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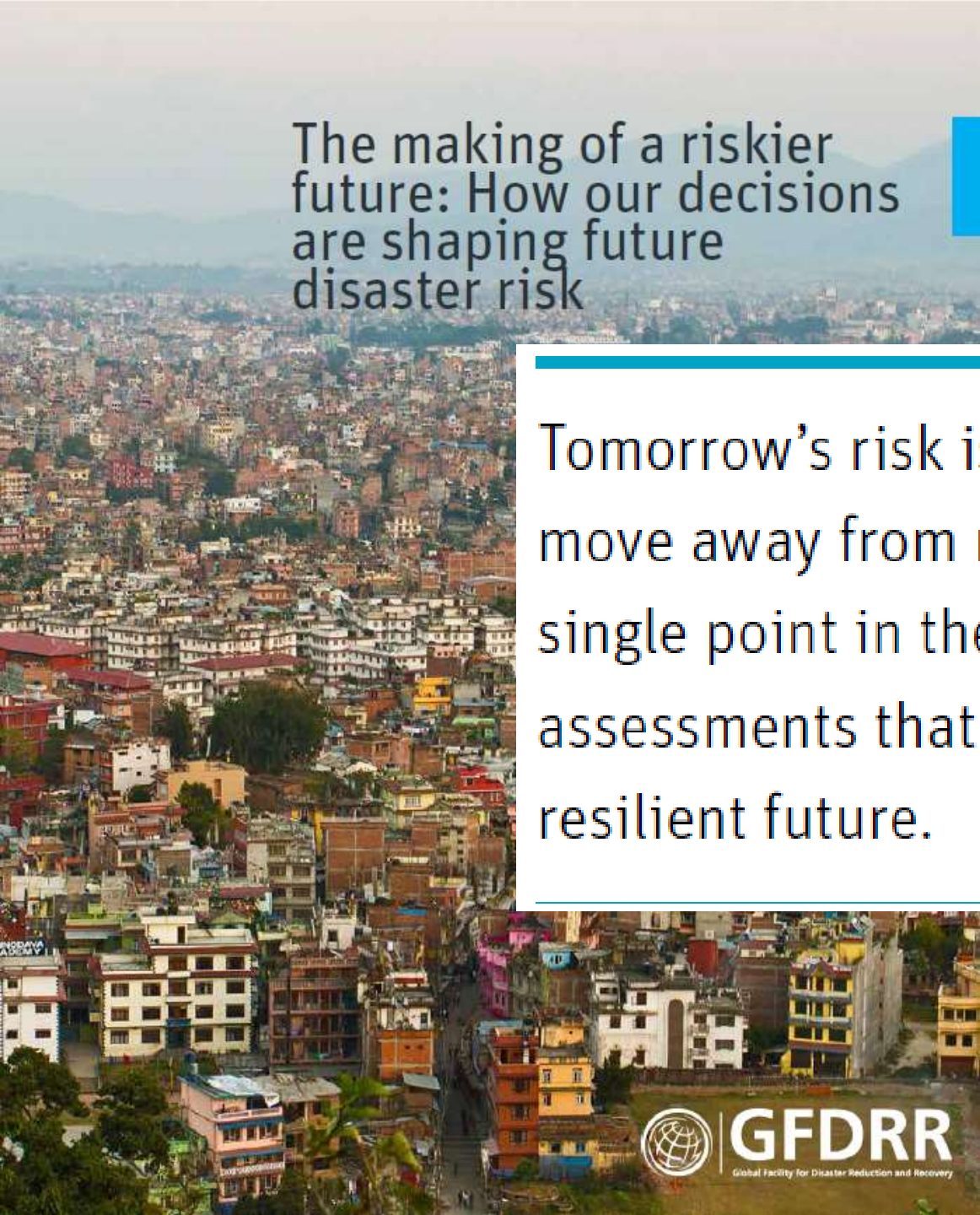
UNHaRMED

Unified Natural Hazard Risk Mitigation Exploratory
Decision support system

Holger R. Maier, Graeme A. Riddell, Hedwig van Delden, Jeffrey P. Newman, Aaron
C. Zecchin, Roel vanHout, James Daniell, Andreas Schäfer, Graeme C. Dandy, Charles
P. Newland

adelaide.edu.au

MOTIVATION

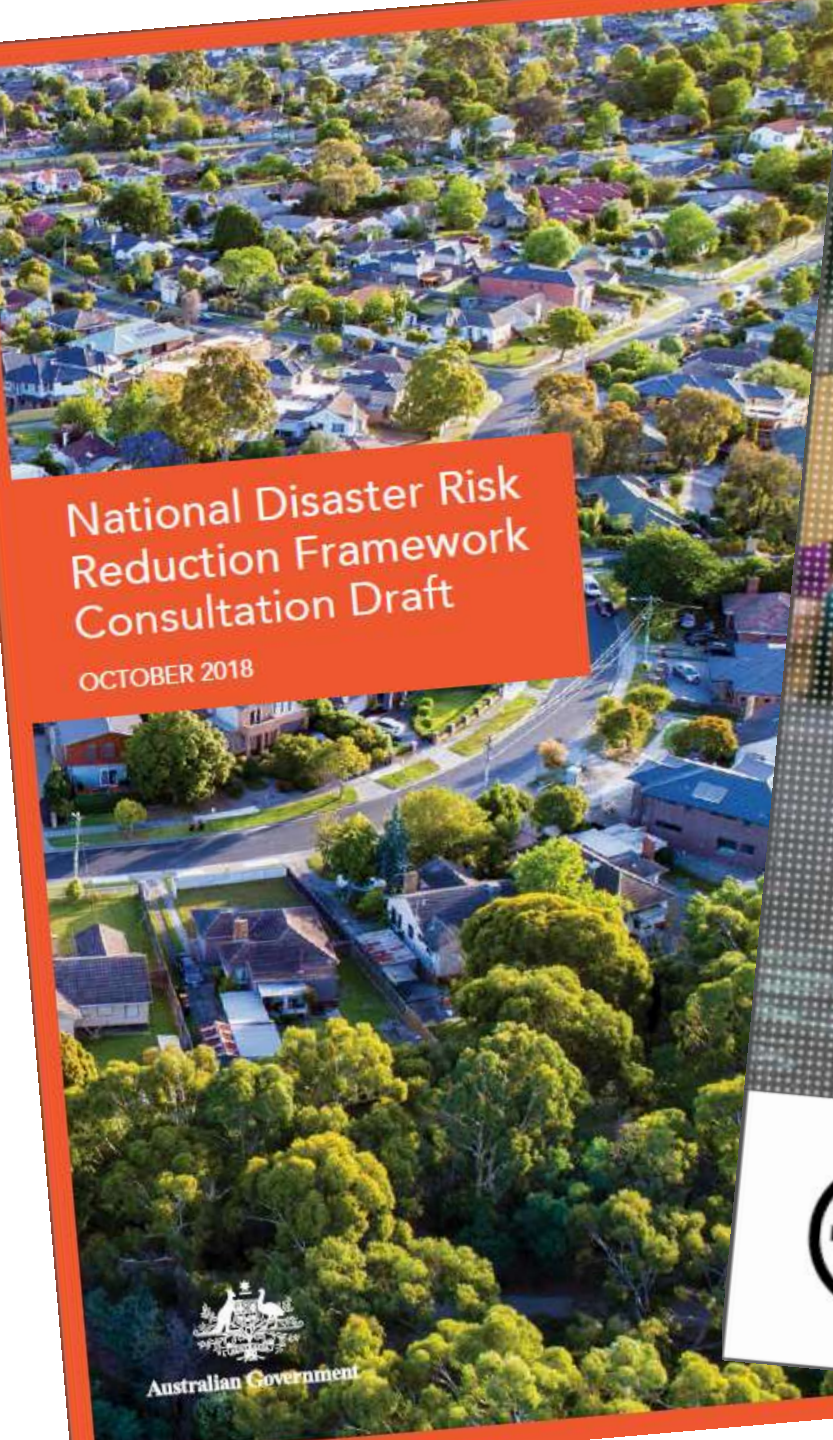


The making of a riskier
future: How our decisions
are shaping future
disaster risk

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) The making of a riskier future: How our decisions
are shaping future disaster risk.



National Disaster Risk
Reduction Framework
Consultation Draft

OCTOBER 2018



VIALE
SUSTAINABLE
LIVEABLE
PROSPEROUS



Climate Change
and the Emergency
Management Sector



DISCUSSION PAPER
Version 1.0
3 July, 2018



Sendai Framework for Disaster Risk Reduction 2015 - 2030



INVESTING IN RESILIENCE

Tools and
frameworks for
managing physical
climate risk

Final Report

Recommendations of the Task Force on Climate-related Financial Disclosures

Investor Group on
Climate Change

TCFD

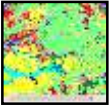
TASK FORCE ON CLIMATE-RELATED
FINANCIAL DISCLOSURES

June 2017

CONCEPT

People

- Socio-economic status
- Spatial distribution
- Age profile



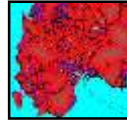
Land

- Residential
- Green spaces
- Urban forest
- Commercial
- Industry



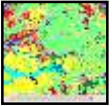
Infrastructure

- Critical infrastructure
- Culturally significant areas
- Neighbourhood renewal



People

- Socio-economic status
- Spatial distribution
- Age profile



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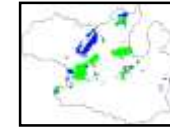


Infrastructure

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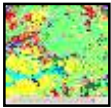


- Physical risk (flood management, climate resilience, health & wellbeing, infrastructure)
- Social cohesion
- Community resilience
- Neighbourhood renewal
- Liveability (mobility & transport, cycling network, metro-rail, green spaces, urban forest, integrated water management)
- Level of service (water, electricity, traffic)



People

- Socio-economic status
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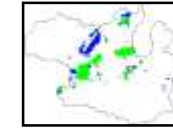


Infrastructure

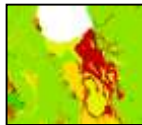
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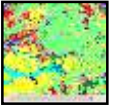


- Weather
- Climate
- Natural hazards
- Population
- Demographics
- Economics
- Politics



People

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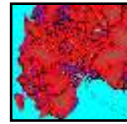
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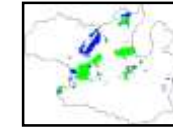


Infrastructure

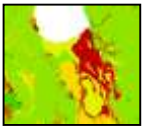
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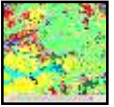


- Infrastructure planning
- Landuse planning
- Community education
- Structural measures



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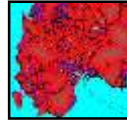
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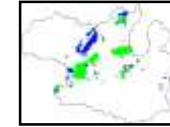


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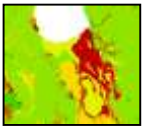
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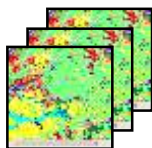


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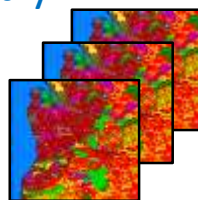
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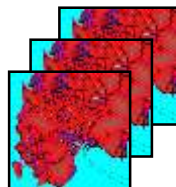
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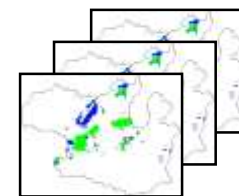


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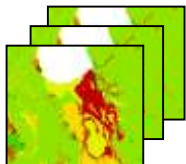


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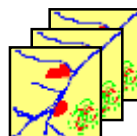


“MODEL LONG-TERM CHANGES”

- Weather
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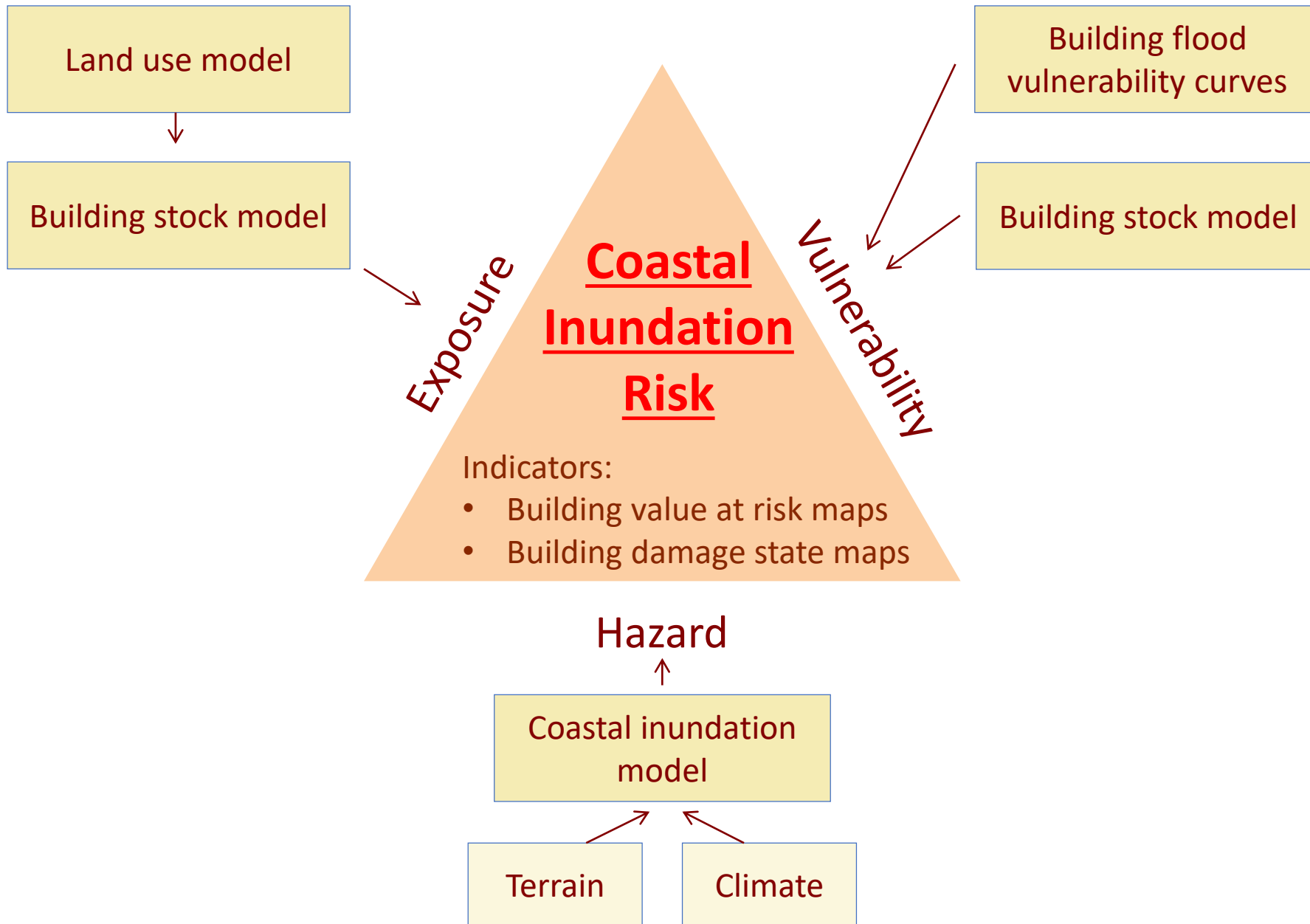


