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India Status Report

Sunanda Manneela
INCOIS, India

ICG/IOTWMS Regional Working Group for the North West Indian Ocean
July 22, 2024

Disaster Risk Knowledge

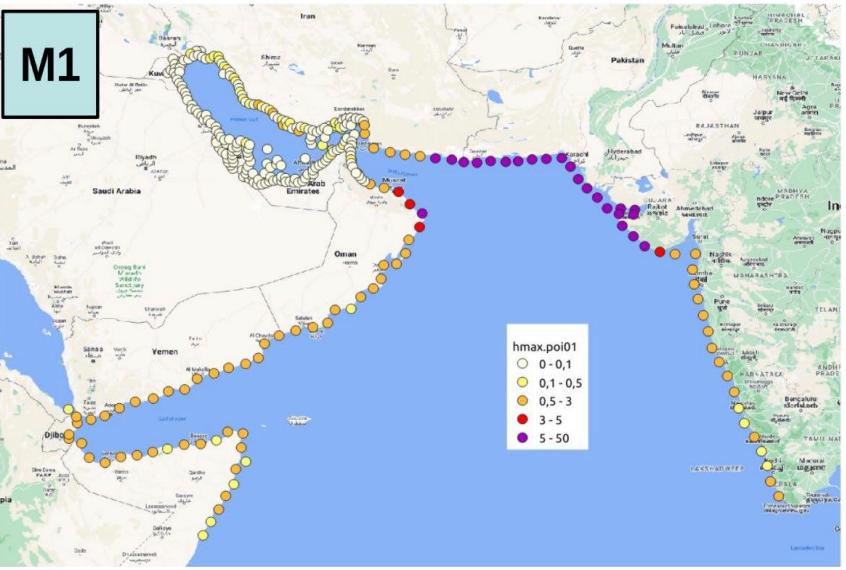


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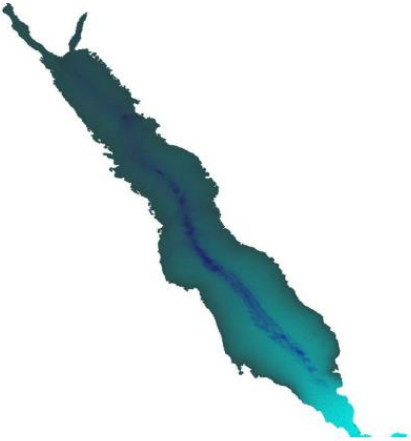
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Probabilistic Tsunami Hazard Assessment

M1

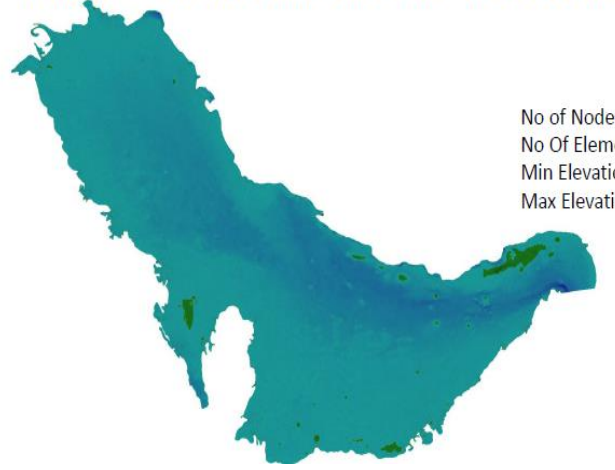


Finite Element Mesh - Red Sea



No of Nodes : 762592
No Of Elements: 1517276
Min Elevation : -2811.5 m
Max Elevation : 405.3 m

