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Morphological Monitoring and Modelling of Rossbeigh Barrier Dune Breach

Michael O'Shea, Dr. Jimmy Murphy, and Patricia Sala
Hydraulics and Maritime Research Centre, University College Cork, Ireland (m.o'shea@ucc.ie)

The focus of this research is on understanding the morphological evolution of a recently breached barrier dune system and the morphological response of surrounding coastal cell. By integrating the recommendations from CONSCIENCE, an FP6 Coastal Erosion Management Policy project with concepts from its predecessor the EUROSION project it is believed that a comprehensive understanding of this coastal system can be achieved. This is essential to predicting the future of the coastal dune barrier system and aid coastal planners in the future to make informed coastal management decisions on the area.

Dingle Bay in County Kerry, Ireland, contains a complex dynamic barrier dune system which includes the barrier beaches of Inch and Rossbeigh. Inch extends from the North to south across the bay and approximately 5 Km long. Rossbeigh located seaward of Inch, is over 4km in length and runs in the opposite direction propagating from the southern coast running North. This barrier beach system encloses Inner Dingle Bay to form the estuarine Castlemaine Harbour encompassing an area of approximately 5,300 hectares.

The dune system has been in a state of dynamic equilibrium with shorelines eroding and prograding cyclically for centuries. However, a breach in the Rossbeigh dunes occurred in 2008 and has since widened to over 600 meters. Extreme erosion at this location in the last decade has seen the removal of approximately 5,000,000 tonnes of sand. The system is undergoing rapid dynamic changes, hydrodynamically and hence morphologically.

Analysis at several temporal scales has already been undertaken. Seasonal beach surveys using GPS equipment to create digital terrain models, wave height monitoring and hydrodynamic modelling of the system before and after the breach has already produced notable results in the near (10-1 years) scale. Estimating the amount of sand removed, identifying changes in the tidal channels and wave patterns around the breach are all products of this analysis. Decadal and century scale analysis of the system utilises aerial photographs, digitised historical maps and satellite imagery has aided in quantifying the shoreline evolution of Rossbeigh.

The breached area of Rossbeigh beach will be the location of a swash zone monitoring campaign. Utilising current and turbidity meters it is planned to repeat the campaign for various meteorological conditions at the site. The data from which will be used to calibrate a numerical morphodynamic model. Aeolian transport monitoring, tracking of the ebb tidal delta and examining changes in the tidal prism leeward of Rossbeigh are also on the monitoring agenda. These programs will be conducted over a much larger area of the coastal cell than the swash zone monitoring campaign.

It is envisaged that combining long-term analysis with specific short term monitoring campaigns will add significantly to understanding of the morphological response to this dune breach. The analysis at several spatial scales will provide an insight into the effect the breaching has on the entire coastal system. This data will also be used to calibrate the numerical model, which will predict the evolution of Rossbeigh barrier beach after breaching under various meteorological and hydrodynamic conditions.