Enhancing the resilience of seaports to a changing climate

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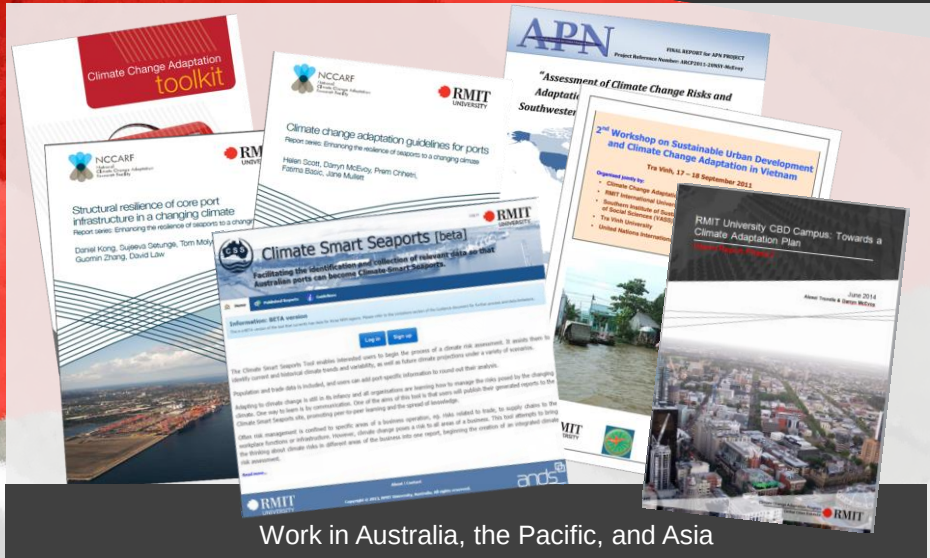

Work in Australia, the Pacific, and Asia

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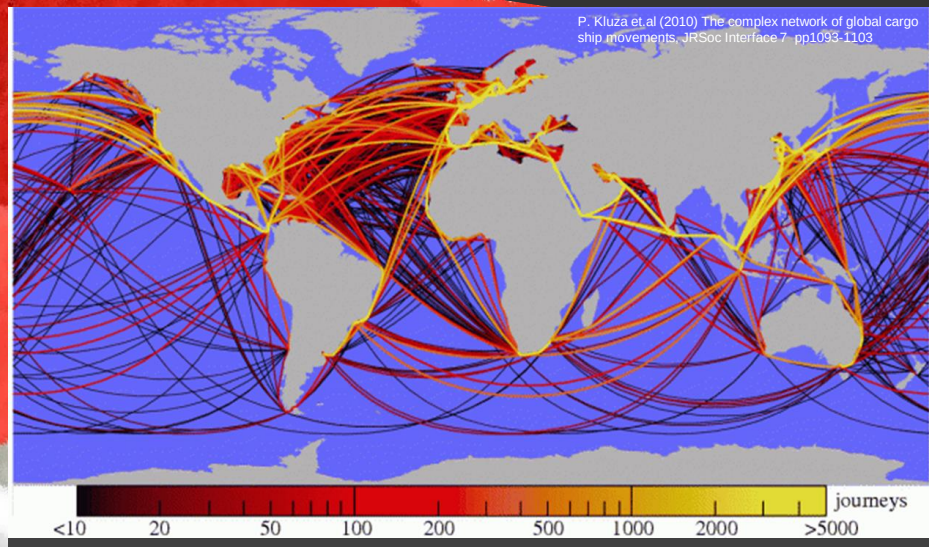
Seaports: nodes in a global network



Relative density of cargo shipping in 2007

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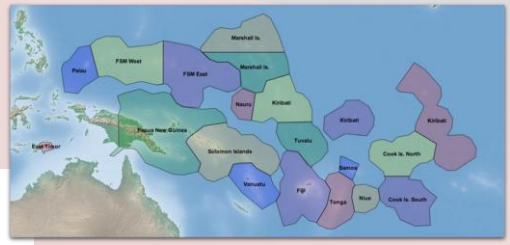
Projects: Australia and Pacific (2010-2014)

Regions defined by the CSIRO Marine & Atmospheric Research (CMAR)
Australia: natural resource management (NRM)
Pacific: Flander's Marine Institute & CSIRO



Case studies in Australia:
Gladstone Ports Corporation (Gladstone)
NSW Ports (Port Botany, Port Kembla, Yamba, Eden)
Gippsland Ports (Lakes Entrance, Corner Inlet)

Case Studies in the Pacific:
Fiji Ports Corporation (Suva Port)
PNG Ports Corporation (Port Moresby)
Swire Shipping

Funders: National Climate Change Adaptation Facility, Australian National Data Service; USAID

