



North-West Indian Ocean Regional Working Group

Ms. Sunanda Manneela

Chair

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Vice Chair

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19th Meeting of ICG/IOTWMS Steering Group, Jakarta, 17-19 June 2025

Terms-of-Reference

Liaise with other working group(s) and task team(s) within the ICG/IOTWMS and with working groups from the other ocean basins through the TOWS-WG to:

1. Evaluate capabilities and **ascertain capacity building requirements of Member States** in the region for providing end-to-end tsunami warning and mitigation services within the framework of the ICG/IOTWMS and within a multi-hazard framework.
2. Facilitate cooperation in the establishment and **upgrading of seismic, sea level and GNSS stations and networks and communication systems** in the region.
3. Facilitate the **capacity building and the sharing of the tsunami-related data** and information in the region.
4. Establish and maintain procedures for National Tsunami Warning Centres (NTWCs) across the region to **exchange information on national tsunami warnings, observations, and impacts** during events.
5. **Support the WG3 effort to implement the Tsunami Ready Recognition Program** in the region.

Members

Chair: Ms V Sunanda Manneela (India), sunanda@incois.gov.in

Vice-Chair: Mr Nasser Al Ismaili (Oman), Nasser.Ismaili@caa.gov.om

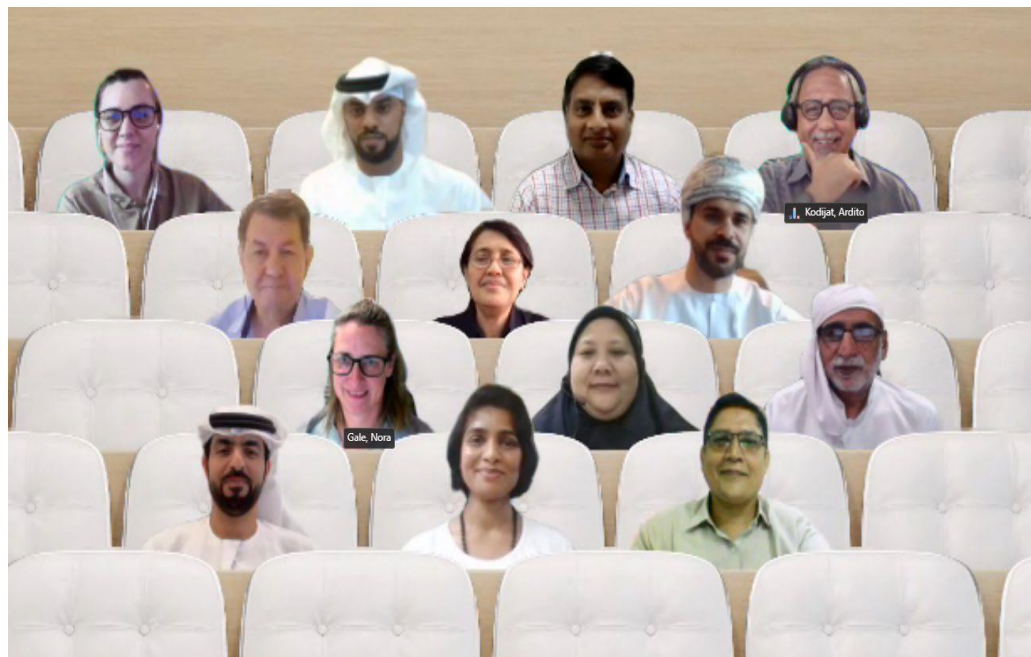
- Mr Zaidi Zainal Abidin (Malaysia), zaidi@met.gov.my
- Mr Mahendra S Ranganahalli (India), mahendra@incois.gov.in
- Dr Ch Patanjali Kumar (India), patanjali@incois.gov.in
- Mr Padmanabham Jijavarapu (India), padmanabham@incois.gov.in
- Mr M Nagaraja Kumar (India), raja@incois.gov.in
- Dr T.M. Balakrishnan Nair (India TRFP), bala@incois.gov.in
- Dr Sudheer Joseph (India), sjo@incois.gov.in
- Dr Ajay Kumar Bandela (India), ajay@incois.gov.in
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- Mr Hilal Alkaabi (UAE), hskaabi@ncema.gov.ae