Finite Element Mesh - Persian Gulf

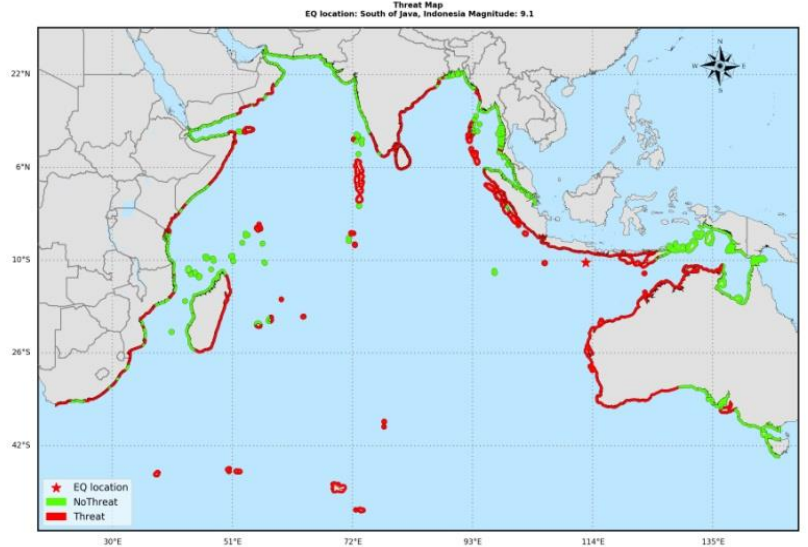
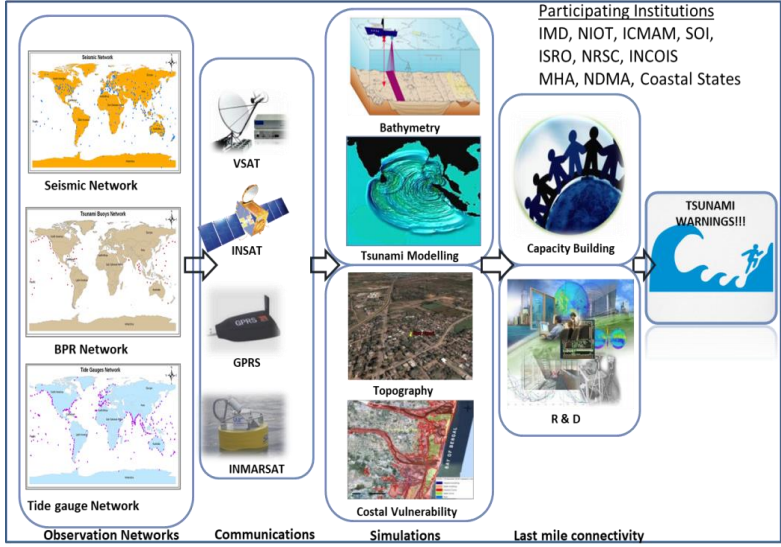
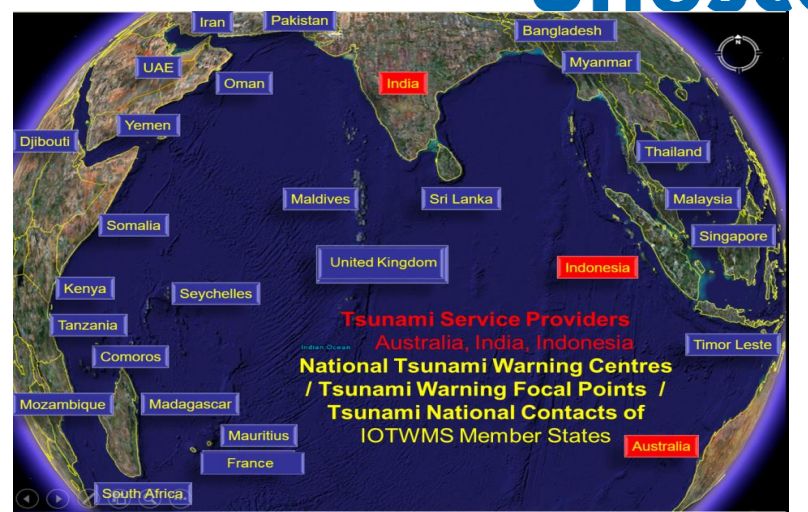
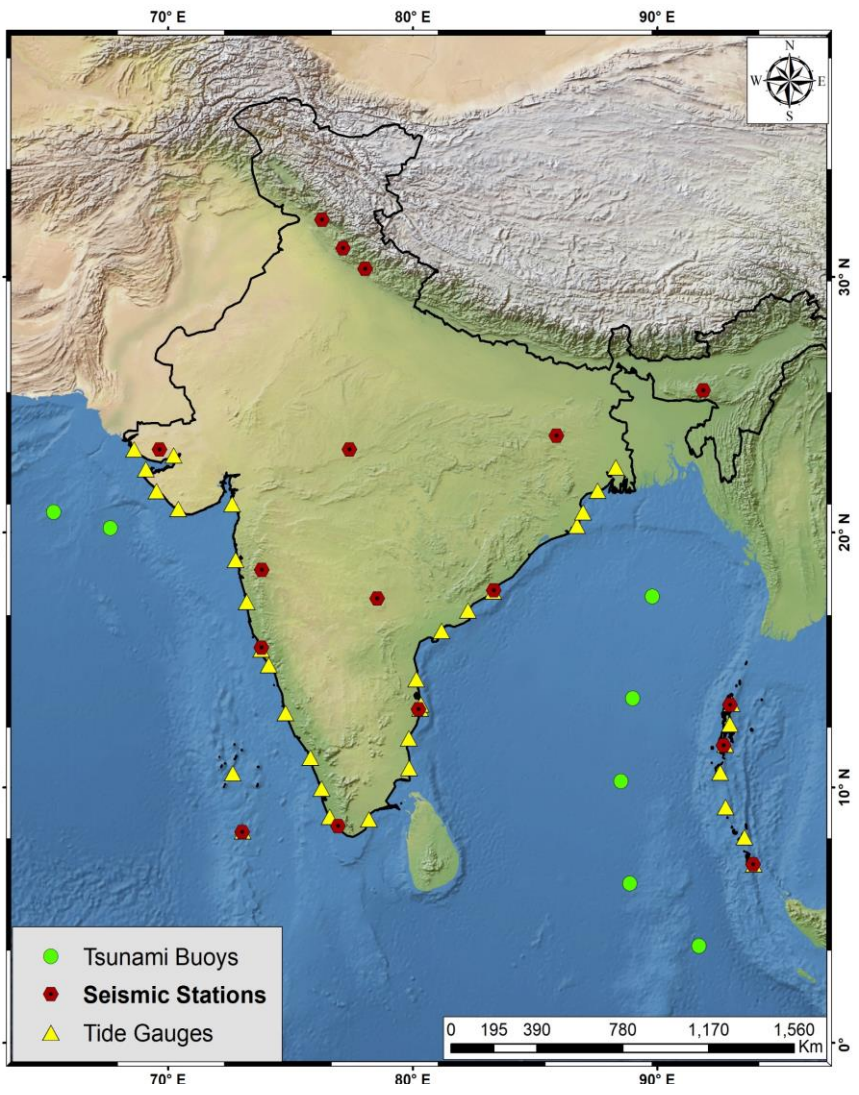


