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1.b. Background
Overview of the IOTWMS

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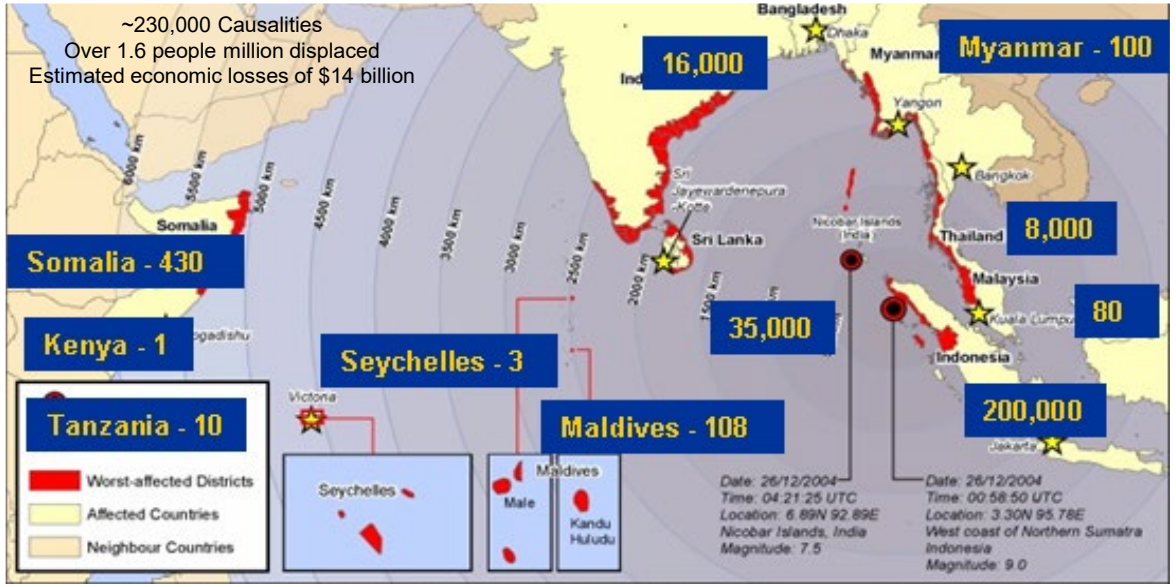
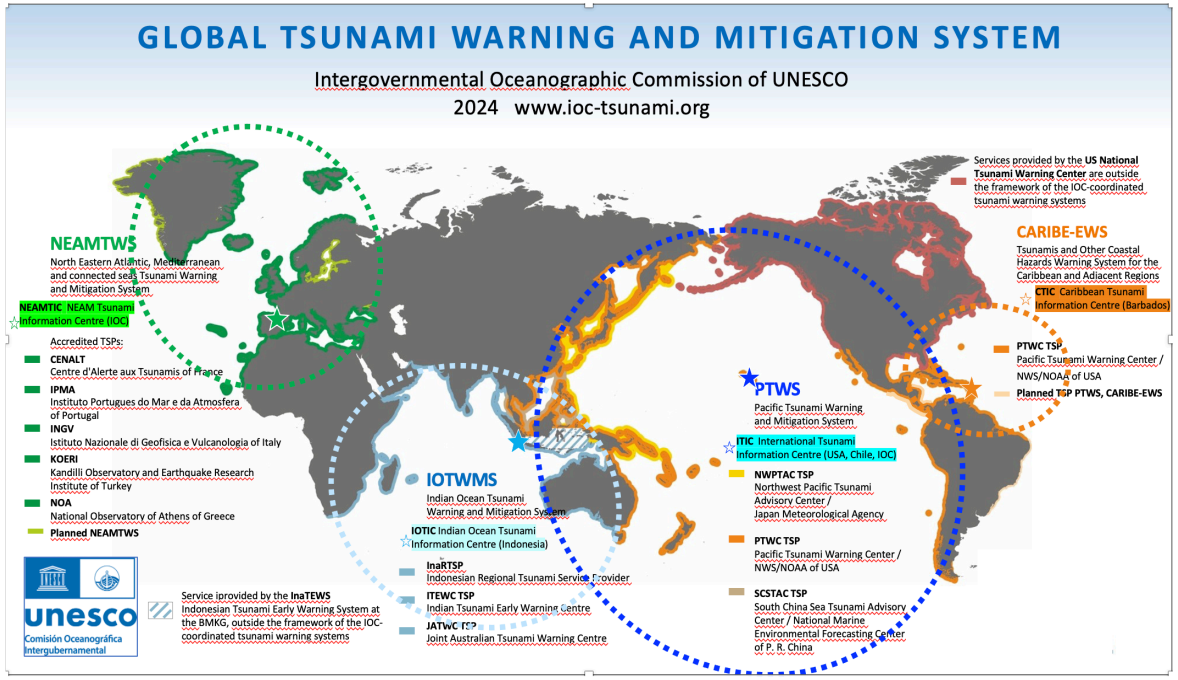
Pre-IOWAVE25 Workshop on Standard Operating Procedures for NTWCs and DMOs
Hybrid – August 2025

