Climate Adaptation Decision Pathways

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Outline

1. The Context
2. Climate Risk and Adaptation
3. Decision Making Pathways
   - Coastal Settlements
   - Water Supply
   - Rail Networks

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Cocos (Keeling) Islands - Climate Risk Assessment

- World Heritage – natural assets
- Population - 80% Cocos Malay
- Remote - middle of the Indian Ocean

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Risk to Infrastructure and Settlement

Climate Change Risk Assessment for the Cocos (Keeling) Islands

- Loss of buildings and facilities
- New port development
- Impacts to roads and airport
- Water security – island water lens
- Power security – diesel supply
- Emergency evacuation
- Heat waves – mental health

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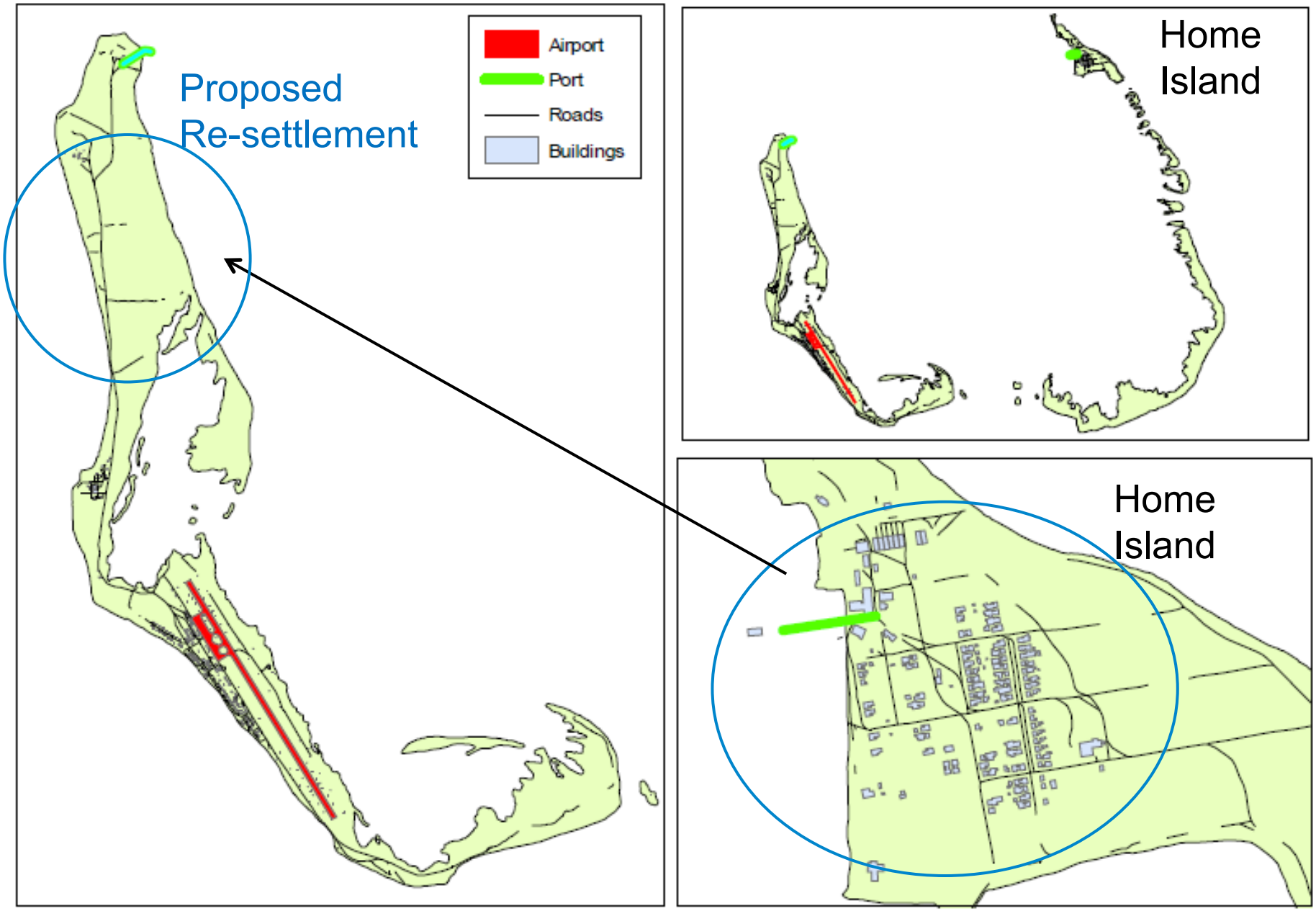
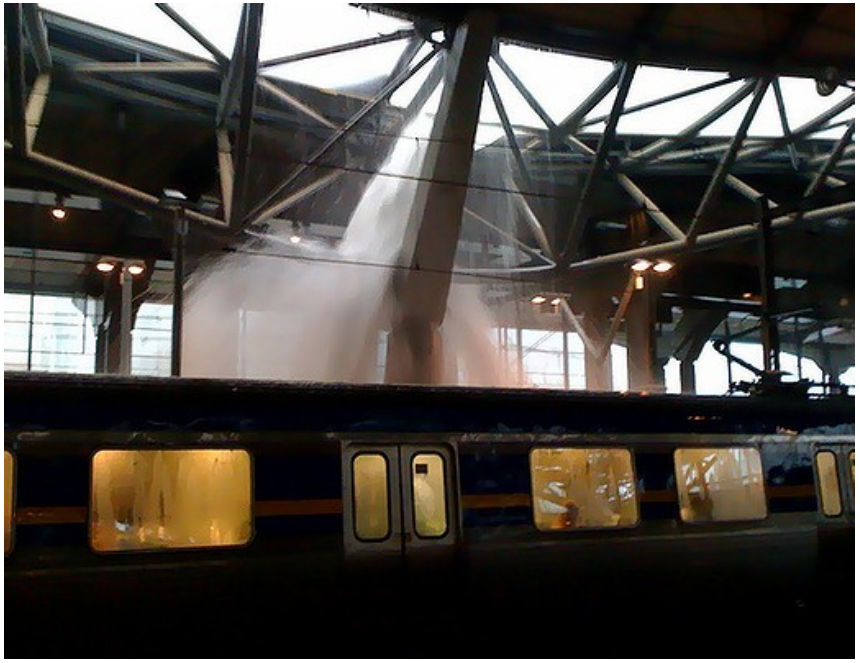
Infrastructure at Risk and Re-settlement



Climate Change Impacts

Melbourne Storms 2010



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40% of Economic Climate Impacts are to Infrastructure

Garnaut
CLIMATE CHANGE
REVIEW

Infrastructure Impacted

- Buildings
- Electricity networks
- Water infrastructure
- Ports
- Roads and bridges
- Communications