No of Nodes : 408106
No Of Elements: 810988
Min Elevation : -222.7 m
Max Elevation : 237.5 m

- Participating in UNESCAP project of PTHA for Makran Subduction Zone
- Initial benchmark PTHA model simulations run at INCOIS [India] with guidance from GFZ [Germany], INGV and University of Malaga
- Generated Scenarios for tsunami threat in the Persian Gulf and Red Sea
- Agreed to host the results and share with member states

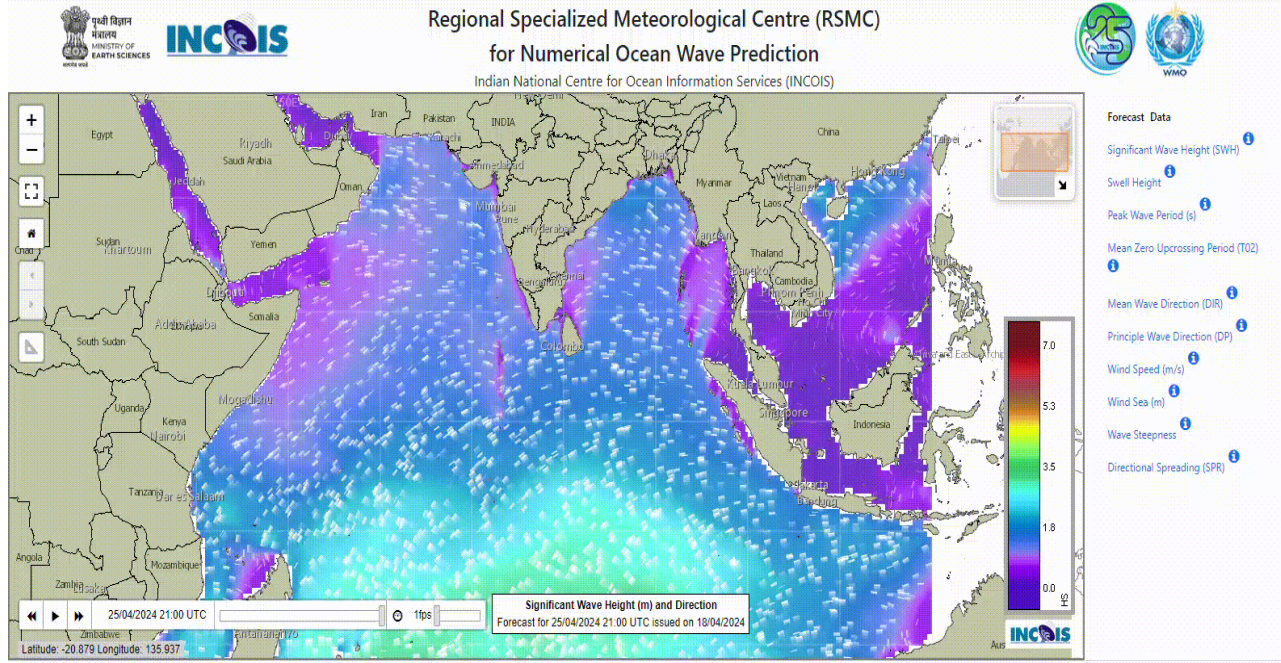
- Arabian Sea tsunami hazard simulations completed (GFZ, Germany/INGV, Italy)
- Red Sea and Persian Gulf tsunami hazard simulations completed (INCOIS/India)
- PTHA2.0 - Hazard curves, maps and non-seismic etc.

Detection, Observations, Monitoring and Forecasting



National Observation Network of Seismometer (17), Accelerometer (32), GNSS (32), Tide Gauge (36), Bottom Pressure Recorders (17)
 24X7 monitoring centre

