

# Water Research Laboratory

## Australian Coastal Observation Network: Monitoring and Forecasting Coastal Erosion in a Changing Climate

Never Stand Still

Faculty of Engineering

School of Civil and Environmental Engineering



Australia's coastline is one of the country's greatest natural, economic and cultural resources. The asset value of existing beach-front infrastructure is immeasurable. Climate change is driving sea level rise and changing regional wave climates, resulting in coastal erosion and increasing threats to coastal sustainability.

This research project launches a strategic international collaboration between university, industry, and government to address the considerable and growing pressure for solutions to observe and forecast accelerating shoreline erosion. The initiative is a proactive response to the October 2009 House of Representatives Standing Committee on Climate Change Report: *Managing our Coastal Zone in a Changing Climate*, that identified the urgent need to better understand the risks of coastal erosion through monitoring and modelling.

The study addresses the knowledge gap between advancing Climate Change science, and the lagging development of our ability to quantify, assess and forecast coastal variability and change.

The three-year project is establishing and rigorously testing a practical approach for establishing baseline coastal monitoring at 10 beaches along the NSW open coastline (Lennox Head, Sawtell, Dixon Park - Newcastle, Wamberal, Terrigal, Collaroy-Narrabeen, Manly, Wanda Beach - Cronulla, Thirroul and Shoalhaven) to build an empirical shoreline model that will enable prediction of wave and sea level impacts on beaches anywhere in the world.

Complementary to existing water-level and ocean wave monitoring programs that already exist around much of the Australian continent, the purpose of this present effort is to initiate and demonstrate the practical capability and value of

### Project Partners:



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sustained, automated and ongoing coastline monitoring (via surf camera technology) in support of coastal management, engineering and research.

Intensive RTK-GPS beach surveying, LiDAR, bathymetric surveying and inshore wave monitoring using aircraft, jetskis, quadbikes, cameras and buoys, are underway to rigorously test the applicability of existing and new coastal camera infrastructure to routinely obtain automated measurements of local wave climate and shoreline variability. Of particular importance, is the application of this new data to underpin new developments in forecasting seasonal to multi-decadal shoreline variability and change.

#### Funding:

- Australian Research Council (Linkage - Projects; Project ID: LP100200348)
- NSW Office of Environment and Heritage
- CoastalCOMS
- Gosford City Council
- Warringah Council

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## Publications

#### Refereed Journals:

- Splinter, K.D. Turner, I.L. and Davidson, M.A. 2013. *How much data is enough? The importance of morphological sampling interval and duration for calibration of empirical shoreline models*. Coastal Engineering, 77, 14-27. (DOI: 10.1016/j.coastaleng.2013.02.009)
- Davidson, M.A., Splinter, K.D. and Turner, I.L., 2013. *A simple equilibrium model for predicting shoreline change*. Coastal Engineering, 73, 191-202.
- Splinter, K.D., Turner, I.L. and Davidson, M.A., 2013. *Monitoring data requirements for shoreline prediction: How much, how long, and how often?* Journal of Coastal Research, SI65 (ICS2013), 2179-2184.
- Mole, M.A., Mortlock, T., Turner, I.L., Goodwin, I.D., Splinter, K.D., Short, A.D. 2013. *Capitalizing on the surfcam phenomenon: a pilot study in regional-scale shoreline and inshore monitoring utilizing existing camera infrastructure*. Journal of Coastal Research, SI65 (ICS2013), 1433-1438.
- Davidson, M.A., Turner, I.L., Guza, R.T., 2011. *The effect of temporal wave averaging on the performance of an empirical shoreline evolution model*. Coastal Engineering, 58, 802-805.
- Middleton, J.H., Cooke, C.G., Kearney, E.T., Mumford, P.J., Mole, M.A., Nippard, G.J., Rizos, C., Splinter, K.S., Turner, I.L. [alphabetical], *Resolution and accuracy of an airborne scanning laser system for beach surveys*, Journal of Atmospheric and Ocean Technology.

#### Conference Proceedings (Peer-Reviewed):

- Mortlock, T.R., Goodwin, I.D., Turner, I.L., (Abstract accepted). *Longshore variability in nearshore wave climates at two embayed compartments on the central New South Wales coast*. Coasts & Ports, Engineers Australia, Sydney, September 11-13
- Splinter, K.D., Turner, I.L., Davidson, M.A., (Abstract accepted). *How well do you know your beach? Monitoring requirements for the application of an equilibrium shoreline model*. Coasts & Ports, Engineers Australia, Sydney, September 11-13.
- Mumford, P.J., Nippard, G., Middleton, J.H., Kearney, E., Cooke, C., Turner, I.L., Mole, M.A., Splinter, K.D. 2011. *The Airborne Science Imitative LiDAR Beach Survey: development and results*. International Global Navigation Satellite Systems Society IGNS Symposium 2011. Sydney NSW 15-17 November.
- Turner, I.L., Goodwin, I.G., Davidson, M.A., Short, A.D., Pritchard, T.R., Cameron, D.W., MacDonald, T., Middleton, J., Splinter, K.D. 2011. *Planning for an Australian National Coastal Observatory – monitoring and forecasting coastal erosion in a changing climate*. Coasts and Ports 2011, Engineers Australia, Perth WA, 28-30 September.

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- Mole, M.A., Davidson, M.A., Turner, I.L., Goodwin, I.D. 2011. *Forecasting seasonal to multi-year shoreline change on the east Australian coast*. Coasts and Ports 2011, Engineers Australia, Perth WA, 28-30 September.
- Kearney, E.T., Harley, M.D., Turner, I.L., Wyeth, B., Goodwin, I.D. 2011. *An energy-based empirical model of storm-induced shoreline erosion, Gold Coast, Australia*. Coasts and Ports 2011, Engineers Australia, Perth WA, 28-30 September.