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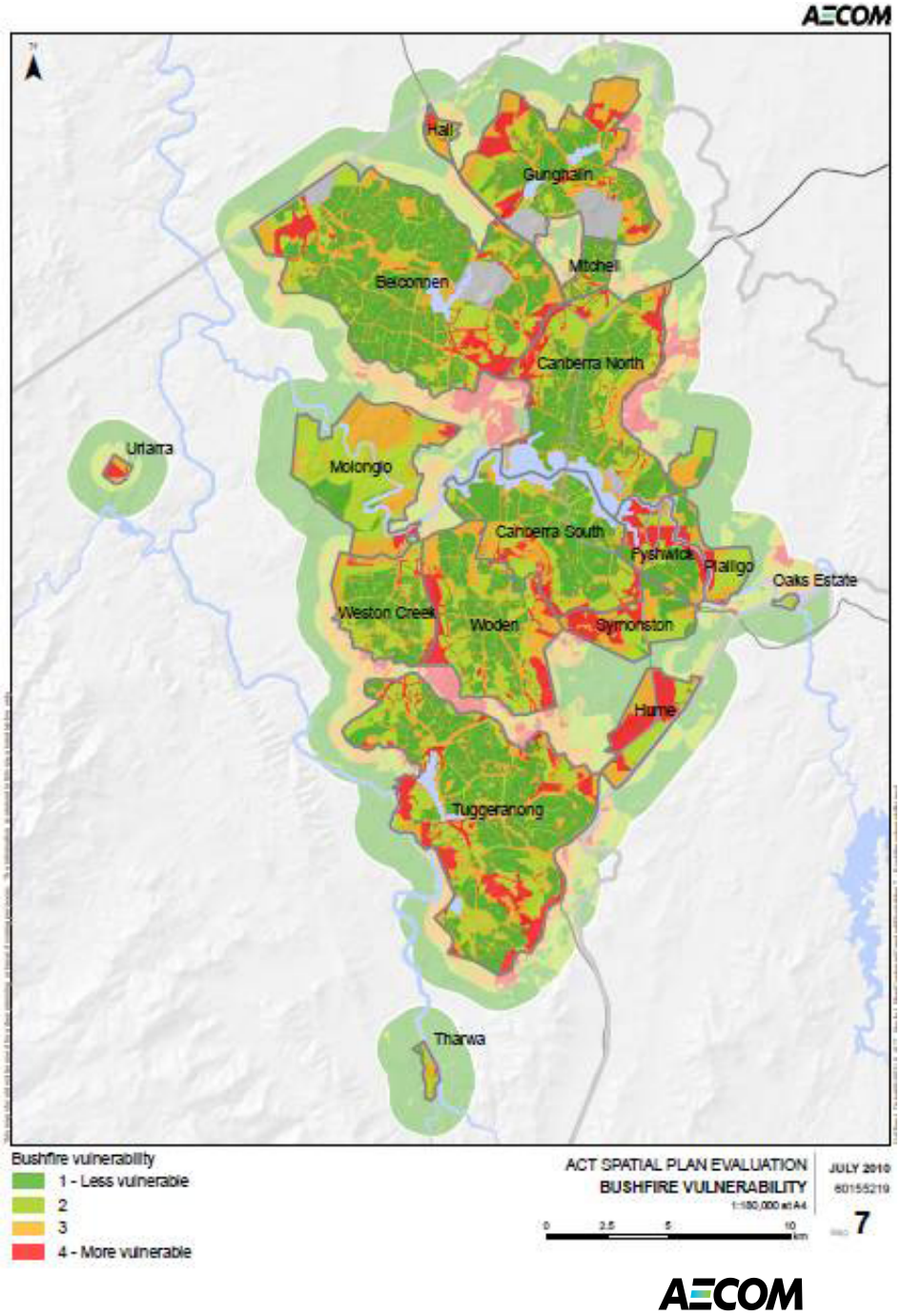
Regional Planning

- Australian Capital Territory Climate Vulnerability Spatial Evaluation

- Peri-Urban Climate Change Risk Assessment for Melbourne

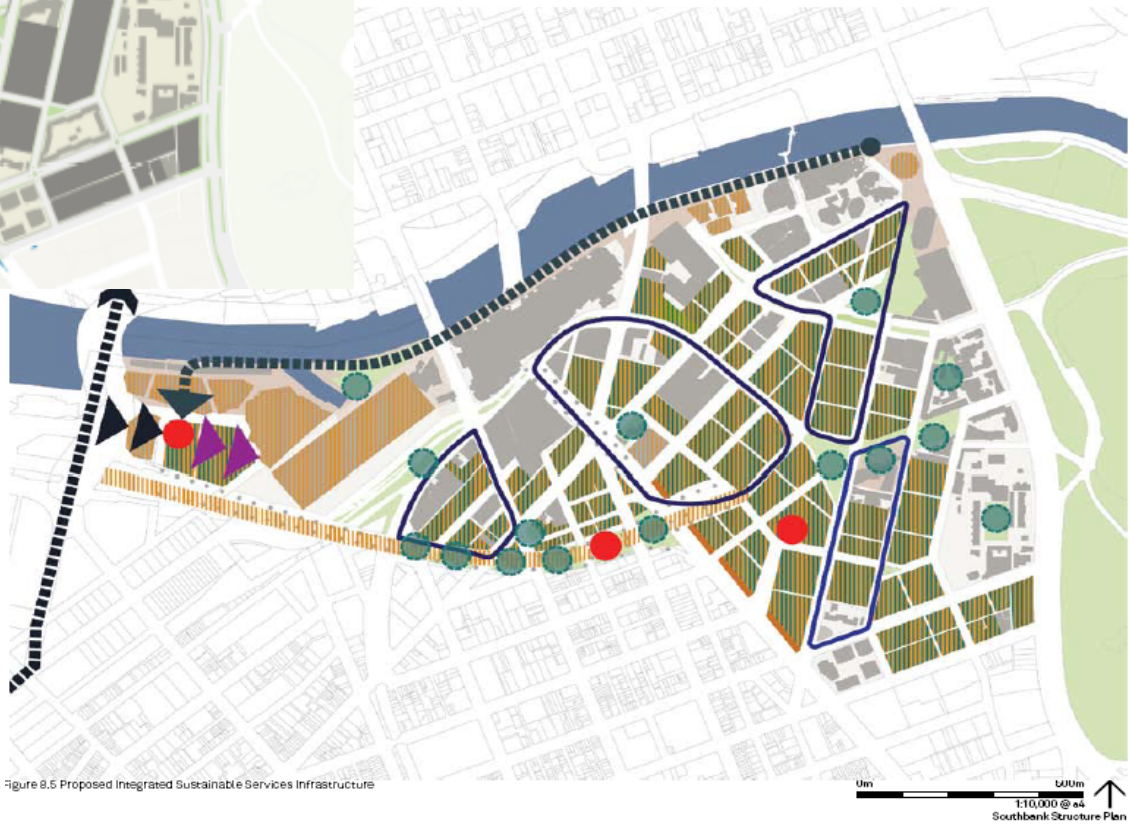
- Port Phillip Bay (Melbourne) Coastal Adaptation Decision Pathways Project