Detection, Observations, Monitoring and Forecasting



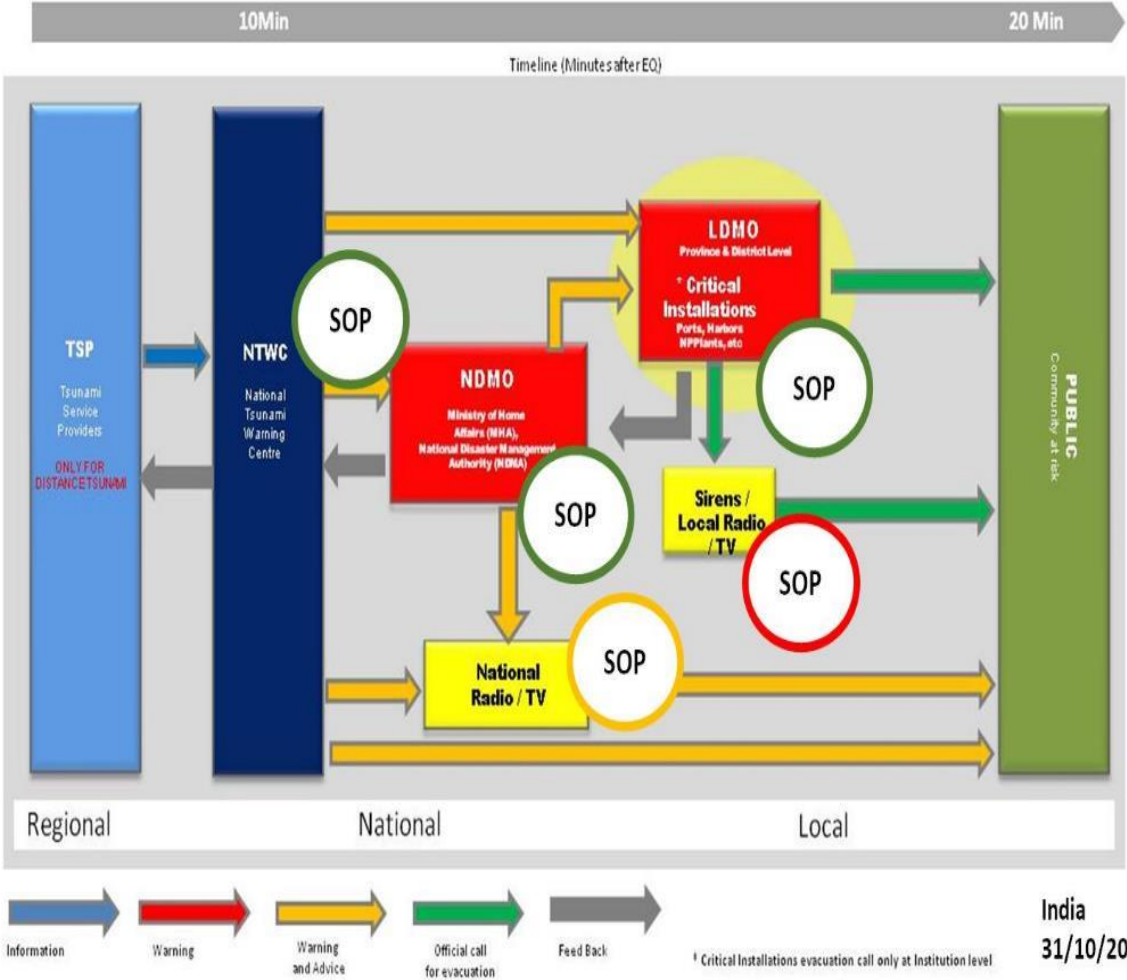
- Honorable Minister of Earth Sciences inaugurated the state-of-the-art Synergistic Ocean Observations Prediction and Services Lab (SynOPS) on 14 February 2024
- Secretary, MoES inaugurated the WMO RSMC Service for the Indian Ocean on 23 August 2023
 - Global Numerical Ocean Prediction
 - Numerical Ocean Wave Prediction
 - Marine Emergency Response (underway)

Warning Dissemination and Communication



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National Warning Chain

- National Tsunami Warning Centres (**NTWCs**), Disaster Management Organisations (**DMOs** at national, provincial, and local level), and **Broadcast Media**
- **Standard Operating Procedures (SOPs)** underpin each link
- SOPs prepared and tested at national, provincial and local level. Media SOP is being tested
- **Routine 6-monthly communication tests** Jun and Dec every year (email, GTS, SMS, Fax)
- Test national tsunami warning chain and SOPs in Mock Drills
- Recent mock drill was in October 2023

Warning Dissemination and Communication

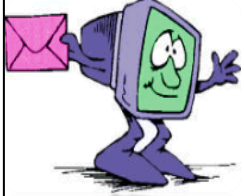


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Fax



Email



SMS



Web



GTS

Tsunami Advisories and bulletins at <https://tsunami.incois.gov.in>

Multichannel, Multilingual, Geo-located, Social Media, Regular tests and Clear & Concise Messages

Indian Tsunami Early Warning System
Ministry of Earth Sciences - Government of India

Tsunami Updates 5M, Southern Sumatra, Indonesia 6.9M, Southern Sumatra, Indonesia

6.5M, Southern Sumatra, Indonesia
Origin Time (UTC): 19 Aug 2020 03:53:00
Location: 4.41S, 101.06E
Depth: 10.0 km
[View Bulletin](#)

Location	Magnitude	Latest Updated Time (UTC)	View Latest Bulletin
Southern Sumatra, Indonesia	6.5M	19 Aug 2020 04:18:31	Public Exchange
Southern Sumatra, Indonesia	6.9M	19 Aug 2020 04:09:30	Public Exchange

Threat: **Warning** Alert Watch No Threat Unavailable

INCOIS SAMUDRA
SMART ACCESS TO MARINE USERS FOR OCEAN DATA RESOURCES AND ADVISORIES

Indian National Centre for Ocean Information Services
Ministry of Earth Sciences, Govt. of India