#### Conferences/Workshops (Non Peer-Reviewed):

- Splinter, K.M., Davidson, M.A., and Turner, I.L. *Modelling equilibrium shoreline response: application across multiple sites and minimum data collection requirements. (Abstract)*. American Geophysical Union, San Francisco, December 2012.
- Davidson, M.A., Turner, I.L., Splinter, K.M. *Predicting shoreline response to cross-shore processes in a changing wave climate*. Coastal Dynamics 2013, ASCE, Bordeaux, France.
- Turner, I.L., Symonds, G., Carley, J.T., Cox, R.J., 2012. *Litoral zone modelling: status and data requirements in Australia*. Australian Coastal and Ocean Modelling and Observations (ACOMO), Australian Academy of Sciences, October 3-4.
- Mole, M.A., Turner, I.L., Davidson, M.A., Turner, I.L., Splinter, K.D. and Goodwin, I.D., 2012. *Modelling multi-decadal shoreline variability and evolution*. 33<sup>rd</sup> International Conference on Coastal Engineering, ASCE, Santander, Spain.
- Turner, I.L., Cameron, D., Davidson, M., Goodwin, I., Hanslow, D., Kearney, E., Lane, C., Macdonald, T., Mole, M., Mortlock, T., Pritchard, T., Splinter, K., Short, A., *Monitoring and forecasting present and future shoreline variability in a changing climate*. Coast2Coast Conference, Brisbane, September 2012.
- Turner, I.L., 2012. *Planning for Coastal-Climite change along the New South Wales open coastline: summary of statewide SLR policy, and an emerging knowledge gap (Abstract)*. Coastal Cities and SL Rise Workshop, Australian Pacific Rim Universities (APRU), San Diego, October.
- Turner, I.L., 2012. *Planning for an Australian National Coastal Observatory: monitoring and forecasting coastal erosion in a changing climate (Abstract)*. 3<sup>rd</sup> Australia-China Ocean Science & Technology Symposium (3ACOST). Sydney Institute for Marine Science, May.
- Splinter, K.D., 2011. *Planning for an Australian National Coastal Observatory – monitoring and forecasting coastal erosion in a changing climate*. Sydney Coastal Councils Group Technical Meeting (invited presentation). October 13, 2011.
- Pritchard, T.R., Turner, I.L., Goodwin, I.D., Davidson, I.D., Short, A.D., Lane, C., Cameron, D.W., Macdonald, T., Splinter, K.D., Mole, M.A., Kearney, E., Middleton, J.H., 2011. *Prospects for an National Coastal Observatory*. 20<sup>th</sup> NSW Coastal Conference, 18 – 21 November, Tweed Heads.
- Turner, I.L., *Planning for a National Coastal Observatory*. 2010. National Coastal Observation Network Workshop (invited presentation). NSW DECCW, Sydney Institute of Marine Science.

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#### Media

- **Feature Article: UNSW School of Civil and Environmental Engineering Annual Report**  
[http://www.civeng.unsw.edu.au/sites/default/files/annual\\_report/2011/AR\\_2011.pdf](http://www.civeng.unsw.edu.au/sites/default/files/annual_report/2011/AR_2011.pdf)
- **ABC Radio Central Coast**  
Morning show interview 23/10/2011
- **TBA**  
Feature article in 'PRISM' Magazine – American Society of Engineering Education, USA
- **Researchers Working Away are on the Level**  
Newcastle Herald 31/05/2011
- **'Factual Approach' to Climate Reporting Welcomed**  
Letter to the Editor section, Northern Star 26/05/2011

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- **ABC Radio Illawarra**  
Morning news item (37 secs) 26/5/2011
- **Future of our Beaches – Thirroul Part of New UNSW Study**  
Illawarra Mercury 25/05/2011
- **Making Waves – Mapping the Changes from Sea Level Rise**  
Brisbane Times 26/05/2011
- **Survey to Keep an Eye on Beaches**  
South Coast Register (Nowra) 25/5/2011
- **Future Map of Seven Mile Beach**  
Northern Rivers Echo 25/05/2011
- **ABC Radio North Coast**  
Midday news item (48 sec) 24/5/2011
- **Future Map of Seven Mile Beach**  
Northern Star (Lismore) 24/5/2011  
<http://www.northernstar.com.au/story/2011/05/24/researchers-map-out-future-of-seven-mile-beach/>
- **Water, Water Everywhere**  
UNSW Engineers Magazine, Issue 23 May 2011 (Cover Story)
- **ABC Radio North Coast**  
Interview 24/5/2011 (Ian Turner)
- **ABC Radio Illawarra**  
Interview 24/5/2011 (Melissa Mole)
- **Making Waves – Mapping the Changes from Sea Level Rise**  
Sydney Morning Herald 21-22/5/2011  
<http://www.smh.com.au/environment/climate-change/making-waves--mapping-the-changes-from-sealevel-rises-20110520-1ewqb.html>
- **Predicting Future for Beaches**  
UNSW Home page  
<http://newsroom.unsw.edu.au/news/science-technology/predicting-future-beaches>
- **Making Waves – Mapping the Changes from Sea Level Rise**  
Illawarra Mercury 21/5/2011  
<http://www.illawarramercury.com.au/news/national/national/general/making-waves-mapping-the-changes-from-sealevel-rises/2170344.aspx>
- **Predicting the Beaches of the Future**  
UNSW Media Release 18/5/2011
- **Research Team Watching our Shifting Sands**  
Manly Daily 17/5/2011  
<http://manly-daily.whereilive.com.au/news/story/research-team-watching-our-shifting-sands/>
- **Study to Forecast the Sands of Time**  
Warringah Council Media Release 11/5/2011