



Improving coastal inundation models for adaptation planning



The ESCC Hub worked with CSIRO's Data61 and the City of Greater Geelong to determine how the Hub's work on coastal extremes could feed into the City-based Flood Adaptation Solutions Tool (C-FAST).

Workshops involving data specialists, coastal extremes researchers and coastal management practitioners identified the new CANUTE-3 tool, currently in development by Hub researchers, as the best way to link the latest research to coastal planning and management practice.

While this case study did not achieve its aim of having coastal extremes data integrated into C-FAST and guidelines for its use finalised, valuable scoping was undertaken that will form the basis for an extension of this work in a new case study in 2019.

More information to help determine future coastal flooding

In 2016, the City of Greater Geelong worked with CSIRO's Data61 to investigate future flooding due to storm surge and sea-level rise. This project, which used the CSIRO Data61 City-based Flood Adaptation Solutions Tool (C-FAST), also looked at the effectiveness of a range of adaptation measures to mitigate the impact of coastal inundation events.

At the conclusion of this project, the City of Greater Geelong identified the need for additional material to assist coastal managers to select extreme sea level and sea-level rise scenarios in the running of C-FAST. At the same time, Hub researchers had been working with Data61 to develop extreme sea-level boundary conditions (i.e. the inputs for the model) for C-FAST, so became involved in this undertaking. A small case study was implemented to facilitate the incorporation of the extreme sea level data and development of appropriate user documentation.

Enhancing C-FAST

C-FAST provides a next-generation solution to investigating and managing urban flooding under climate change. Unlike 'bathtub' or 'bucket-fill' modelling approaches, which only take into account the flooding height and land surface height, C-FAST factors in dynamic processes that affect coastal inundation. At present, the processes that are included are:

- the variation of sea levels over time during a storm surge due to the astronomical tidal component
- the connectivity of flood water pathways via the stormwater drainage system
- frictional influences on overland flow.
- rainfall runoff inputs.

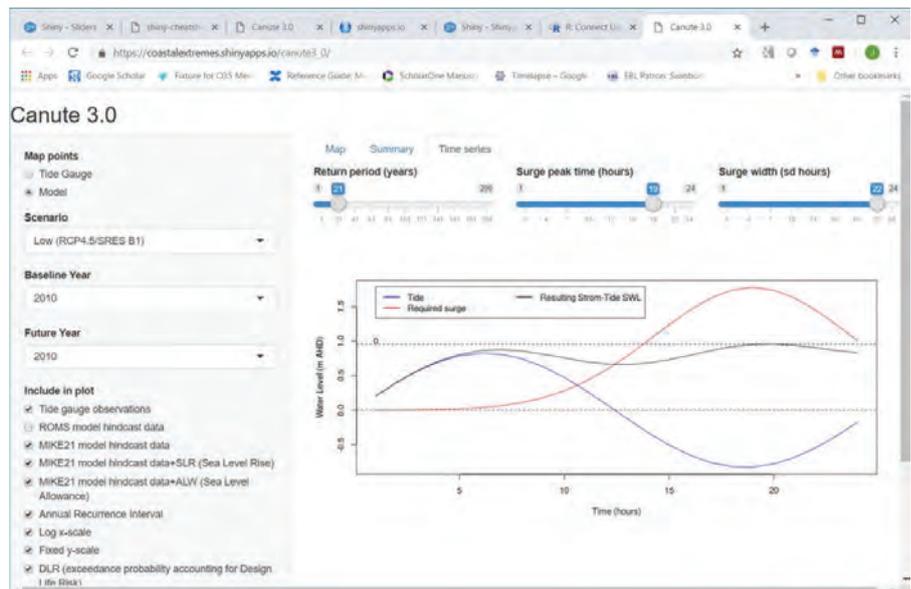
Typically, C-FAST is run under scenarios such as a 1-in-100-year storm tide event combined with a particular sea-level rise. To allow C-FAST to be implemented efficiently in a range of coastal settings, it needs inputs that realistically represent local tide and storm surge conditions, which vary over time.

Calculating extreme sea level

The data needed to generate these inputs for C-FAST will come from a new version of CANUTE, a sea-level calculator first developed by the Antarctic Climate and Ecosystems Cooperative Research Centre. CANUTE provides extreme sea level height return periods around the coastline of Australia based on observational data from tide gauges together with one particular hydrodynamic dataset (to provide information at locations for which there was no tide gauge data).

In the latest version, CANUTE-3, Hub researchers are adapting the tool to make use of new tide and storm surge datasets that have been analysed to provide information on the return periods of extreme sea levels around the coastline of Australia.

CANUTE-3 also replaces the sea-level rise projections from the Intergovernmental Panel on Climate Change's fourth assessment report with those from the fifth assessment report. In addition, there is the option to access different sources of extreme sea level data, including new hydrodynamic datasets developed by Hub scientists, and a completely new, purpose-built interface to allow the generation of time-varying scenarios of water levels during extreme sea level events for models such as C-FAST, also developed by Hub scientists.



Canute-3, the sea-level calculator currently being developed by Hub researchers.

Next steps

Over the course of this case study, the team of climate researchers, flood modellers and coastal management practitioners determined what information was available to incorporate into C-FAST, what information would be useful to coastal planners, and how this information could be best delivered into C-FAST.

With a better understanding of the data, technological requirements and the needs of coastal management practitioners, the Hub will continue to work with Data61 to incorporate the

CANUTE-3 extreme sea level calculator with C-FAST. Researchers will also continue to work closely with the City of Greater Geelong to test these improvements to C-FAST as they become available.

The incorporation of data from CANUTE-3 into C-FAST will make it quicker for modellers to implement the tool in other coastal settings, ultimately making C-FAST more widely available to councils planning for future coastal inundation.

This work was carried out under *Case study 3.4: Coastal climate adaptation with the City of Greater Geelong*. Case studies are activities undertaken by the Hub to facilitate the path-to-impact of the Hub's research, in this case from *Project 2.10: Coastal hazards in a variable and changing climate*. For more information contact:

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