12:39 Swell Surge Alerts

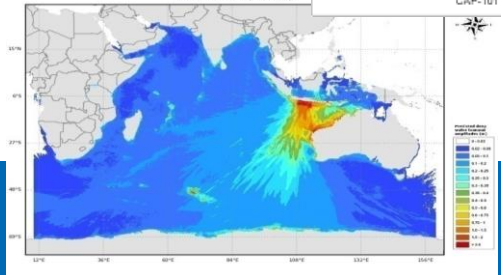
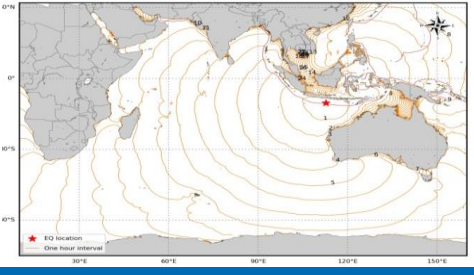
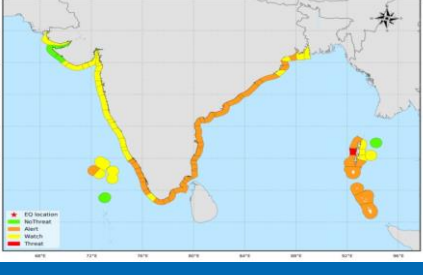
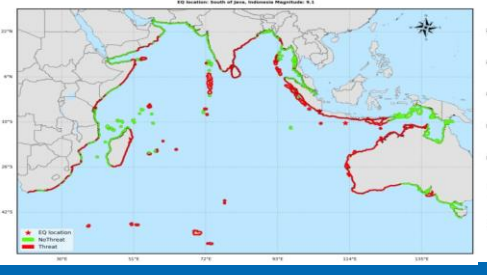
Active Alerts: SSA, Currents, Tsunami

Threat Status: Warning, Alert, Watch, No Threat

SAMUDRA (Smart Access to Marine Users for ocean Data Resources and Advisories) The mobile app empowers users with real-time updates and critical alerts on oceanic disasters such as tsunamis, storm surges, high waves, swell surge alerts, etc.

CAP All-Hazards, All-Media

CAP-101 Introducing CAP



Maritime products for NAVAREAs



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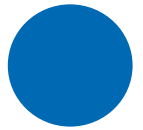
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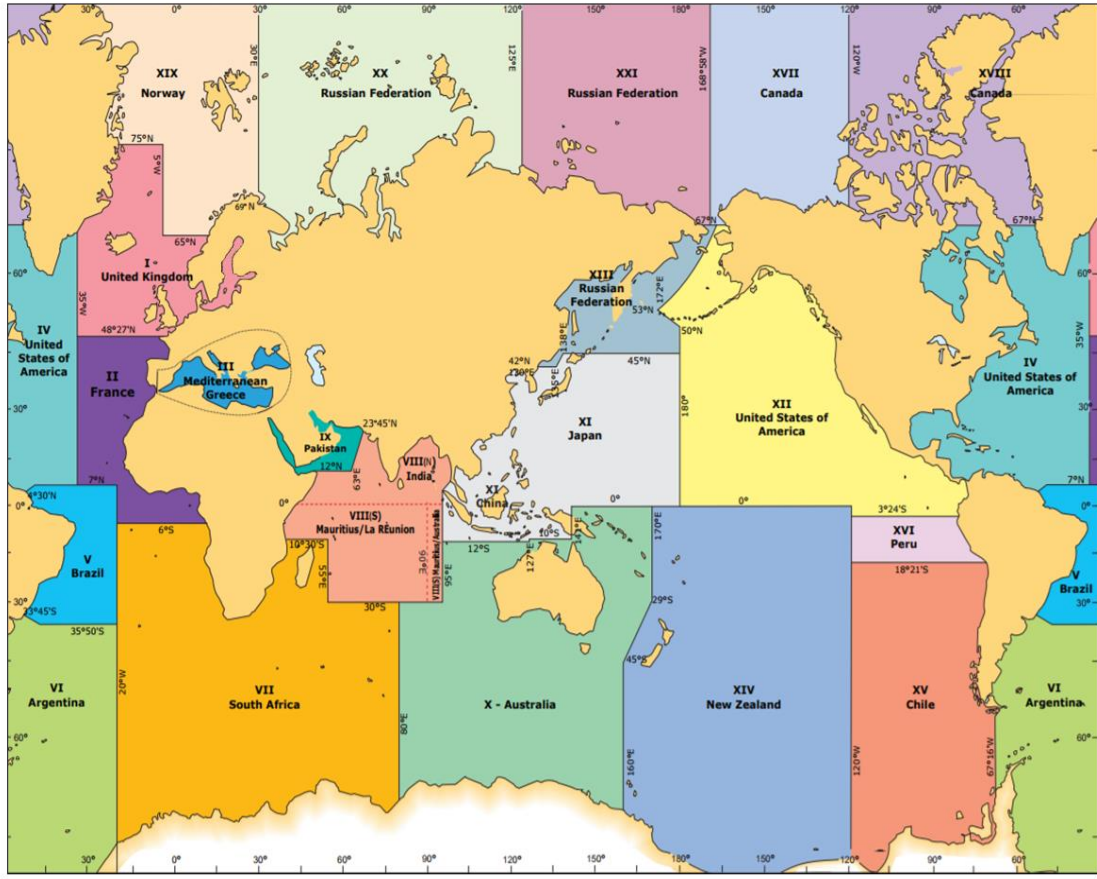
As a TSP, India is now generating the NAVAREA messages as per the service definition document version 5.0 and is ready for trial.



