Developing a multi-scale early warning system for Australia's coastal flooding and erosion hazards

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Australian Government Bureau of Meteorology

UWA PERTH·AUSTRALIA

NSW GOVERNMENT Planning, Industry & Environment

northern beaches council

USGS science for a changing world

City of MANDURAH

Department of Transport

Australian Government Australian Research Council

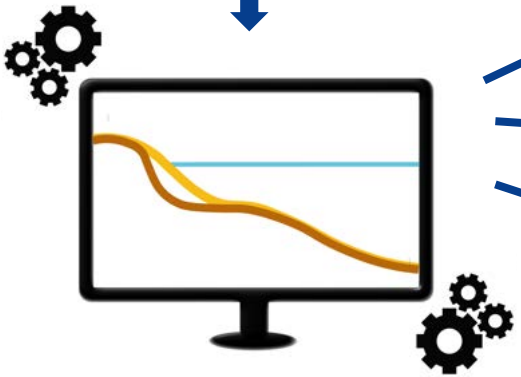
Water Research Laboratory

Never Stand Still | Faculty of Engineering | School of Civil and Environmental Engineering

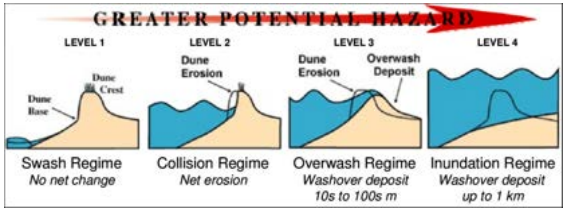
Previous work

Meteorological forcing

Wave, water level forcing

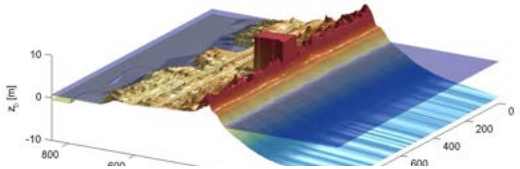


1. Empirical formulations



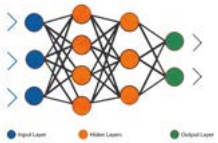
USGS 2018, adapted from Sallenger, 2000

2. Numerical simulations



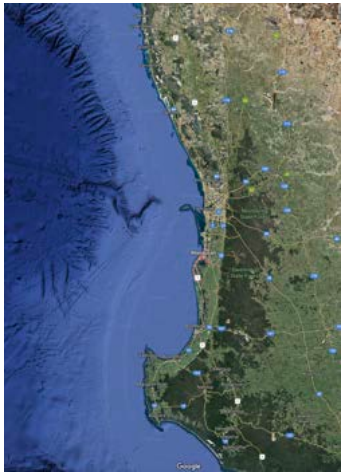
Hurricane Sandy simulation, Kees Nederhoff

3. Data-driven / machine learning methods



Aims

~ 300 km of coastline in WA (Mandurah)

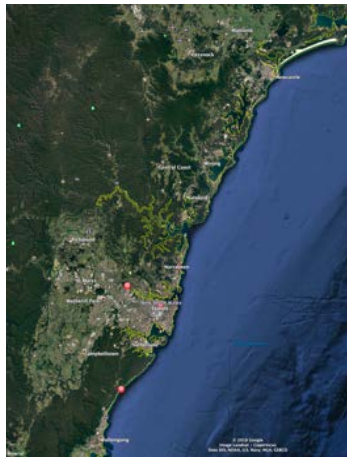


A national research initiative to deliver the knowledge framework and practical guidelines for:

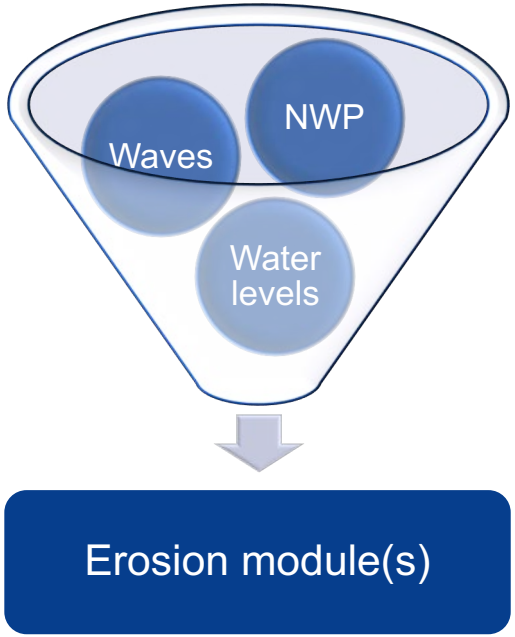
An Australian storm wave damage and beach erosion Early Warning System

