

A Preliminary Assessment of Coastal and Estuarine response to Climate change impacts

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NSW Government

DEPARTMENT OF NATURAL RESOURCES

Motivation

- Over 80% of the NSW population lives along the coastline
- The coastal zone is the peak economic margin in NSW



To date - NO systematic study of physical and economic impacts of climate change on NSW coastline

Some potential *1st order* impacts on coasts and estuaries

POTENTIAL IMPACT	MAIN DRIVER
<i>Coasts</i>	
<u>Shoreline recession</u>	Sea level rise, changes in alongshore transport gradients
Increased storm erosion	Increasing severity and frequency of storms
<u>Re-alignment of embayed beaches</u>	Changes in average offshore wave direction
Changes to extent and frequency rotation at pocket beaches	Changes to average and storm wave characteristics during La Niña/El Niño
<i><u>Estuaries</u></i>	
Increased sea water penetration	Sea level rise
Changes in flushing characteristics	Changes in sea level, wind, runoff, tidal prism, inlet characteristics
Permanent inundation of low lying marginal land	Sea level rise

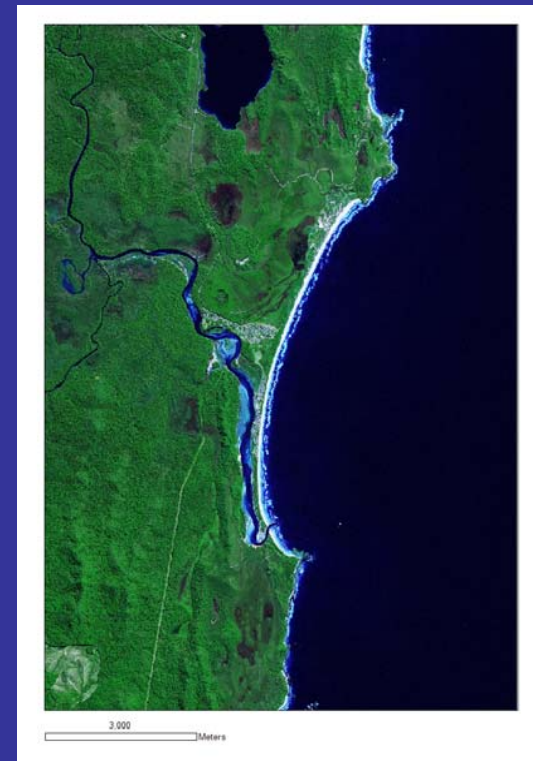
Study Objectives:

- Quantifying climate change driven physical and economic impacts on NSW beaches and estuaries
- Investigating adaptation strategies

Two main categories of NSW coasts



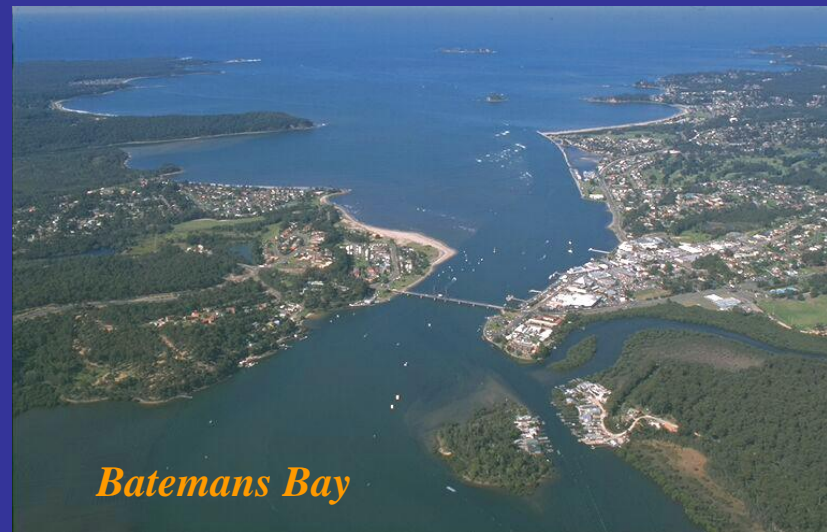
South coast - *embayed*



North coast – *straight*

SPOT5 imagery

Study areas



Study structure

Stage 1

How will climate change affect the environmental forcing parameters governing coastal and estuarine processes?

Stage 2

What will be the range of physical impacts on coasts and estuaries due to the changes in environmental forcing parameters?

Stage 3

What are the associated economic losses and how can we adapt effectively?

Stage 1: *in collaboration with CSIRO Marine and Atmospheric research, Melbourne*

Quantifying potential climate change driven changes in:

Coastal forcing parameters (eg.)

- Regional sea level rise
- Average wave height, period, direction
- Storm wave height, direction, frequency, duration, groupiness, surge

Estuarine forcing parameters (eg.)