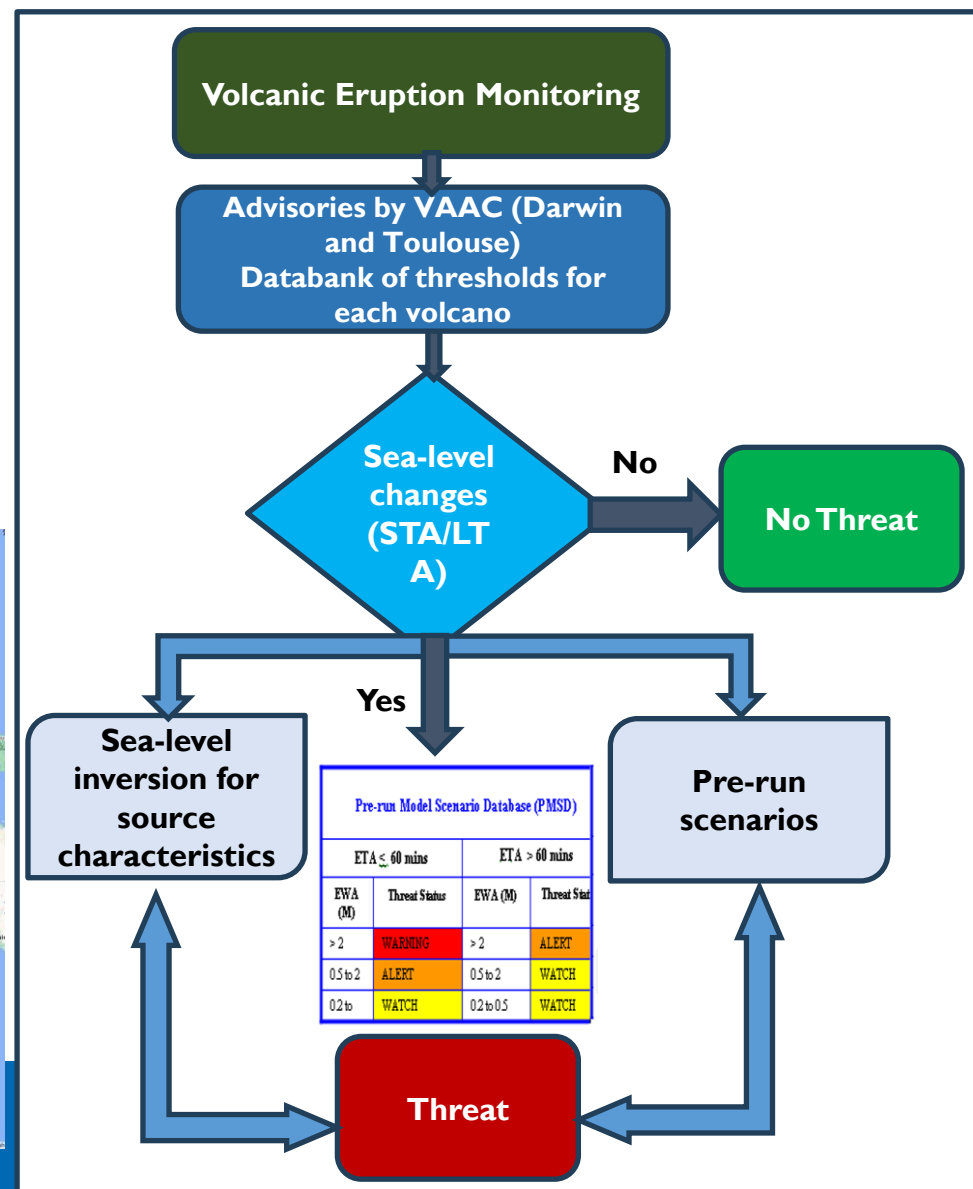
TSP INDIA TSUNAMI BULLETIN NUMBER 2 FOR
NAVAREA VII, VIII, X, XI
EAST INDIAN OCEAN, NORTH INDIAN OCEAN, SOUTHWEST INDIAN OCEAN, WEST INDIAN OCEAN
TSUNAMI CANCELLATION MESSAGE ISSUED BY TSUNAMI SERVICE PROVIDER INDIA IN SUPPORT OF THE UNESCO/IOC INDIAN OCEAN TSUNAMI WARNING AND MITIGATION SYSTEM AT 0616 UTC WEDNESDAY 12 JUNE 2024.
THE THREAT HAS NOW LARGELY PASSED FOR THE TSUNAMI GENERATED BY A MAGNITUDE 9.0 EARTHQUAKE THAT OCCURRED NEAR SUNDA STRAIT, INDONESIA [-6.94S, 104.70E] AT 0600 UTC 12 JUN 2024.
HOWEVER, SHIPS APPROACHING THE COAST SHOULD STILL CONSULT LOCAL AUTHORITIES REGARDING LOCAL CONDITIONS AND ADVICES.