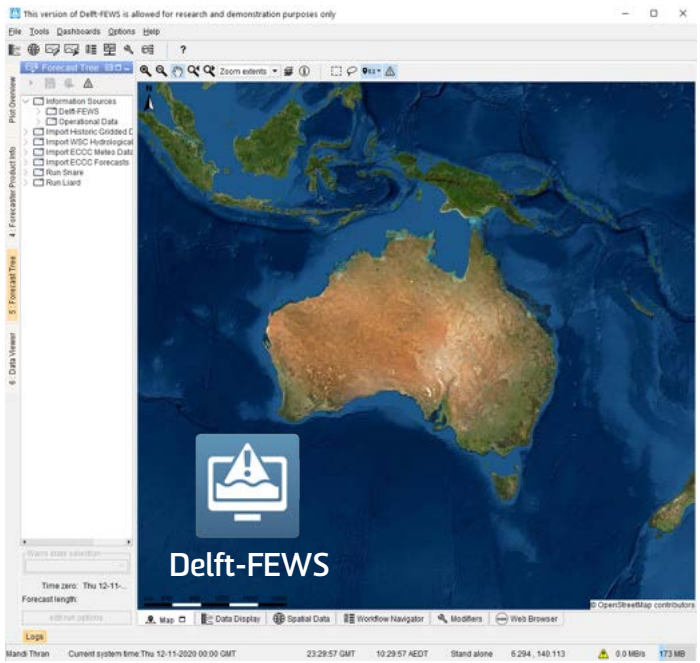
Recognising the significant diversity in coastal landforms around Australia's coast, this project is targeted at open ocean sandy shorelines

~ 300 km of coastline in NSW (Narrabeen)

