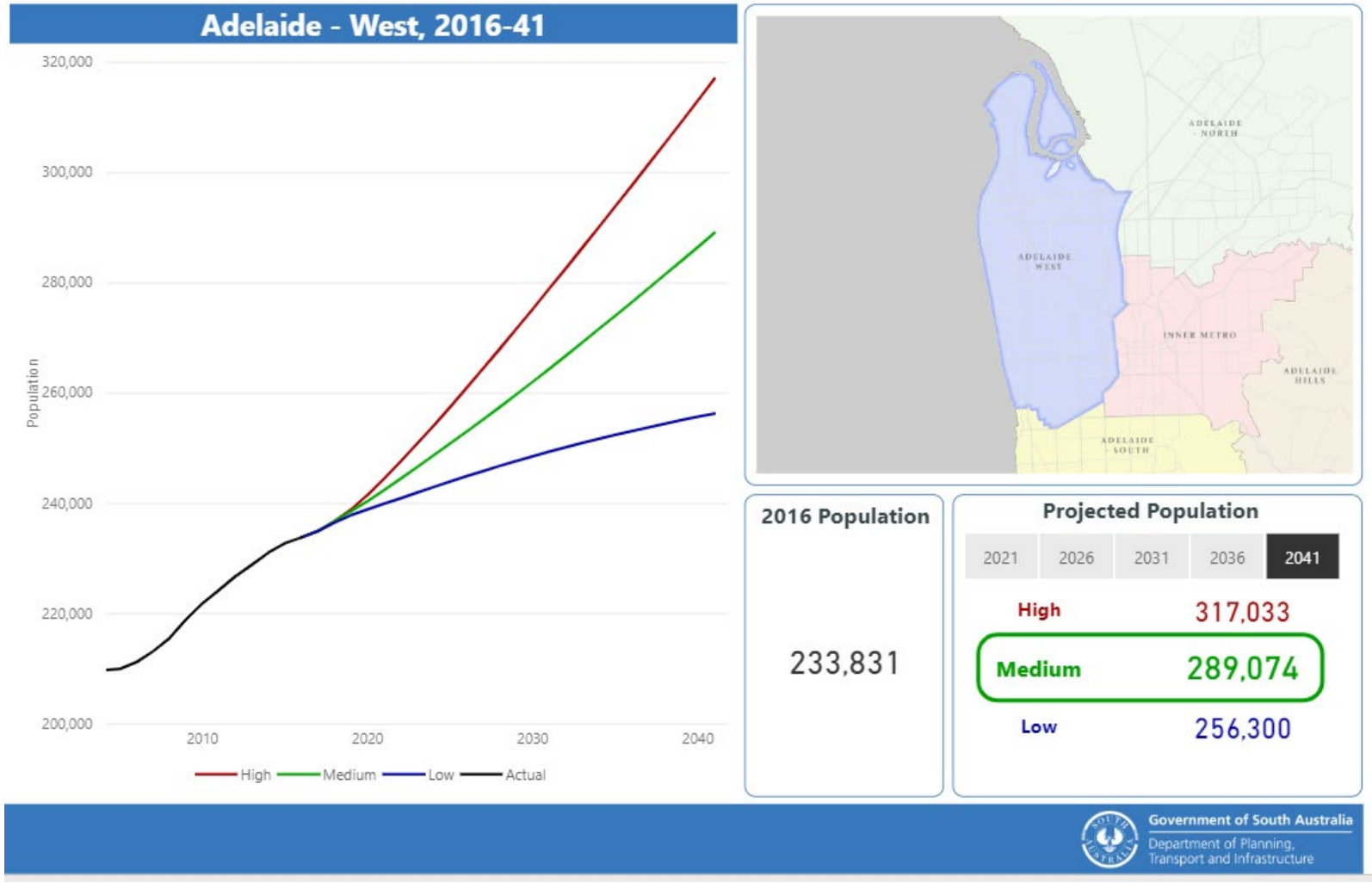
graeme.riddell@adelaide.edu.au

The UNHaRMED model was very good and useful to try to quantify this (consequences) and make it tangible.

