

Development and Implementation of an Integrated Ocean Information System for Indian Ocean Countries

Ocean information is critical for effective management of maritime activities, such as shipping, fisheries, and disaster preparedness in the islands and coastal regions. Most RIMES Member States in the Indian Ocean have access only to forecasts at coarse resolutions (global and regional scales), which are hardly interpreted and operationally used by user agencies in the countries. Precise and realistic coastal hazard and risk assessment, e.g. tsunami and storm surge risks, requires local bathymetric and topographic and exposure datasets, with capacity to generate customized user-relevant information for reducing risks.

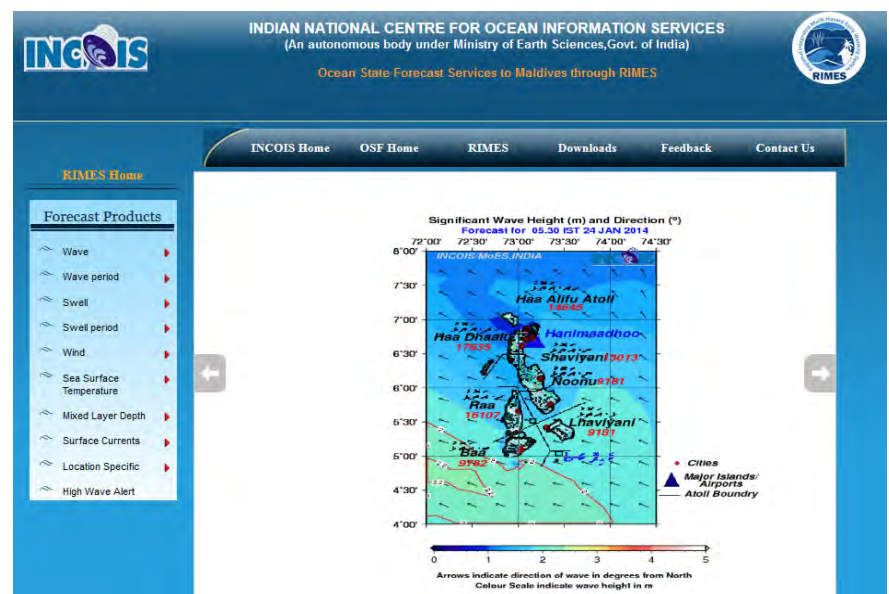
Objectives

The project on Development and Implementation of an Integrated Ocean Information System for Indian Ocean Countries is supported financially and technically by the Indian National Centre for Ocean Information Services (INCOIS), as Regional Tsunami Watch Provider (RTWP) for Indian Ocean Countries under UNESCO/IOC framework. The project caters to expressed needs and demands of RIMES Member States and collaborating countries for tsunami warning and inundation information, meeting UNESCO/IOC IOTWS Service Level 3 requirements, as well as an integrated ocean information service, including ocean state forecasts, for their user agencies. The project is being implemented in a phased manner, with first phase covering 4 countries (Comoros, Mauritius, Mozambique and Tanzania), and subsequent phases covering all RIMES Member States and Collaborating Countries along the Indian Ocean. Specific objectives of the project are:

- i. Enhanced near-shore bathymetric, topographic and exposure datasets for undertaking tsunami risk assessment as per IOTWS Service Level 3 requirements
- ii. Capacity building for application of customized ocean/marine forecast information
- iii. Capacity building for tsunami risk assessment
- iv. Capacity building for improved warning response and preparedness

Approach

This project operationalizes collaboration between RIMES and INCOIS on providing services to RIMES Member States and Collaborating Countries, as per IOTWS Service Level 3 requirements, and for enhancing application of ocean information, generated by INCOIS. This replicates the ongoing INCOIS-RIMES collaboration in Maldives, where INCOIS, through RIMES, provides Maldives Meteorological Service (MMS) with customized ocean information services at national, atoll, and site levels, and with RIMES assisting in forecast information application, ensuring forecast information integration into users' decision-making, and in collecting local data and facilitating feedback from users to lead to further improvement of services.



This project also builds on the learning and experience from an ESCAP-supported capacity building project in Myanmar, Philippines, Sri Lanka, and Thailand for generating bathymetric, topographic and exposure data through cost-effective means and to utilize these data to generate tsunami risk information, for meeting IOTWS Service Level 3 requirements.

This project focuses on:

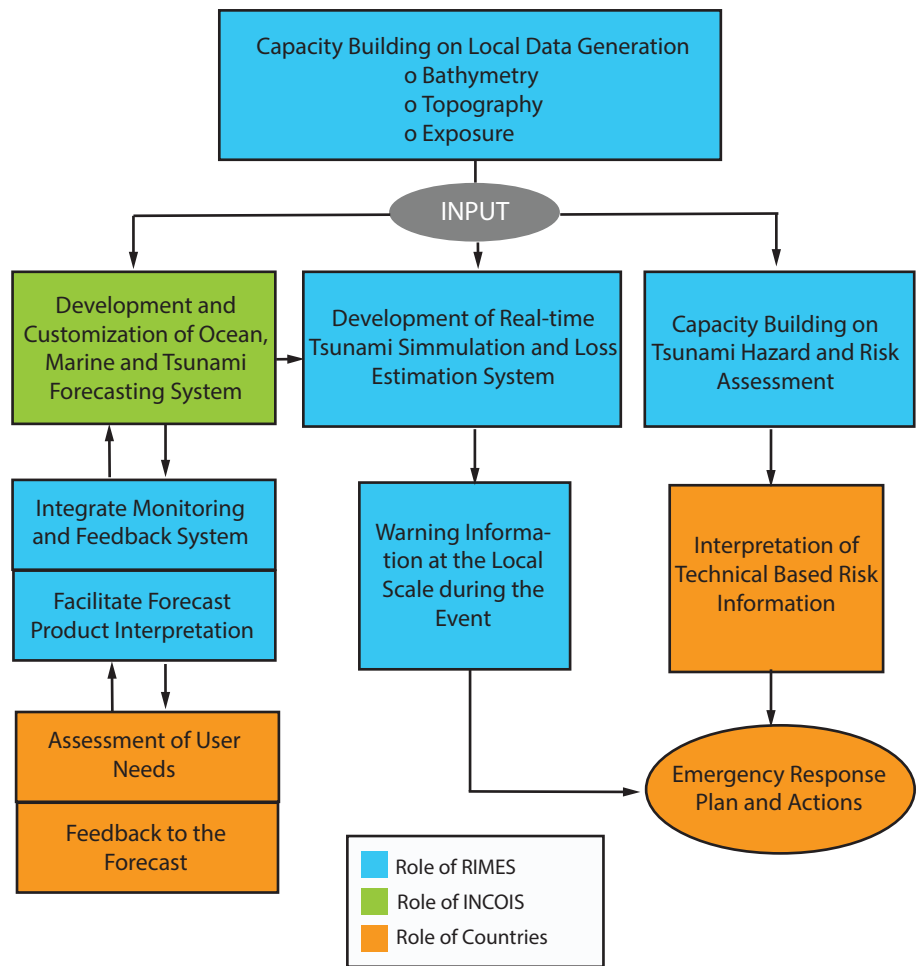
1. **Generation of Seamless Multi-source Near-shore Bathymetry-Topography-Exposure Dataset.** This project demonstrates the methodology to collect, analyze, and process coastal datasets of differing formats, projections, resolutions, accuracies, and datums, for generating seamless near-shore bathymetry-topography-exposure dataset for tsunami risk assessment.

2. **Customization of Ocean/Marine Forecast Information.** Existing data and updated local bathymetric data would be integrated by INCOIS into its forecasting system to generate desired products for a range of users -locally and regionally- in each country. These products include 72-hour wave and swell height, direction and period, sea surface currents, sea surface temperature, mixed layer depth, depth of the 20 degree isotherm (as a measure of thermocline), wind speed, and tide prediction from INCOIS' Indian Ocean Forecast System (INDOFOS). Additionally, information from INCOIS' Marine Fishery Advisory (information derived from satellite images and Potential Fishing Zone (PFZ) advisories) and Coral Reef Mapping and Reef Health Monitoring (information derived from satellite images and Coral Bleaching Alert System) could also be provided.

RIMES shall also work closely with national agencies to integrate all locally available real-/near real-time ocean observations into a regional server that INCOIS could use for forecast verification and modeling purposes. RIMES Member States and Collaborating Countries, with support from RIMES, would facilitate user feedback on forecast information generated by INCOIS, to guide for further improvements.

3. **Development of real time tsunami inundation simulation and loss estimation system (IOTWS Service Level 3 program).** Real-time tsunami inundation simulation and loss estimation system shall be developed at RIMES to assist countries in the analysis of risks from tsunamigenic earthquake events. A Web Map Service (WMS) will be customized to store geo-referenced vulnerability database, which shall be built from field survey data, and display tsunami inundation map from real-time simulations. Using inundation depth forecast and exposure data, the system shall analyze potential impact on population and infrastructure. Estimates of potential loss and damage shall be based on the tsunami vulnerability function concept.

4. **Capacity building on tsunami risk assessment and evacuation planning.** RIMES shall build tsunami risk assessment capacity through training, and demonstration and transfer of tools developed at RIMES: i) INSPIRE, a computer-based tsunami propagation and inundation risk assessment tool, which calculates and maps tsunami travel time, amplitude, and current velocity, and probabilities of human death and building damage; ii) ESCAPE, a computer-based tool that integrates INSPIRE outputs into evacuation planning, which calculates and maps the fastest evacuation route, taking into consideration decelerating factors, such as land use, water dynamics, etc.



Roles of RIMES, INCOIS and Member States

Stakeholders

- o Comoros: National Agency for Civil Aviation and Meteorology
- o Mauritius: Mauritius Meteorological Services
- o Mozambique: National Institute for Meteorology
- o Tanzania: Tanzania Meteorological Agency
- o Hydrographic departments, land survey departments, risk assessment institutions, National Tsunami Warning Centers, Disaster Management Organizations at national and local levels
- o At-risk communities

Expected Outcomes and Outputs

- 1.1 Seamless near-shore bathymetry-topography-exposure datasets and DEM
- 2.1 Customized ocean forecast information
- 2.2 Mechanism for forecast validation and user feedback
- 3.1 Operational real-time tsunami inundation simulation and loss estimation system at RIMES
- 3.2 Locally relevant tsunami warning information
- 4.1 Enhanced preparedness and response to tsunami hazard emergencies

The **Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES)** is an international and intergovernmental institution that is owned and managed by its Member States for the generation and application of early warning information. RIMES helps to build capacity of Member States in the observation and monitoring of seismic, tsunami, oceanic, meteorological, hydrological, and climate phenomena, and in the communication of associated risks, for appropriate and timely responses to warnings.