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“policy wind tunnel”





Mitigation options coastal inundation

- **Hazard**

- **Structural measures**

- **Vulnerability**

- **Retrofitting building types**

- **Changes to the building stock mix**

- **Education and awareness to manage your property**

- **Exposure**

- **Land use planning**

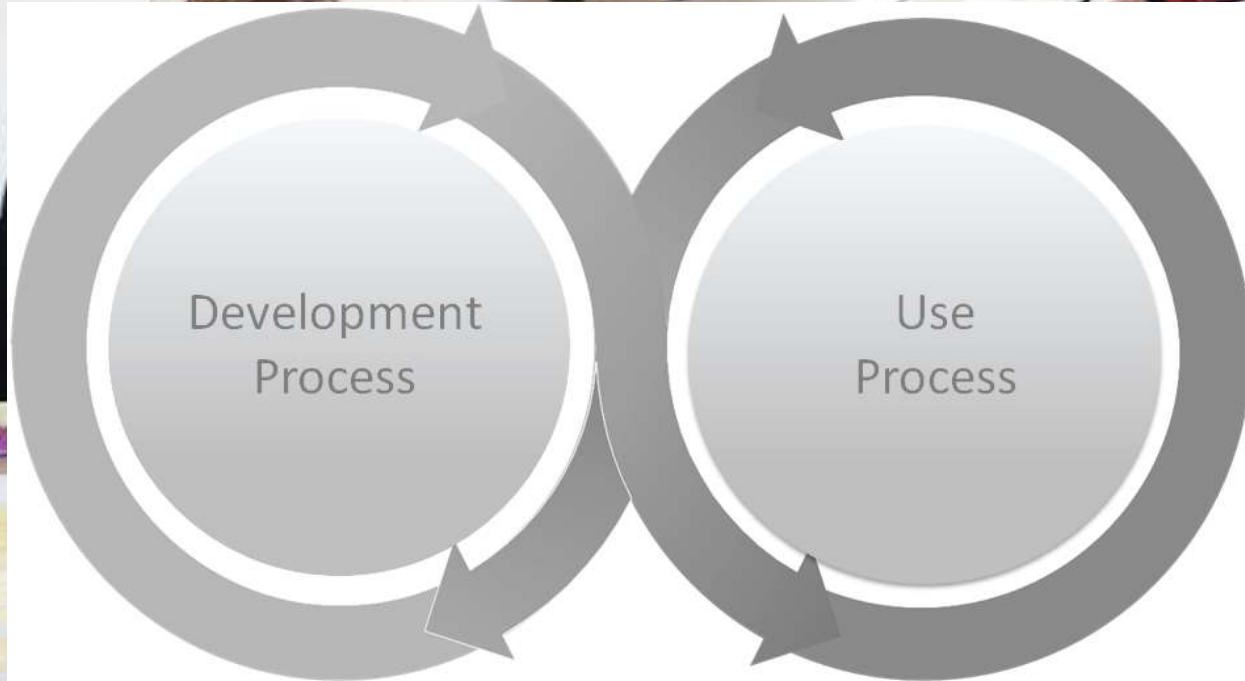
DEVELOPMENT



Collaborative approach



Collaborative approach



BENEFITS OF PROPOSED APPROACH

End users involved in:

- **Model development & selection**
- **User interface design**
- **Scenario development**
- **Policy assessment & planning**

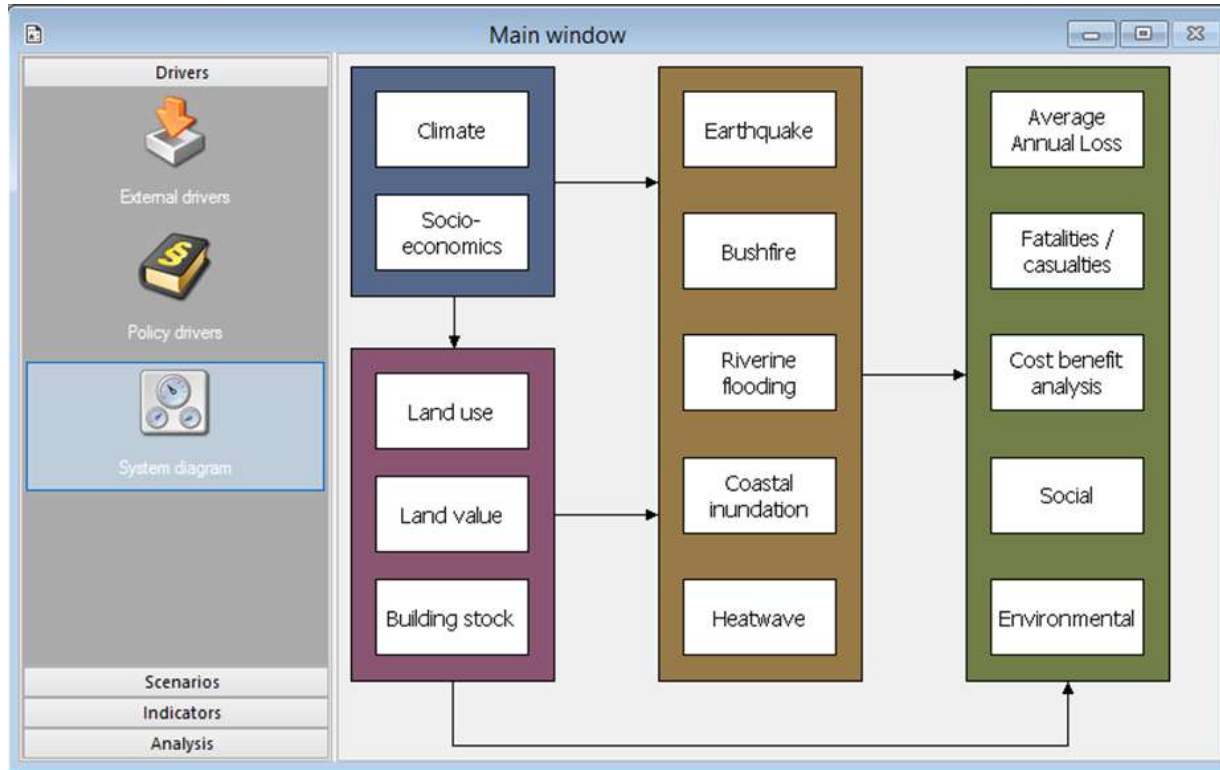
Social learning occurs when stakeholders, modellers and facilitators explore and evaluate policy options through group interaction with the DSS

Builds strategic capacity by exploring future risk profiles

Looks towards integration of system within organisations



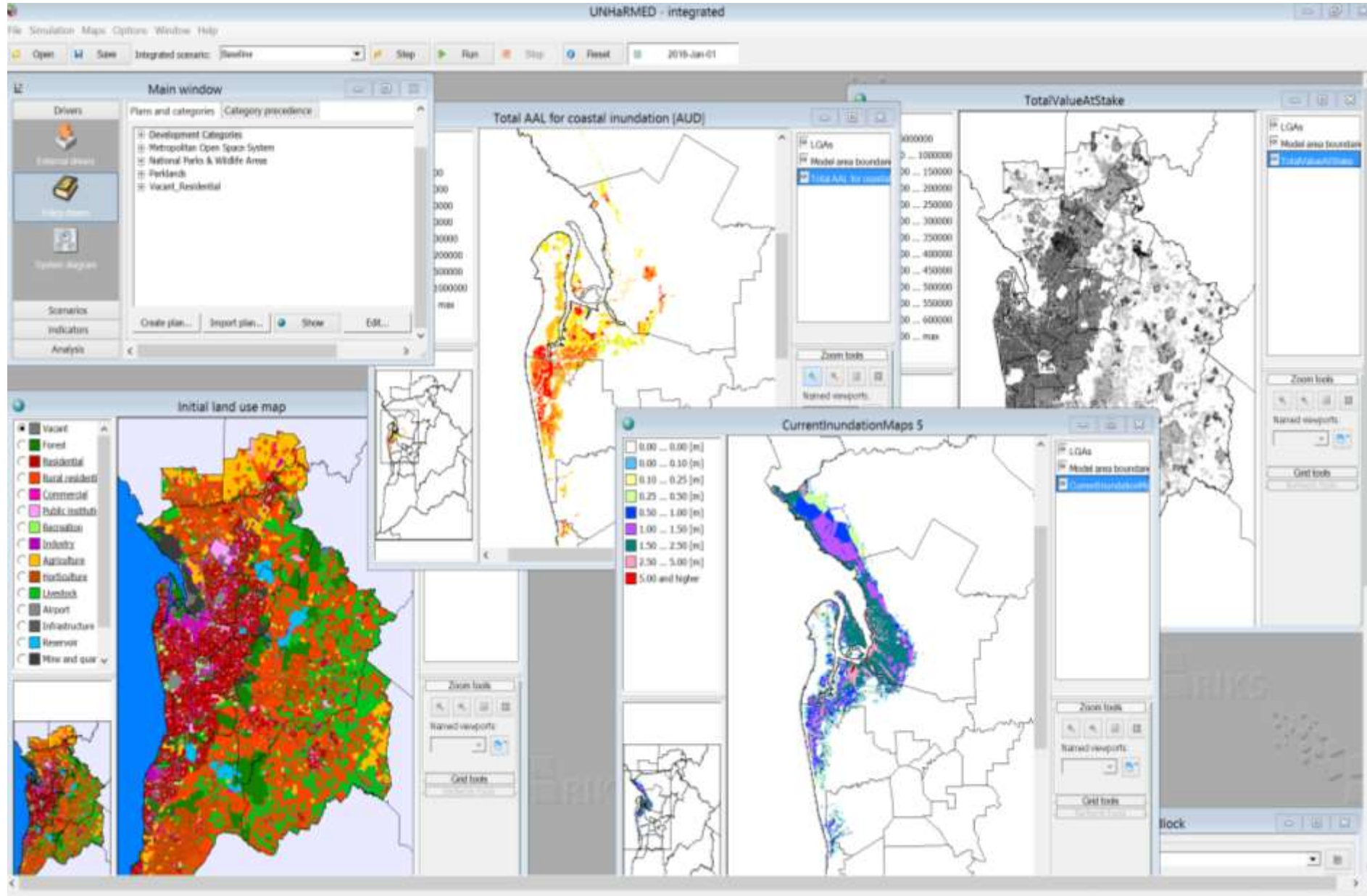
EXPECTED OUTCOMES



- Best-practice approach to identification of outcomes that represent value of money
 - Evidence-based decision-making
 - Increased transparency, efficiency and effectiveness in decision-making processes
- Development of shared understanding of risks, how they interact and what can be done about them
- Understanding of relative importance of different factors in specific decision contexts
- Development of flexible, adaptable pathways

APPLICATION

IMPACT OF CLIMATE CHANGE ON CRITICAL INFRASTRUCTURE



ASSESSMENT OF PHYSICAL CLIMATE RISK (TCFD)

INVESTING IN RESILIENCE

Tools and frameworks for managing physical climate risk

NATURAL HAZARD RISK AND PLANNING SPATIAL TOOL

Name and details

UNHaRMED – University of Adelaide / BNHCRC²⁷

UNHaRMED is a sophisticated spatial mapping tool that can map changes in hazards through planning and economic development, developed as part of the Bushfire and Natural Hazard Cooperative Research Centre (BNHCRC).

Suggested application area and example

Property, infrastructure, due diligence

The UNHaRMED tool was designed for state planning and is used to model spatial maps of various climate risk indicators (e.g. average annual loss, people / floor space impacted, property damage) change over time in response to different climate scenarios on hazards (i.e. extreme heat, precipitation and coastal flood) and the impact of different economic and population change scenarios on exposure (i.e. land use and building stock). Adaptation measures can be modelled to allow a cost-benefit-assessment.