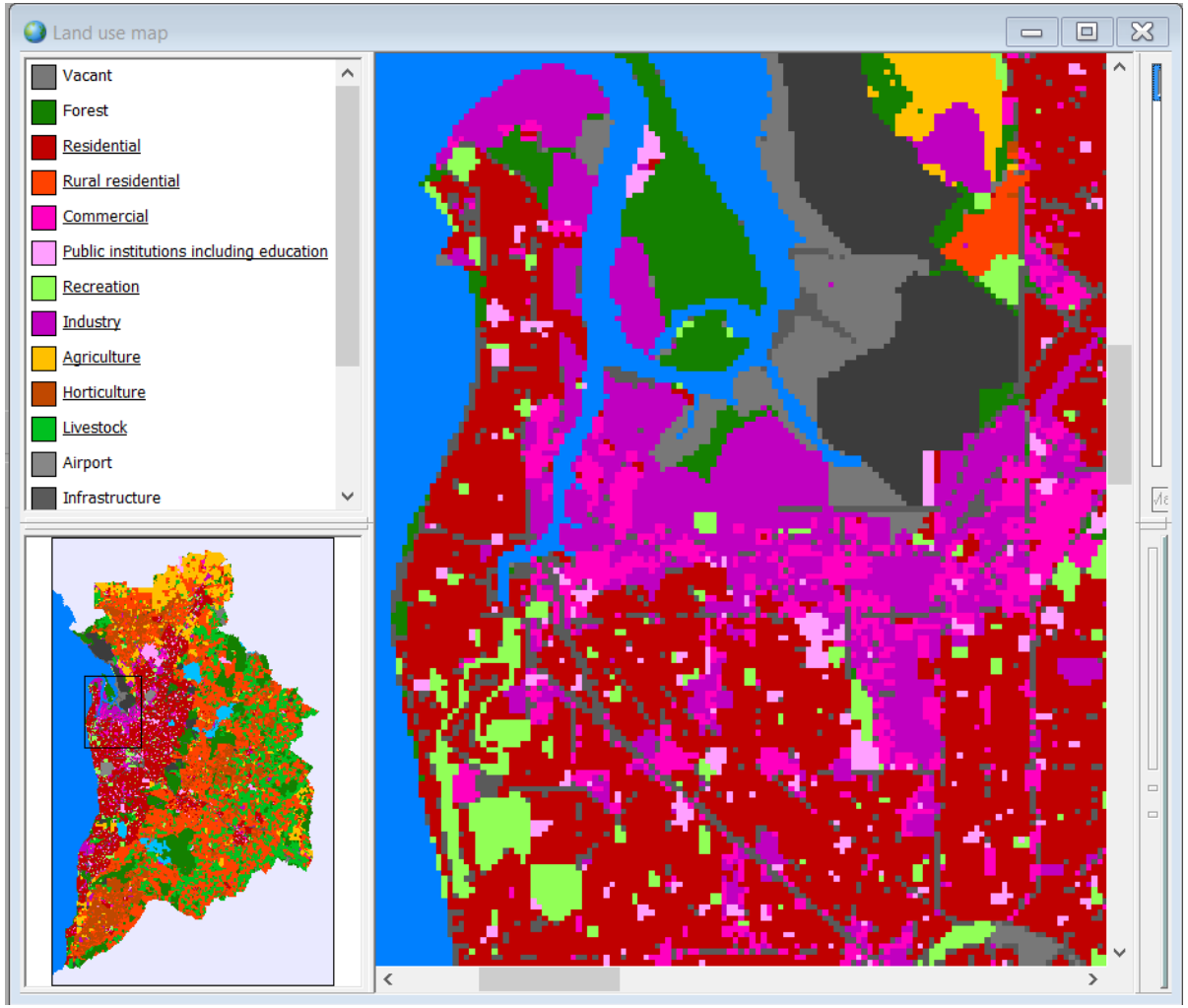
Future exposure

Population change

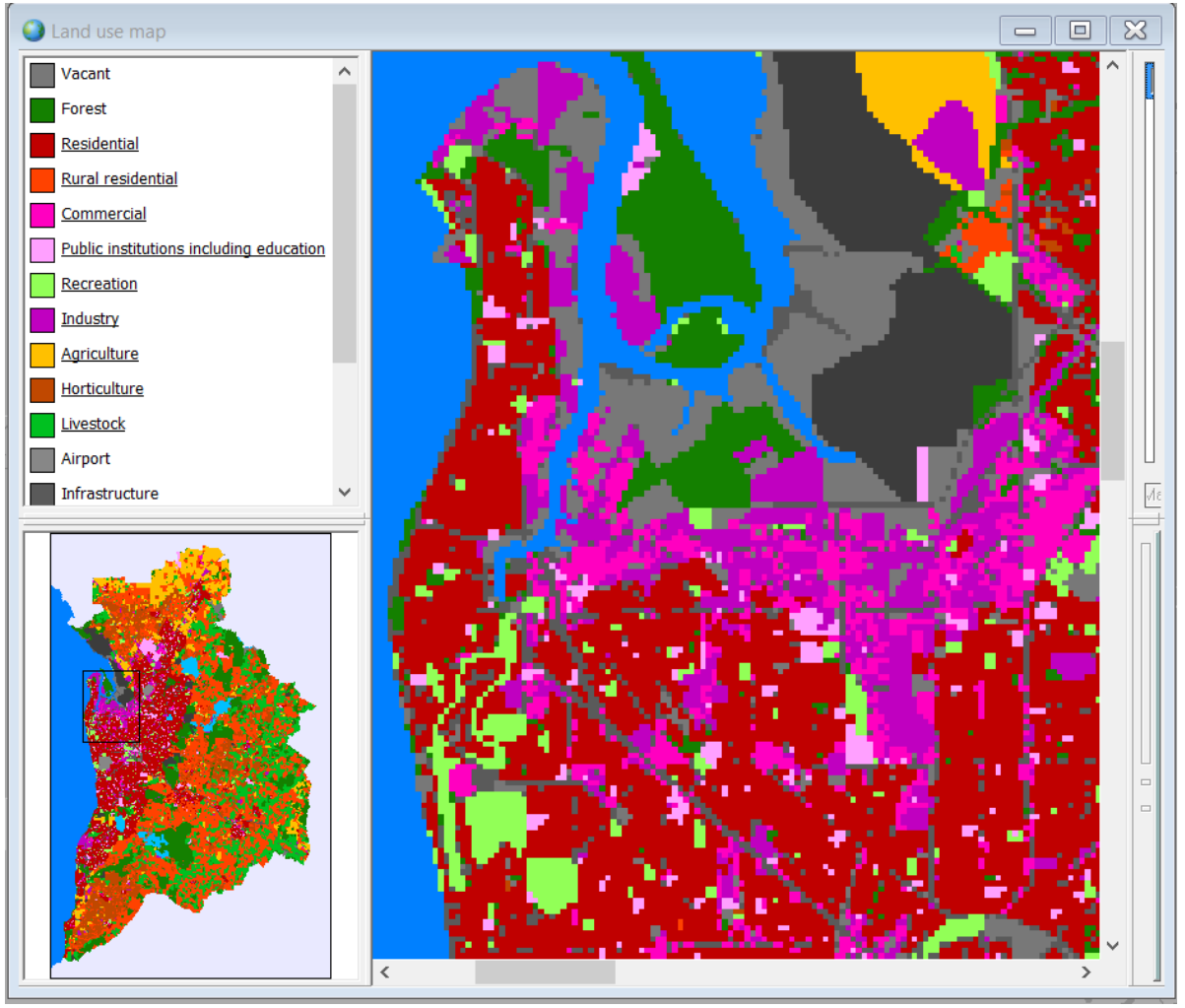