Current Group is composed of members representing **NTWC & TRFP, DMO** from each of the Member states of India, Iran, Oman, Pakistan, United Arab Emirates, Yemen

Last Activities in the region

Chair: Dr Mohammad Mokhtari

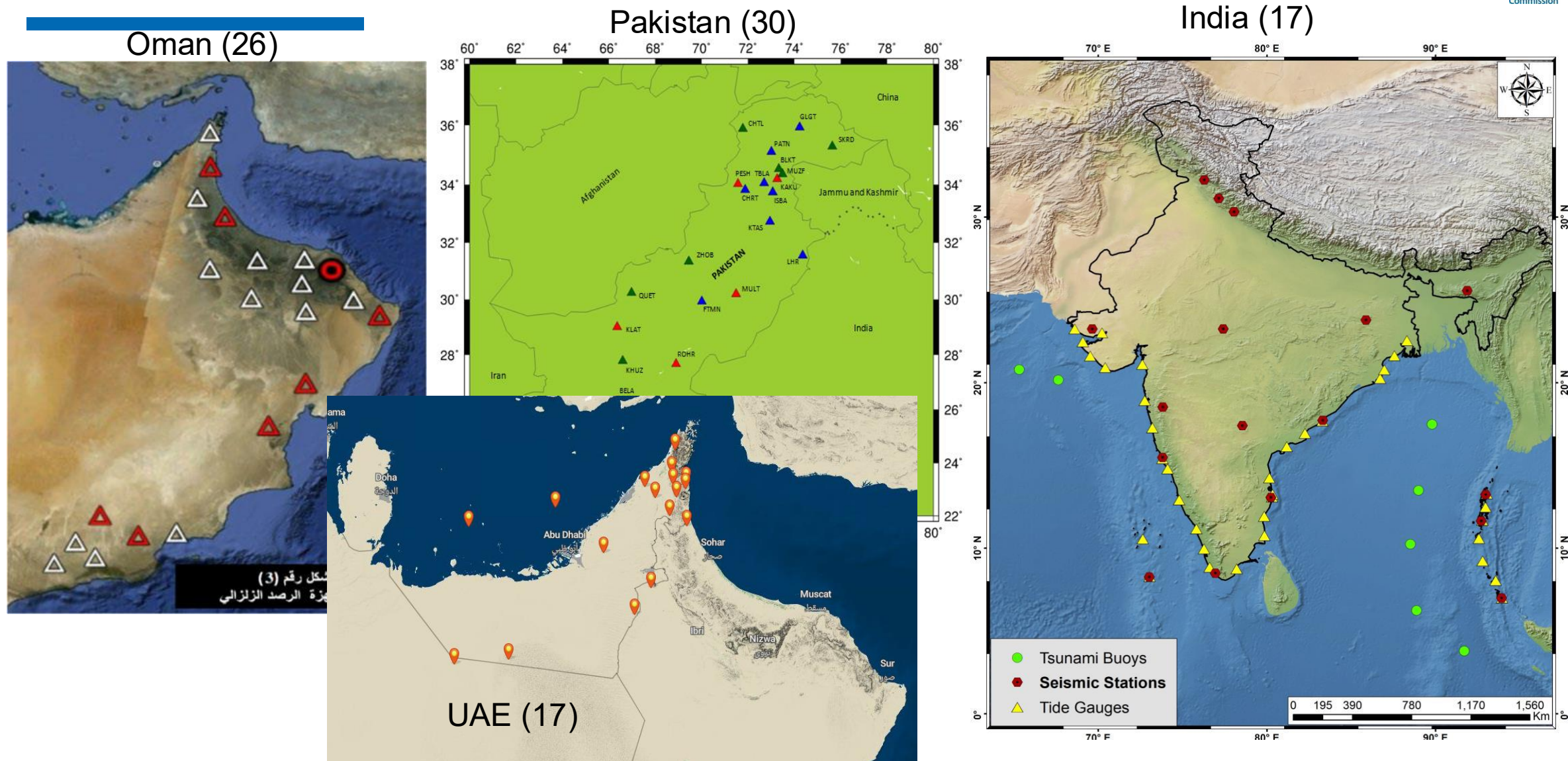
Virtual meeting on 22 July 2024



TEMPP training in Musat 21-25 April 2024



Observation Network



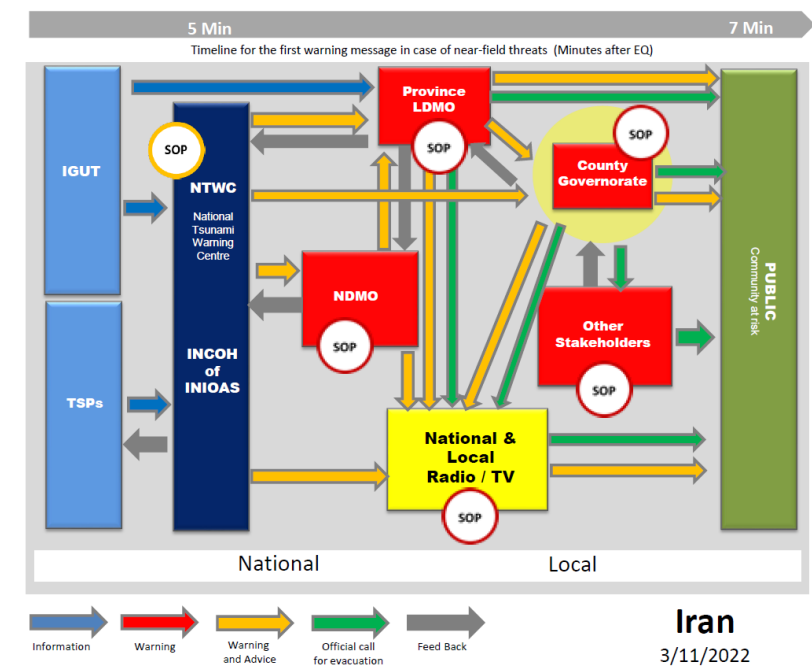
Strengthening Tsunami Warning in the North West Indian Ocean through Regional Cooperation

Timely delivery of national tsunami warnings to at-risk coastal communities who are prepared to respond effectively (*Tsunami Ready*)

- Phase 1: Hazard & risk assessment and National tsunami warning chain development (India, Iran, Pakistan + Oman and UAE self-funded)
- Phase 2: Inundation and evacuation mapping capacity development
- Phase 3: At-risk coastal community preparedness