A/Level



Access




Type



KEY:

ASSESSMENT LEVEL: Portfolio 

Asset 

ACCESS: Open source 

Propriety 

TYPE: Climate data focus



Impact data focus



Rating based



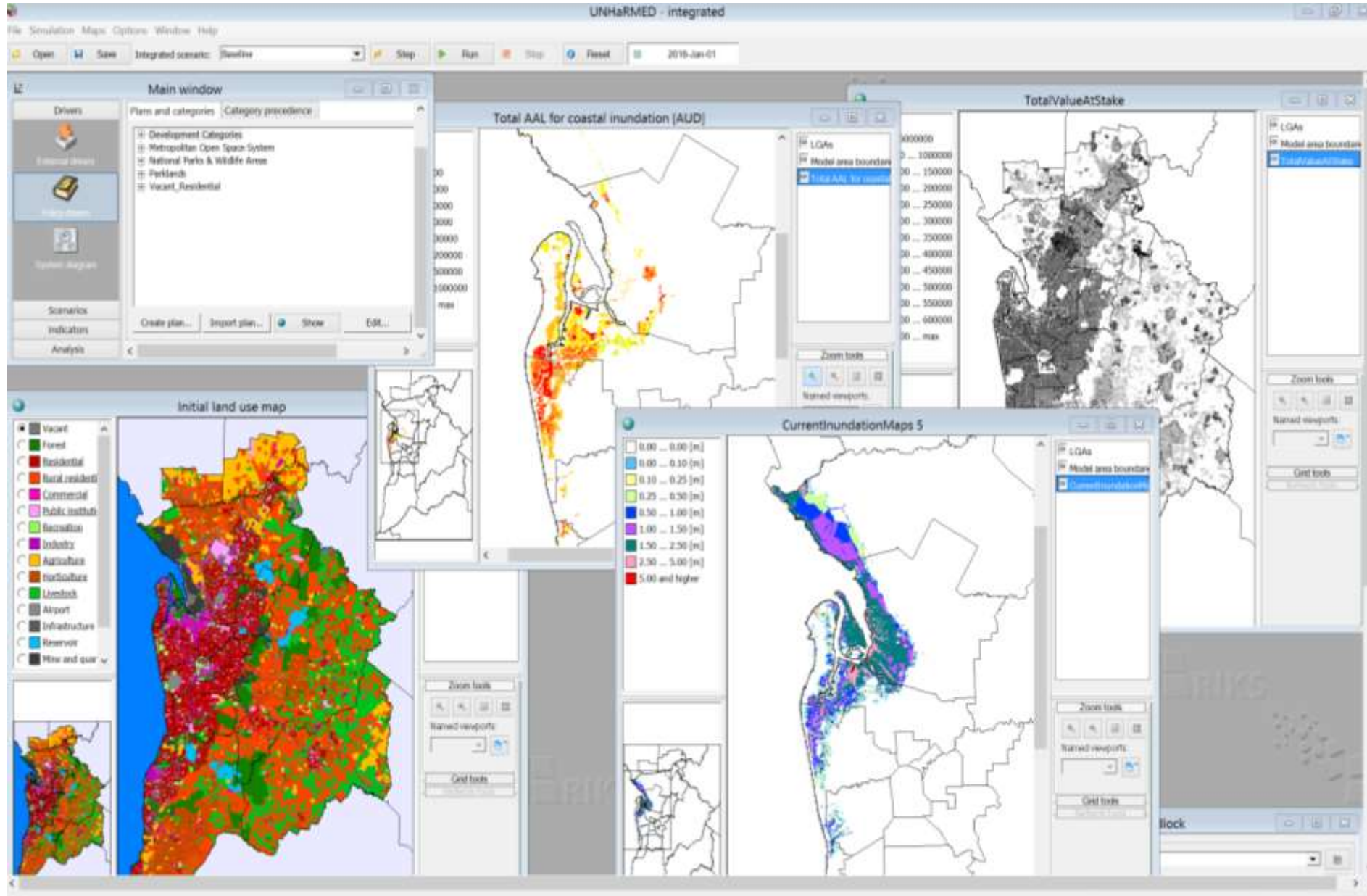
Geo-spatial focus

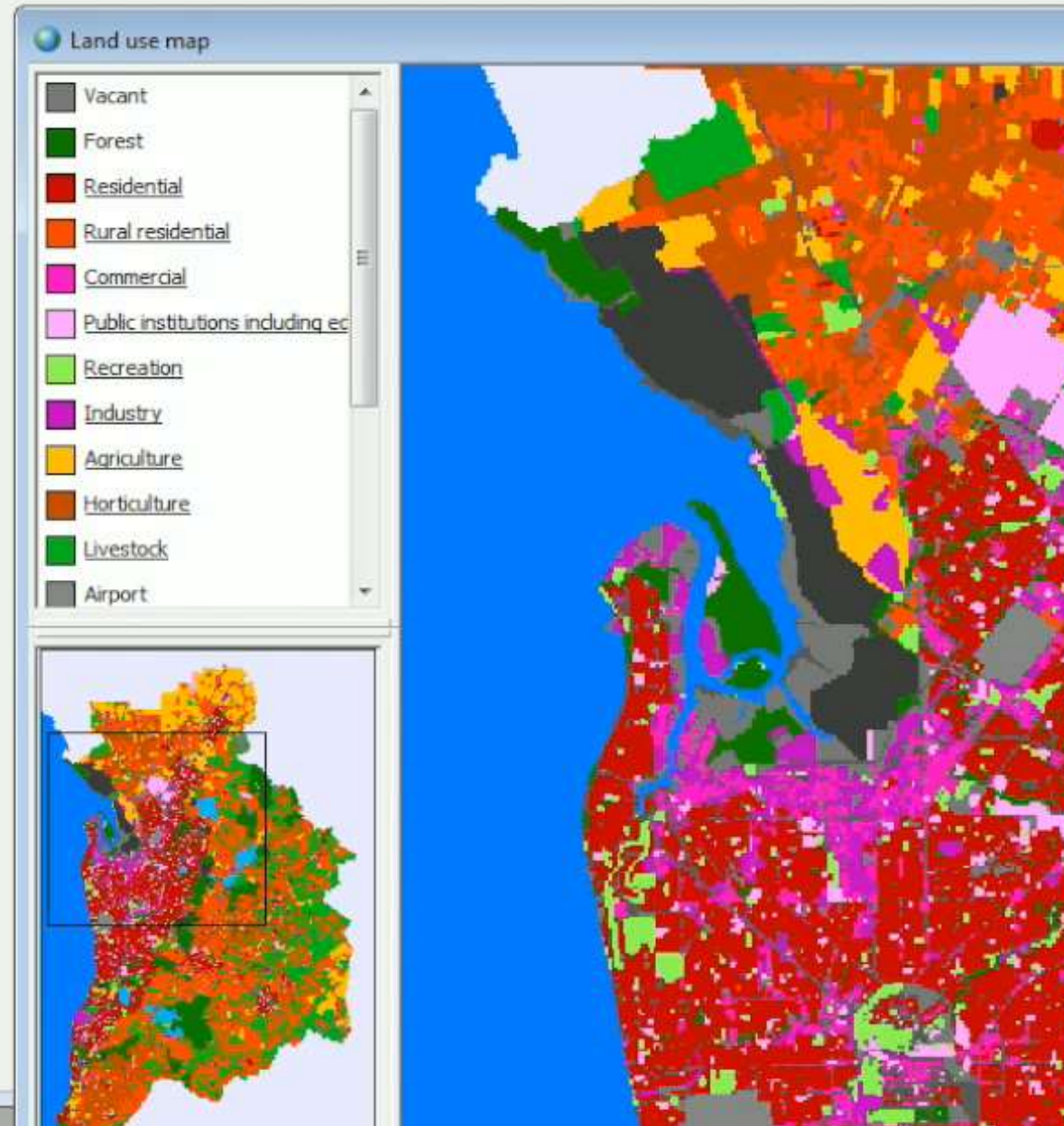
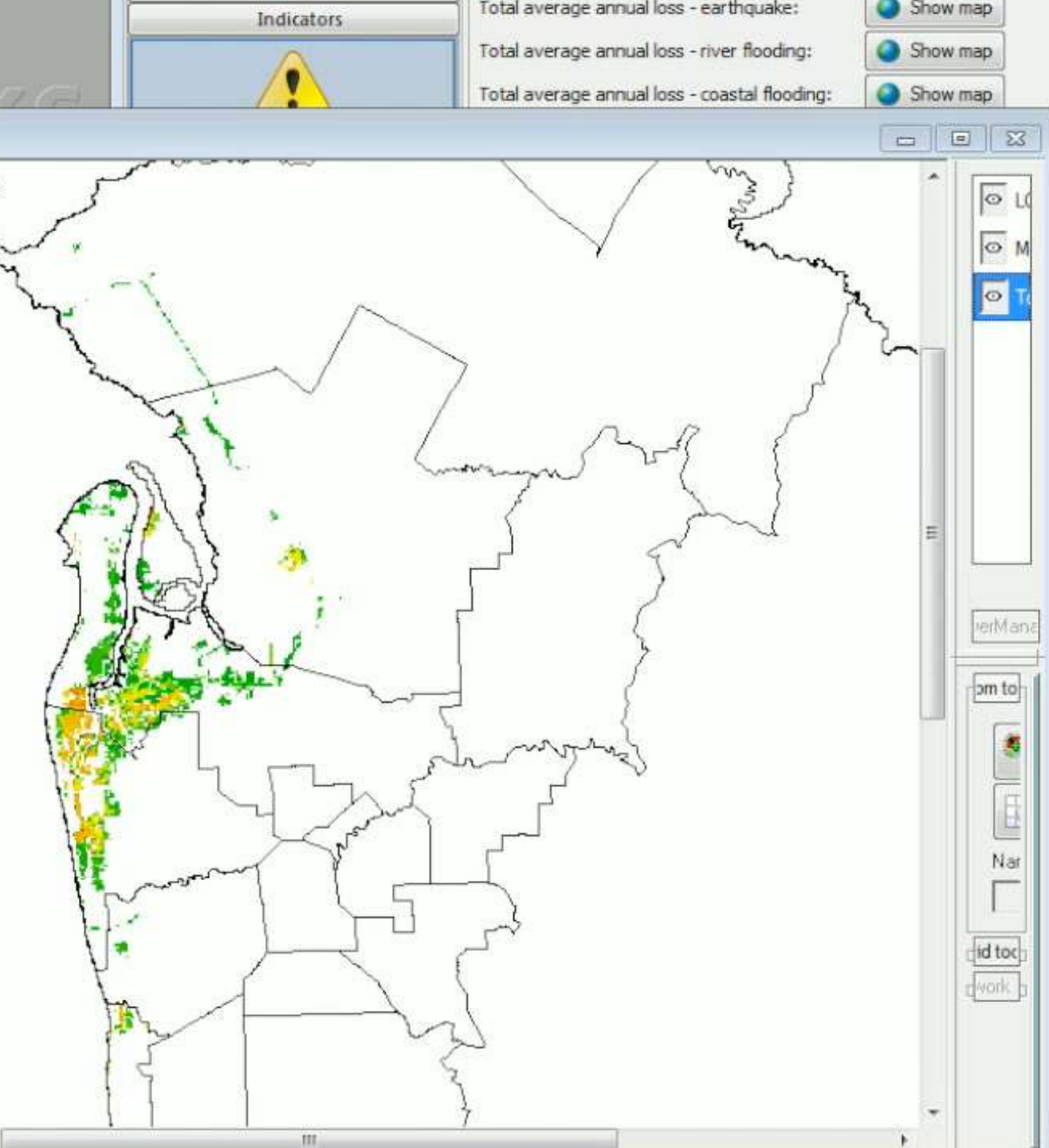