TSP INDIA TSUNAMI BULLETIN NUMBER 3 FOR
NAVAREA VII, VIII, X, XI
EAST INDIAN OCEAN, NORTH INDIAN OCEAN, SOUTHWEST INDIAN OCEAN, WEST INDIAN OCEAN
TSUNAMI CONFIRMED THREAT MESSAGE ISSUED BY TSUNAMI SERVICE PROVIDER INDIA IN SUPPORT OF THE UNESCO/IOC INDIAN OCEAN TSUNAMI WARNING AND MITIGATION SYSTEM AT 0629 UTC WEDNESDAY 12 JUNE 2024.
A TSUNAMI HAS BEEN GENERATED BY A MAGNITUDE 9.0 EARTHQUAKE THAT OCCURRED NEAR SUNDA STRAIT, INDONESIA [-6.94S, 104.70E] AT 0600 UTC 12 JUN 2024.
HAZARDOUS TSUNAMI WAVES ARE FORECAST FOR SOME COASTS OF AUSTRALIA, BANGLADESH, DJIBOUTI, FRANCE (INDIAN OCEAN TERRITORIES), INDIA, INDONESIA, KENYA, MADAGASCAR, MALDIVES, MAURITIUS, MOZAMBIQUE, MYANMAR, OMAN, SEYCHELLES, SOMALIA, SOUTH AFRICA, SRI LANKA, TANZANIA, THAILAND, TIMOR-LESTE, UNITED KINGDOM, YEMEN TSUNAMI WAVES ARE NOT A HAZARD TO SHIPS IN DEEP WATER BUT CAN CAUSE STRONG CURRENTS AND RAPID SEA LEVEL CHANGES IN SHALLOW WATER, AS WELL AS INUNDATION OF THE COAST. SHIPS APPROACHING THE COAST SHOULD CONSULT LOCAL AUTHORITIES REGARDING LOCAL CONDITIONS AND ADVICES.



Monitoring Tsunamis Generated by Volcanoes



Monitoring of Volcano

- Volcano Seismicity
- Ground Deformation
- Acoustic Pressure
- Satellite Monitoring

Volcano Alert levels

Alert Level	Meaning
GREEN/NORMAL	Background
YELLOW/ADVISORY	Above Background
ORANGE/WATCH	Escalation of Parameters
RED/ALERT	Eruption imminent/Ongoing

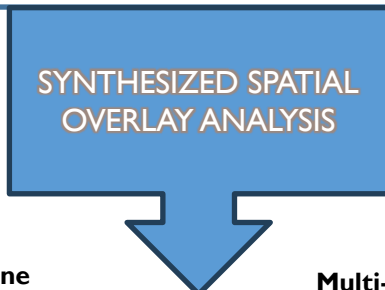
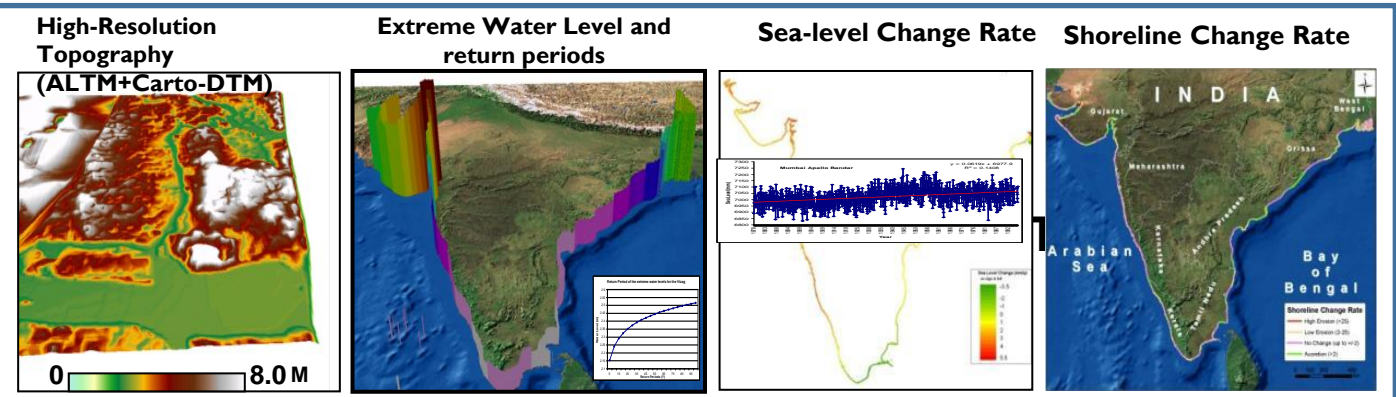
Volcano Observatory Notice for Aviation (VONL) is used by Volcano Observatory to the Volcanic Ash Advisory Centres (VAAC)

Coastal Multi-Hazard Vulnerability Assessment

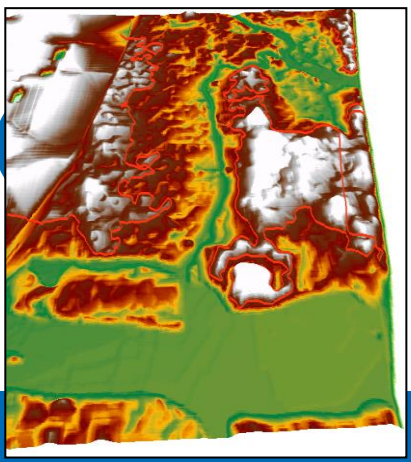


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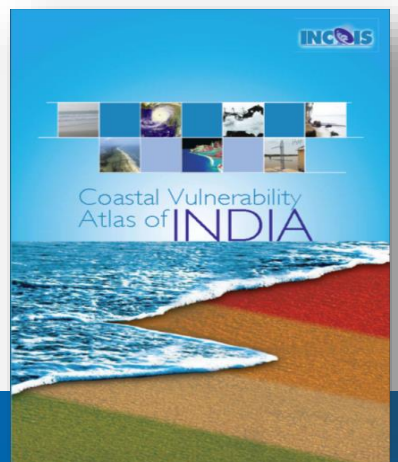
Coastal Inundation – 3D Mapping