Pakistan

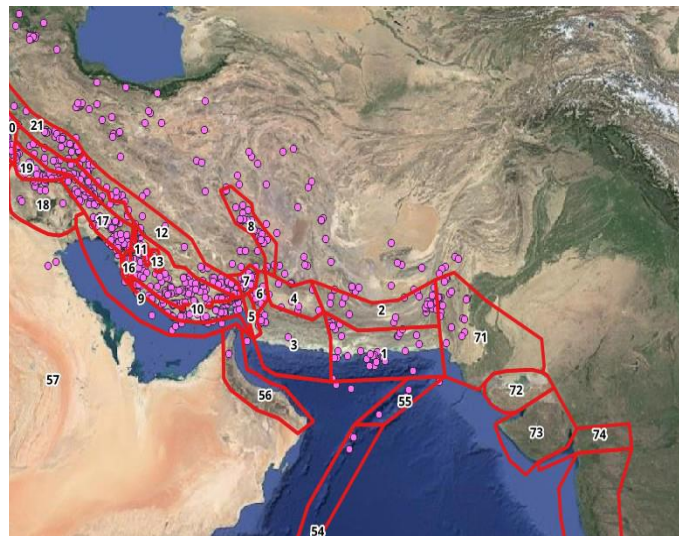
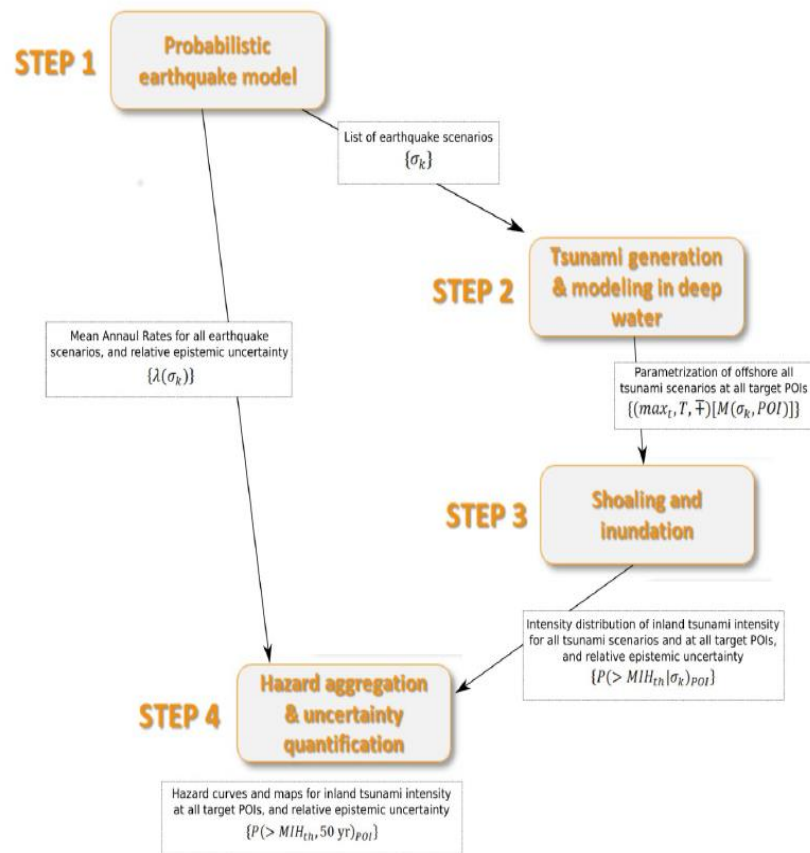
Oman



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Probabilistic Tsunami Hazard Assessment v1.0

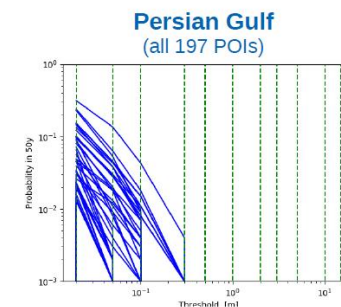
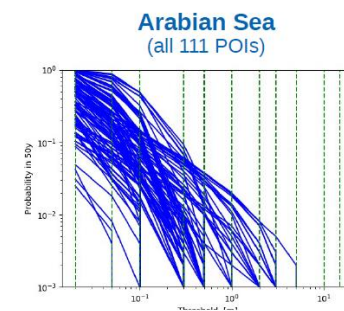
PTHA method as implemented in TSUMAPS-NEAM



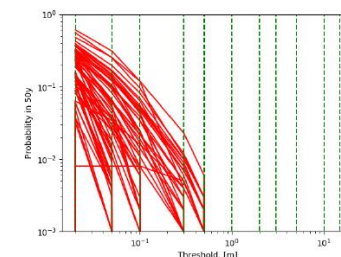
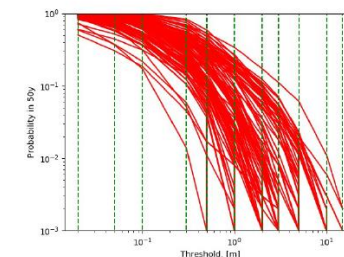
Only TWO alternative models up to now:

Model 1 “optimistic”	Model 2 “pessimistic”
BS: as in PSHA	BS: $M_{\max} + 3 \sigma$
PS: segmented as in PSHA ($M_{\max}=6.2$ for West and 8.4 for East)	PS: unsegmented, $M_{\max}=9.1$
STEP2 & 3 – no alternatives	