- Greater Sydney Climate Adaptation Strategy (developed project plan)



Sustainable Southbank Structure Plan

1.1 m Sea Level Rise by 2100
City of Melbourne
Australia 2009



Planning sustainable
infrastructure services

Environmental Impact Assessments

- Framework applied to following sectors:
  - Mining
  - Road
  - Rail
  - Ports
  - Water
  - Electricity and Gas Networks
  - Coastal Development
  - Major Buildings

Incorporating Climate Change Impacts and Adaptation in Environmental Impact Assessments

Opportunities and Challenges

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Photo © Victor Zastolskiy - Fotolia.com

JEL Classification: Q51, Q54, Q58

Please cite this paper as:

Agrawala S., A. M. Kramer, G. Prudent-Richard and M. Sainsbury (2010), "Incorporating climate change impacts and adaptation in Environmental Impact Assessments: Opportunities and Challenges", *OECD Environmental Working Paper No. 24*, OECD Publishing, © OECD. doi: 10.1787/5km959r3jcmw-en

Climate Adaptation in Major Projects

- Draft Australian Standard AS5334 Climate Adaptation for Settlements and Infrastructure, Standards Australia

- Design Guidelines for Climate & Sustainability, Major Australian Port

- Over 20 major projects incorporating climate change adaptation – roads, rail, ports, mines, tunnels and bridges

AUSTRALIAN GREEN INFRASTRUCTURE COUNCIL

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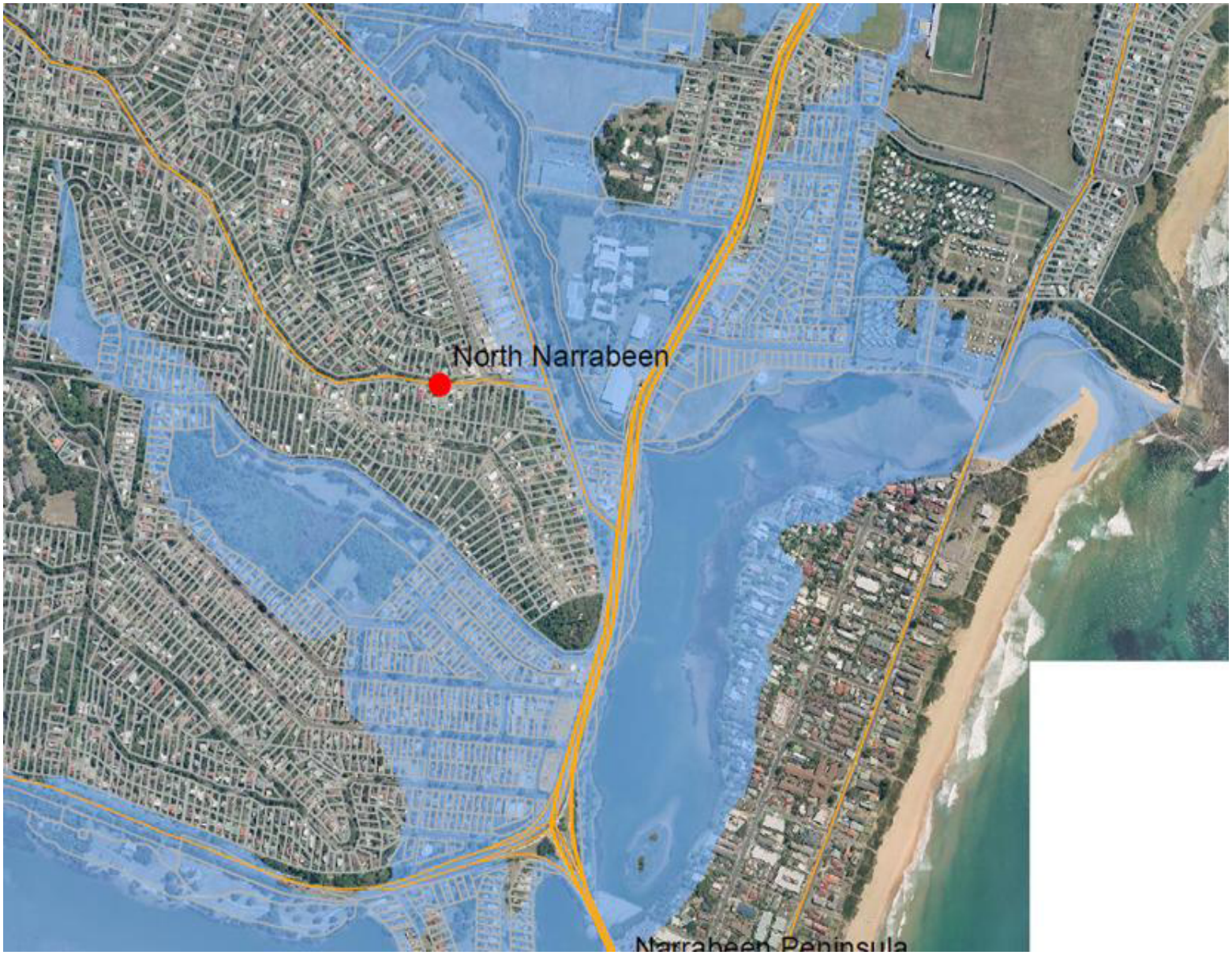
Coastal Adaptation to Changing Climate



Narrabeen Lagoon, Sydney (Department of Climate Change)