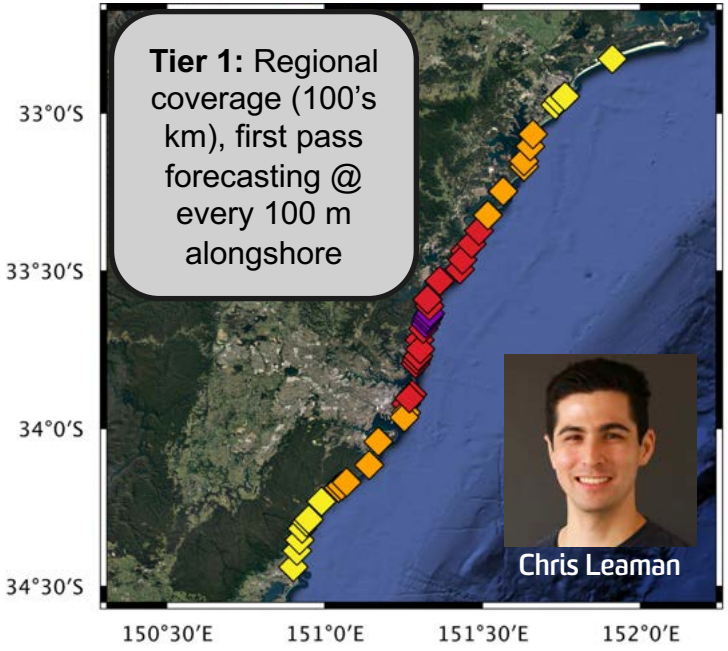


Forecasting Workflow





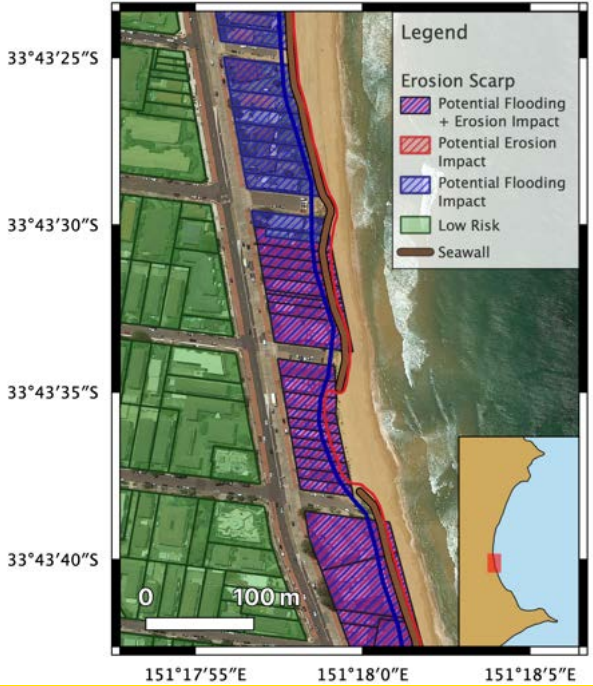
Erosion Module: Two "Tiers"



Tier 1: Regional coverage (100's km), first pass forecasting @ every 100 m alongshore

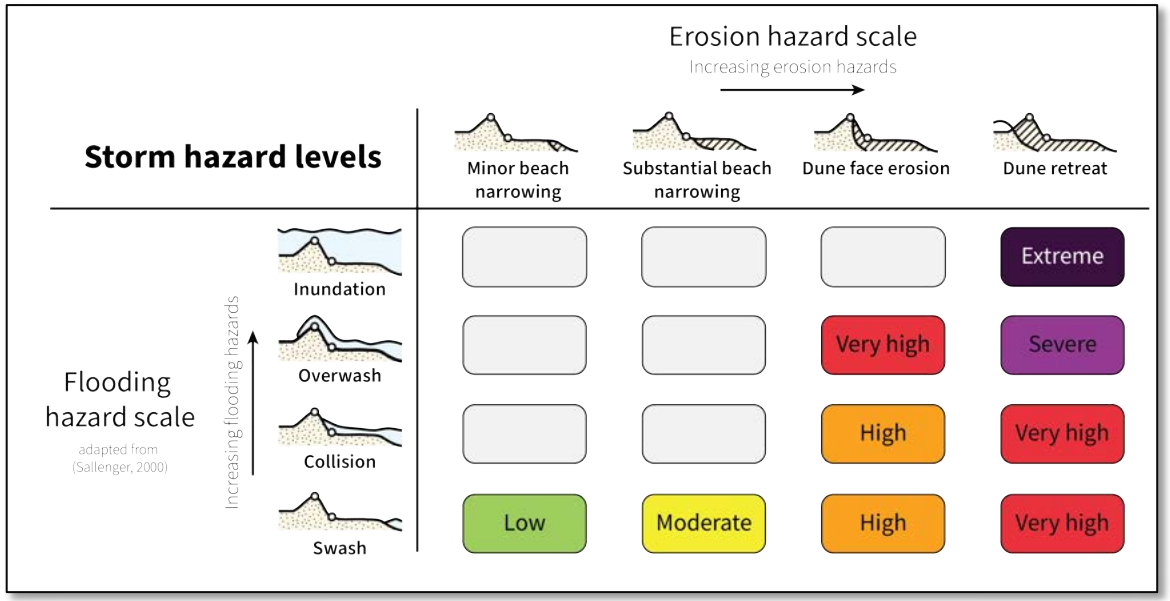
Tier 2: Localised, high resolution, process-based erosion modelling at pre-identified 'hot spot' locations