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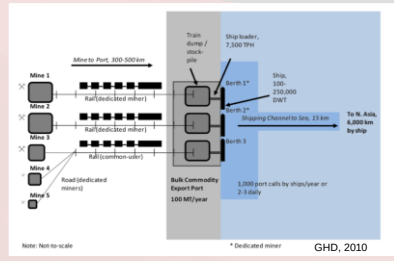
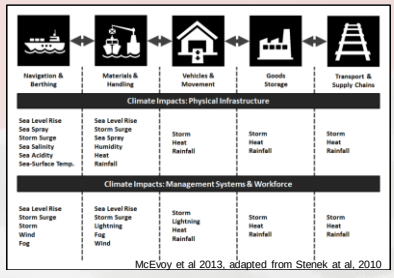
Integrated assessment focus

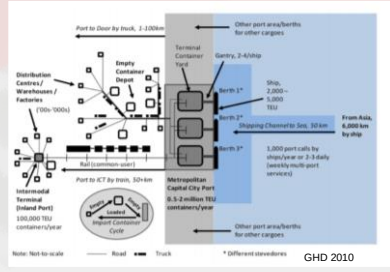
- Climate impacts on ports vary spatially and temporally (including extreme events and long term climate change)
- Bulk and container ports are sensitive to different climate impacts
- Few ports have dealt with climate change across all areas of the port business
- Integrated management of climate change is needed



GHD, 2010



McEvoy et al 2013, adapted from Stenek et al, 2010



GHD 2010

Climate data: climate futures methodology

	Annual surface temperature (°C)				
Annual rainfall (%)		Slightly warmer <0.50	Warmer 0.50 to 1.50	Hotter 1.50 to 3.00	Much Hotter > 3.0
	Much drier < -15.00			Likelihood 5 of 18 models (27%)	Likelihood 1 of 18 models (5%)
	Drier – 15.00 to – 5.00			Likelihood 4 of 18 models (22%)	
	Little change - 5.00 to 5.00			Likelihood 5 of 18 models (27%)	Likelihood 1 of 18 models (5%)
	Wetter 5.00 to 15.00			Likelihood 2 of 18 models (11%)	
	Much Wetter > 15.00				

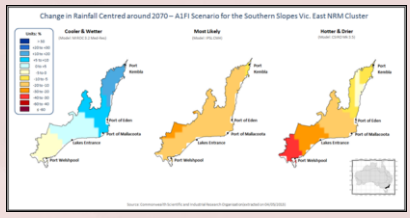
22.5N/151.5E
Scenario: A1FI
Time period: 2070
Matrix: climate variables temperature/rainfall
Model output: CMIP 3

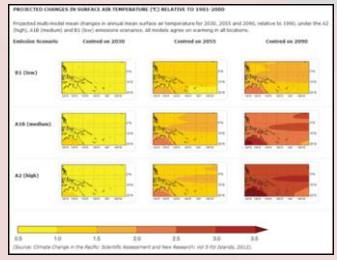
Settling on 3 models described as: cooler/wetter; most likely; hotter/dryer

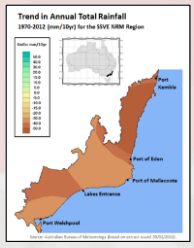
Hennessy, K., J. Clarke, P. Whetton and D. Kent 2012. An introduction to internally consistent climate projections, CAWCR
http://climatechangeinaustralia.com.au/documents/resources/An%20introduction%20to%20internally%20consistent%20climate%20projections.pdf

Contributing organisations: CSIRO, Bureau of Meteorology (Australia, Fiji, PNG)

Climate data: visualising the future







Contributing organisations: CSIRO, Bureau of Meteorology (Australia, Fiji, PNG)

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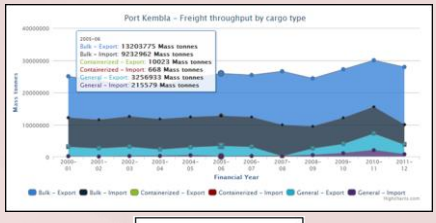
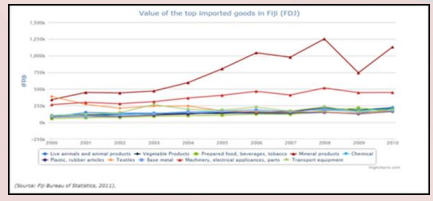
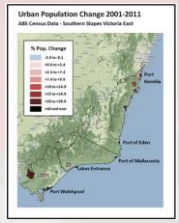
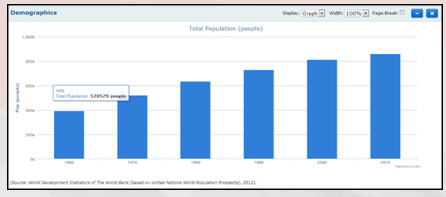
Non-climate data: visualising the future