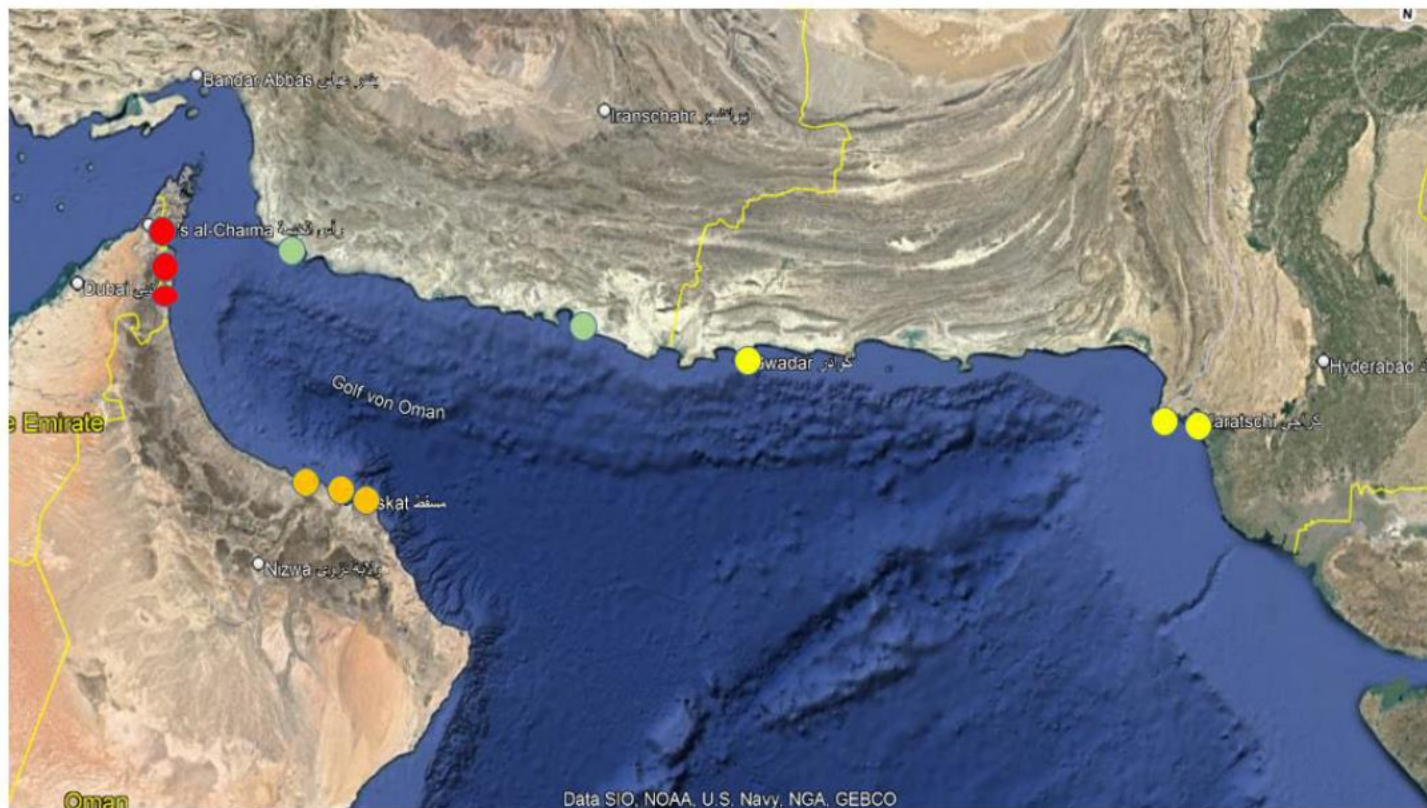
M1



M2



Pilot Areas for Tsunami Ready



Iran: (1) Chabahar, (2) Jask

Oman: (1) Muscat, (2) Barka, (3) Sib

Pakistan: (1) Gwadar District, (2) Karachi: West-District (Keamari), (3) Karachi: Malir District

UAE: (1) Dibba, (2) Kalba, (3) Khor Fakkan.