Future exposure

2050

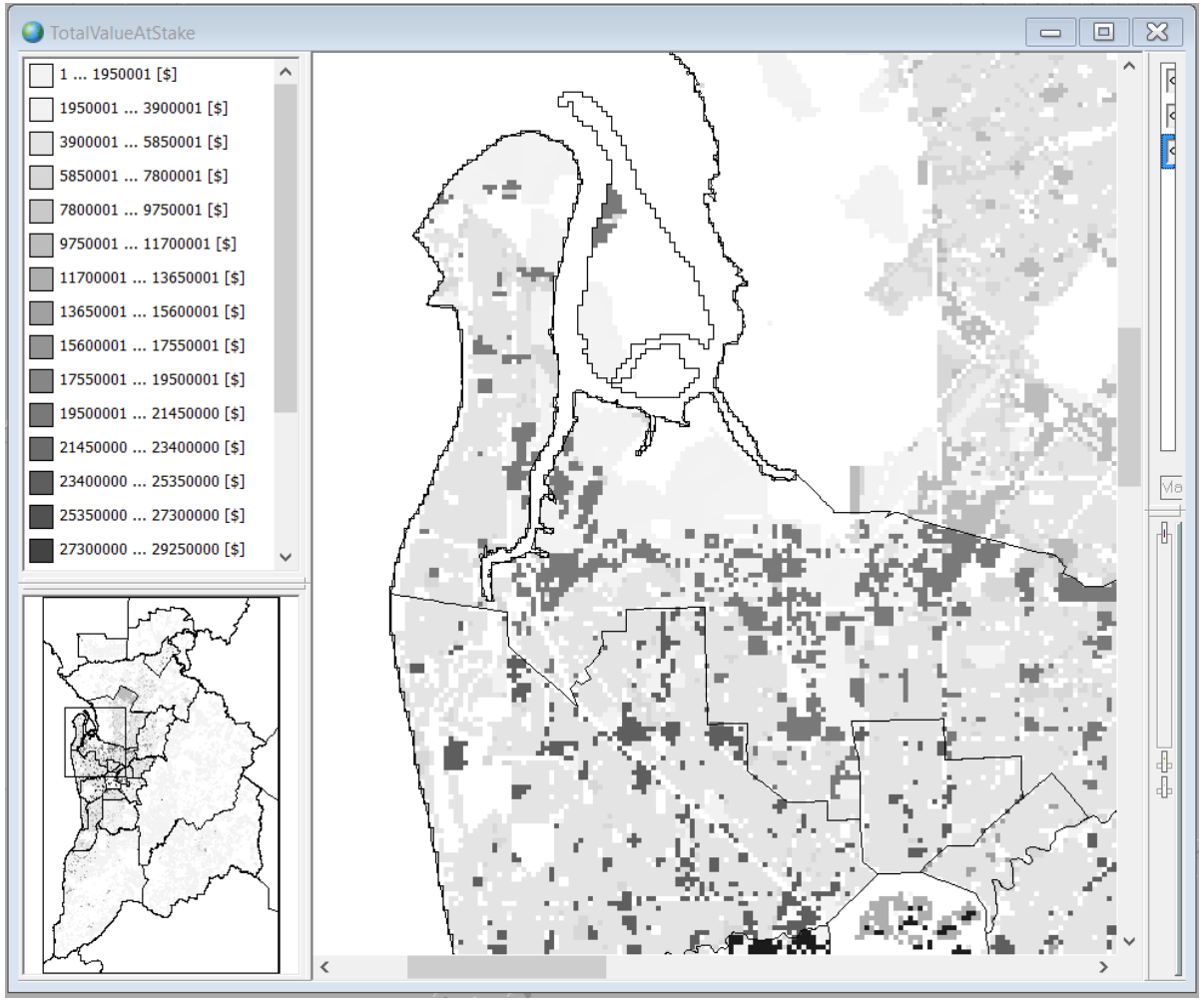


2016

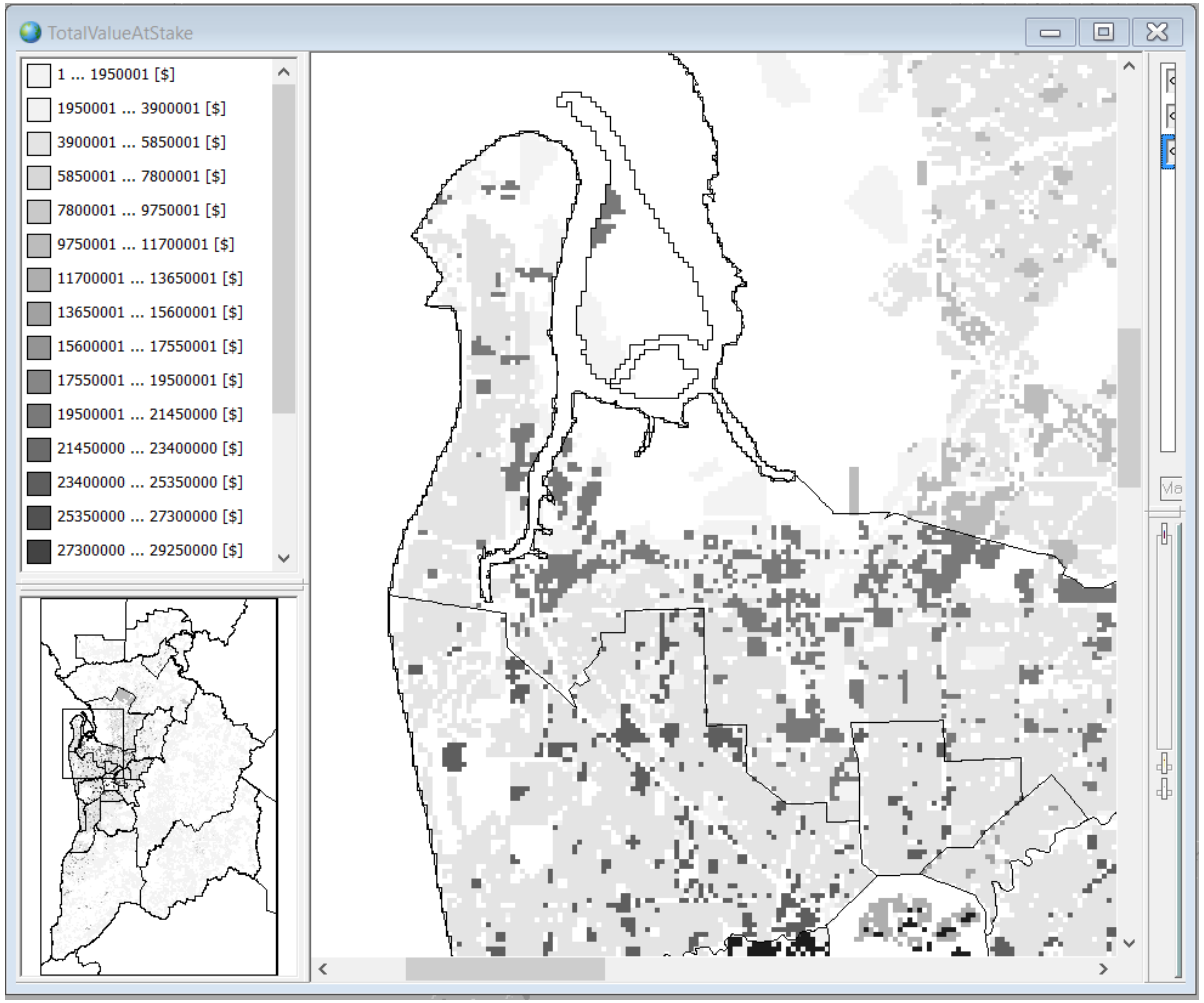


