ARC LINKAGE 2007-2010

PORT STEPHENS FLOOD TIDE DELTA
SHORELINE MANAGEMENT ISSUES

Progress meeting 22 September 2009.
Madsen Building Conference Room, University of Sydney

Flood-tide delta morphodynamics
and management implications,
Port Stephens, Australia
Schedule:

10:30h: Welcome coffee/tea.

11:00h: Project overview.

11:30h: Measurements on the Flood Tide delta (Tim Austin).

12:00h: Numerical modelling in Port Stephens (Wenping Jiang).

12:30h: Shoal Bay evolution (Dan Harris)

13:00h: Jimmy’s Beach evolution (Ana Vila Concejo)

13:30h: Lunch

14:00h: Discussion and closure.
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)
- DHI Water and Environment

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.

Aims:

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.

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 could not have done it without:

Craig Allery (DHI) who has spent a lot more time than he was expected in helping us with the numerical modelling.

Students and ex-students who have kindly volunteered to help during fieldwork.

Feet first dive (Nelson Bay) for offering constant boat availability and very competitive rates.
ACHIEVEMENTS:

- GIS analyses of historic data mostly completed (~100 aerial photos, maps and charts). New results are also being added as we obtain them.
- Fieldwork:
  - Beach measurements are completed:
    - 4 Intense Hydrodynamic field campaigns winter and summer both in Jimmy’s beach and Shoal Bay (~25 days of intensive hydrodynamic measurements, most of the days had at least two sets of instruments deployed simultaneously)
    - Periodic topographic measurements in Shoal Bay and Jimmy’s beach during the first two years of the project ~20 days spent surveying.
      - Some extra measurements both in Jimmy’s (nourishment) and Shoal Bay (Dan’s honours + cusps monitoring).
  - Flood tide delta studies:
    - Bathymetry completed by DECC.
    - ADCP deployments (mostly completed; nine deployments and one instrument still there).
    - ADCP transects (only spring tide conditions at the entrance, December 2008)
- Numerical Modelling using MIKE 21.
  - Hydrodynamic model up and running
  - Finalising wave model

WORK FOR THE FINAL YEAR:

- 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.

• Link all results from the project to obtain sediment transport paths and magnitudes on the entire system and to assess impacts of climate change.

• Dissemination: conferences, papers...

CURRENT LIST OF PUBLICATIONS


