Concept Note
On the Job Training on Tsunami Inundation Modeling and Mapping and Development of Tsunami Hazard Map for Implementation of UNESCO-IOC Tsunami Ready in Pilot Sites in Maldives, Sri Lanka, Madagascar and Seychelles.

16 – 21 March 2026

Venue:
International Training Centre for Operational Oceanography (ITCOOcean),
UNESCO Category2Centre,
Indian National Centre for Ocean Information Services (INCOIS),
Hyderabad, India

I. Background

The UNESCO-IOC 2nd Global Tsunami Symposium in commemoration of 2 decades after the Indian Ocean Tsunami (Banda Aceh, 2024) highlighted that the Indian Ocean is much safer against the threat of tsunamis than it was in 2004, but much needs to be achieved to enhance the accuracies of tsunami early warning and community preparedness. As an outcome of this Symposium, the UNESCO and its partners called on States and civil society to drastically step up their investments and efforts to strengthen Tsunami Early Warning Systems and achieve 100% of Tsunami Ready Communities across the world by 2030.

One of the major hazards in the Indian Ocean region is the potential for a powerful earthquake in the Makran Subduction Zone, located north of the Arabian Sea. Such an event could generate destructive tsunamis capable of reaching nearby coastlines within 20 minutes, underscoring the urgent need for preparedness among Northwest Indian Ocean (NWIO) Member States. To address this, UNESCO-IOC is implementing the UNESCAP-funded project “Strengthening Tsunami Early Warning in the North-West Indian Ocean through Regional Cooperation”.

The overall activity of the project consists of three phases that have been designed using a programmatic approach to promote a long-term, sustained and effective tsunami early warning system in the Indian Ocean. Countries supported in Phases 1 and 2 include India, Iran and Pakistan while, Oman and the United Arab Emirates (UAE) participated with their own funding resources. Phase 3 of the project will engage Maldives and Sri Lanka in addition to the above countries.

Phase 3 is contributing to the long-term goal of the overall programme to enhance national end-to-end tsunami warning systems in the Indian Ocean region, especially to strengthen self-protection capacities at the community level. It builds up on the achievements of phases 1 and 2 to meet the following objective: Improved community capacities for tsunami preparedness and response that are in line with the set of indicators of the

UNESCO Tsunami Ready Recognition Programme (TRRP) in the 5 participating countries.

The phase 3 project will enable required in-country mechanisms and build the capacities of national stakeholders to achieve the 12 TRRP indicators in 2 communities each in the participating countries. It will also support assessing the status of knowledge of non-seismic tsunami hazard in the Makran region as well as documenting best practices for Standard Operating Procedures, which will form the basis for future work.

Alongside of the UNESCAP Project Phase 3, UNESCO-IOC also implement the Strengthening Community Resilience to Ocean Hazards through implementation of Tsunami Ready Recognition Programme in Indian Ocean SIDS and Africa funded by the Flanders UNESCO Science Trust Fund (FUST). The project focused on the Western Indian Ocean (WIO) region that is prone to tsunami threats caused by undersea seismic and volcanic activity. Coastal populations in Madagascar and Seychelles face heightened vulnerability due to gaps in early warning systems, preparedness strategies, and public risk awareness. The UNESCO-IOC Tsunami Ready Recognition Programme (TRRP) offers a structured approach to building local capacity for tsunami resilience. This project seeks to implement the TRRP in selected pilot communities within Madagascar and Seychelles.

This concept note is addressing one of the key steps in the implementation strategy of the Phase 3 of the UNESCAP Project and the FUST Project: Capacity building on Tsunami Inundation Modelling and Mapping for Maldives and Sri Lanka (UNESCAP) and Madagascar and Seychelles (FUST) through an on-the-job training by leveraging the capacity of INCOIS experts.