Global Tsunami Warning and Mitigation System



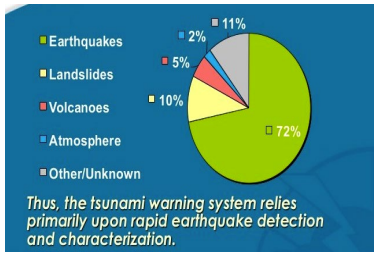


Great progress since 2004

- 4 Regional Systems coordinated by the IOC UNESCO - PTWS, IOTWMS, CARIBE EWS, NEAMTWS
- Operate as inter-operable “system-of-systems”
- Network of NTWC/TWFPs receiving tsunami forecast information from one/more TSPs
- Sovereign responsibility of NTWCs/TWFPs to provide warnings, watches, and advisories to their citizens
- Seismic & Sea Level Observing networks, models, computational, communication facilities, DSS and SOPs
- Tsunami Ready Recognition Programme
- Successfully monitored several events

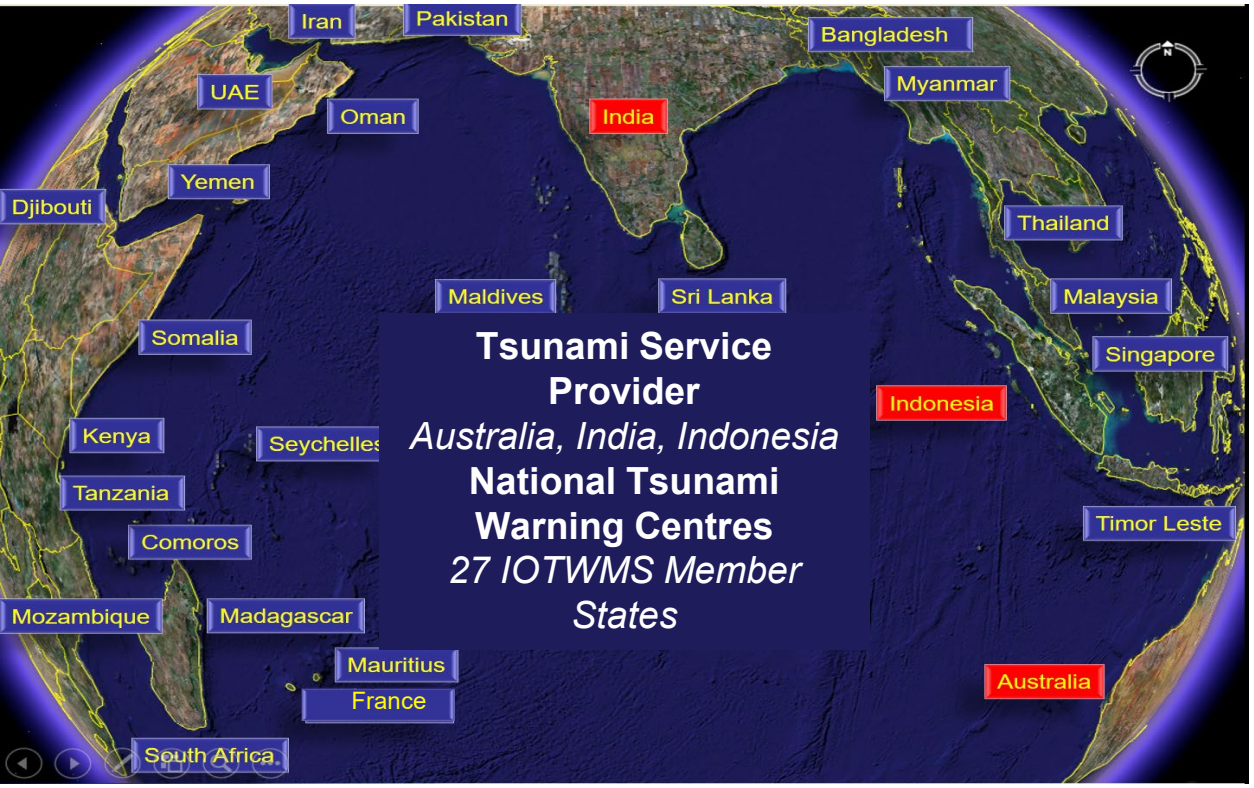
Several challenges evidenced from recent events