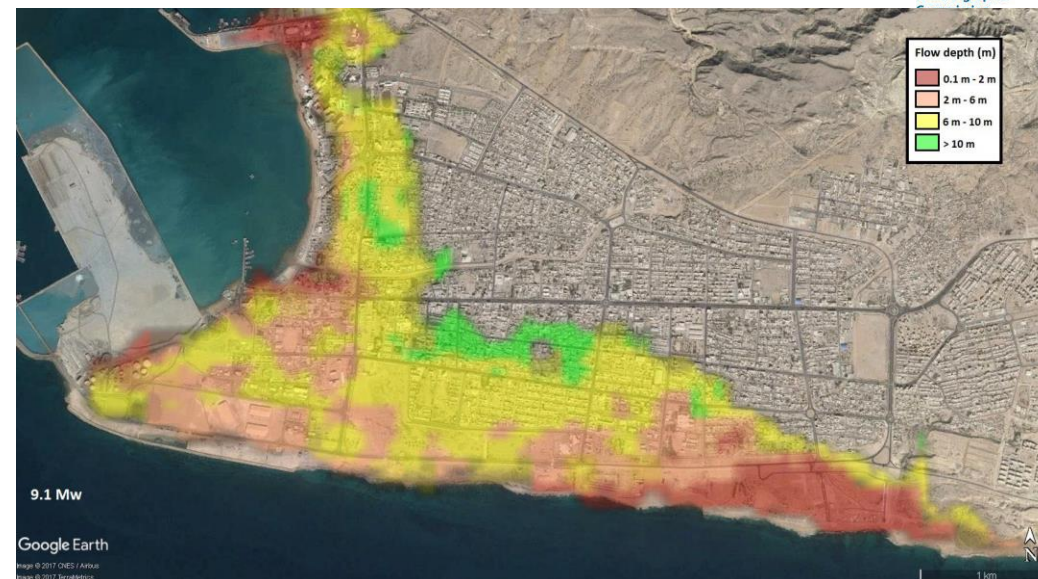
India – Gujarat (2), Kerala (9)

Inundation maps of Pilot Areas

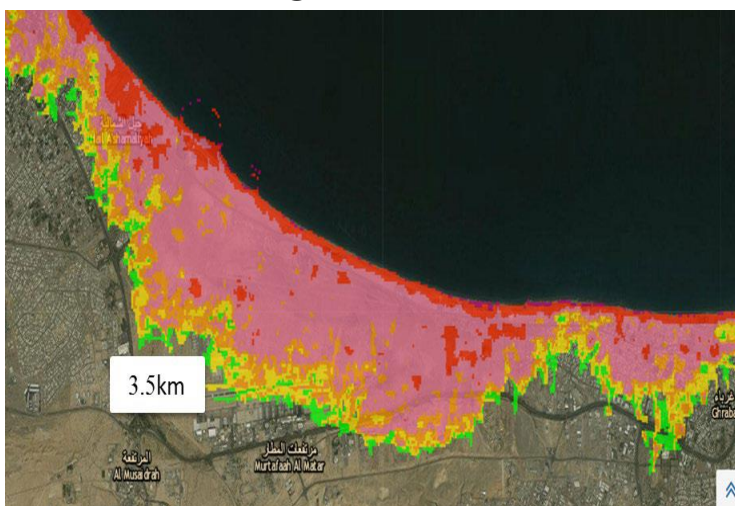
UAE



Iran



Oman



Pakistan



India

Strengthening Tsunami Warning in the North West Indian Ocean through Regional Cooperation

Timely delivery of national tsunami warnings to at-risk coastal communities who are prepared to respond effectively (*Tsunami Ready*)

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- Workshop on “Tsunami Evacuation Maps, Plans, and Procedures and UNESCO-IOC Tsunami Ready Recognition Programme” at INCOIS Hyderabad during April 15-23, 2025
- Pilot communities in each country are preparing tsunami evacuation maps as per the tsunami inundation results
- These maps will be tested and refined through community evacuation drills
- PTHA v1.0 results will be hosted by INCOIS. Currently working on updated sources from Westcoast of India and will be updated, including hazard curves as PTHA v2.0