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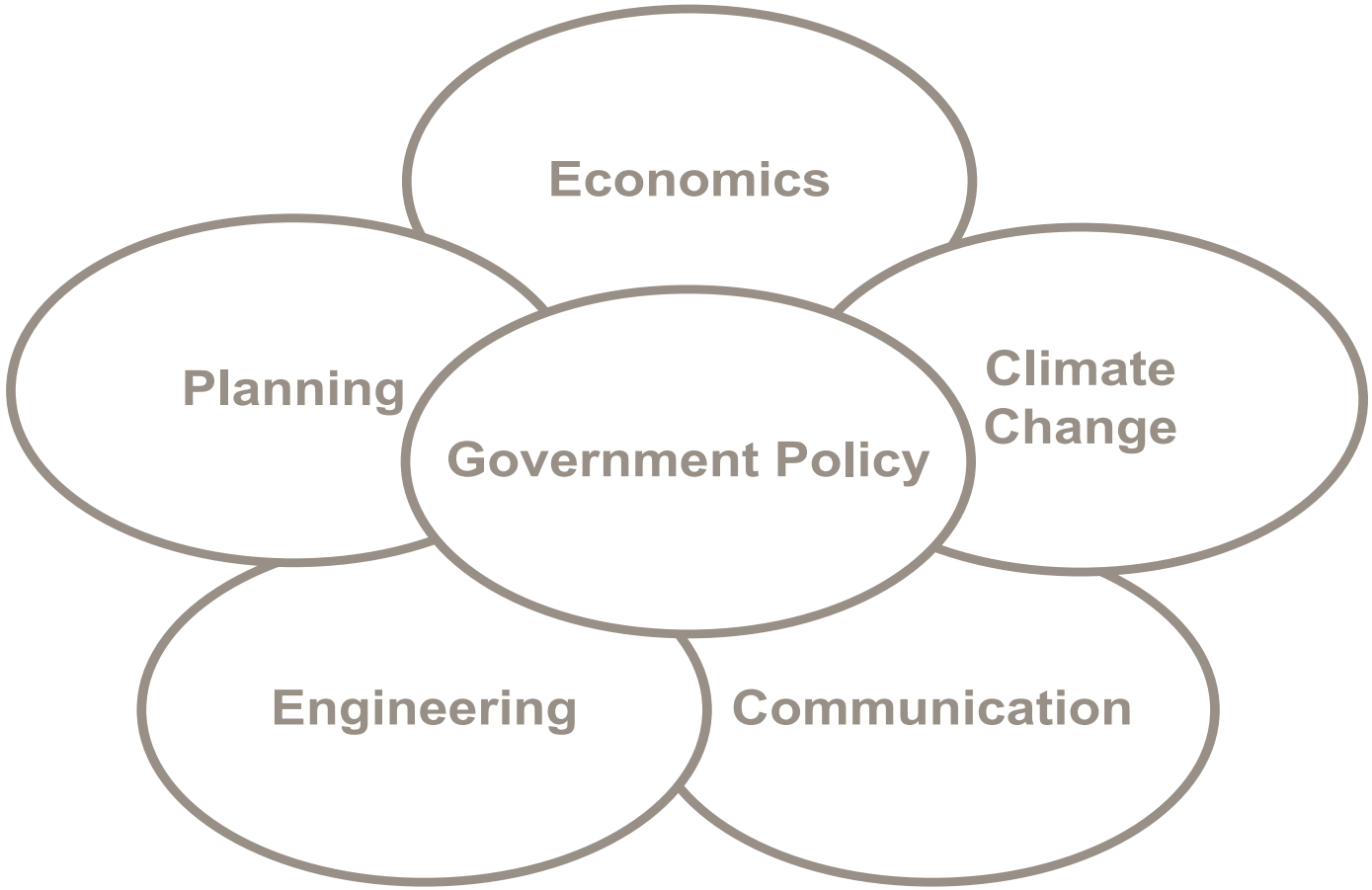
Integrated multidisciplinary approach



Fully addresses diverse technical issues by integrating disciplines into one economic framework

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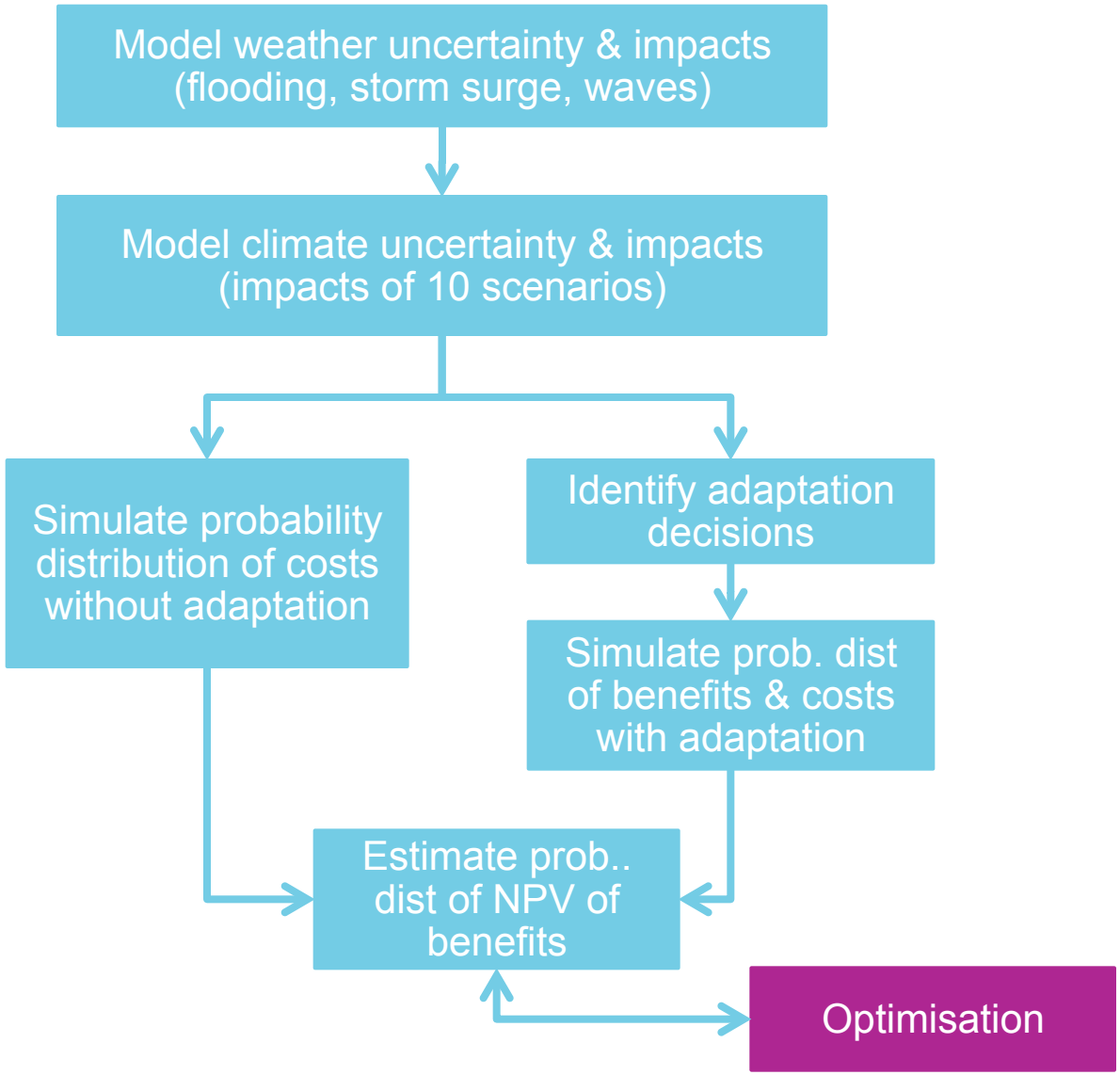
Overview of methodology