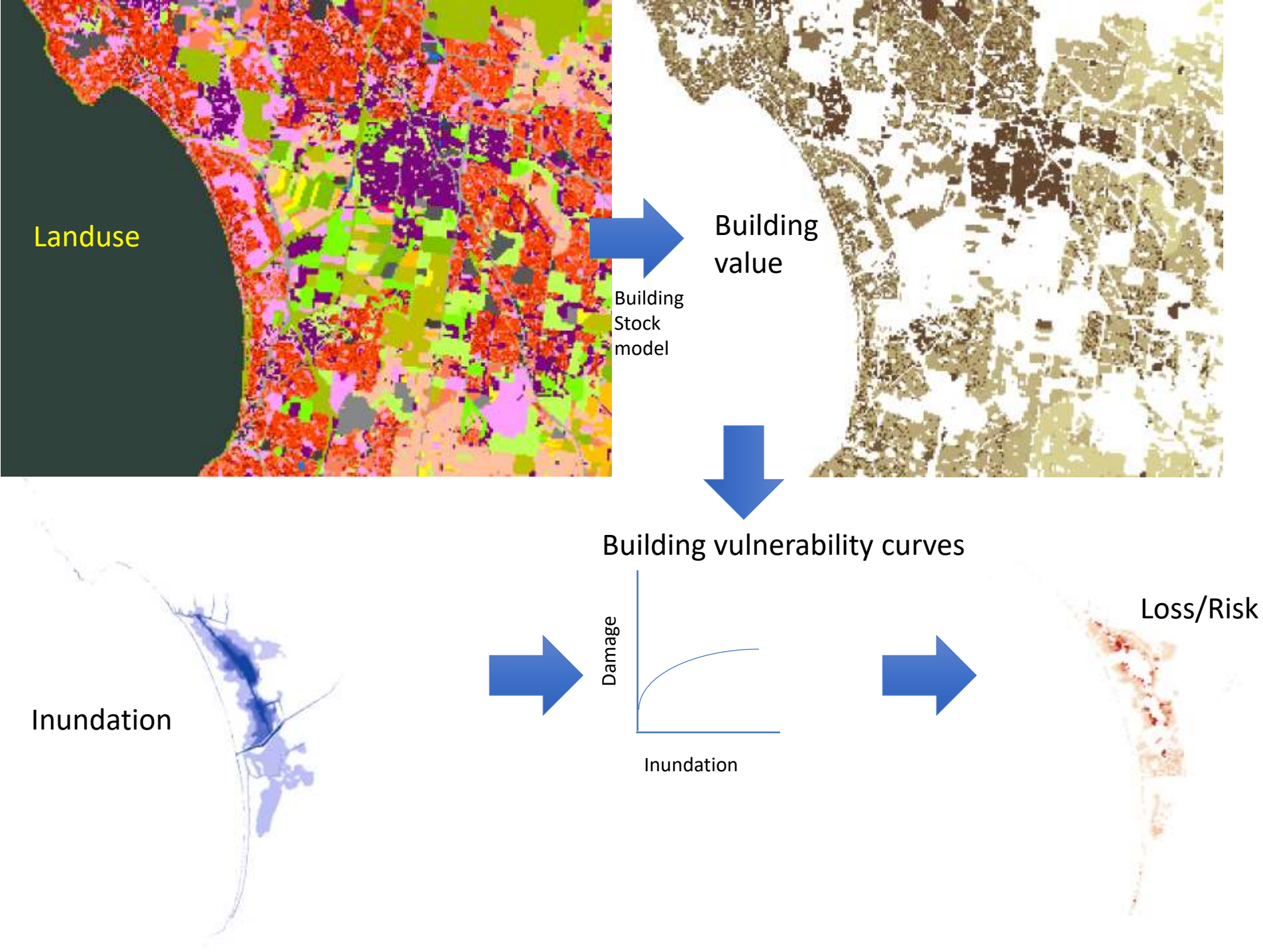
Finance focus

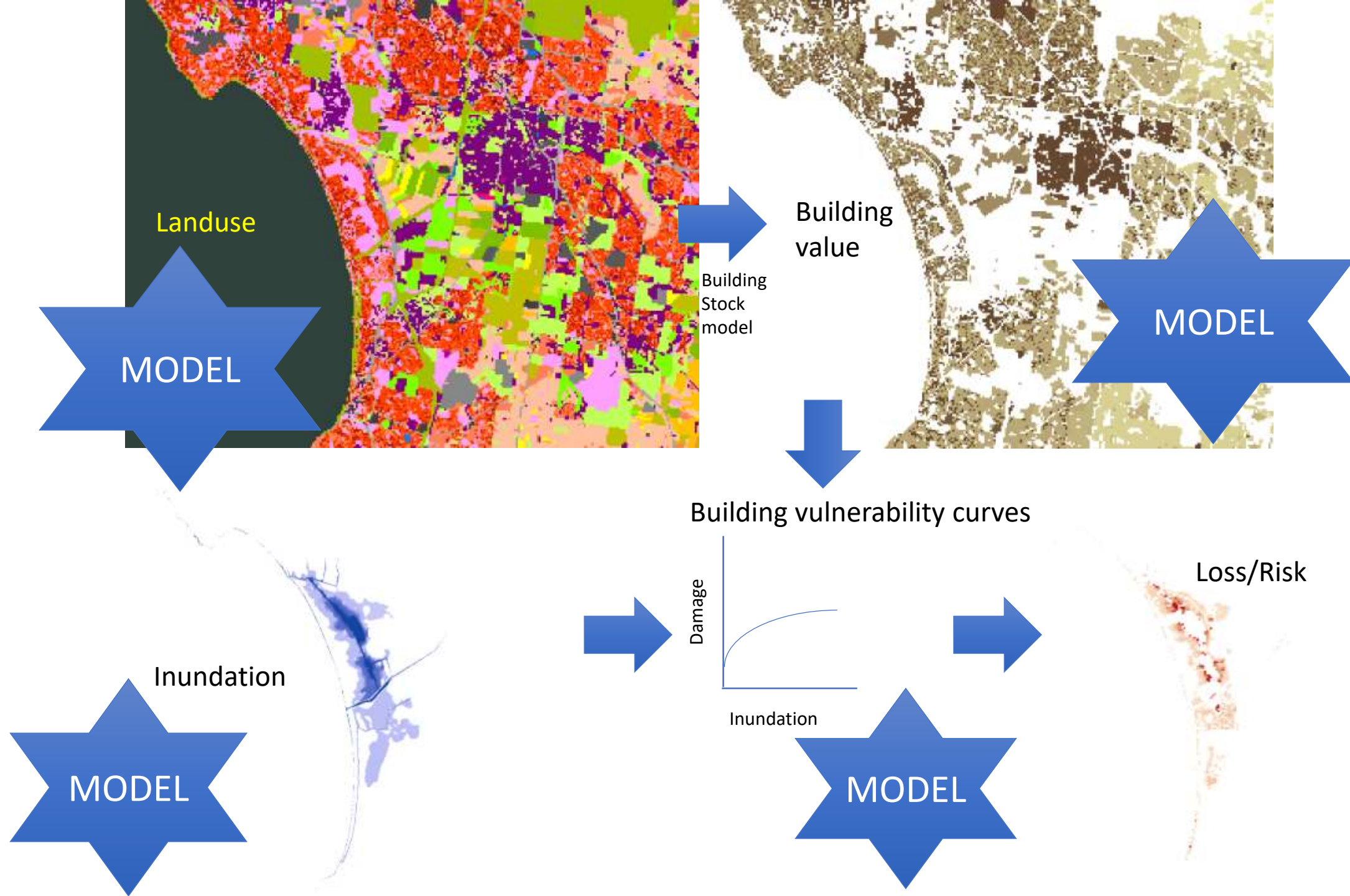


Coastal Inundation – Regional Risk









Landuse

Building
value

Building
Stock
model

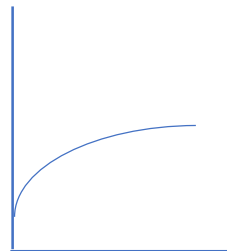
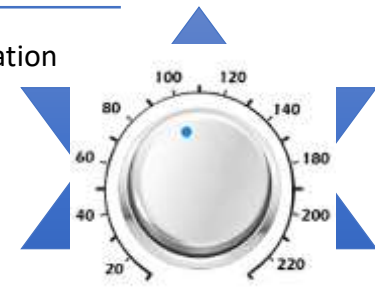
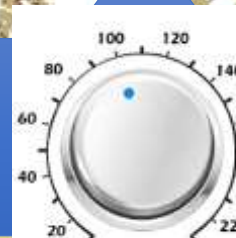
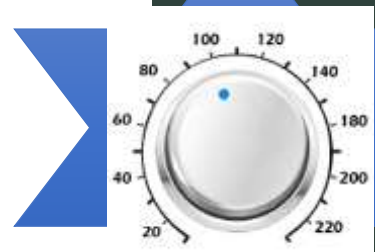
Building vulnerability curves

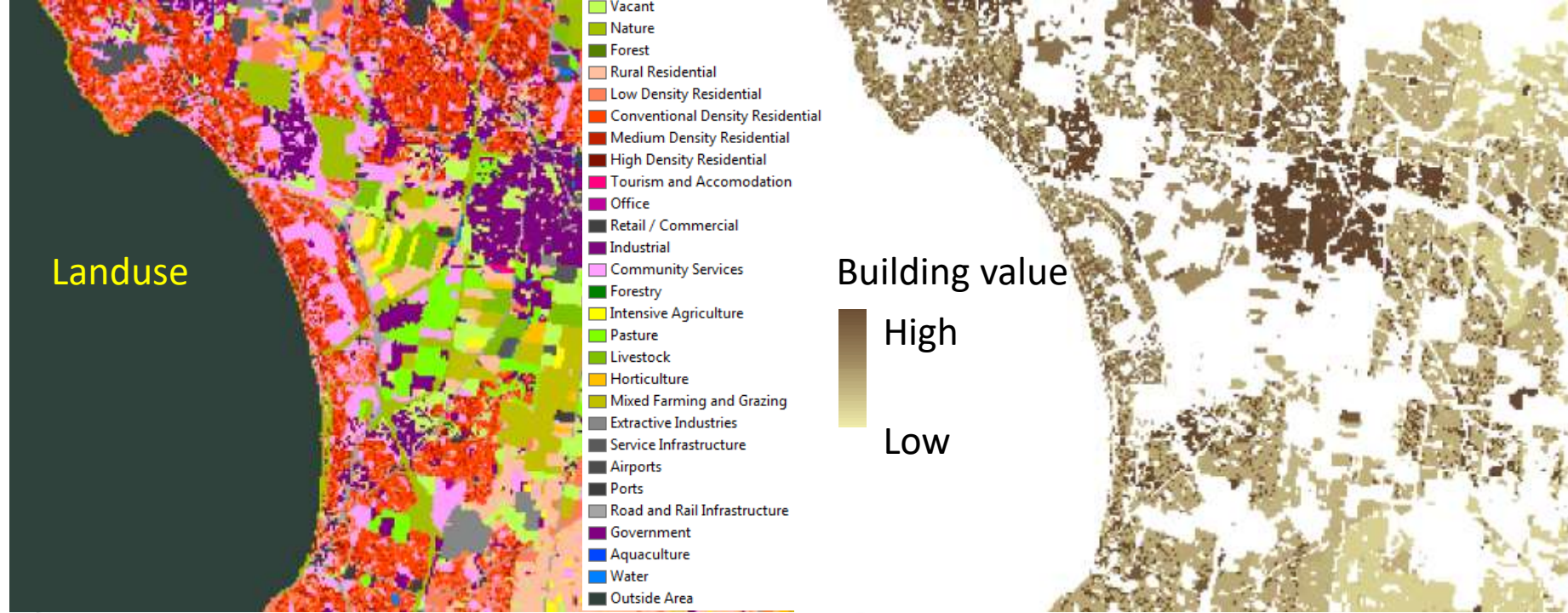
Loss/Risk

Inundation

Damage

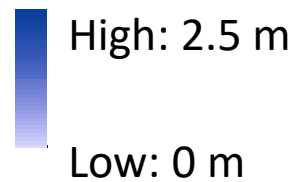
Inundation



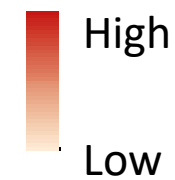


2015

Inundation



Loss/Risk



NEWS

Leaders reveal what led us to massive overcrowding in capital cities

Rohan Smith, news.com.au

October 17, 2018 6:59am

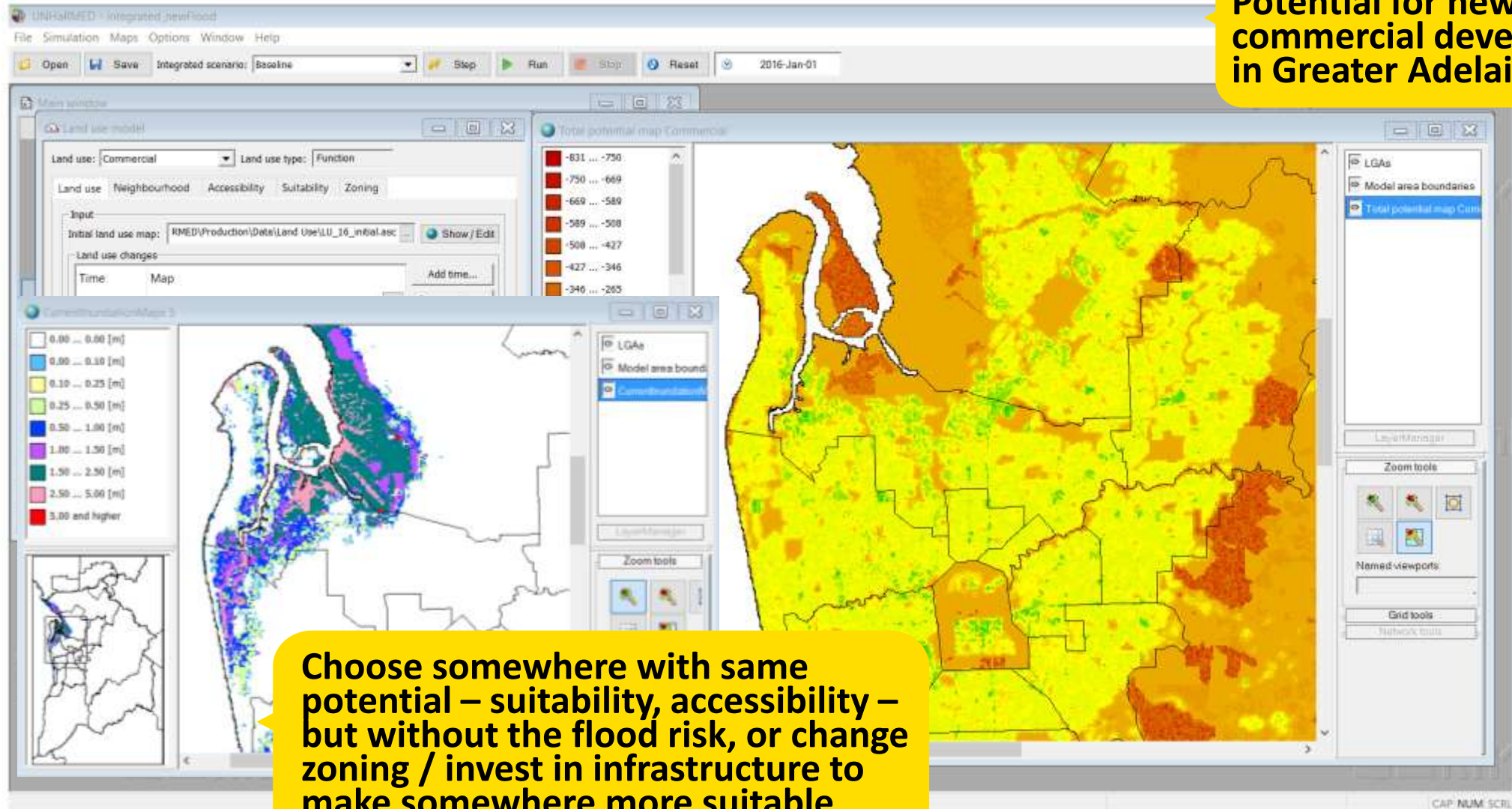


“But how did we get to this? Why are our cities overcrowded, slow, congested? Well, part of the reason is that nobody saw this coming. In 2004, the Australian Bureau of Statistics predicted that Melbourne would grow its population by 500,000 people over the next 13 years. That didn’t happen. Instead, Melbourne grew by a massive 1.2 million people. Around 5 million people now occupy Greater Melbourne and that number is set to rise to 8 million by 2050.”