Capacity Assessment Report 2024

SI No.	Action Items from ICG/IOTWMS-XIV (Banten, Indonesia, 17-19 November 2024)	India	Iran	Oman	Pakistan	UAE
1	Tsunami Warning Focal Point (TWFP) and Tsunami National Contact (TNC) Tsunami Ready Focal Point (TRFP)	√	√	√	√	√
2	Tsunami Hazard Assessment	√	√	√	√	√
3	Tsunami Risk Assessment	√	√	√	√	√
4	National tsunami policy	√	√	√	√	√
5	National, local and community level tsunami disaster risk reduction plans	√	√	√	√	√
6	National tsunami DRR guidelines	√	x	√	√	√
7	National capability to assess and/or receive potential tsunami threat information and advise/warn its coastal communities	√	√	√	√	√

Capacity Assessment Report 2024

SI No.	Action Items from ICG/IOTWMS-XIV (Banten, Indonesia, 17-19 November 2024)	India	Iran	Oman	Pakistan	UAE
8	Does the organisation have the capability of analysing real-time seismic and sea-level data for potential tsunami threat?	√	x	√	√	√
9	Tsunami information dissemination (CAP)	√ (√)	√(x)	√ (√)	√ (√)	√ (√)
10	Tsunami Emergency Response	√	x	√	√	x
11	Evacuation infrastructure	√	x	√	√	√
12	Tsunami Awareness	√	√	√	√	√
13	Participation in the UNESCO-IOC TRRP	√	√	√	√	√
14	Capacity of Communities	√	Partial	Partial	Partial	√

Action Items

SI No.	Action Items from ICG/IOTWMS-XIV (Banten, Indonesia, 17-19 November 2024)	Status
1	Progress data sharing amongst the North-West Indian Ocean countries, and with the TSPs	Bilateral arrangements exist. Need to work on regional cooperation with TSPs
2	Formulate a regional Paleo-tsunami study proposal for possible funding and contribution to the UN Ocean Decade Tsunami Programme	To be prepared
3	Extend the inundation and evacuation maps, as developed for the pilot areas under the UNESCAP project, to the other areas of NWIO region in line with the results of the hazard assessments towards implementation of the UNESCO-IOC Tsunami Ready Recognition Programme	Use TEMPP training to support
4	Facilitate on-the-job training for National Tsunami Warning Centre representatives	Call will be issued through the Secretariat

Workplan

SI No.	ToR/Action Item	Activity	Timeline	Outcome	Partners
1.	Use the capacity assessment project results to identify the needs of NWIO region	Compile a detailed gap assessment for the region	Q3-Q4 2025	Country specific prioritised actions based on gaps	NTWCs and Secretariat
2.	Strengthening of Observation and Monitoring Network	Assess the existing network inventory, identify key stations for sharing	Q4 2025-Q12026	Promote bilateral, regional data sharing, including TSPs	NTWCs/TSPs/I NCOIS
3.	Capacity building and the sharing of the tsunami-related data and information in the region.	Support IOTIC for developing knowledge base for Makran region	Q1-Q2 2026	Hazard and Risk Assessment data, Training materials, publications, research data, inventories, inundation and evacuation maps etc.	NTWC/IOTIC/S ecretariat
4.	On-job Training	Conduct regional trainings for operators	Q4 2025 and Q4 2026	Practical sessions to build data processing capabilities of MS	NTWCs/INCOIS

Workplan

SI No.	ToR/Action Item	Activity	Timeline	Outcome	Partners
5.	Tsunami Ready Implementation	<ol style="list-style-type: none"> 1. Use IOWave25 to assess TR progress in the region 2. Support TR Recognition application process of pilot areas in the region identified as part of ESCAP project 3. Extend to identify new communities 	Q1 - Q2 2026	NWIO TR communities	NTWCs and IOTIC
6.	Paleo-tsunami studies	<ol style="list-style-type: none"> 1. Prepare a proposal 2. Regional workshop on Paleo-tsunami studies 	Q3-Q4 2025 Q4 2026	Historical events in the region and their sources	Secretariat/IOTIC
7.	Non-seismic tsunamis	SOP for monitoring and early warning in the region	Q4 2026	Developing early warning capability of NTWCs for non-seismic and complex events	NTWCs/Secretariat
8.	NWIO as a platform for testing New/Emerging technologies for observations and forecasting	To implement the recommendations of the Task Team	Q1-Q4 2027	Development of methodology for new advancements	NTWCs



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THANK YOU