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Damage costs increase as lagoon height increases

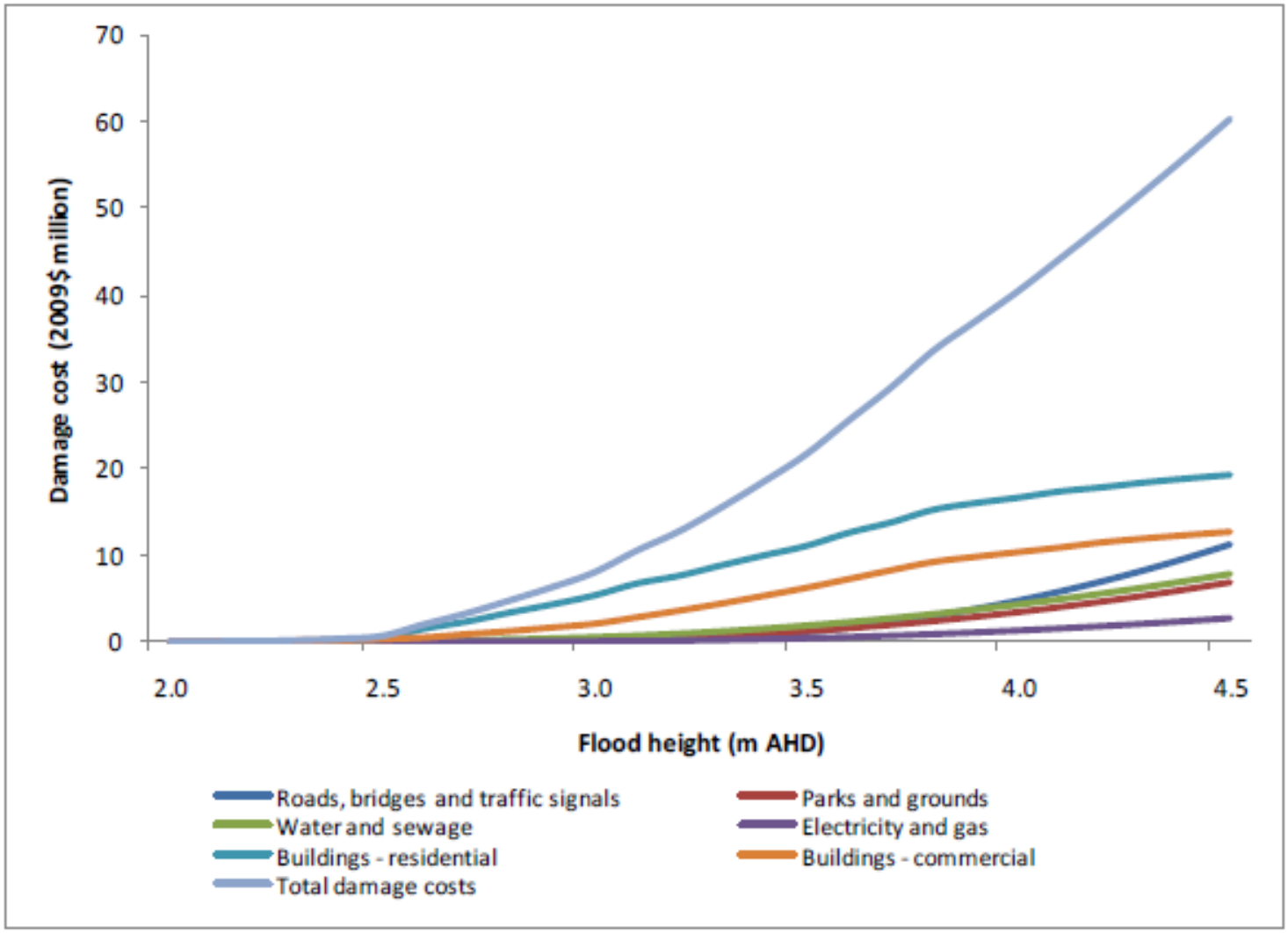

Figure 25: Total flood damage cost curve for the Narrabeen Lagoon area

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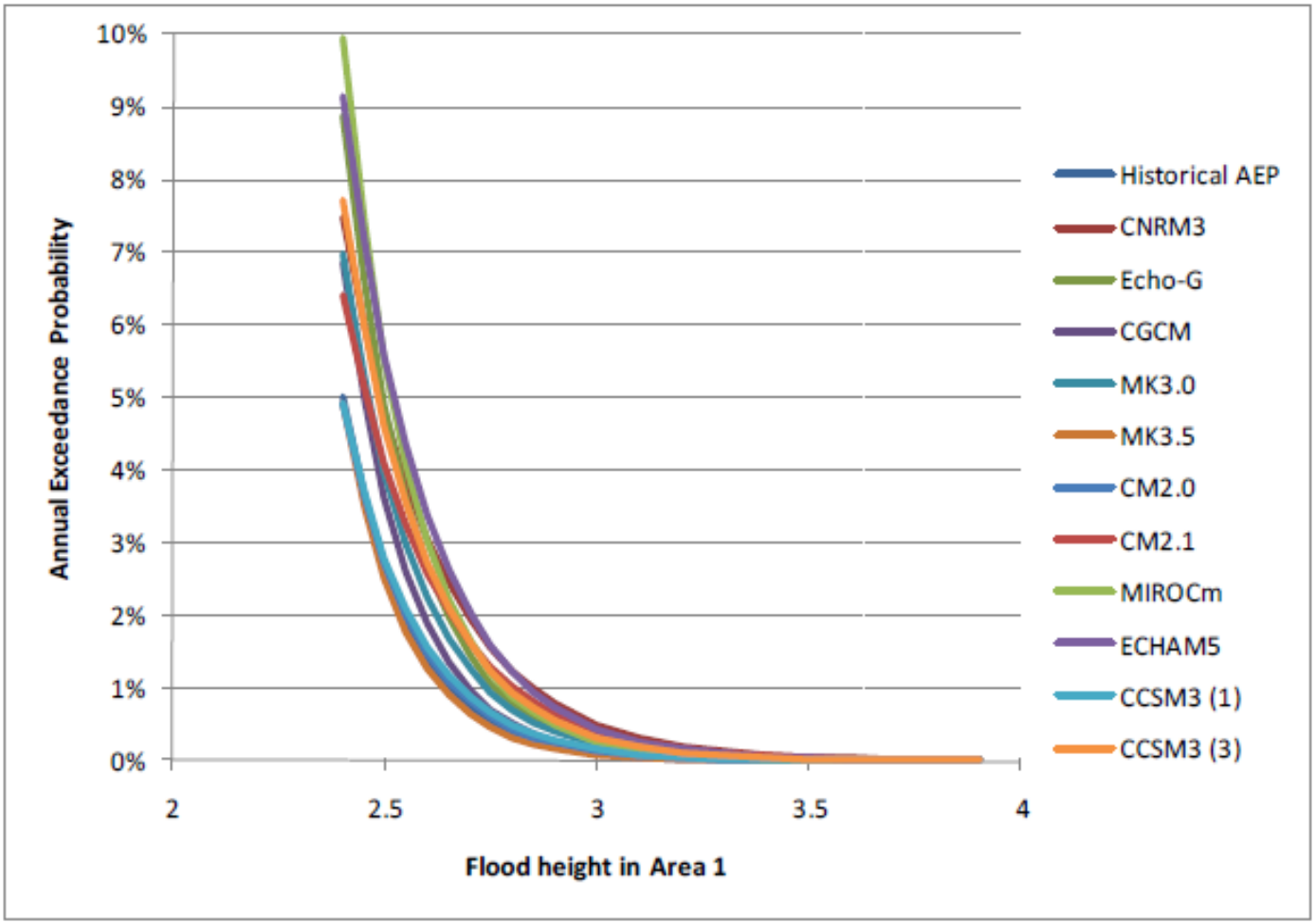
Adding climate uncertainty to weather uncertainty