- Rainfall/runoff
- Wind
- Heat fluxes

Method: Climate modelling using CSIRO climate models (*Mark, CCM etc*)

Output: Potential range (low → high) of changes in the various forcing parameters

Projected variations in Coastal and Estuarine forcing conditions in NSW due to climate change (*McInnes et al.*), Coasts & Ports (*Engineers Aust*): July 07 Melbourne

Commenced: September 06

Scheduled completion: February 07

Stage 2:

Quantifying the range of potential physical impacts due to changes in the environmental forcing parameters (*from Stage 1*) on:

Coasts (eg.)

- shoreline recession
- storm erosion
- shoreline re-alignment

Estuaries (eg.)

- Sea water penetration
- vertical stratification/mixing
- flushing

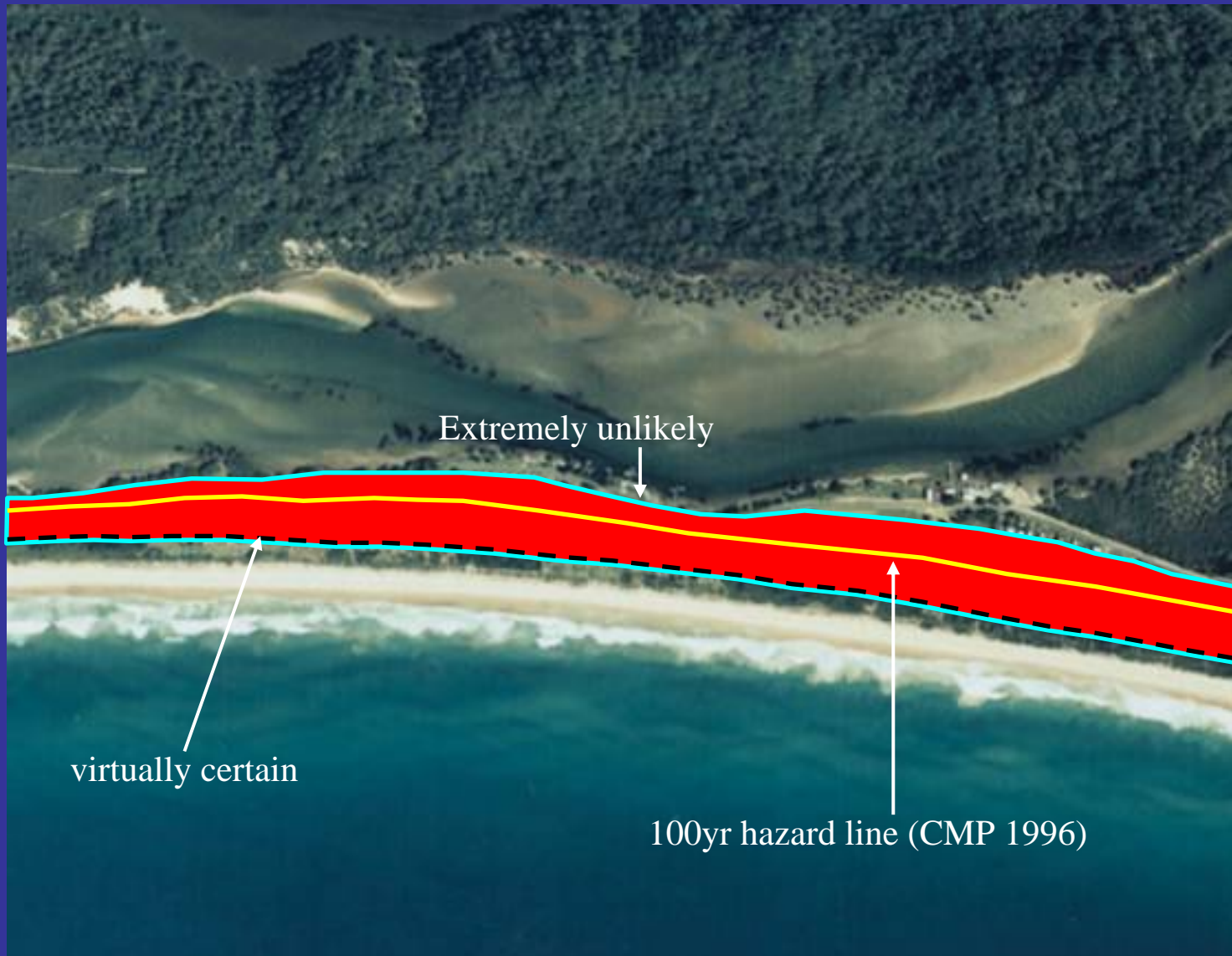
Method: Numerical modelling using a suite of 2 and 3D coastal and estuarine models

Scheduled Commencement: March 07

Completion: June 08

Example output for Wooli Wooli

Coastal erosion hazard



Stage 3:

- Estimating the economic losses associated with the range of physical impacts on coasts and estuaries (*from Stage 2*)
- Evaluating cost/benefit of various adaptation strategies to mitigate the economic losses

Output:

- Maps of projected property damage for the various scenarios and as a function of distance from the coast
- Average annual losses and exceedance loss statistics
- Cost/benefit analysis of adaptation strategies

Results

..will be uploaded to dnr.nsw.gov.au as they become available