

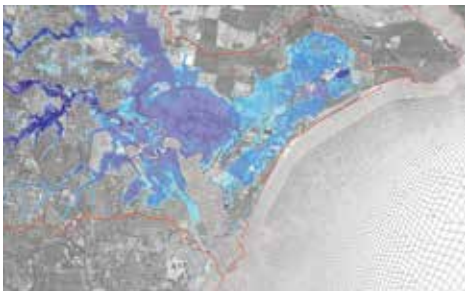
Coastal Inundation

Environment and Engineering Solutions



Storm tide and tsunami risk assessments allow the coastal inundation hazard to be mapped and the threat to the community, infrastructure and assets to be quantified.

Detailed numerical modelling and robust statistical methods typically underpin coastal inundation assessments. These studies often inform regional planning schemes, disaster management planning or the design of marine and coastal infrastructure.



Coastal Inundation Mapping

BMT WBM can assist with coastal inundation risk assessments through:

- Hydrodynamic modelling of tides and storm surge
- Swell and wind wave modelling
- Parametric modelling of wind and atmospheric pressure fields
- Access to and application of various global atmospheric model predictions maintained by third-parties (e.g. The Bureau of Meteorology or National Oceanic and Atmospheric Administration)
- Monte-Carlo assessment to generate inundation statistics up to the 50,000 year return period
- Estimation of wave runup elevation and the overtopping of coastal barriers
- Numerical modelling of tsunami generation, propagation and inundation
- Mapping of the inundation hazard and community vulnerability assessment
- Joint probability assessment of storm surge and river flooding

TUFLOW FV

BMT WBM has a long history of modelling coastal processes both in-house and through collaboration with universities and state government agencies. This commitment has led to the development and release of commercial software packages. TUFLOW FV is a finite-volume, flexible mesh hydrodynamic engine that is particularly suited to simulating coastal inundation. Key features of the solution scheme include:

- Intrinsically handles shocks
- Locally and globally conservative to numerical precision
- Robust handling of wetting and drying throughout inundation areas
- Explicit scheme ideally suited to parallelisation

Mixed sub/super-critical flow regimes are well handled by the TUFLOW FV scheme which intrinsically accounts for flow discontinuities such as hydraulic jumps or bores that may occur in trans-critical flows during an extreme coastal inundation event.

With over forty years of experience, some of our key projects and capabilities are listed below:

Coastal Inundation Model Validation

Analytical solution and controlled laboratory scale experiments are the benchmark test used to determine the suitability of a numerical model for coastal inundation application. TUFLOW FV has participated in a number of international benchmarking exercises with a focus on flood and coastal inundation risk management (e.g. Environmental Agency UK, 2013; IAHR, 2013).

Further validation for specific coastal inundation applications involves hindcasting significant events for which recorded data is available, including:

- Weather stations that provide winds and pressure recordings
- Storm tide gauges that record coastal water levels
- Wave buoys that record offshore wave parameters
- Debris lines used as an indicator of maximum inundation extent
- Offshore water level monitoring systems (tsunami)

References:

Environment Agency UK (2013). Benchmarking the latest generation of 2D hydraulic modelling packages, Flood and Coastal Erosion Risk Management Research and Development Programme, August 2013.

www.environment-agency.gov.uk

Guard, P., Nielsen, C., Ryan, P. and Teakle, I. (2013). Parameter sensitivity of a 2D finite volume hydrodynamic model and its application to tsunami simulation, Proceedings of the 35th IAHR World Congress, Chengdu, China, August 2013.

www.iahr2013.org/proceedings.html

Tsunami Inundation

TUFLOW FV accommodates a wide variety of boundary conditions, initial conditions and other input specifications to ensure its applicability to a range of applications. Tsunami risk assessments have been completed by BMT WBM for various locations, including:

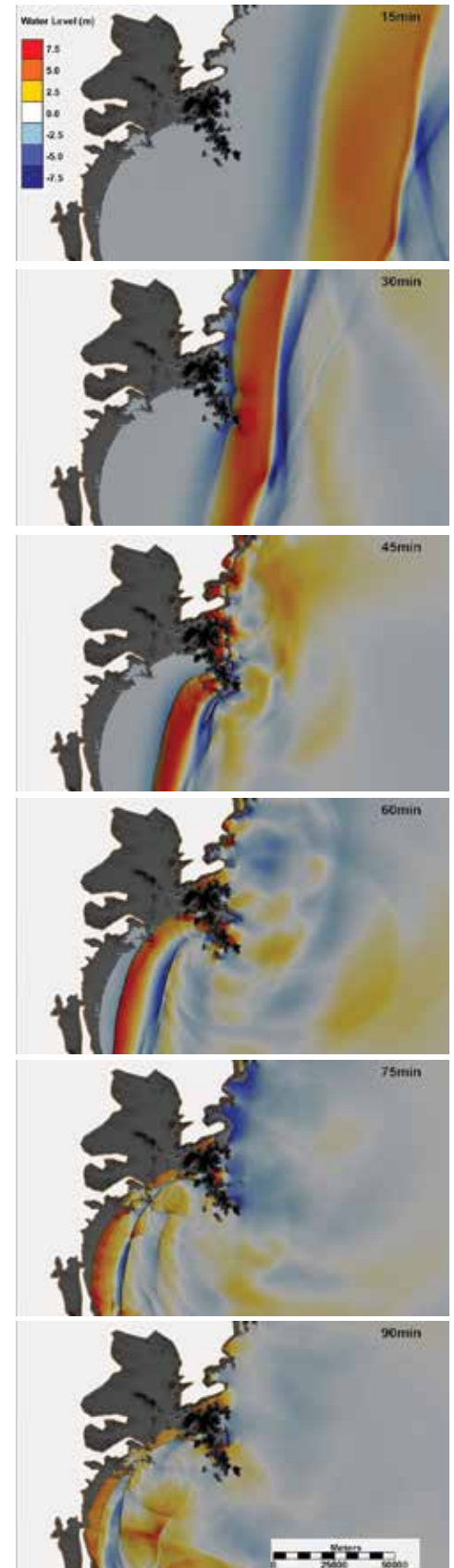
- West coast of Japan
- Papua New Guinea, New Island Province
- Solomon Islands

Local Government Planning Schemes

BMT WBM regularly undertakes storm tide risk assessments for local government authorities to inform planning schemes. The key outcomes of these studies include defining design water levels for population centres, mapping of the inundation hazard and community vulnerability assessments. These studies typically require close liaison and ultimately support from the state government authorities.



Damaged Vessels in Port Hinchinbrook following Tropical Cyclone Yasi Storm Tide



Predicted Tsunami Propagation and Inundation at outputs 15, 30, 45, 60, 75 and 90 minutes from simulation start