Figure 21: Shifts in extreme value distributions for floods in Area 1, for 10 OAOAGCM under the A1FI scenario



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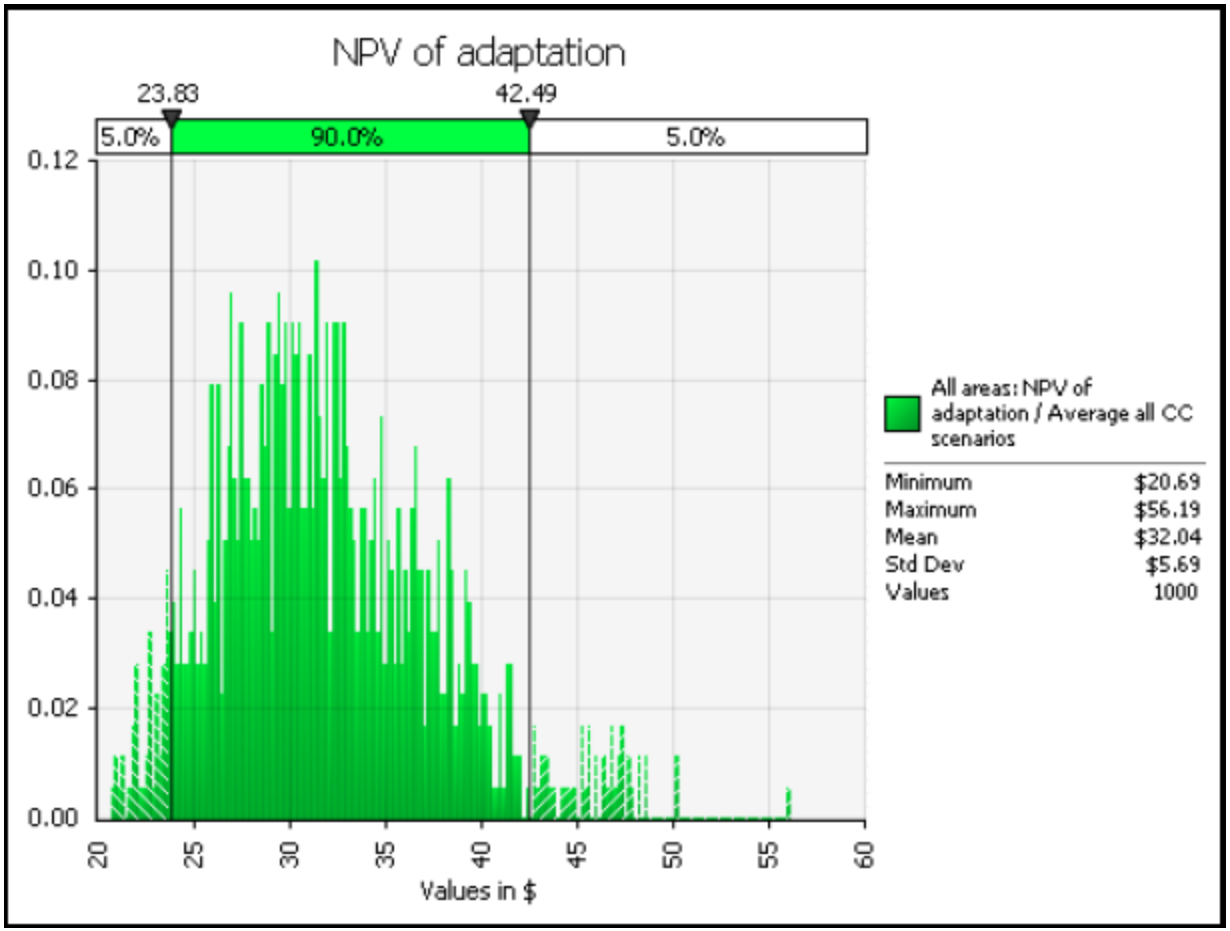
Adaptation options

Adaptation Measure	Dimensions (m)	Timing
Lagoon opening	70.0 width	2035
Lakeside levee	2.7 height	2010
Progress Park levee	2.5 height	After 2100
Nareen Creek levee	2.3 height	After 2100
Flood awareness	Not applicable	2010
Planning control	Height not modelled	2010