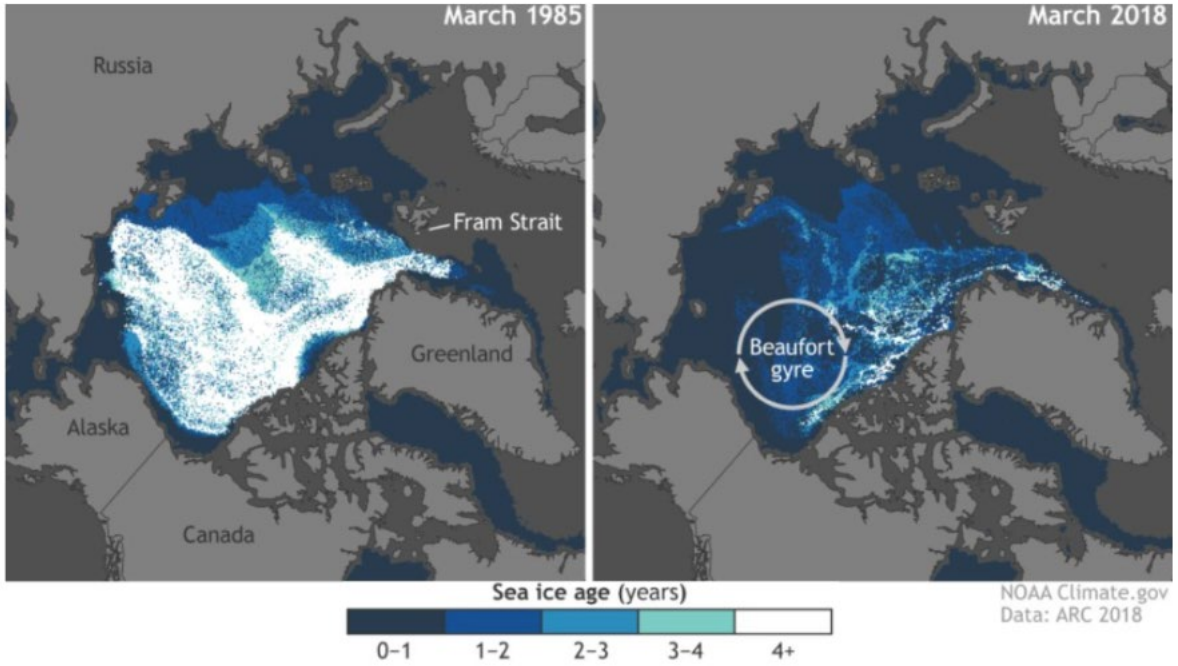
Future exposure

2050



2016





Heatwaves amplify near-record levels of ice melt in northern hemisphere

Greenland's ice sheet shrank more in past month than in average year, experts warn

▲ Visitors walk among free-floating ice jammed into the Ilulissat Icefjord during unseasonably warm weather on