Contributing organisations: Ports Australia, Port Authorities, Fiji Statistics

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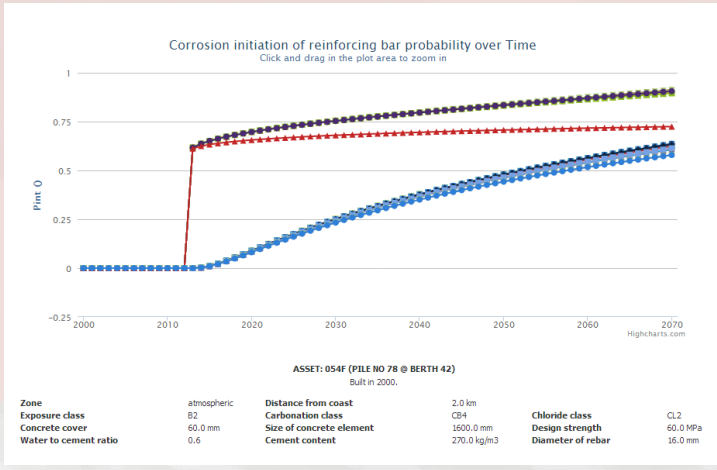
Engineering: Structural resilience of materials



Creation of a software tool

There is likely to be increases in the frequency of maintenance required for concrete and wooden structures and . a significant reduction in time for a structure to reach a deterioration threshold

Concrete deterioration under climate change

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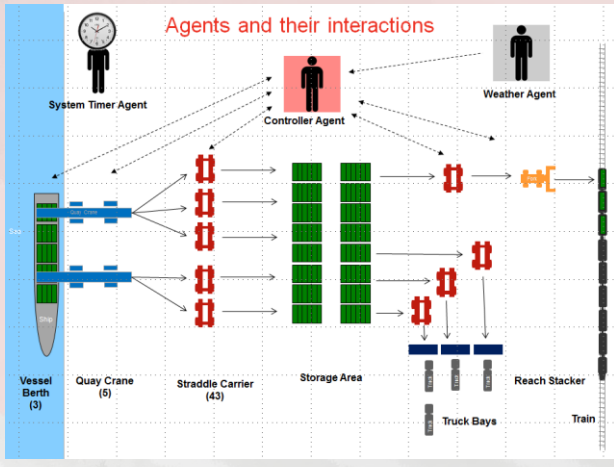
Logistics: Functional resilience of port environs



Modelled intra-port container flows and assessed future climate scenarios associated with extreme weather events

Impacts are greatest on the supply chain, both hinterland and at sea, rather than at port.

Incremental adjustments are being made at port mainly via OHS and Emergency Response procedures

Agent-based model of container flows using time out as the event indicator

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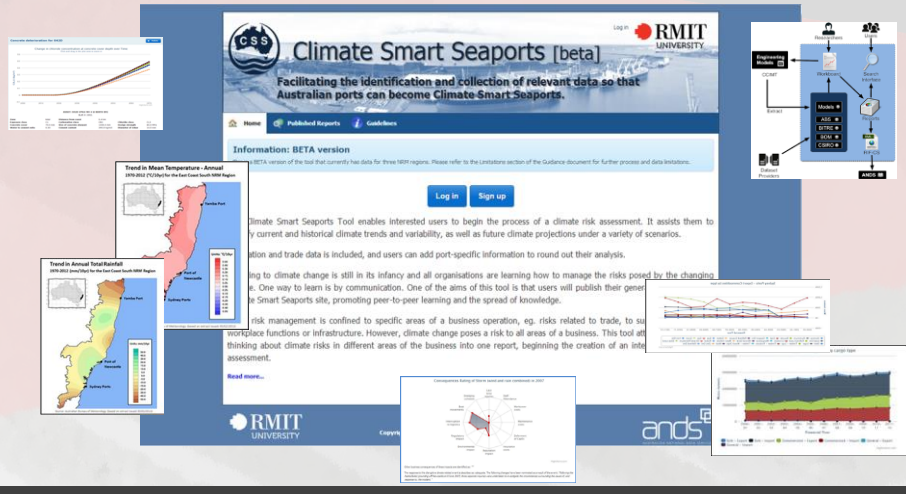
Building decision-support tools



Integrating work and developing online decision-support tools

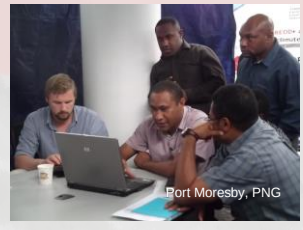
Workshops: iterative learning


RG Tanna, Gladstone


Suva, Fiji


Port Moresby, PNG


Aukland Point, Gladstone


Port Moresby, PNG

On site in Australia and the Pacific

Online resources

Enhancing the resilience of seaports to a changing climate
http://www.nccarf.edu.au/publications/enhancing-resilience-seaports-synthesis-and-implications

Climate Smart Seaports – Australia
http://seaports.eres.rmit.edu.au:8080/

Climate Smart Seaports – Pacific
http://115.146.87.23:8080/

Tools and guides developed through the projects

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THANK -YOU

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