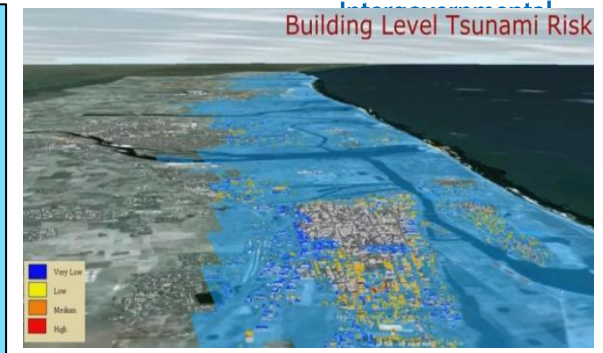
Composite Multi-hazard Line



Multi-hazard Vulnerability Maps



- **Coastal Vulnerability Indices Atlas** covering Indian coast comprising 156 maps on 1:0.1 million scale have been prepared
- **The multi-hazard mapping** has been carried out using the parameters sea level change, shoreline change rate, elevation contours, extreme water level from tide gauges and the return periods of extreme events
- **Realistic 3D models** of the buildings along with the attributed details of the owner, address and other socio-demographic details.



Preparedness and Response Capabilities

➤ **IOWave Exercise 2023:**

- Participated in IOWave23 tsunami exercise on October 4th with an Andaman Trench scenario and on October 11th with a Makran Trench scenario at a national level
- 40,000+ people were evacuated from 42 coastal villages on the east coast

➤ **World Tsunami Awareness Day:**

- Hosted an open day, set up a selfie booth,
- Tsunami mock drill in Odisha,
- Science model exhibition, an extempore competition, and drawing/painting competitions for students

➤ **Other Workshops:**

- INCOIS conducted five major workshops covering India's East and West coasts under national campaign "Azadi Ka Amrit Mahotsav" in east and west coasts
- A total of 2300 fishermen took part in the mega awareness campaigns across five coastal states



Preparedness and Response Capabilities



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- **Kerala State Disaster Management Authority (KSDMA)**

- Proposed 9 villages from 9 coastal districts
- Orientation workshop for SDMOs and DDMOs completed on May 24, 2024
- Workshops BDMOs and local Gram Panchayat stakeholders is completed 8 villages
- Tsunami Evacuation Plan is under preparation
- By mid of August tsunami mockdrill will be conducted on all 9 villages

- **Gujarat State Disaster Management Authority (GSDMA)**

- Proposed 2 villages
- Meeting with SDMA concluded on July 6, 2024 for planning the TRRP implementation



Kerala Tsunami Evacuation Plan Preparation



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“Towards Empowering Local Communities to get Tsunami-Ready!”



STAKEHOLDER CONSULTATION

ON IMPLEMENTING TSUNAMI READY PROGRAMME

KERALA, INDIA
24th May 2024, Thiruvananthapuram



UN Ocean Decade Tsunami Programme



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Decade Collaborative Centre for the Indian Ocean Region

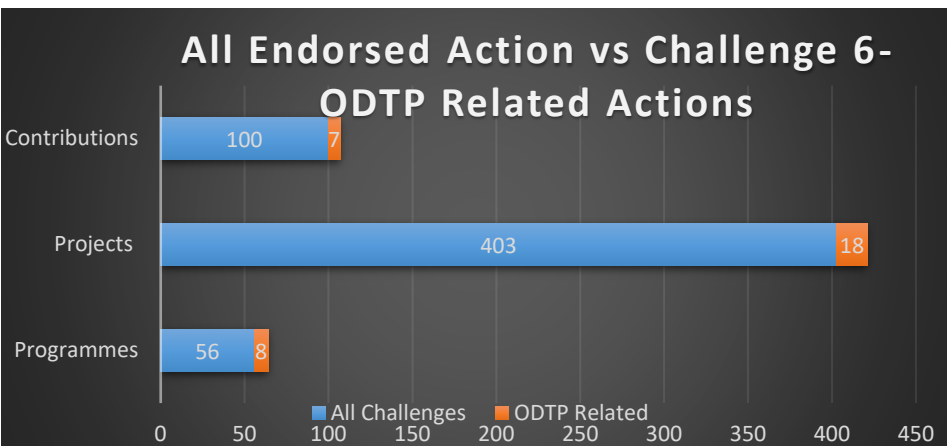
Indian Ocean Regional Ocean Decade Conference (IOCon-24)

Barcelona Conference



Ocean Decade Actions

Coastal cities and communities joining Tsunami Ready



Coastal Futures: Charting priorities for Coastal Resilience

Tsunami Night: 3 Films related to tsunami

2630 onsite & 3000+ online participants from 124 countries, 165 satellite events

Ocean Decade Vision 2030

White Papers

Challenge 6:
Increase community resilience to ocean hazards

The United Nations
Decade of Ocean Science
for Sustainable Development
(2021-2030)

Goal: A safe ocean where life and livelihoods are protected from ocean-related hazards

- Design people-centred multi-hazard early warning systems
- Design adaptation strategies to increase coastal resilience

8/56 Programmes; 18/403 Projects; 7/100 contributions

Source: <https://oceanexpert.org/document/29188>



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THANK YOU