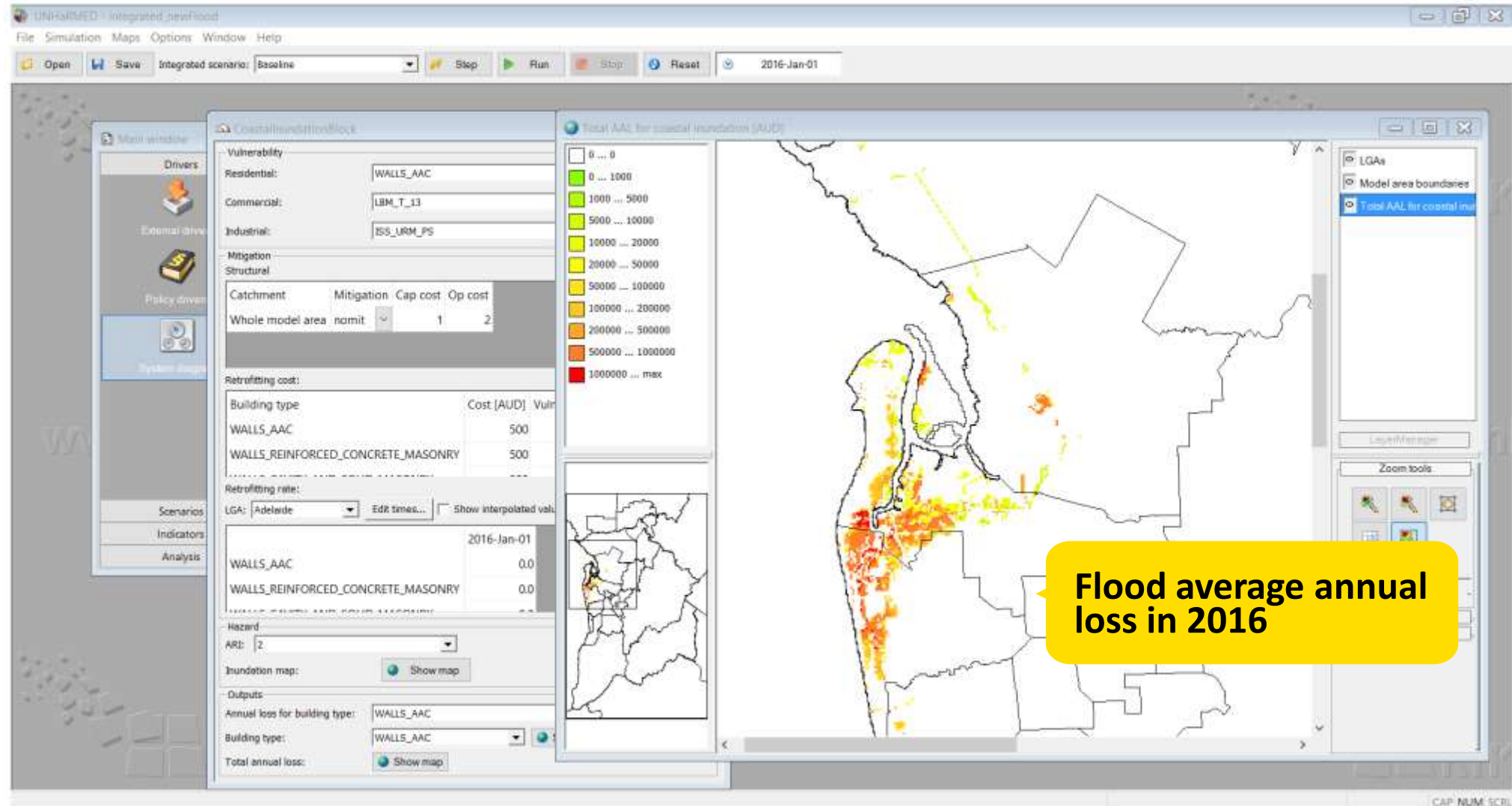
MOL

Coastal Inundation – Future Exposure

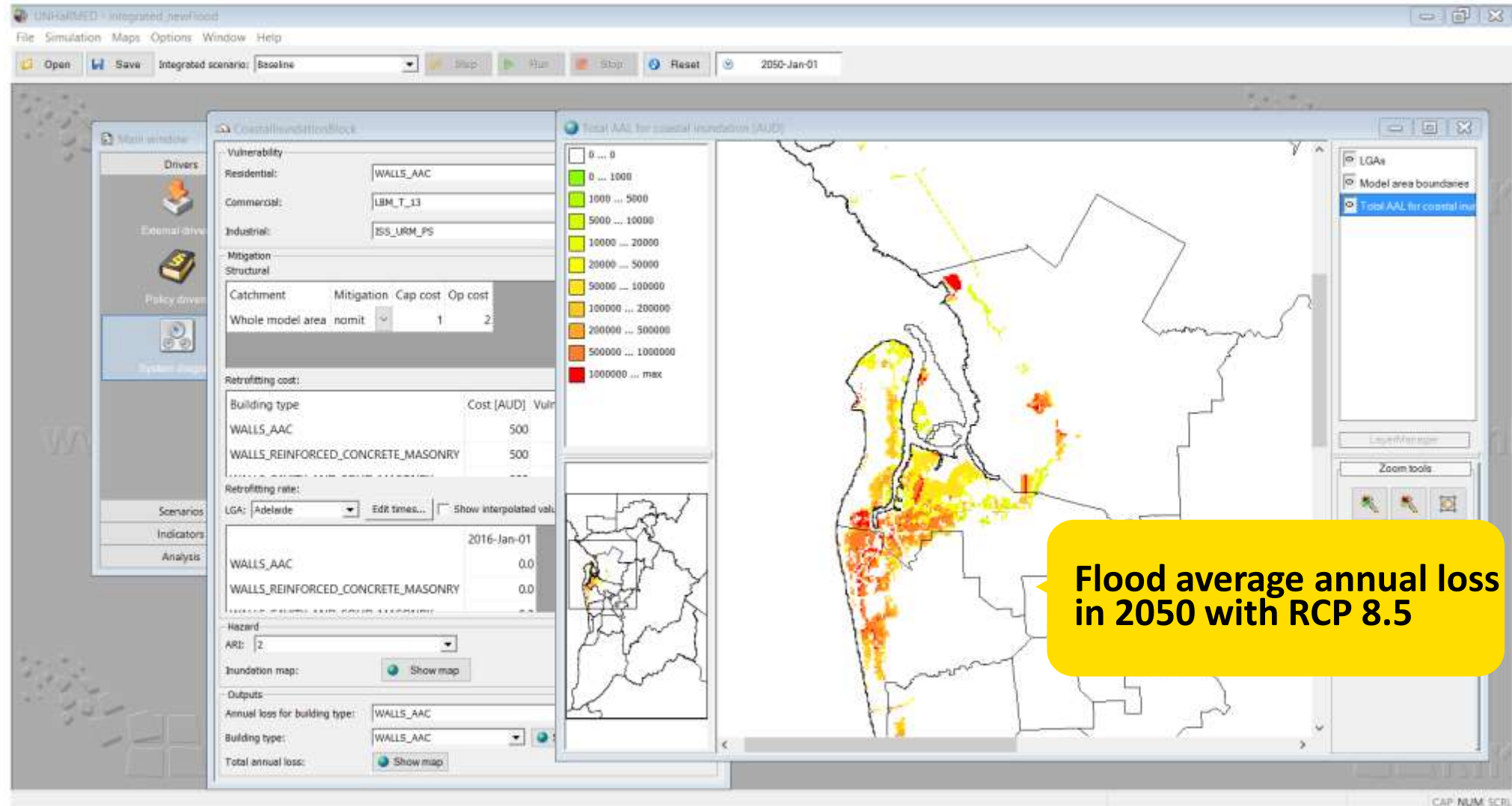
Potential for new commercial developments in Greater Adelaide



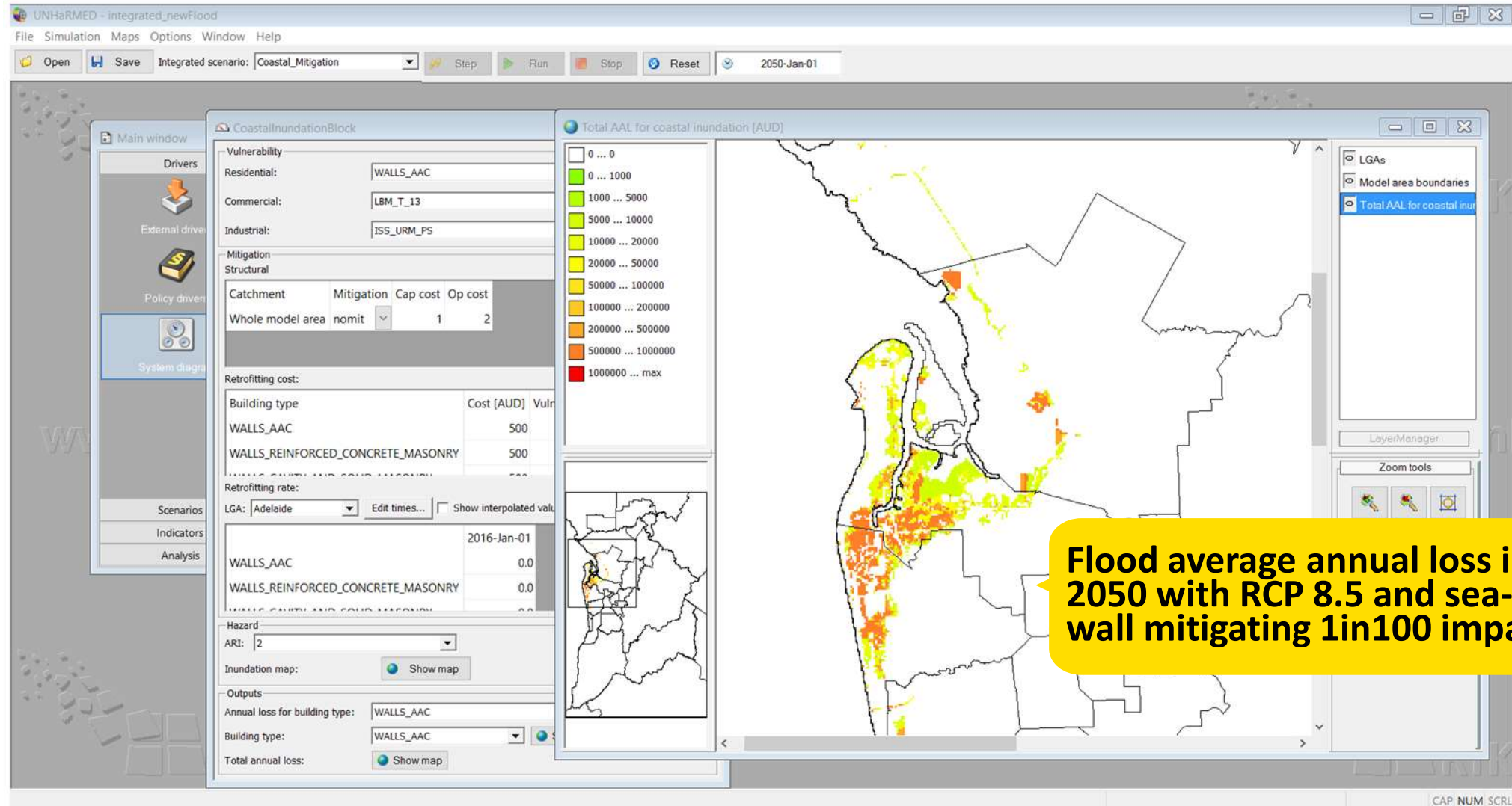
Coastal Inundation – Mitigation Investment



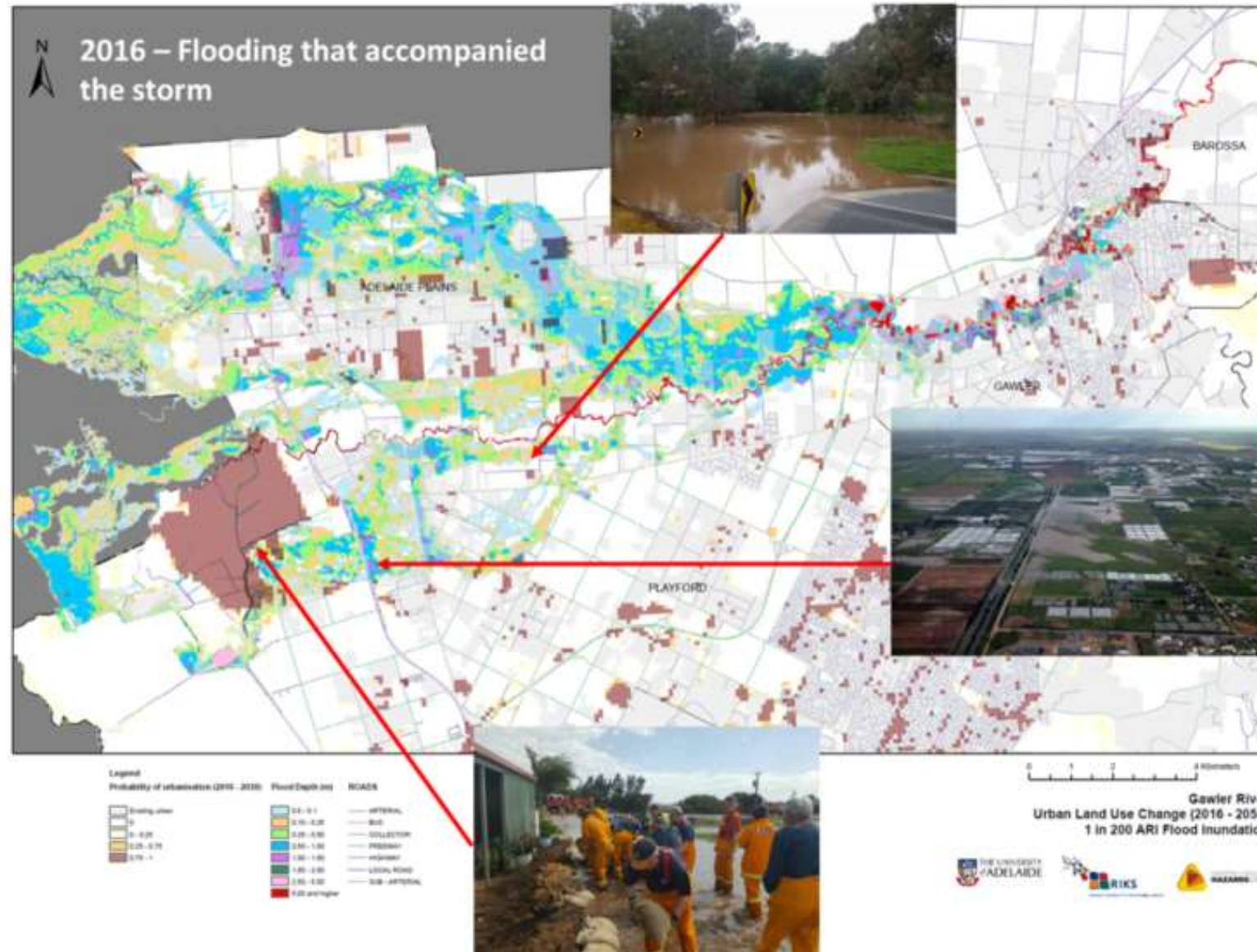
Coastal Inundation – Mitigation Investment