II. Objectives:

The overall Objective is to enhance the technical capacity of four Indian Ocean countries to conduct tsunami inundation modelling, develop tsunami hazard maps, and support implementation of the UNESCO-IOC Tsunami Ready Recognition Programme. The specific objectives on this on-the-job training are:

- To train selected experts in the principles, methods, and software tools used for Tsunami Inundation Modelling and Mapping (TIMM).
- To enable participants to process and utilize high-resolution bathymetry and topography datasets needed for tsunami inundation simulation.
- To guide participants through generating tsunami scenarios, running numerical simulations, and producing hazard maps for two pilot communities per country.
- To enhance national capability to support long-term tsunami hazard assessment , evacuation planning, tsunami preparedness, and coastal risk reduction.
- To strengthen regional cooperation and harmonize methodologies for tsunami hazard assessment within the IOTWMS region.

III. Outcome and Output

The expected outcome of this on-the-job training is improved national technical capacity for inundation modelling and tsunami hazard assessment, enhanced preparedness of pilot communities progressing toward UNESCO-IOC Tsunami Ready Recognition, and the availability of updated tsunami hazard maps to support evacuation planning, risk communication, and coastal risk reduction. It also strengthened collaboration between INCOIS, UNESCO-IOC, and Indian Ocean countries on tsunami modelling and early warning

The main output are eight trained and skilled experts in Tsunami Inundation Modelling and Mapping (TIMM), two from each country (Maldives, Sri Lanka, Madagascar and Seychelles) and at least 4 Tsunami Hazard Maps of selected pilot site, one from each country that could be used for the implementation of UNESCO-IOC Tsunami Ready Recognition Programme. Several more specific outputs covering, but not limited to:

- Pre-processed bathymetry and topography grids for selected pilot sites in each country.
- Tsunami inundation model setup (grid nesting, boundary conditions, scenario definition).
- Completed tsunami inundation simulations for identified tsunami scenarios.
- Preliminary Tsunami Hazard Maps for at least one pilot sites per country.
- Training documentation and technical guidelines for further national application.
- Strengthened pool of national experts capable of conducting TIMM and supporting TRRP implementation in the Indian Ocean.

IV. Venue

This training workshop will be hosted by the Indian National Centre for Ocean Information Services (INCOIS) and conducted in the UNESCO Category2Centre: International Training Centre for Operational Oceanography (ITCOOcean),

V. Programme:

(Sunday): Arrival in INCOIS and settle in INCOIS Guest House.

Day 1 (Monday): Orientation, Tsunami Science Refresher & Data Foundations
- Opening
- Introduction to inundation modelling concepts
- Review of pilot sites and available datasets
- DEM development, integrating bathymetry & topography
- Data quality control and initial grid generation

Day 2 (Tuesday): Scenario Development & Model Input Preparation
- Selecting credible tsunami sources
- Historical and synthetic scenarios
- Preparing model inputs and parameters
- Finalizing grids and boundary conditions

Day 3 (Wednesday): Model Setup, Execution & Sensitivity Analysis
- Model setup, grid nesting, and boundary conditions
- Running simulations
- Conducting sensitivity analyses
- Troubleshooting model performance

Day 4 (Thursday): Inundation Mapping & Hazard Products
- Extraction of inundation layers
- Developing flood depth, velocity, and arrival-time maps
- Hazard classification
- GIS map styling, layout, and metadata standards

Day 5 (Friday): Development of Tsunami Hazard Map & Way Forward
- Review and refinement of outputs
- Integrate multi-scenario results (worst-case, credible, buffering, etc.).
- Apply GIS processing and cartographic standards (symbology, color coding, legend design, metadata, etc.).
- Incorporate exposure and local context (street, landmarsk, critical infrastructure, etc.).

Day 6 (Saturday): Presentation and Way Forward
- Country presentations and peer feedback
- Roadmap for completing hazard maps and meeting TRRP milestones
- Depart for home country

(Sunday): Depart for home country.

