

# TSUNAMI EARLY WARNING INTERFACE

## Governance of the upstream-downstream interface in end-to-end tsunami early warning systems

Experience over recent years of the impacts of tsunamis has shown that inadequate preparation for, and response to, emergency situations have contributed to widespread damage and the avoidable loss of lives and livelihoods. A 2015 United Nations (UN) report estimates that each year, an additional 60,000 people and \$4 billion (US\$) in assets are exposed to the threat of tsunami hazard. As demonstrated by the human and economic losses from the 2004 Indian Ocean and 2011 Tōhoku disasters, and most recently in Palu, Indonesia, tsunamis inflict death and damage through violent, powerful flooding along the world's coastline. The shortcomings in preparation have been due to a lack of warning through poor regional detection and communication systems, but they also reflect inadequate awareness, planning and coordination.

Tsunamis can be broadly classified as local, where coastal residents feel an earthquake and have only minutes before the tsunami begins flooding, or distant, where coastal residents do not feel the earthquake and have an hour or more before tsunami flooding commences. In both types, an effective end-to-end early warning system is fundamental to mitigate losses. The decision on whether to evacuate an area is central to this system, but also fraught with difficulties. Failure to evacuate in a timely manner can leave tens of thousands of people exposed to a tsunami wave. Unnecessary evacuation and false alarms are also costly, as demonstrated by the Alaskan Earthquake in 1986, which is estimated to have cost Hawaii \$40M. A false alarm is also liable to reduce confidence in the reliability of any warnings that are issued and increase complacency among communities, thereby hindering preparedness for future tsunami threats.

An end-to-end tsunami warning system begins with the upstream rapid detection of a tsunami wave, including detection, verification, threat evaluation, and forecasting. It ends with a well-prepared community that is capable of responding appropriately to a warning, including delivery of public safety messages, risk assessment and management, initiating national counter-measures, and preparing and implementing standardised reactions.

Recent studies undertaken in Indonesia and Sri Lanka have identified that the interface between upstream and downstream activities is vital, as it involves a wide array of jurisdictional agencies and response partners, including regional tsunami service providers, tsunami national contact points, and a range of sub-national emergency operational centres and related actors. The problem has technical, legal and socio-cultural complexities. Several specific problems were identified, and the following will be addressed through the next phase of the research:

- Extend our previous study in Indonesia and Sri Lanka, which exposed significant differences in the legal frameworks and technical capacities of the respective countries, to address two other Indian Ocean countries, namely Myanmar and the Maldives
- Develop a self-assessment tool on tsunami early warning at the interface between upstream and downstream activity
- Development and testing of decision-making criteria for Tsunami when the evidence is less straightforward, or the scenario is marginal

### Implementing partners

Global Disaster Resilience Centre, University of Huddersfield, UK (Lead)  
The Maldivian National University, Maldives  
University of Yangon and Mandalay Technological University, Myanmar  
Ministry of Disaster Management and Disaster Management Centre, Sri Lanka  
Department of Meteorology, Sri Lanka  
Asian Disaster Preparedness Centre, Thailand  
Bandung Institute of Technology, Indonesia

### Associate partners

Indonesian National Board for Disaster Management (BNPB)  
Indonesian Broadcasting Commission (KPI)  
Meteorology, Climatology, and Geophysical Agency (BMKG), Indonesia  
National Disaster Management Center (NDMC), Maldives  
Department of Meteorology (Maldives Meteorological Services), Maldives  
Department of Meteorology and Hydrology (DMH), Myanmar  
Intergovernmental Oceanographic Commission of UNESCO IOTWMS  
Centre for Development Research and Interventions, Sri Lanka

### Planned outputs

- 1 Briefing paper on improved decision making criteria for tsunami evacuation.
- 2 Two country reports on the current status of the upstream-downstream tsunami interface, for Myanmar and Maldives.
- 3 Two journal papers based on near tsunami status and the tool kit.
- 4 Final toolkit, which will be disseminated to all 28 Indian Ocean countries as identified above [Training will be provided during the launch of the tool kit which will be held as part of the proposed impact conference].

### Planned activities

- 1 Primary data collection, including key informant interviews and expert focus groups, in conjunction with national key actors at upstream-downstream interface in Maldives and Myanmar.
- 2 Validation workshops to confirm interface status, in Maldives and Myanmar.
- 3 Development and testing of decision-making criteria for tsunami evacuation, in conjunction with ICG-IOTWMS, the Sri Lankan Department of Meteorology & Disaster Management Centre.
- 4 Development of self-assessment toolkit based on analytical framework, for dissemination across 28 member states of IOTWMS.
- 5 Testing of Tsunami interface self-assessment toolkit in Sri Lanka, Maldives and Myanmar.
- 6 International Impact Conference on Governance of the upstream- downstream interface in end-to-end tsunami early warning systems in collaboration with IOC-UNESCO IOTWMS, held in Colombo, Sri Lanka
- 7 Advisory panel meeting with Maldives, Myanmar and Sri Lanka in-country leads, and IOC-UNESCO IOTWMS Chair of Working Group 1, Dr Harkunti Rahayu. This will ensure that the research is aligned with regional priorities and the needs of ICG-IOTWMS, who are responsible for overseeing the warning system in the Indian Ocean.

### For further information:

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