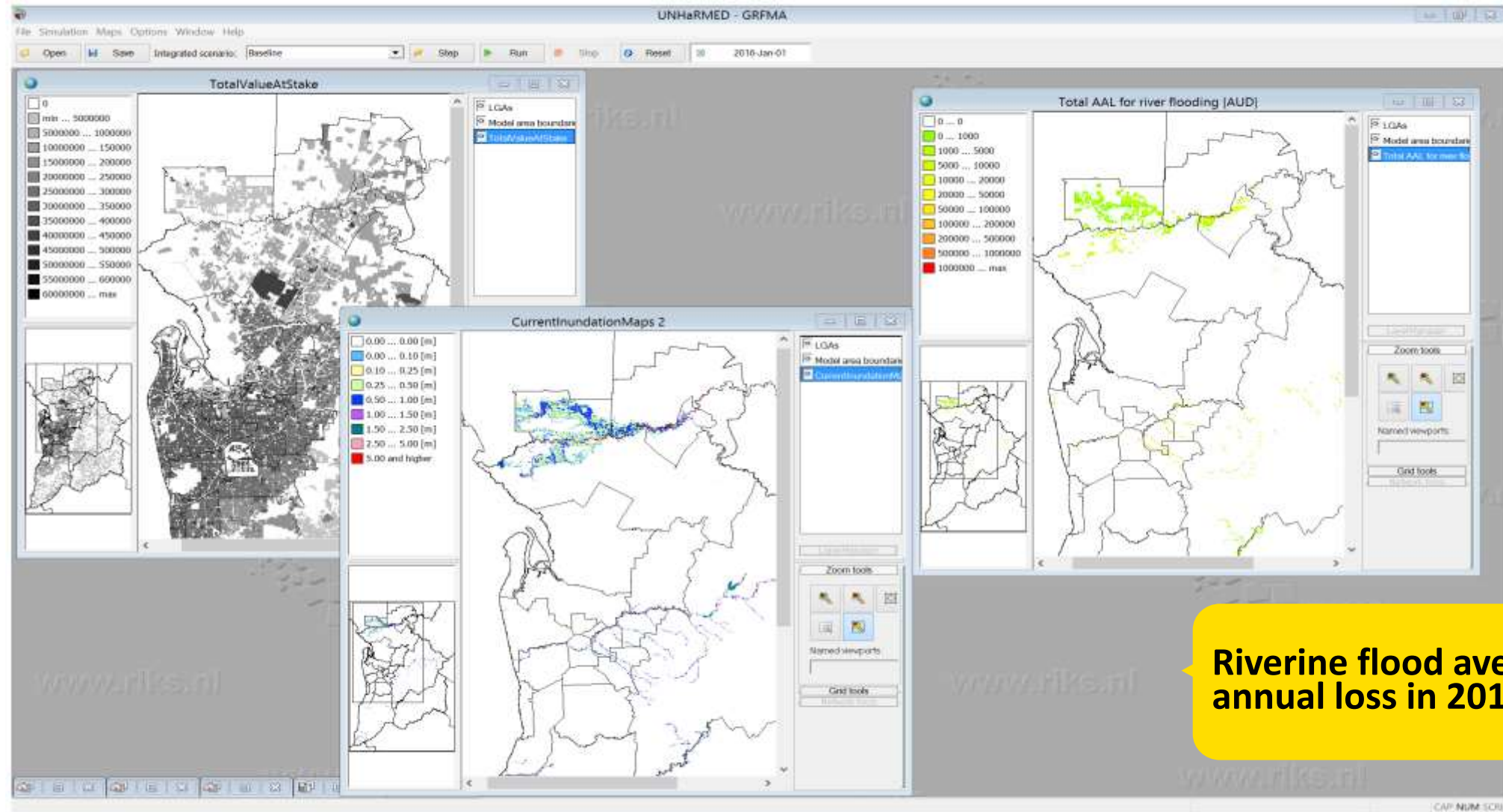
Coastal Inundation – Mitigation Investment



FLOOD MASTER PLANNING

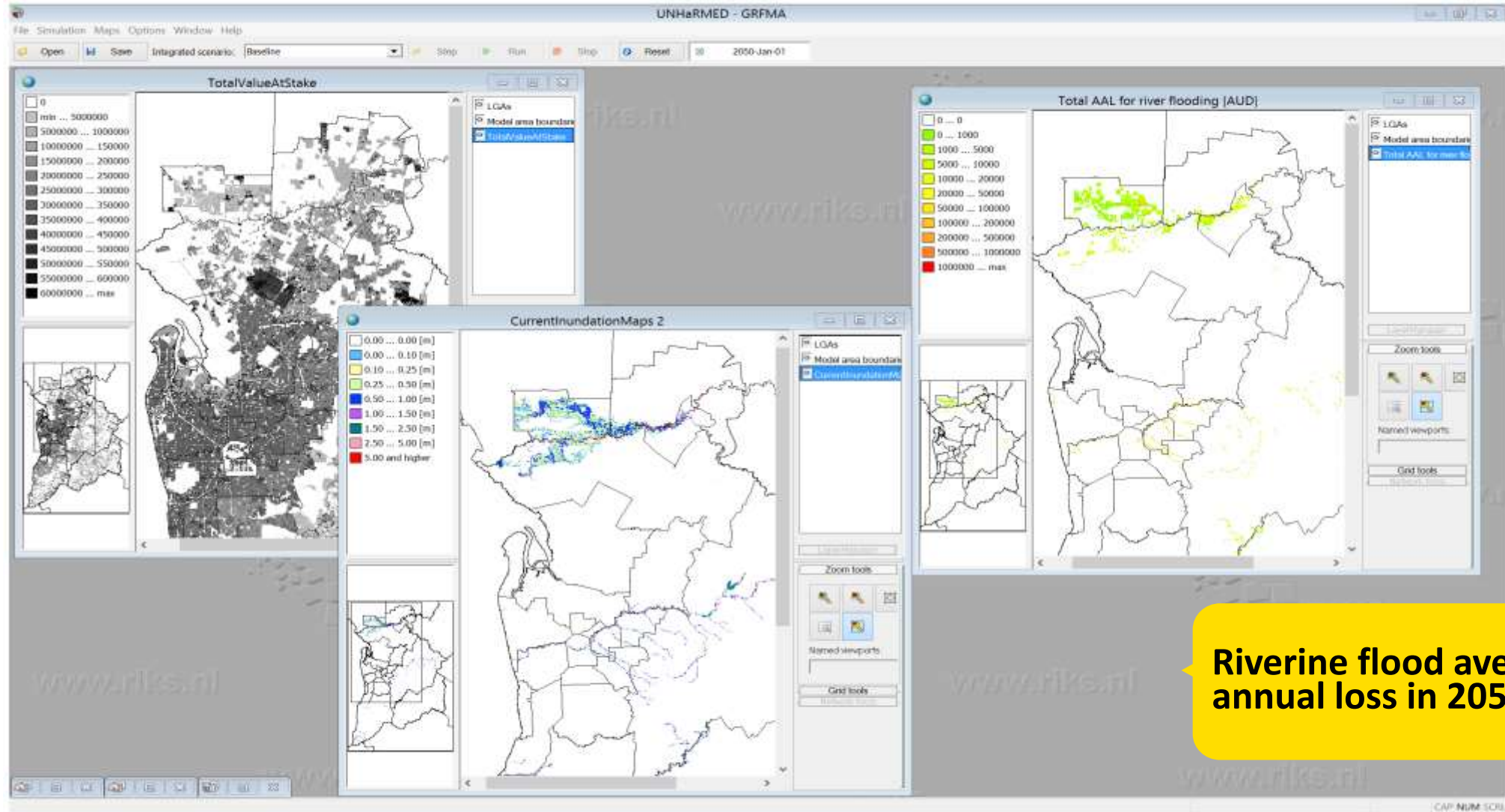


Floodplain Development



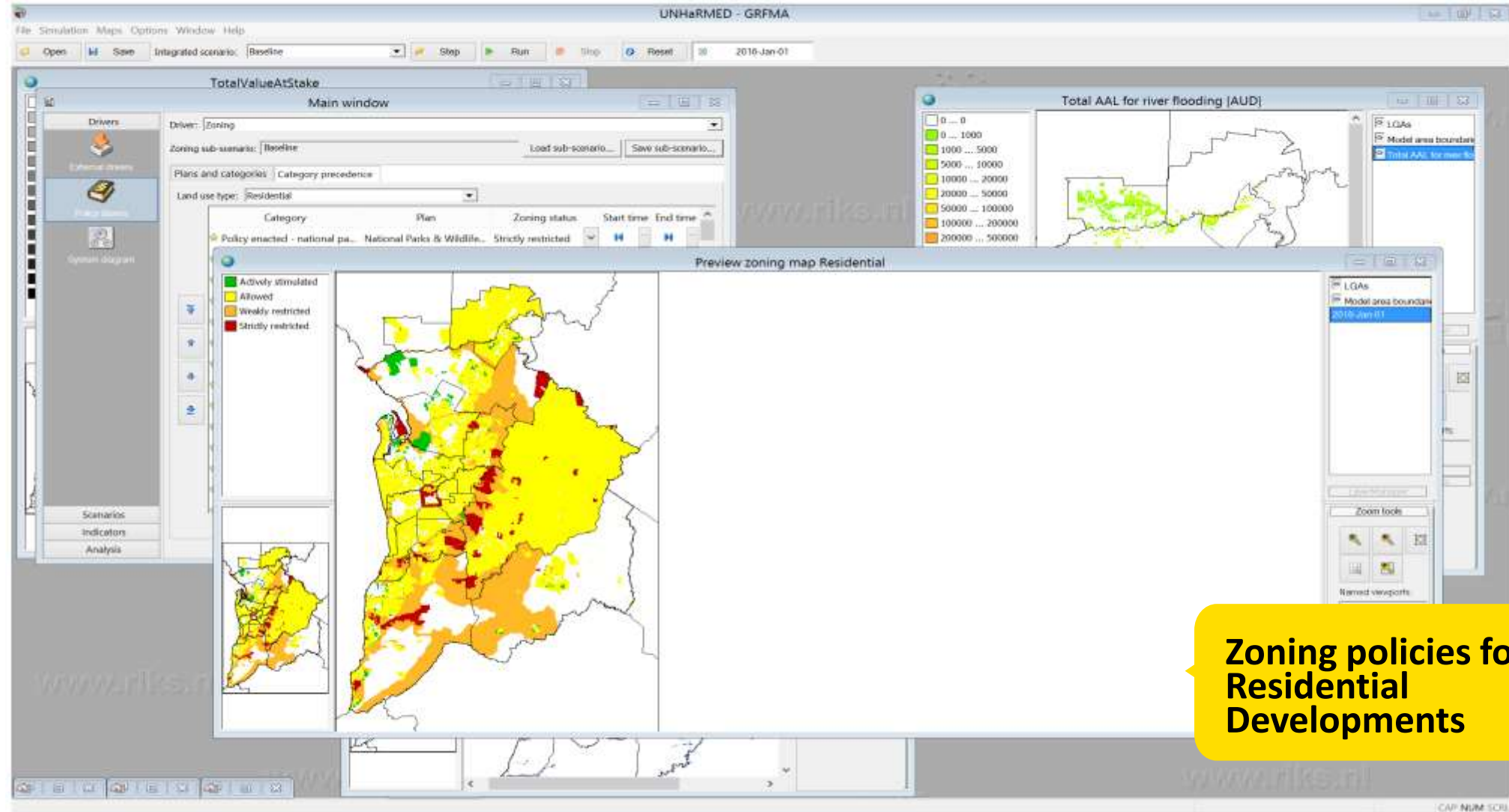
Riverine flood average annual loss in 2016