VI. Schedule

The training will be organized over a 6-day period during 16-21 March 2026

VII. Participants:

Two experts from each country (Maldives, Sri Lanka, Madagascar and Seychelles) will be selected based on the following criteria:

- Background in oceanography, coastal engineering, hydrodynamics, geospatial analysis, disaster management, or related fields.
- Working affiliation either with University, the National Tsunami Warning Centre (NTWC), Meteorological Department, National Disaster Management Agency/Authority, Research Institute, or relevant technical institution.
- Demonstrated experience in GIS, modelling tools, or geospatial data processing.
- Ability to commit to all 7 days of intensive training and do subsequent follow-up work on Tsunami Inundation Modeling and Mapping and Development of Tsunami Hazard Map in the country.
- Strong analytical and computing skills.

VIII. Training requirements

Data and resources for the hands-on-the-job training, all participants must bring:

- High-quality bathymetry data for the two selected pilot sites:
    - Preferably multibeam data or latest available national/hydrographic datasets
    - Coverage extending offshore sufficiently for inundation modelling
- 2.High-resolution topographic data:
    - LiDAR if available, or high-quality DEM from national survey agencies
    - Shoreline and land-use data for map refinement and validation
- Geodetic reference information (vertical datum, coordinate system)
- Any national tsunami scenario data available
- Detail information of the selected pilot sites (Demography, Landmarks and Critical infrastructures including schools, hospitals, harbour, gas station, water treatment, and other relevant information of the pilot sites.

Technical Requirements

- Laptop with a minimum of:
    - 16 GB RAM
    - i5/i7 or equivalent processor
    - At least 50 GB free storage
- GIS software if available (QGIS or ArcGIS preferred)

IX. Support

- Travel arrangement for 2 experts (each from Maldives and Sri Lanka) covering ATK, Reduced DSA, TF by UNESCO-IOC through ESCAP Project
- Travel arrangement for 2 experts (each from Madagascar and Seychelles) covering ATK, Reduced DSA, TF by UNESCO-IOC through FUST Project
- Local Logistics (Accommodation, Local Transport, Training Facilities, etc by INCOIS)

X. Institutional Arrangements

UNESCO-IOC/IOTWMS

- Prepare the overall concept note and TOR of the On-the-Job training (OJT)
- Coordinate the organization, implementation, and management of the OJT with INCOIS.

- Liaise with UNESCO Regional Office in Jakarta for the administrative process and procedures
- Liaise with the Tsunami National Contact of the participating countries (Maldives, Sri Lanka, Madagascar, and Seychelles)
- Ensure the right participants are nominated and selected for the OJT
- Monitor and collect all the materials, results, and outputs of the OJT from INCOIS and participants
- Develop report of the implementation of the OJT for internal purpose and donor reporting purpose.

UNESCO Office Jakarta

- Provide support in administrative and financial procedure / processing.
- Travel arrangement for 8 Experts (2 each from Maldives, Sri Lanka, Madagascar, and Seychelles)
- Establish contract for services with INCOIS for the OJT
- Monitor activity for payment and reporting for the travel and contract for services.

INCOIS

- Host the On-the-Job training (OJT), i.e. classroom and training facilities.
- Develop detailed training plan based on the concept note and presentation materials as needed.
- Organize, manage, and coordinate the accommodation and local transportation of all participants
- Provide modelling tools and expert support.
- Guide simulation, analysis, and map production.

Participating Countries (Tsunami National Contact)

- Nominate experts, ensuring the nominated participants met the participant criteria
- Facilitate the participant to obtain the high-quality datasets for the training.
- Lead and/or monitor national activities post-training, especially development of Tsunami Hazard Map in the country and implementation of Tsunami Ready in the country.

XI. Other Information

Further information on detailed agenda, local logistics, hotel accommodation and visa requirements will be sent to participants by the organizer and will also be posted on the website (Ocean Expert) as it becomes available.