ASSESSING THE UTILITY OF GEOMORPHIC SENSITIVITY MAPPING ON THE ILLAWARRA COAST

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17th NSW Coastal Conference, Wollongong 4-7 November 2008

GeoQuEST Research Centre | UTAS | Australian Government Geoscience Australia | University of Wollongong

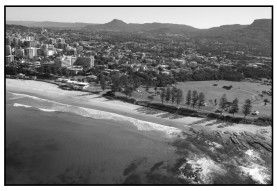
Outline

- Aim and objectives
- Components of vulnerability
- National Coastal Vulnerability Assessment
  - Smartline mapping
  - Polygon mapping
- 'Smartline' mapping of the Illawarra coast
  - Landform types
  - Sensitivity rankings and maps
  - Evaluation of sensitivity
- Conclusion

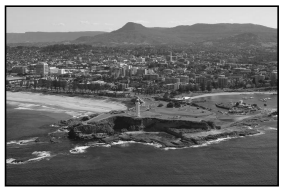
Stanwell Park beach

Aims and Objectives

- Map landforms that are sensitive to coastal hazards and the potential impacts of sea-level rise.
- Describe landform types of the Illawarra and derive sensitivity rankings.
- Evaluate Smartline and polygon mapping.

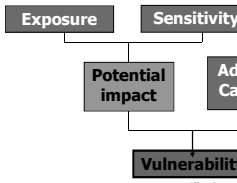


North Wollongong beach



Flagstaff Point

What is **'coastal vulnerability'**?



Allen Consulting Group, 2005

Large swell at Flagstaff Point

Eroded beach dunes at Corrimal beach

Seawall at Warilla

'Vulnerability' is a combination of the physical sensitivity, the assets at risk and the ability of society to cope with these risks (Harvey and Woodroffe, 2007)

The National Coastal Vulnerability Assessment

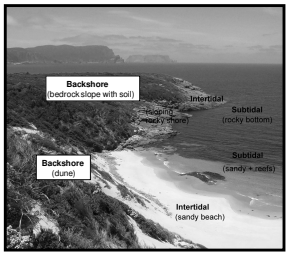
- Department of Climate Change - **'first pass'** assessment of **coastal vulnerability to the impacts of climate change**.
- Identify coastal ecosystems and infrastructure most at risk.
- Rely on geomorphic mapping.
- 2 phases,
  - **1.** 'Smartline' mapping (UTas)
  - **2.** Polygon mapping (GA)
- Available through the OzCoasts website (www.ozcoasts.org.au)

Lake Illawarra and Perkins beach

Smartline Maps

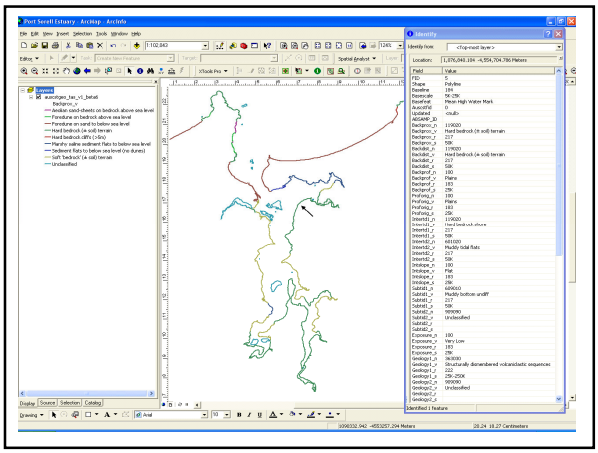
(University of Tasmania)

- Geomorphic line map of Australia's coastal zone using existing geomorphic and geology data.
- Polyline segmented into various attributes related to the landform type, exposure, geology etc of the coast.
- Identify shores that are potentially susceptible (sensitive) to physical instability (erosion, slumping etc).



Broad tidally-defined and shore-parallel zones

smartline coastal data segmentation | UTAS

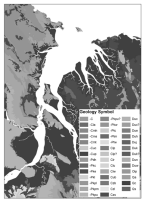


Coastal geomorphology polygon mapping

- Procure existing digital polygon datasets
  - State/local government and private consultancies
  - Geology, geomorphology and habitat data
- Develop and apply a consistent coastal geomorphology classification scheme.
- Amalgamate datasets and realign with detailed coastline position.