Floodplain Development

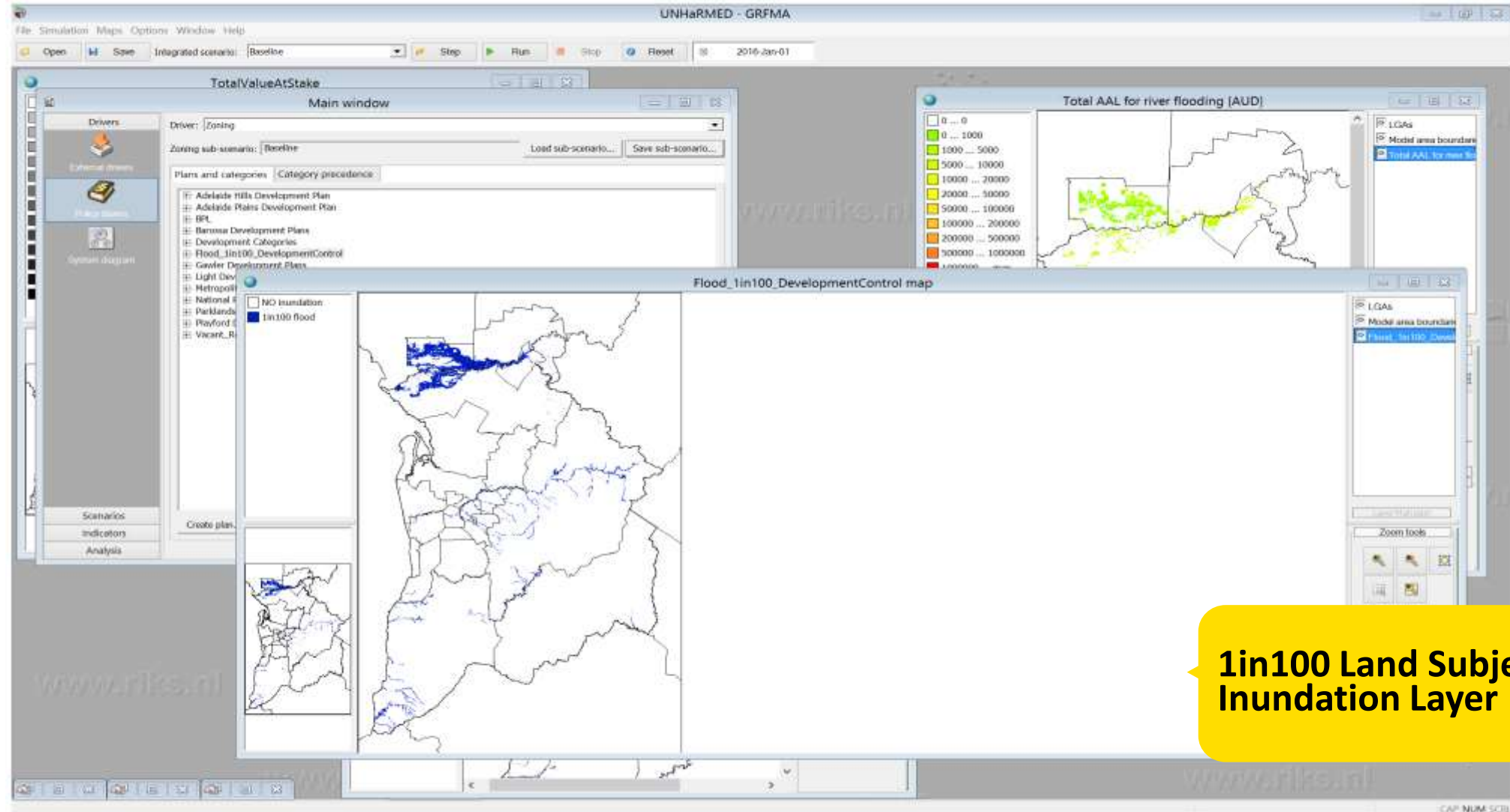


Riverine flood average annual loss in 2050

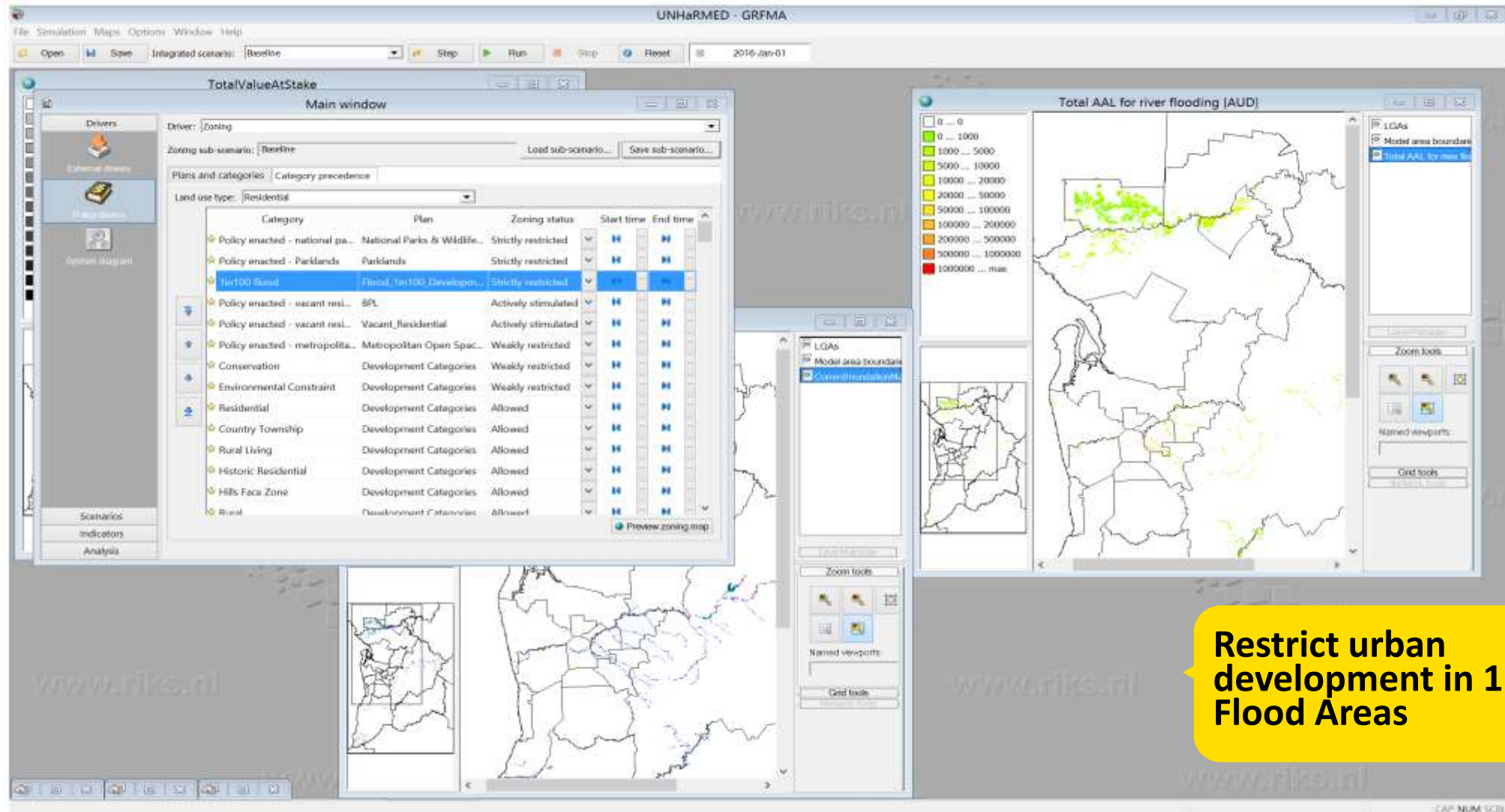
Floodplain Development



Floodplain Development

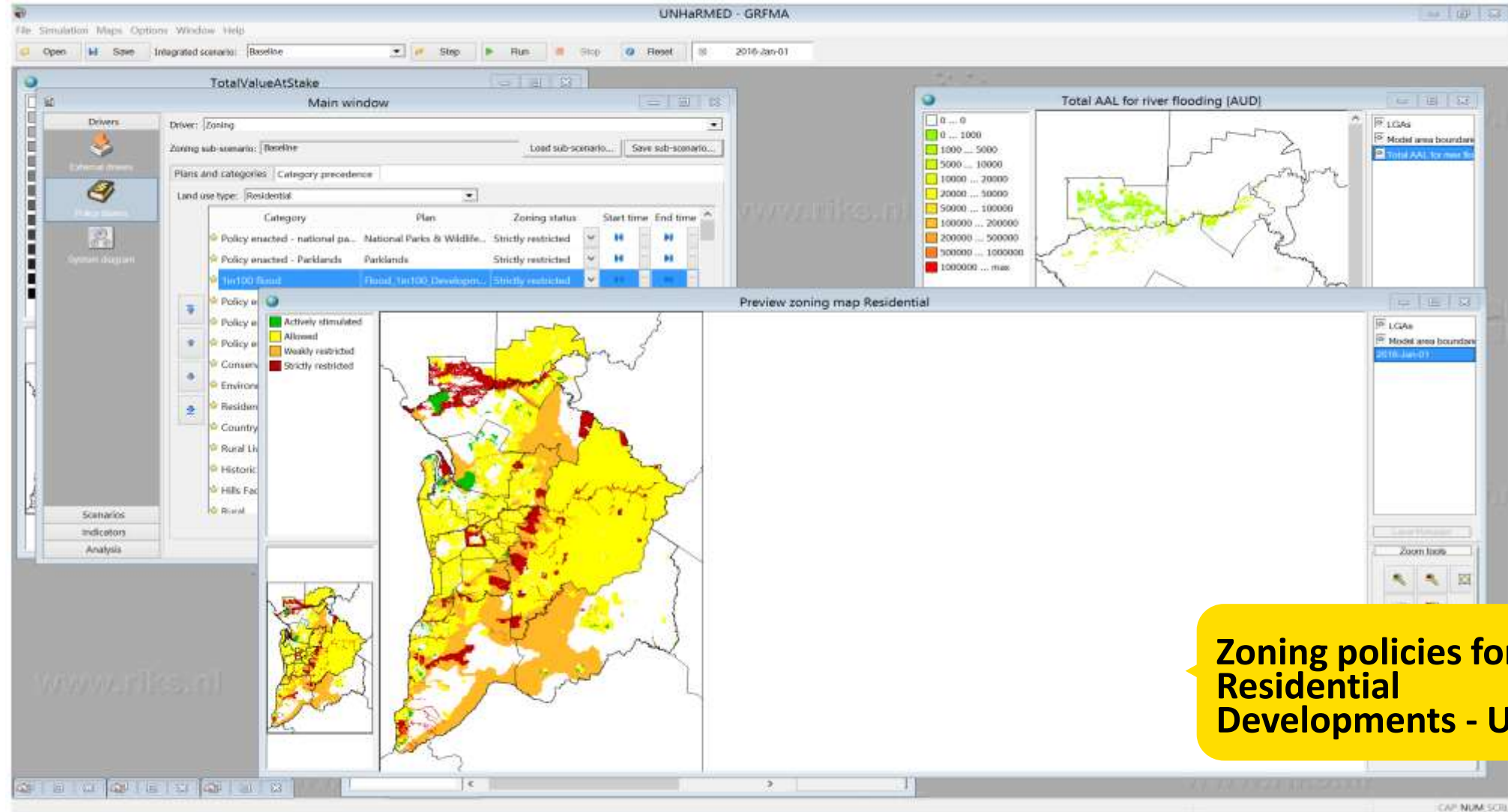


Floodplain Development



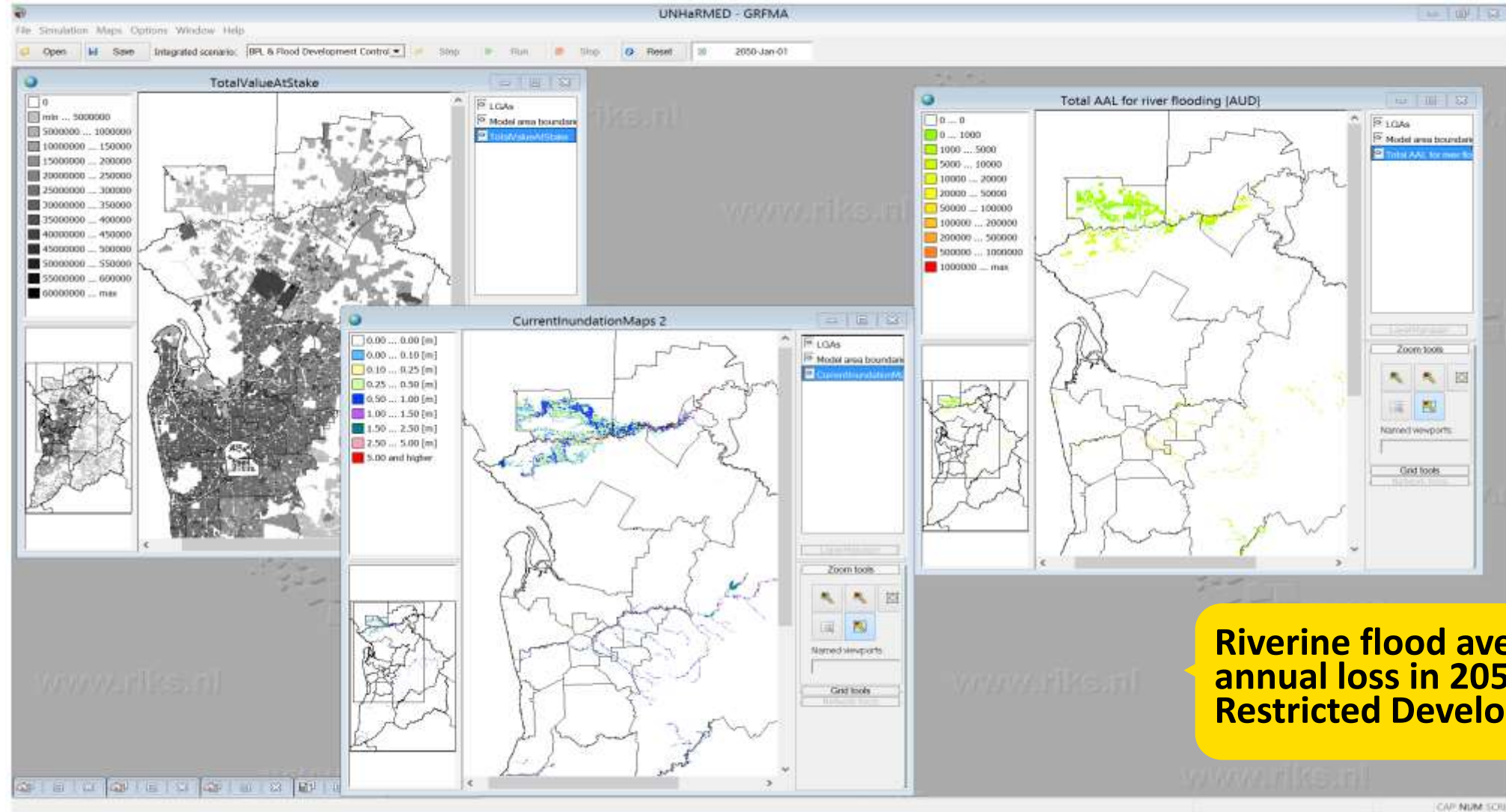
Restrict urban development in 1 in 100 Flood Areas

Floodplain Development



**Zoning policies for
Residential
Developments - UPDATED**

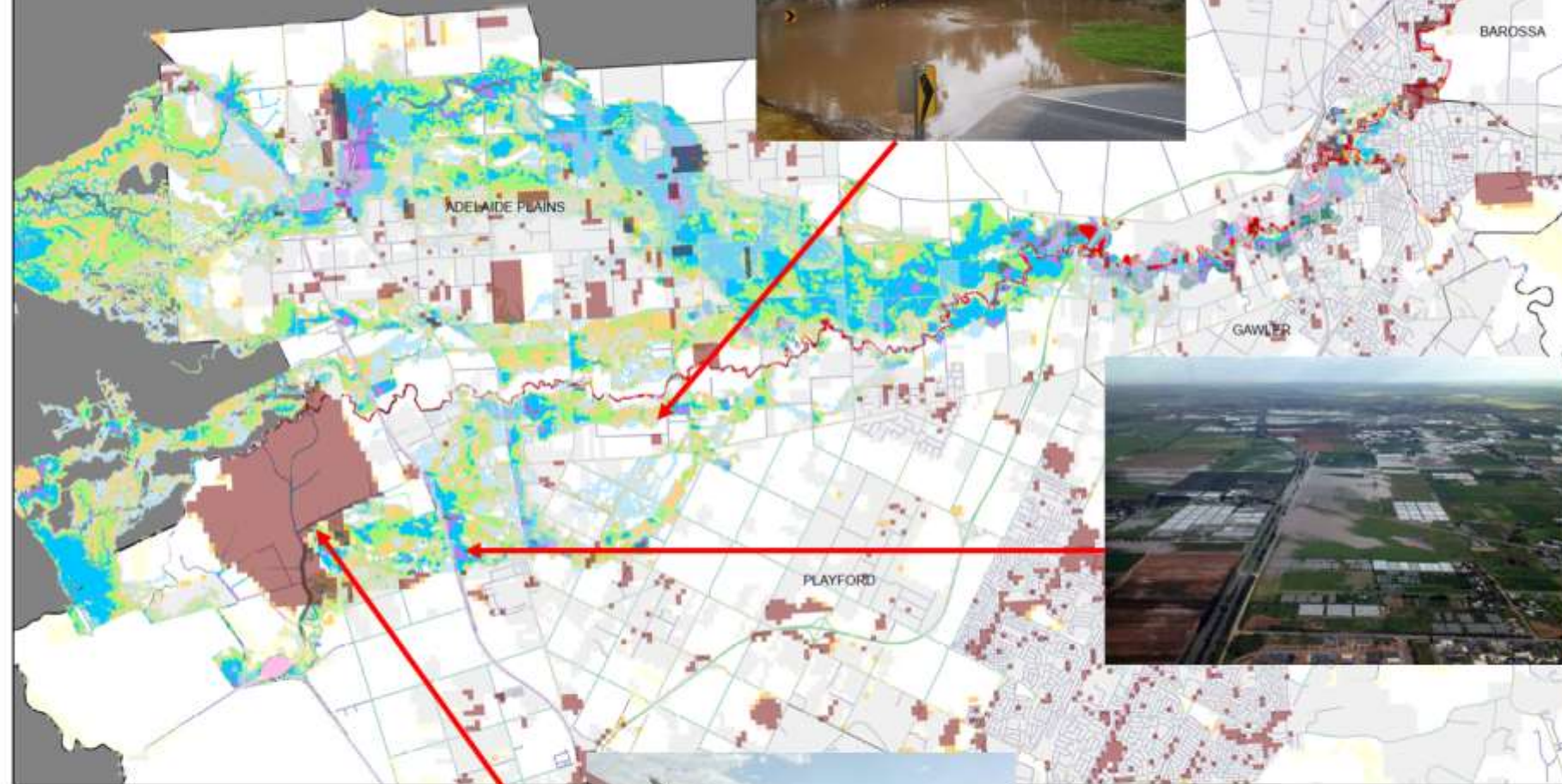
Floodplain Development



Riverine flood average annual loss in 2050 – Restricted Development



2016 – Flooding that accompanied the storm



Legend

Probability of urbanisation (2016 - 2030)