Jonathan Watts *Global environment editor*

@jonathanwatts

Fri 2 Aug 2019 16.00 AEST

1,478

Future risks

Accelerated sea-level-rise

Future hazard

Subsidence in Port Adelaide – estimated* 2.1mm / year

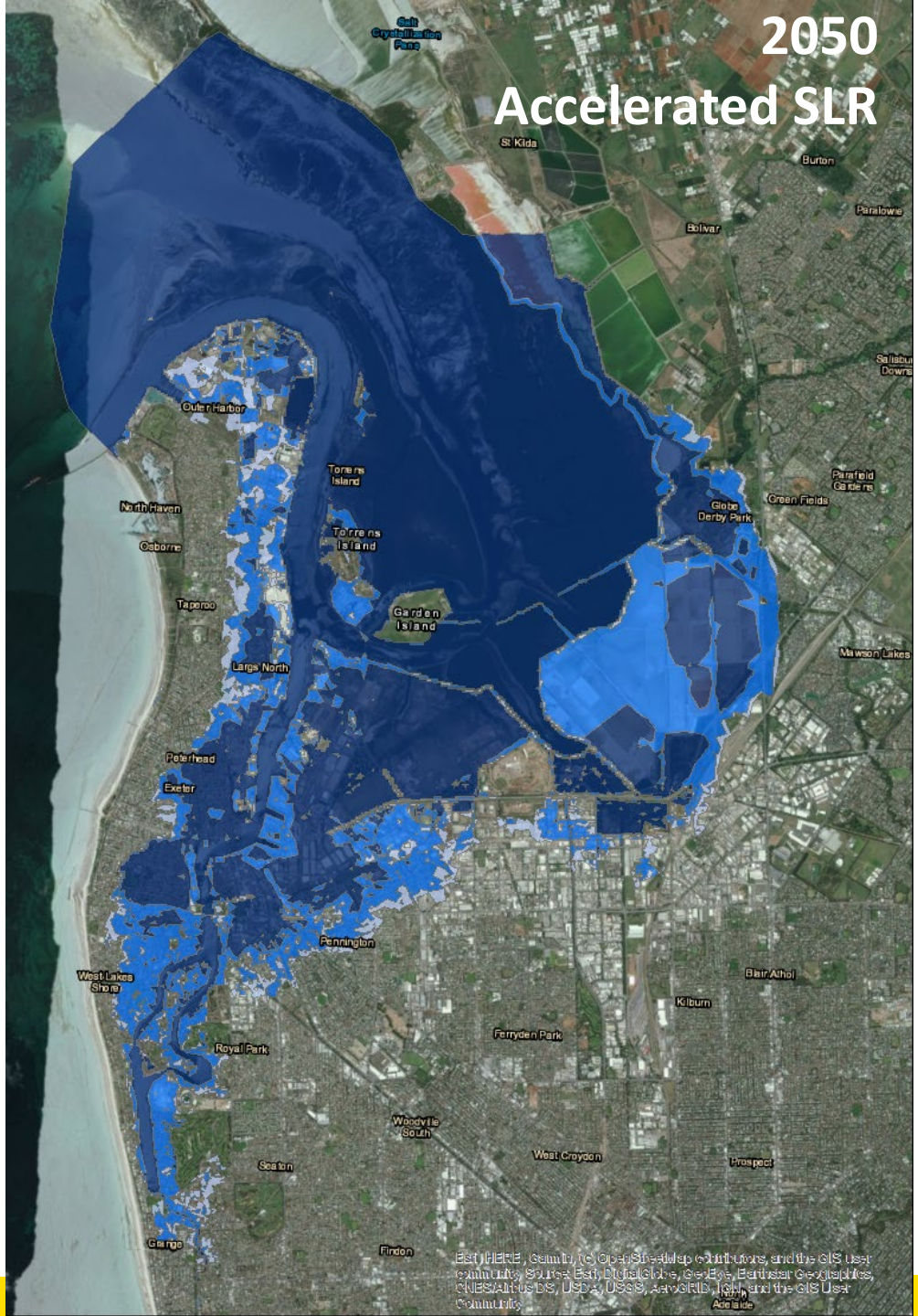
From 2000 to 2050: **10.5cm subsidence**

