Flood-tide delta morphodynamics and management implications, Port Stephens, Australia
1. Background

**ARC-Linkage Project** (March 2007- June 2010)
Involving:

- The University of Sydney researchers (2 PhD students, 1 Postdoc, 3 senior academic staff)
- Jimmy’s Beach Restoration Society
- Port Stephens Council (Shoal Bay)
- Great Lakes Council (Jimmy’s Beach)
- Department of Environment & Climate Change (DECC)
- Danish Hydraulic Institute (DHI)

1. Background

Abstract:

Flood tide deltas are the most dynamic component of estuarine systems and result in unstable estuarine shorelines worldwide. We will investigate Port Stephens which has been experiencing ongoing shoreline erosion. In this project, we will investigate wave-tide processes and sediment transport paths within the delta-beach systems and use numerical models to describe the hydrodynamics, sediment transport and beach response over a range of wave, tide and sea level scenarios. We will examine the possible engineering solutions and add value to the existing coastal management strategic plan.
1. Background

The main aims are:

• To determine the interrelated morphodynamics of flood tide deltas and adjacent estuarine beaches.
• To model these relationships using numerical models run for a range of different hydrodynamic and morphological scenarios.
• To evaluate the system’s response to climate change and sea level rise using numerical models.

The main aims are to be achieved through:

• Determination of location, direction and rates of sediment transport (field data).
• Measurements of waves and tidal currents that drive the transport (field data).
• Use field data to model the delta and shorelines to test solutions to immediate problems (field data plus modelling)
• Apply the model to predict impact of climate change: rising sea levels, increasing tidal prisms, and a changing wave climate.
2. Progress

SOME HURDLES:

- The project started in March 2007 instead of July 2006 (8 months late)
  - Dong Jeng moved overseas and resigned from the project
  - Andy Short retired – still involved.
  - Michael Hughes moved away from Sydney Uni – still involved.
  - Rosh Ranasinghe moved overseas – still involved.

- The project assumed USyd had a fully functional boat:
  - Boat broke too many times.
  - Diving bureaucracy.
  - Lack of survey grade echo sounder in rental boats.

- Numerical modelling started in July 2007, in the absence of Dong Jeng, Craig Allery, Peter Cowell, Rosh Ranasinghe and Ana Vila-Concejo have been supervising Wenping Jiang.
2. Progress

The team at the University of Sydney:

- Ana Vila-Concejo
- Andy Short
- Michael Hughes
- David Michell
- Tim Austin
- Wenping Jiang (Peter Cowell)
- Arjen Overduin (Peter Cowell)
- Michelle Frolich
- Lara Ainley
- Genoveffa Pezzimenti
- Daniel Harris
- Javier Benavente
- Laura del Rio

We couldn’t have done it without:
- Craig Allery (DHI)
- Fieldwork volunteers.
- Feet First Dive (Nelson Bay)
2. Progress

ACHIEVEMENTS:

• GIS analyses mostly completed.

• Fieldwork:
  • Beach measurements are completed:
    • 4 Intense Hydrodynamic field campaigns winter and summer both in Jimmy’s beach and Shoal Bay.
    • Periodic topographic measurements in Shoal Bay and Jimmy’s beach during the first two years of the project.
      • Some extra measurements both in Jimmy’s (nourishment) and Shoal Bay (Dan’s honous + cusps monitoring).
  • Flood tide delta studies:
    • Bathymetry completed by DECC.
    • ADCP deployments (mostly completed)
    • ADCP transects (only spring tide conditions at the entrance, December 2008)
2. Progress

ACHIEVEMENTS:

• Numerical Modelling
  • Hydrodynamic model up and running
  • Finalising wave model

CURRENT SCIENTIFIC PRODUCTION:

• Four honours theses and two ongoing PhD theses.
• Eight conference communications (6 international and 2 national)
• Four peer-review papers
3. What is next?

- More GIS analyses, integrating new data.
- Fieldwork (one more honours thesis?):
  - Bathymetric measurements in areas of the flood-tide delta.
  - More ADCP transects.
- Modelling:
  - Finalise wave model.
  - Implement sediment transport - we are currently investigating the best way to do it.
  - Test different scenarios.
- Data analyses:
  - Finalise all analyses.
  - Work on the sediment transport.
- Dissemination: conferences, papers...
4. Assessment

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