1:250K Geology

WA Dept. of Industry and Resources



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1:100K Geo-habitat Types

Geoscience Australia

Classification Scheme

Level 1 — **Coastal depositional environment,** i.e. alluvial plain, estuarine plain, coastal barrier/backbarrier, shelf, bedrock feature, anthropogenic feature.

Level 2 — **Coastal geomorphic feature,** i.e. beach, channel, dune, delta… This is the primary field (1:100K – 1:25K).

Level 2a — **Coastal geomorphic feature detail,** i.e. dune type. Will be mapped if additional information is available (1:25K – 1:10K).

Level 3 — **Sediment texture and lithology,** i.e. mud/sand/gravel, carbonate, plutonic… (1:250K – 1:100K).

Level 3a — **Rock Type,** lithology description i.e. basalt, sandstone, conglomerate… Mapped where data is available (1:100K – 1:25K).

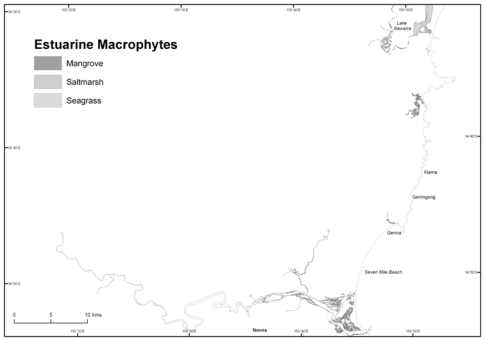
Level 4 — **Biota,** i.e. mangrove, salt marsh, coral, seagrass… Mapped where data is available (1:100K – 1:25K).

Level 5 — **Substrate type** – **CONSOLIDATED** or **UNCONSOLIDATED**

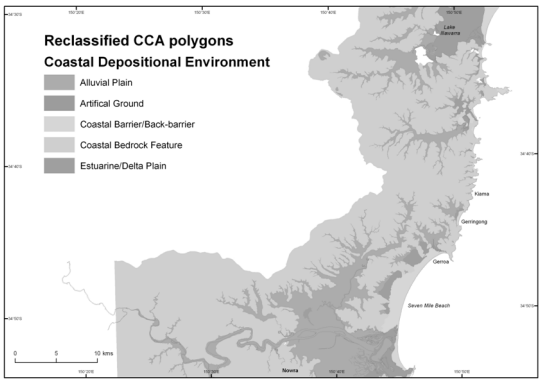
Case Study: The Comprehensive Coastal Assessment Toolkit

NSW Dept. of Planning

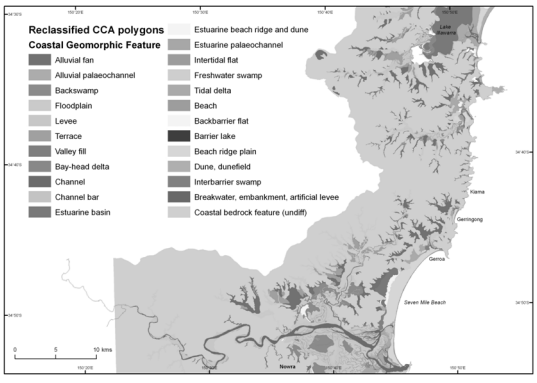
Lake Illawarra to Seven Mile beach



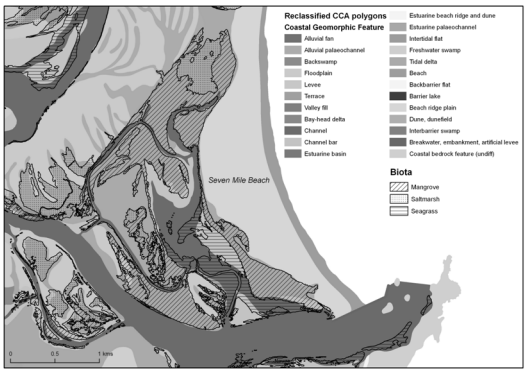
Reclassification – **Level 1** Coastal Depositional Environment