Flood Depth (m)



ROADS

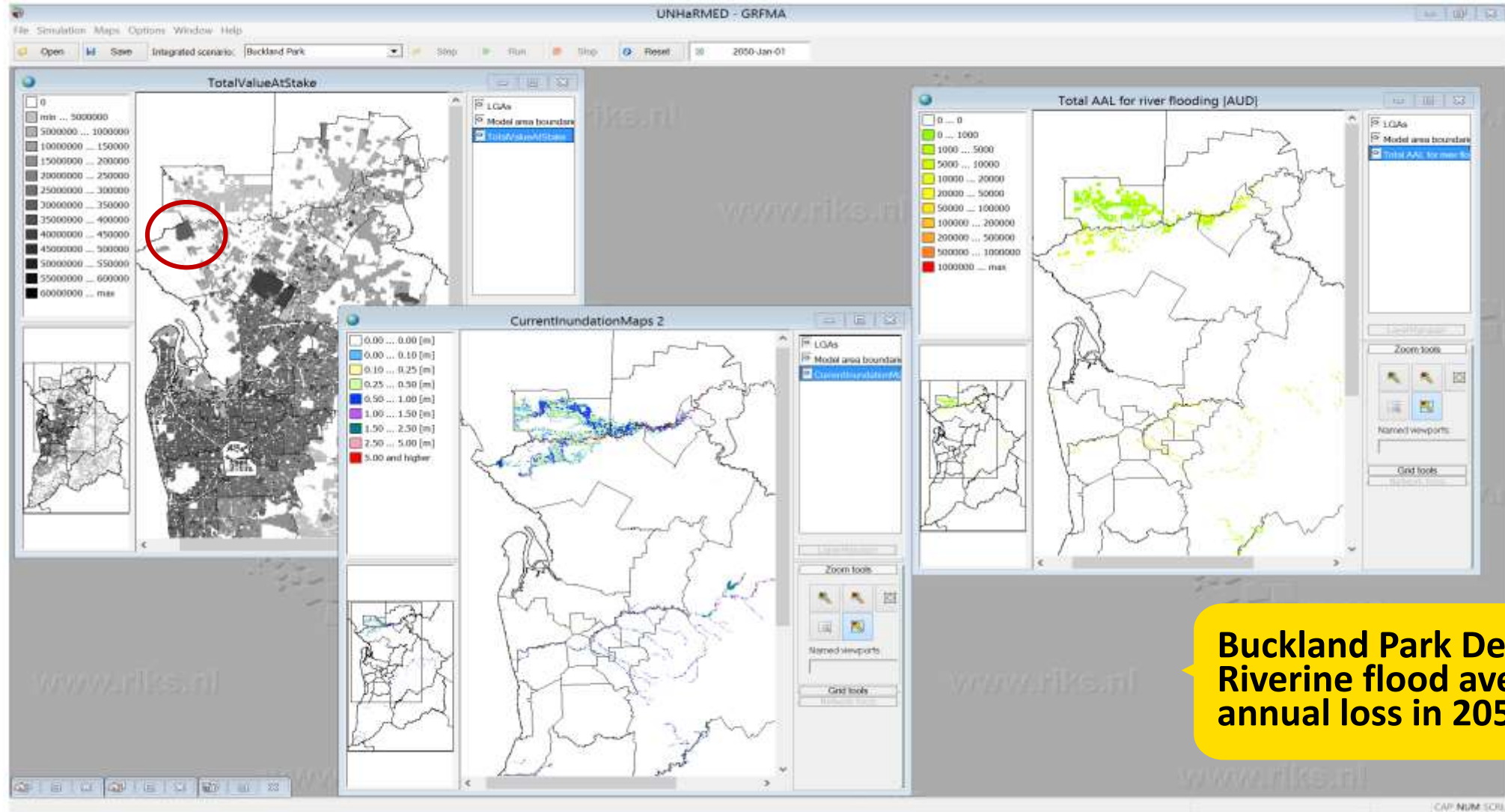


0 1 2 4 Kilometers

Gawler River
Urban Land Use Change (2016 - 2050)
1 in 200 ARI Flood Inundation

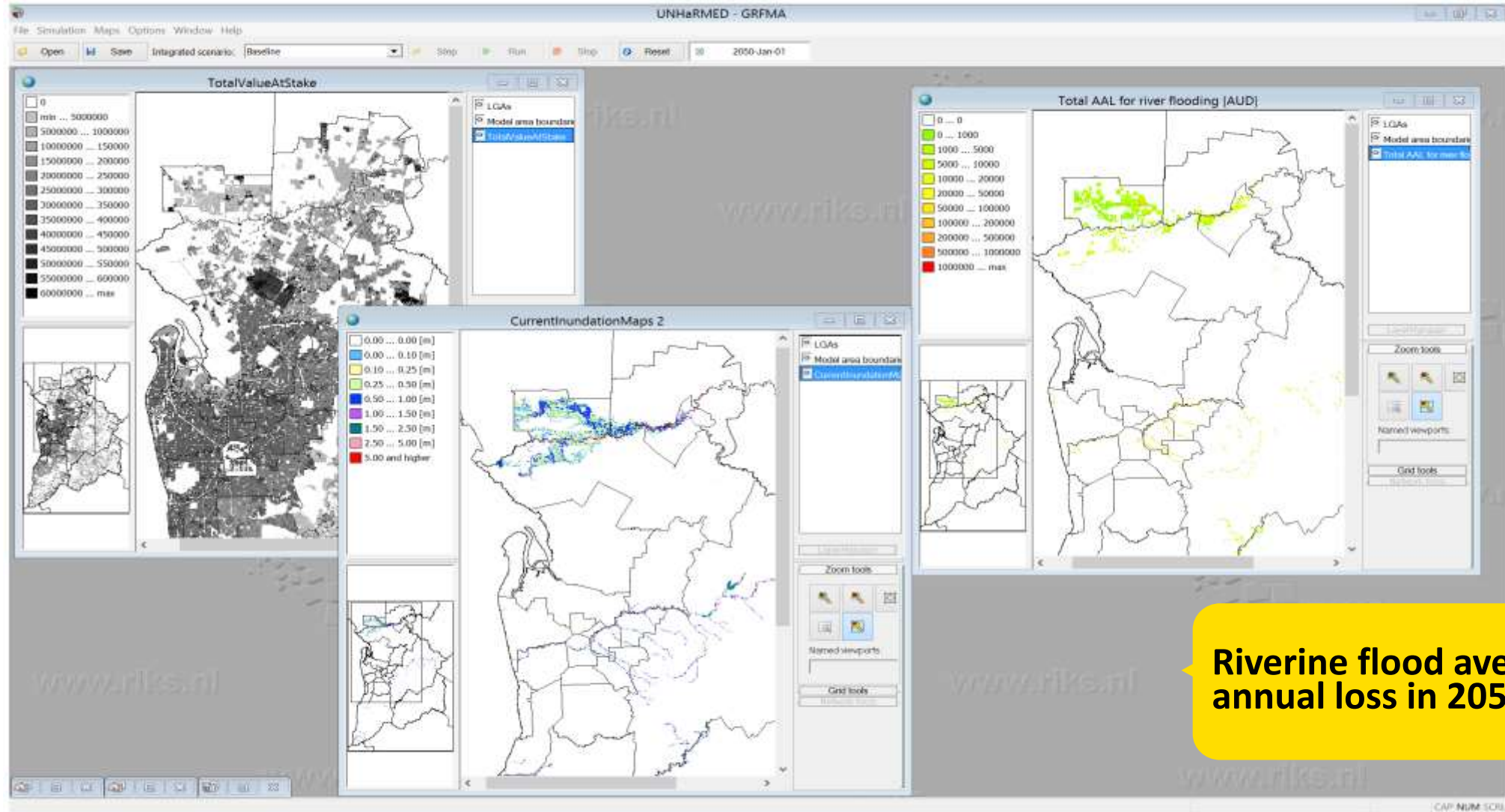


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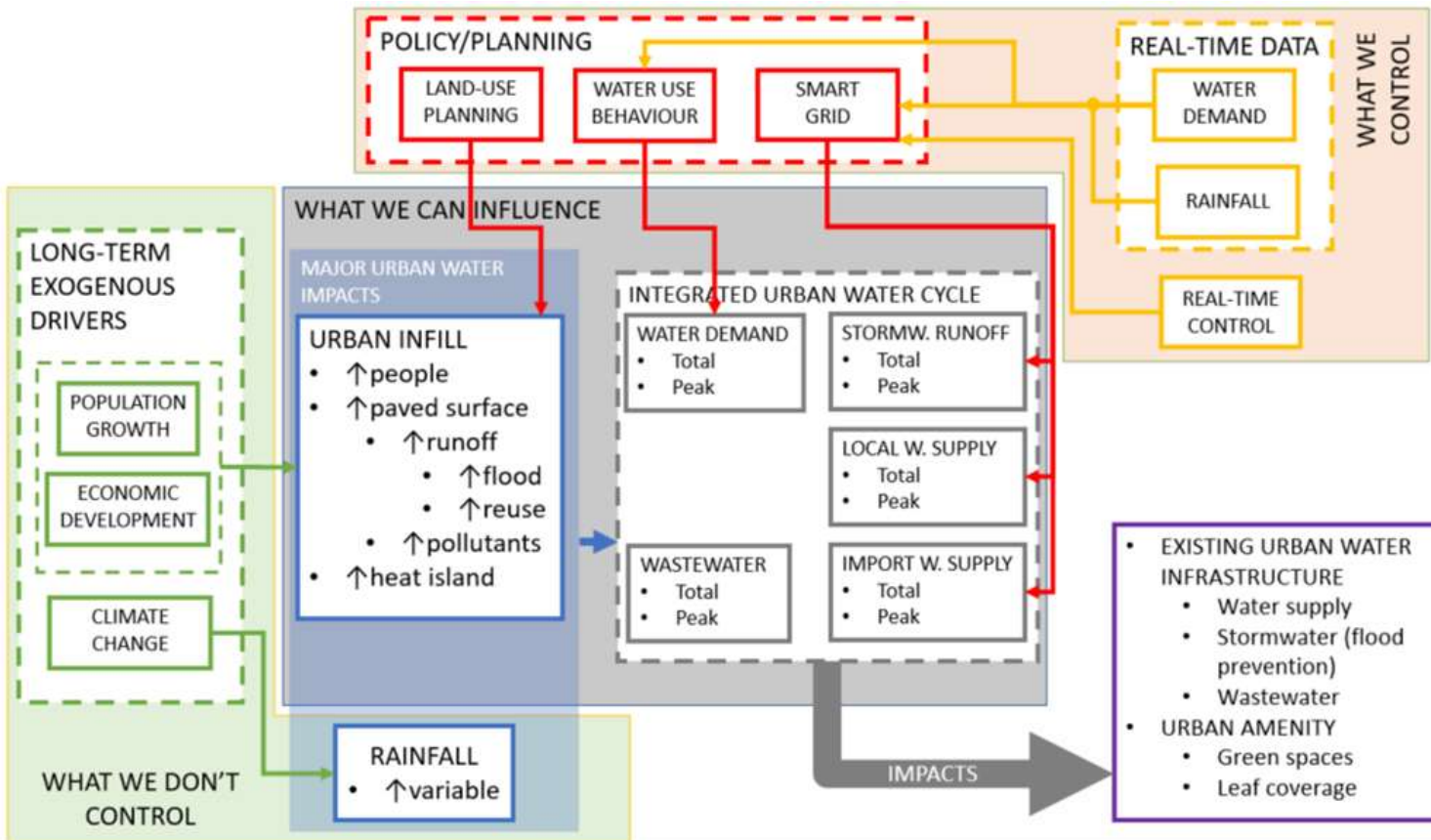
**Buckland Park Development
Riverine flood average
annual loss in 2050**

Floodplain Development



Riverine flood average annual loss in 2050

WATER SENSITIVE URBAN DESIGN / INTEGRATED WATER MANAGEMENT



- Identify growth hot spots
- Identify plausible future population distributions
- Identify plausible future problem areas (heat, stormwater etc.) and best adaptive pathways
- Identify impacts of different urban forms on heat, stormwater etc.
- Identify opportunities for green spaces / corridors

Uses

Strategic risk analysis

- SWOT analysis of organisation
- TCFD Physical Risk Assessment

Modelling to inform long-term resource needs and vulnerabilities

Modelling to inform future 'hotspots' or areas of concern

- Test opportunities to reduce these
- Identify areas/factors that agencies have limited control over

Assessment of climate resilience of systems

- Can consider individual systems or regions
- Can assess the resilience of supply chains





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Thank you

Professor Holger Maier

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