RESILIENCE TO CLUSTERED DISASTER EVENTS ON THE COAST: STORM SURGE

Partner Briefing
3-4 December 2014
PROJECT TEAM & END USERS

• Official start July 1, 2014
• Researchers
  ➢ Geoscience Australia
    o Scott Nichol, Jane Sexton, Martyn Hazelwood, Martine Woolf, Andrew McPherson, Duncan Moore, Gareth Davies, Wenping Jiang, Floyd Howard
  ➢ University of Queensland
    o Tom Baldock, David Callaghan, Uriah Gravois (postdoc)
• End Users
  • NSW, Office of Environment & Heritage
  • SA, Dept of Environment, Water & Natural Resources
  • QLD, Dept of Science, Information Tech, Innovation & Arts
  • C/wealth Attorney General Dept
April 2003

Shoreline dynamics
Shoreline dynamics

June 2008
April 2009

Shoreline dynamics
Shoreline dynamics

Sept 2012
April 2014

Shoreline dynamics
THE PROBLEM

• Coastal communities and infrastructure are at risk from the impacts of storm surge
• Clustered surge events means little time for recovery of the coastline
• By not accounting for the impact of clustered events we may underestimate the risk to coastal assets
PROJECT APPROACH
EROSION IN THE CONTEXT OF THE COASTAL SEDIMENT SYSTEM: SOURCES, SINKS & PATHWAYS

Davies, 1974
PROJECT APPROACH
COASTAL SEDIMENT COMPARTMENTS – AT THE NATIONAL SCALE
PROJECT APPROACH
COASTAL SEDIMENT COMPARTMENTS – AT THE NATIONAL SCALE
PROJECT APPROACH
COASTAL SEDIMENT COMPARTMENTS – AT THE NATIONAL SCALE
PROJECT APPROACH
COASTAL SEDIMENT CELLS – EXTENDING RECENT WORK IN WA

METHODOLOGY – CASE STUDIES

• Identify coastal landform systems that are vulnerable to erosion during storm surge events

• Develop modelled storm surge events to represent clustering at study sites

• Reconstruct shoreline response to clustered storms

• Assess numerical models quantifying coastal response to storm surge based on coastal system characteristics

• Collect field data to validate findings

• Quantify the impact of clustered storm surge events on coastal assets (buildings and infrastructure).
PROJECT GOALS & OUTCOMES

• A standard framework for integrating coastal studies across a range of scales (local/regional/national)

• A demonstrated methodology
  • for quantifying the impact of clustered events on coastal infrastructure
  • for including clustering as part of integrated quantitative risk and impact modelling approach for storm surge

• Recommendations for a national approach to the acquisition of coastal data for studies to minimise the impacts of coastal risks
PROJECT ACHIEVEMENTS: SITE SELECTION

• Workshop 14 October, 2014
• Science team + End Users
• Sites selected using agreed criteria

➤ Old Bar Beach, NSW (central coast)
  • An erosion ‘hotspot’
  • Science challenges re: coastal processes

➤ Adelaide Metropolitan Beaches, SA
  • Required sand nourishment since 1970s
  • Clustered storms not previously considered in management strategies
STUDY SITES
SELECTION CRITERIA

**Existing Data:**
- Elevation – LiDAR derived elevation surfaces is key, both topo and bathy
- Geomorphology – over and above the NSW CCA dataset would be useful
- Stratigraphy – subsurface studies to help inform estimates of sediment volumes
- Previous local studies – in particular, sediment transport or process modelling

**Priority Areas for End-users** – particularly sites where a better understanding of shoreline response to coastal storms, and impacts on infrastructure is needed for land use planning

**Representative of a common coastal (beach-barrier) morphotype** – this will ensure applicability of developed approach to other locations.

**Sites where clustered storms (may) have occurred** and there is data on these events
# PROJECT ACHIEVEMENTS: DATA AUDIT & COMPILATION

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Format</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary Sediment Compartments</td>
<td>GIS</td>
<td>Context for study sites</td>
</tr>
<tr>
<td>Secondary Sediment Compartments</td>
<td>GIS</td>
<td>Context for study sites; modelling</td>
</tr>
<tr>
<td>Tertiary Boundaries</td>
<td>GIS</td>
<td>Context for study sites; modelling</td>
</tr>
<tr>
<td>Geomorphic Units</td>
<td>GIS</td>
<td>Field work; modelling</td>
</tr>
<tr>
<td><strong>Local/Regional</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil Maps (SA)</td>
<td>GIS</td>
<td>Field work; modelling</td>
</tr>
<tr>
<td>Drillholes (SA)</td>
<td>GIS</td>
<td>Field work; modelling</td>
</tr>
<tr>
<td>Extreme Water Levels</td>
<td>Tba</td>
<td>Cluster modelling</td>
</tr>
<tr>
<td>Wave Buoy Data</td>
<td>Tba</td>
<td>Model calibration</td>
</tr>
</tbody>
</table>
PROJECT ACHIEVEMENTS:
SITE CHARACTERISATION – UNDER WAY

Geomorphologic maps
Subsurface data

Geomorphologic maps
Subsurface data
PROJECT PLANNING: FIELDWORK

• **Purpose:**
  - Assist site characterisation
  - Baseline information for shoreline modelling

• **Scheduled:**
  - Feb/March 2015
  - GPR used to find **rock basement** of dune system & map **old storm lines**
  - Used to estimate potential sediment **volumes** that can be mobilised in extreme events

The ground penetrating radar (GPR) being towed behind a research vehicle on Fraser Island. 
[http://www.abc.net.au/local/photos/2014/07/22/4050857.htm](http://www.abc.net.au/local/photos/2014/07/22/4050857.htm)
PROJECT PLANNING: CLUSTERED EVENTS
FOCUS OF OUR DISCUSSION AT THIS MEETING

- ACECRC extreme water level dataset to drive modelling
- NARCLiM hindcast wave data could be useful for understanding frequency but not use for driving data
- Waverider buoys for model validation/calibration
PROJECT PLANNING: SHORELINE MODELLING

• Will get underway Jan 2015 (UQ postdoc)
• Determine appropriate model approach
  • Investigate available options
  • Integrate cross-shore and long-shore component
  • Test etc
• Collecting input data
  • Elevation
  • Wave, wind, etc
NEXT STEPS

- Finalise Workshop Report following end-users comment
- Finalise Science Plan (Dec milestone)
- Finalise Field Work Plan (Dec milestone)

- Progress the Case Studies
  - Field Work – Feb/March
  - Integrate datasets for uptake into modelling

Questions ?