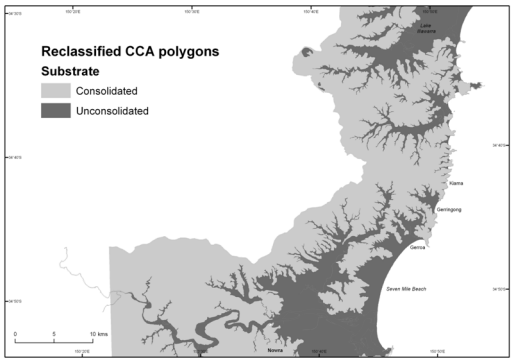
Reclassification – **Level 2** Coastal Geomorphic Feature



Reclassification – **Level 4** Biota Type

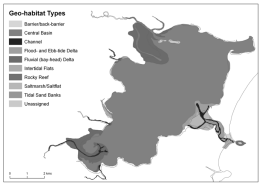


Level 5 – identification of consolidated (hard) and unconsolidated (soft) sediments.



Line vs. Polygon

- **Polylines**
  - Store many attributes for a single spatial location (i.e. backshore, near shore, exposure described in one line segment).
  - Allow simple GIS queries.
- **Polygons**
  - Map the spatial extent that vulnerable landform units occupy, allows for modelling of coastal processes.

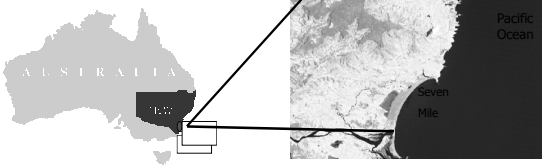


Lake Illawarra, NSW, geo-habitats

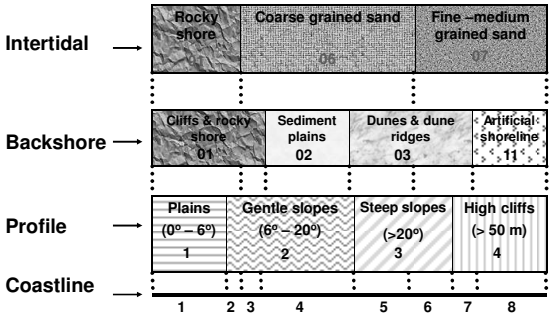
Hardy Inlet, WA, intertidal landform type

Illawarra coast

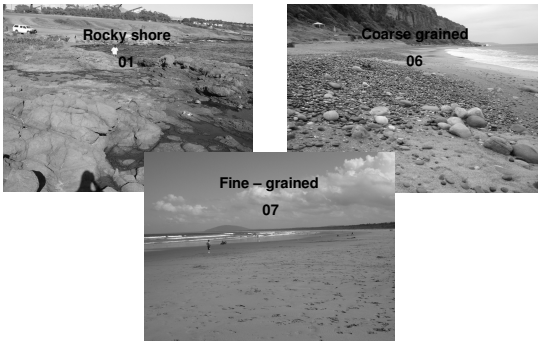
- 80 km S. of Sydney
- 167 km long
- Narrow coastal plain
- Wave-dominated
- Over 300,000 people