* Gillman ranges between 2.1 and 10mm/year

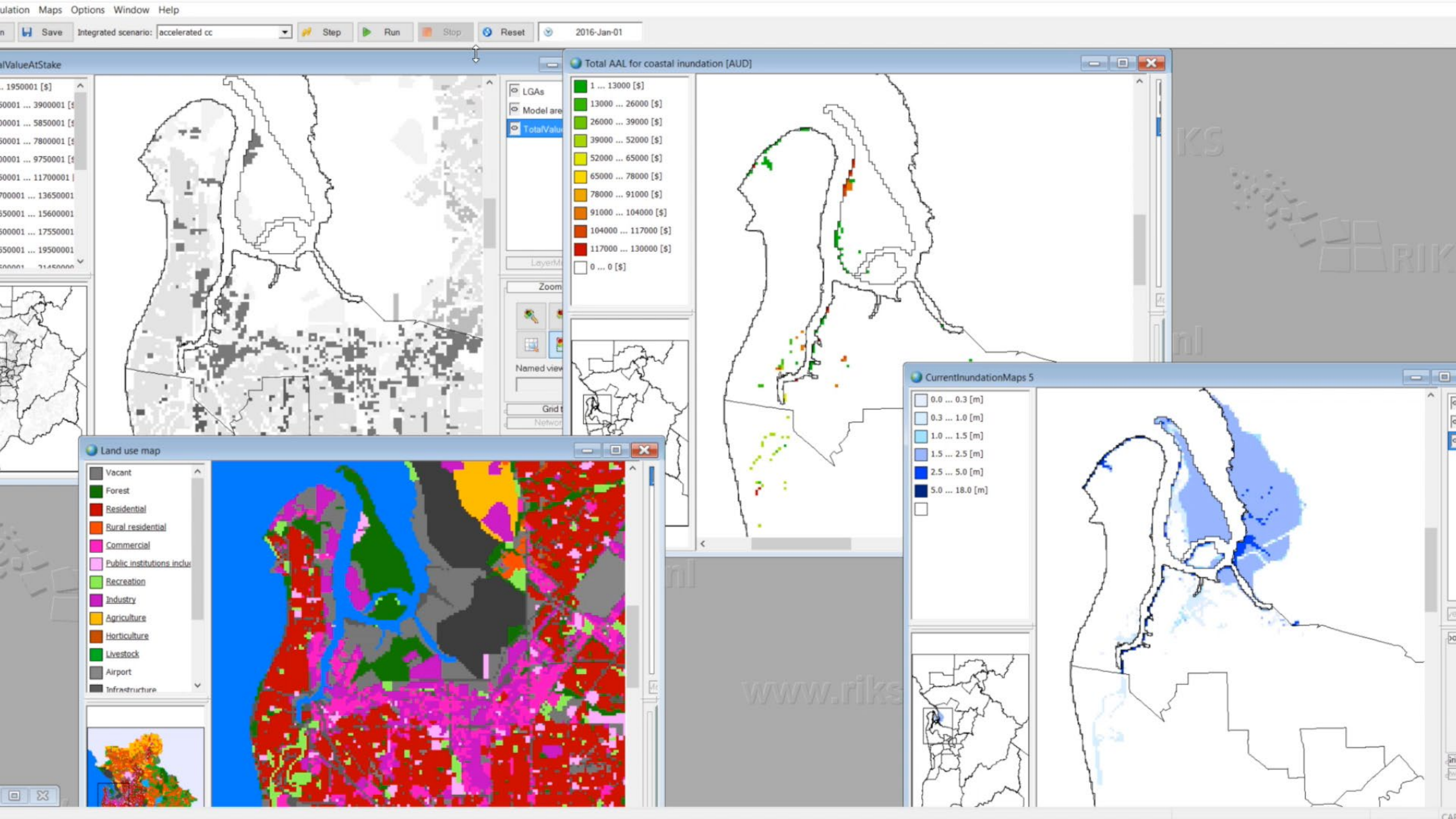
Sea level rise by 2050*: **88cm**

Total: **98.5cm**

*Accelerated form 2100 projected values



Depth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1.0 ... 1.5 [m]
1.5 ... 2.5 [m]
2.5 ... 5.0 [m]
5.0 ... 18.0 [m]
Land use map
Vacant
Forest
Residential
Rural residential
Commercial
Public institutions inclu
Recreation
Industry
Agriculture
Horticulture
Livestock
Airport
Infrastructure