Nash Matheen



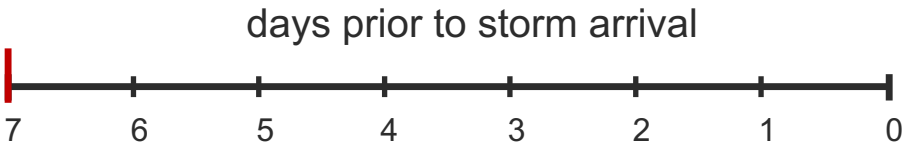
EWS Mock-ups: Tier 1

Chris Leaman

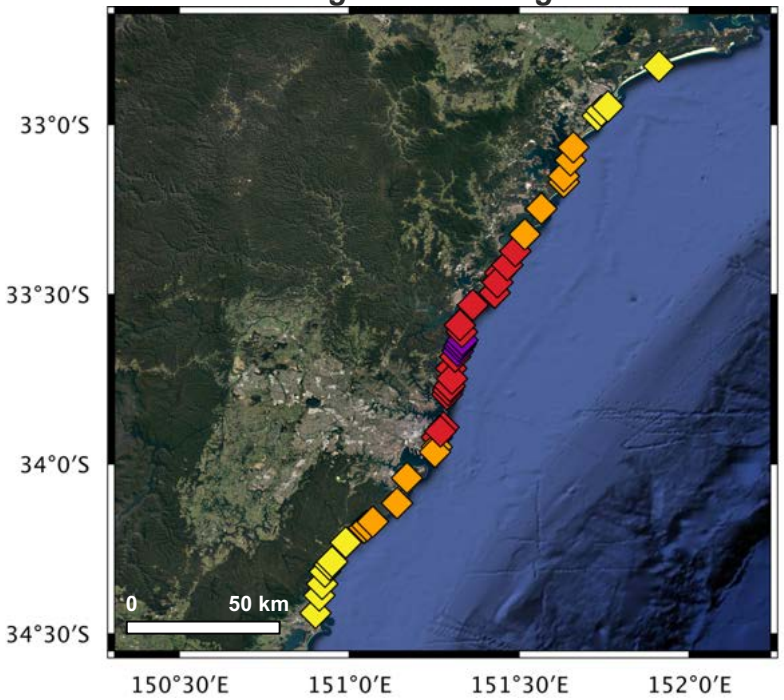


Leaman et al., under review

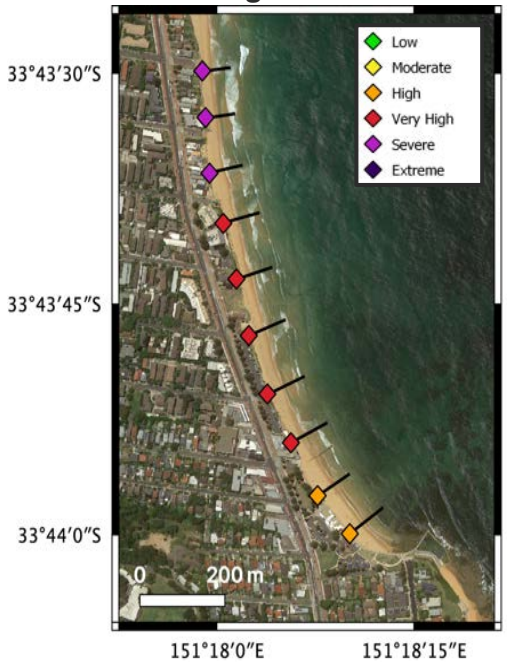
EWS Mock-ups: Tier 1



regional coverage

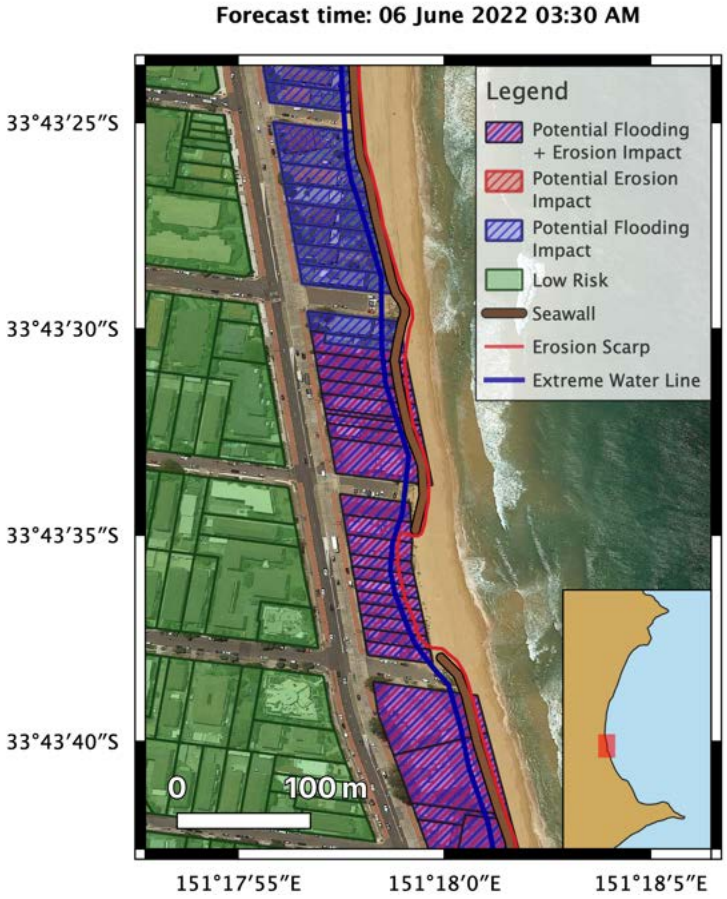


100m alongshore resolution



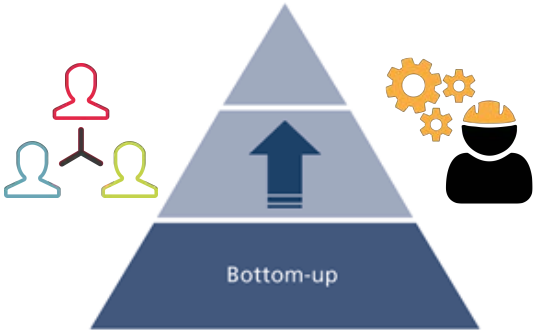
EWS Mock-ups: Tier 2

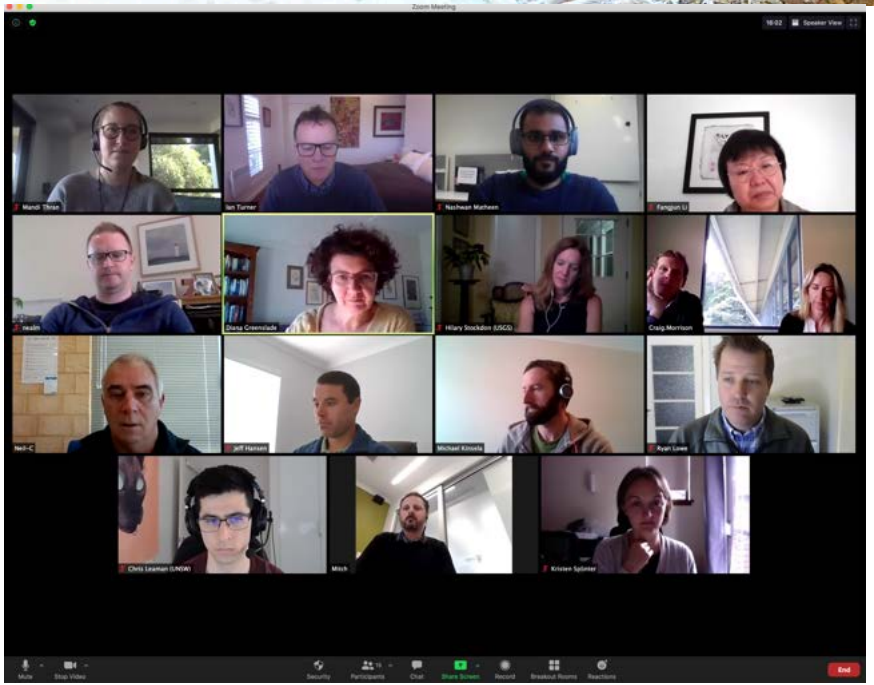
- Detailed predictions of flooding extent and erosion scarp relative to property boundaries
- Physics/process-based numerical simulations



Nash Matheen

EWS Mock-ups: (potential) end-user feedback





Summary and upcoming milestones

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Key components of a coastal hazard early warning system

1 Monitoring

2 Forecasting

3 Hazard level

4 Dissemination

Upcoming project milestones

1 Prototype regional forecasting framework

2 Prototype systems for the two Australian beach sites