'Smartline' segmentation

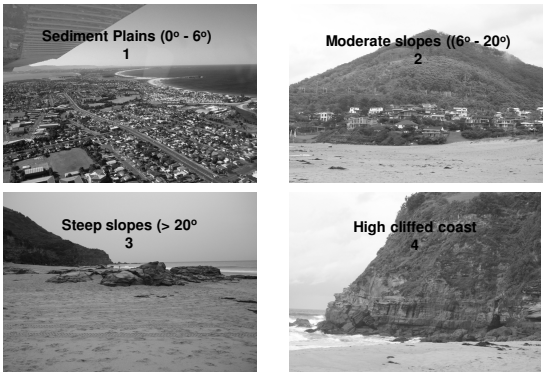


Landform types - intertidal

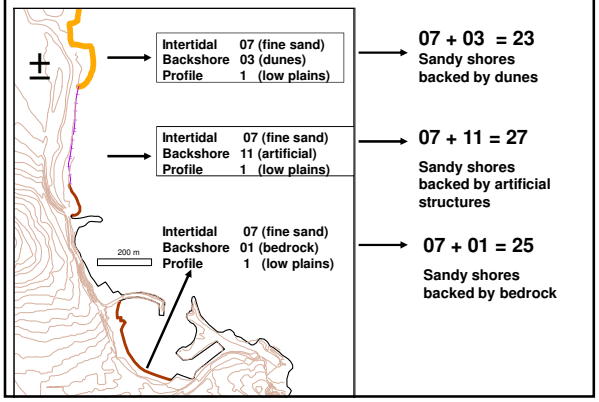


Landform types - backshore

Landform types - profile



GIS queries - sandy sensitivity



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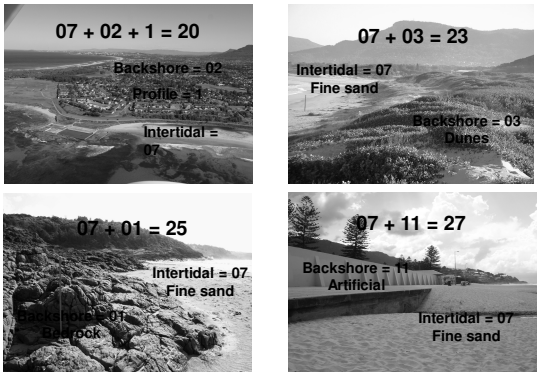
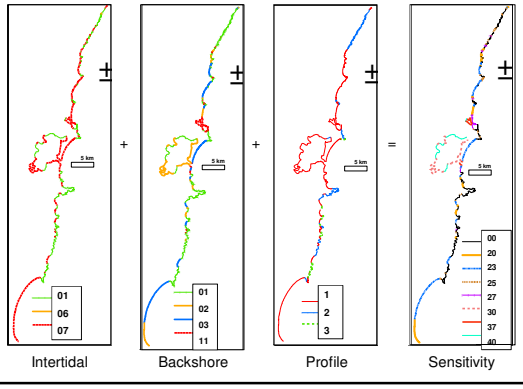
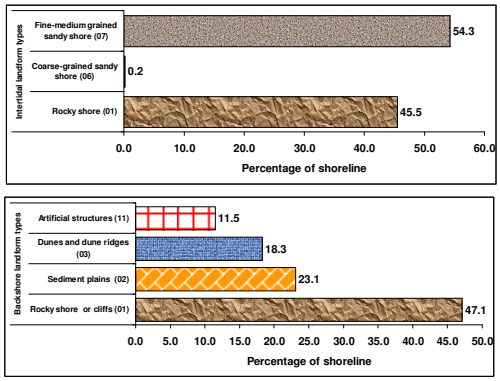
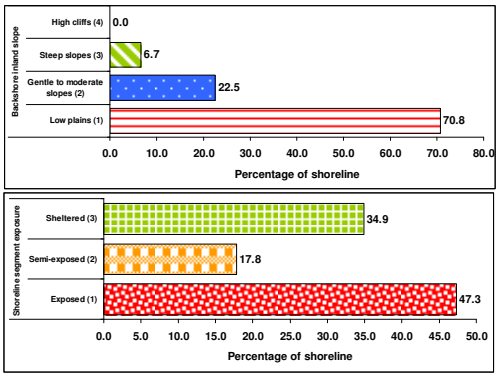


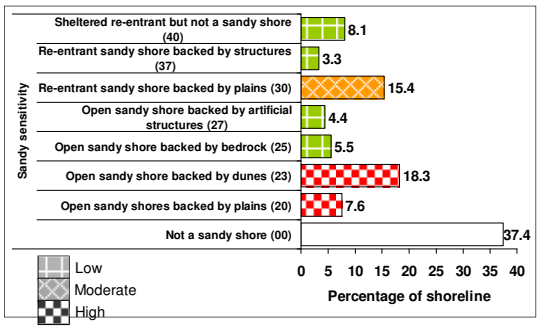
Illawarra sandy sensitivity







Sandy sensitivity for the Illawarra



Conclusions

- Geomorphology plays an important role in the identification of coastal areas that are vulnerable to the potential impacts of sea-level rise.
- Coastal geomorphology maps are currently being developed for Australia and these will provide fundamental data layers for assessing the impacts of sea-level rise.
- Illawarra coast:
  - high sensitivity 25.9 %
  - moderate sensitivity 15.4%
  - low sensitivity 21.3 %
  - non-sandy shores 37.4 %

Bellambi/Woonona beach

- Future study:
  Investigate historic rates of shoreline movement

Questions?