90% likely that NPV of adaptation between $23m and $42m



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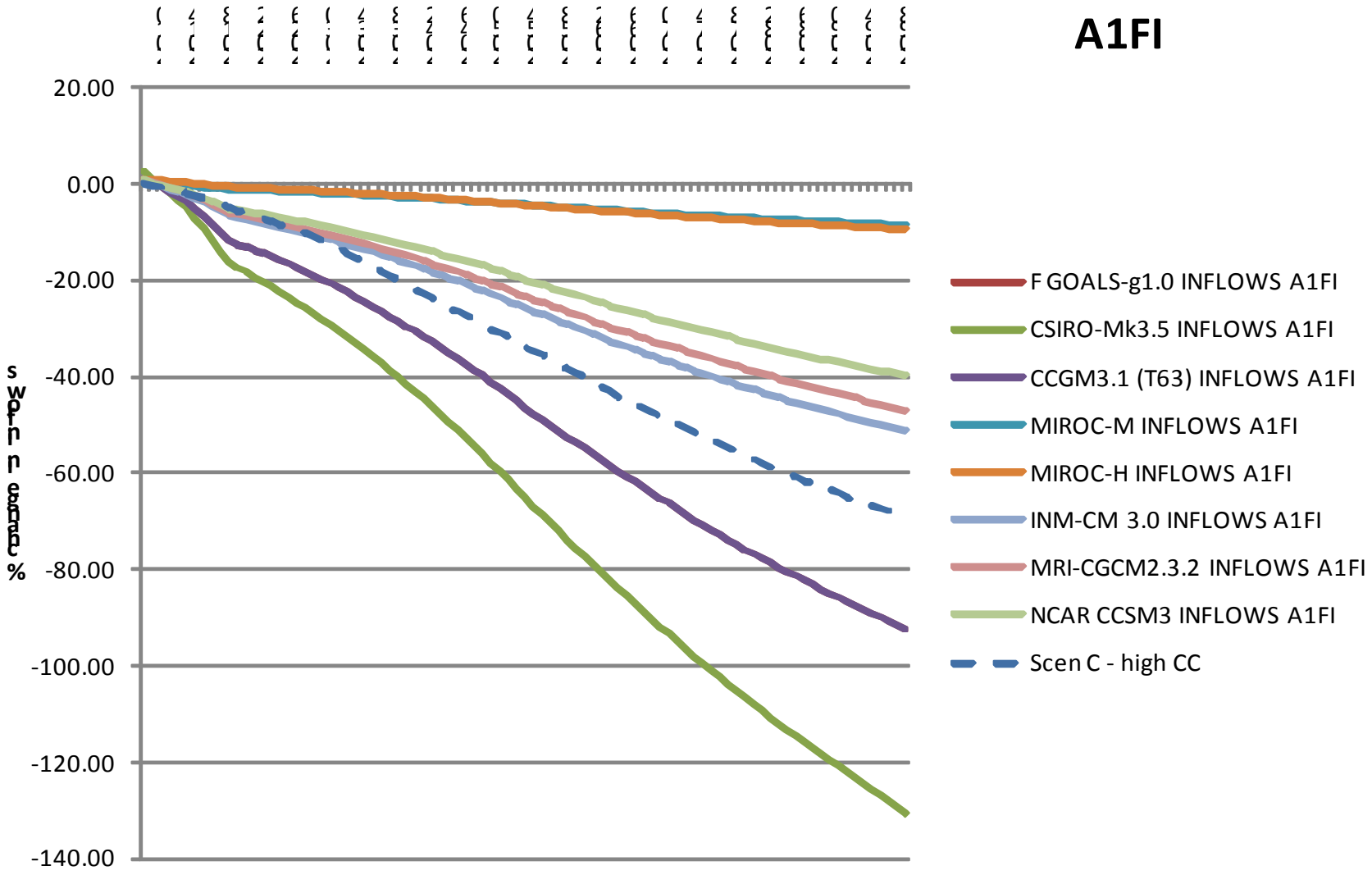
Central Highlands Water Supply & Demand Adaptation CBA

Changes to inflows from A1FI Scenario



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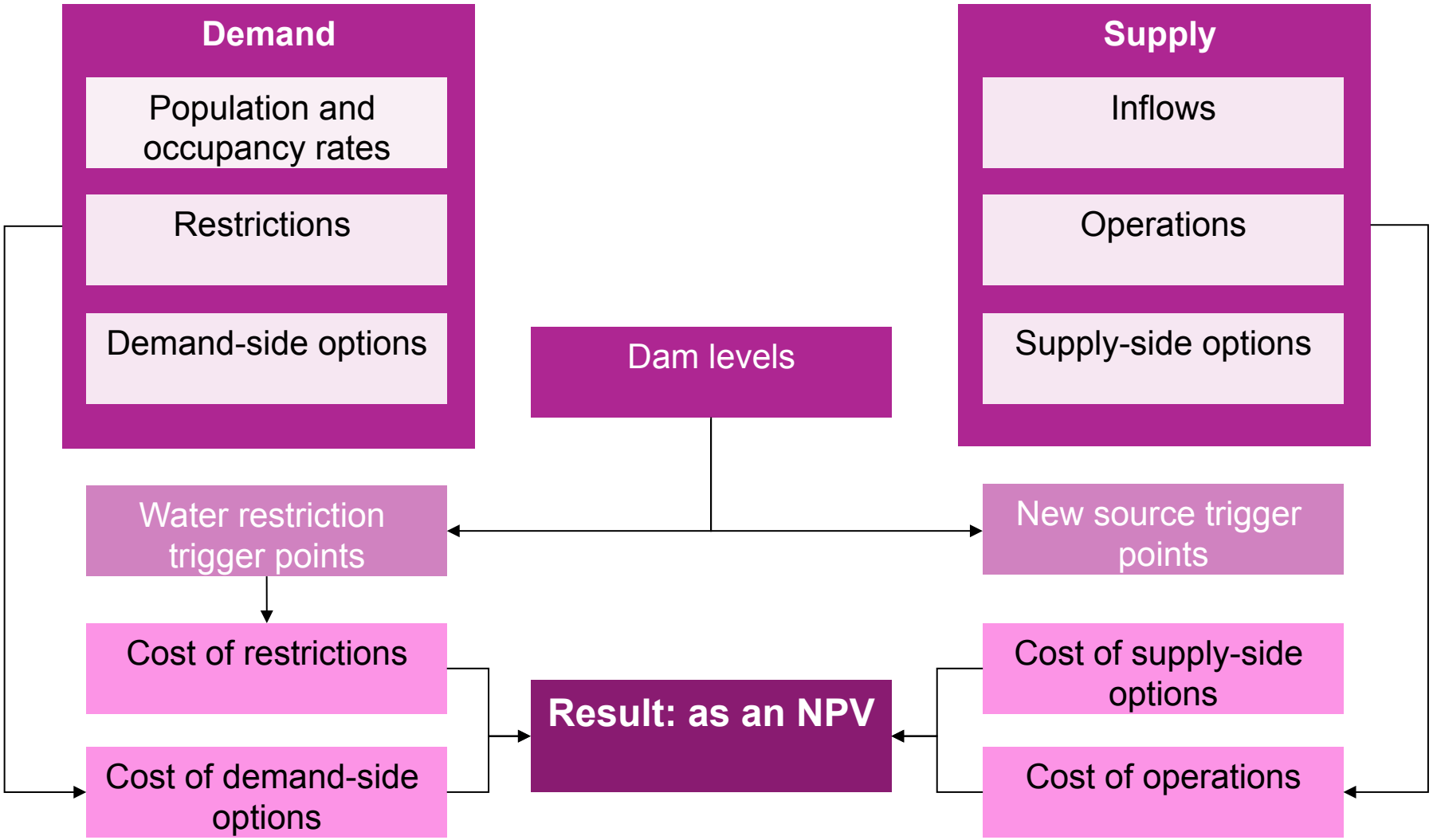
Economic Model to Balance Demand and Supply



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Central Highlands Water Context

- Goldfields Superpipe is a new water supply to CHW as an adaptation response to recent drought
- Superpipe has provided CHW with a 30-40 year buffer to the changing climatic conditions
- Not all water authorities have access to new water supply options such as the ‘Superpipe’

Commuter Rail Networks – Adaptation CBA

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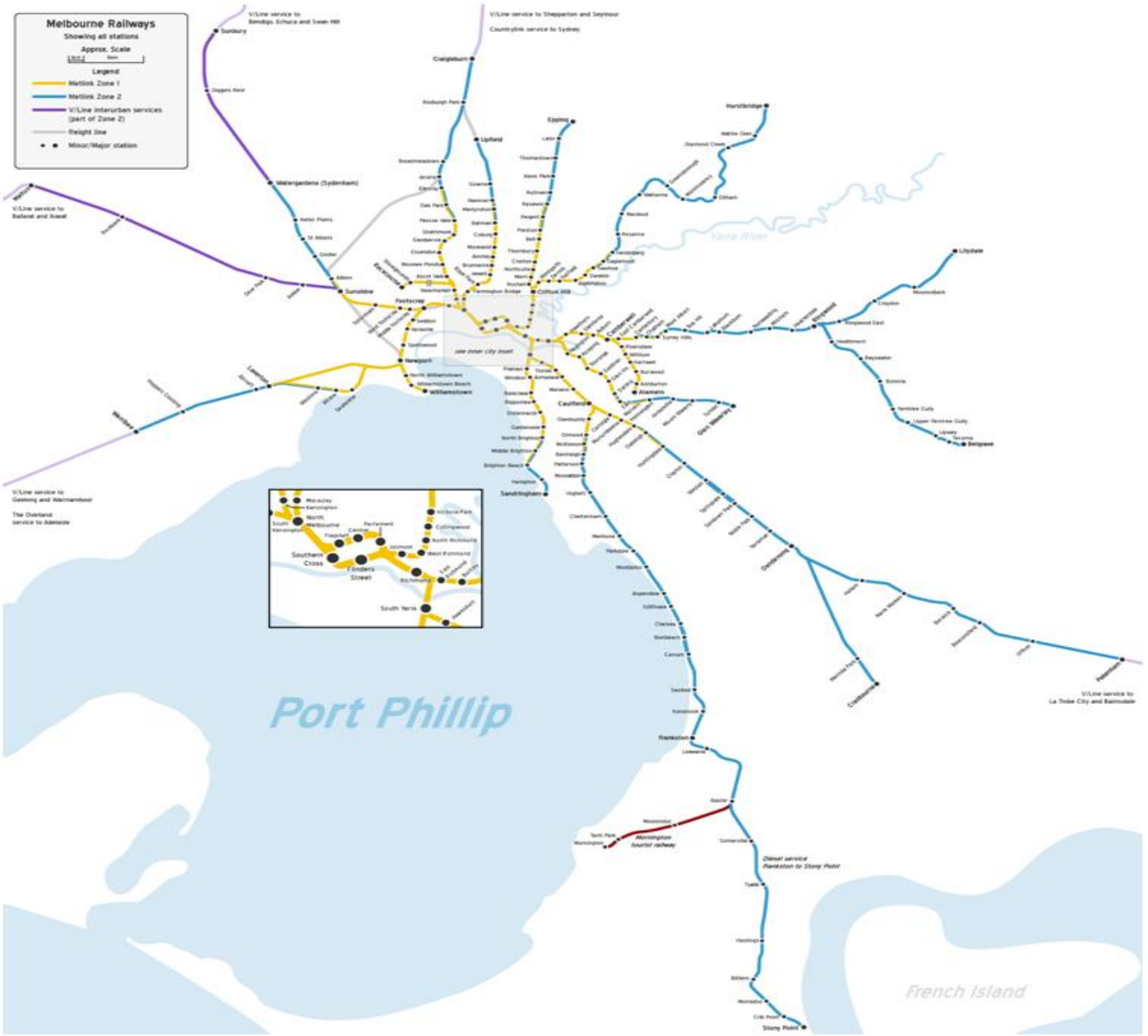
Melbourne Metro Rail Network



Simplified Adaptation CBA

No modal shift included

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High Temperature Impacts to Rail Operations

Temperature thresholds		Passenger Weighted Delay Minutes per Event (historic)	Average number of events per year			
			1970 - 2009 (historic)	2009 (historic)	2100 (A1FI) High GHG	2100 (A1B) Mod GHG
Single days	>34.5ºC to <37ºC	91,702	**7**	**14**	**48**	27
	>37ºC to <40ºC	277,313	**3**	**7**	**33**	16
	>40ºC	490,092	**0**	**4**	**20**	7
Three consecutive days	>34.5ºC to <37ºC	507,463	**0**	**2**	**16**	7
	>37ºC to <40ºC	1,021,273	**0**	**1**	**8**	2
	>40ºC	3,599,598	**0**	**1**	**3**	1

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Adaptation Options Assessed

ADAPTATION OPTION	LOW GHG SCENARIO (A1B)		HIGH GHG SCENARIO (A1FI)	
	Net Present Value ($M)	Benefit Cost Ratio	Net Present Value ($M)	Benefit Cost Ratio
Option 1 - Concrete Sleepers	-$120	0.09	-$115	0.12
Option 2 - Replace air conditioning	-$80	0.13	-$75	0.18
Option 3 - Regenerative Breaking	$107	1.70	$107	1.70
Option 4 - Cabling	$1	1.27	$4	1.78
Option 5 - Protect equipment	-$295	0.01	-$242	0.01
Option 6 - Behaviour change program	-$29	0.04	-$28	0.05

Summary

The climate is changing…

So are the opportunities:

- Climate resilience response required
- Integrate climate resilience into existing decision making processes
- Consider spectrum of decision making needs (simple versus complex CBA)

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