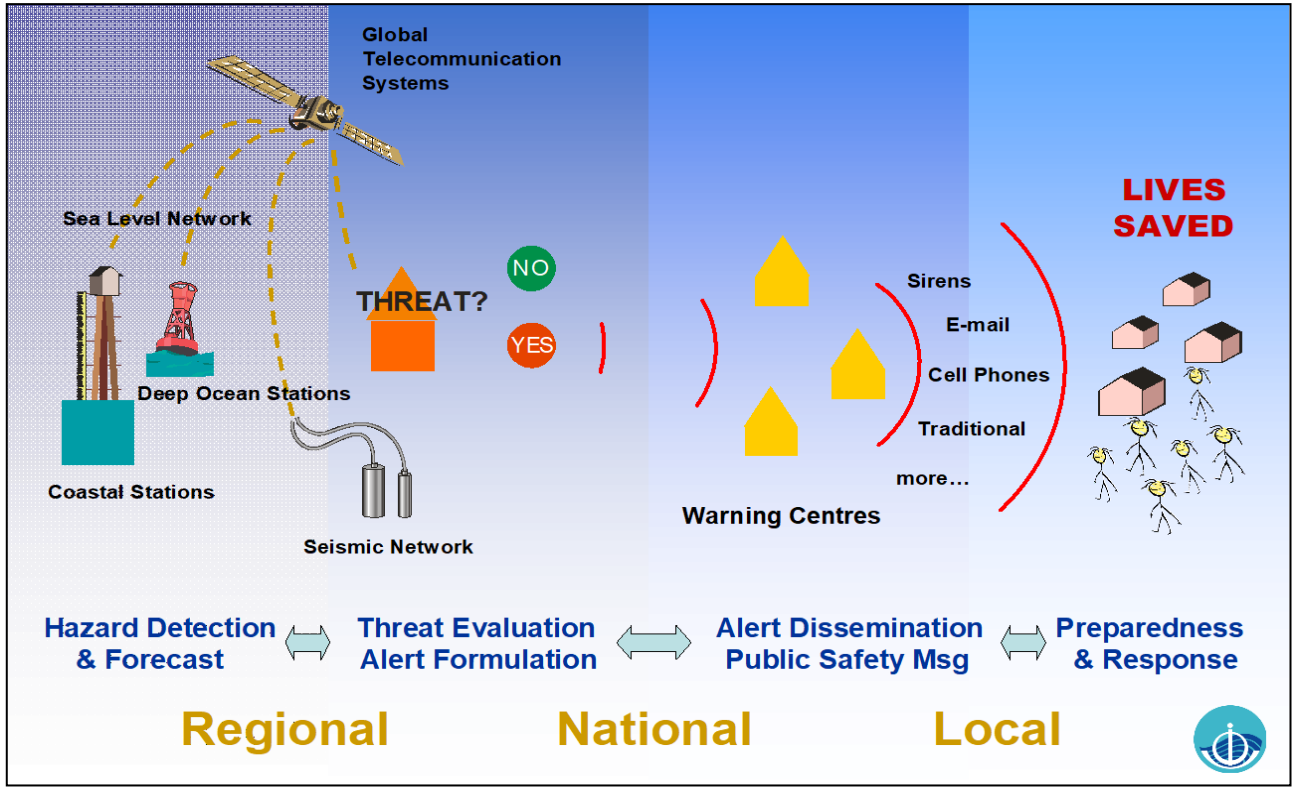
- Tsunami warning is race against time - Uncertainties in tsunami warning
- Gaps in Warning and Response capabilities, specially for non-seismic and near-field sources
- Gaps in SOPs and Early Warning Chains
- Gaps in preparedness & response



IOTWMS: The Key Elements

Risk Assessment and Reduction	Detection, Warning and Dissemination	Awareness and Response
Systematically collect data and undertake risk assessments	Develop hazard detection, monitoring and warning services Communicate threat information and early warnings	Build national and community response capabilities





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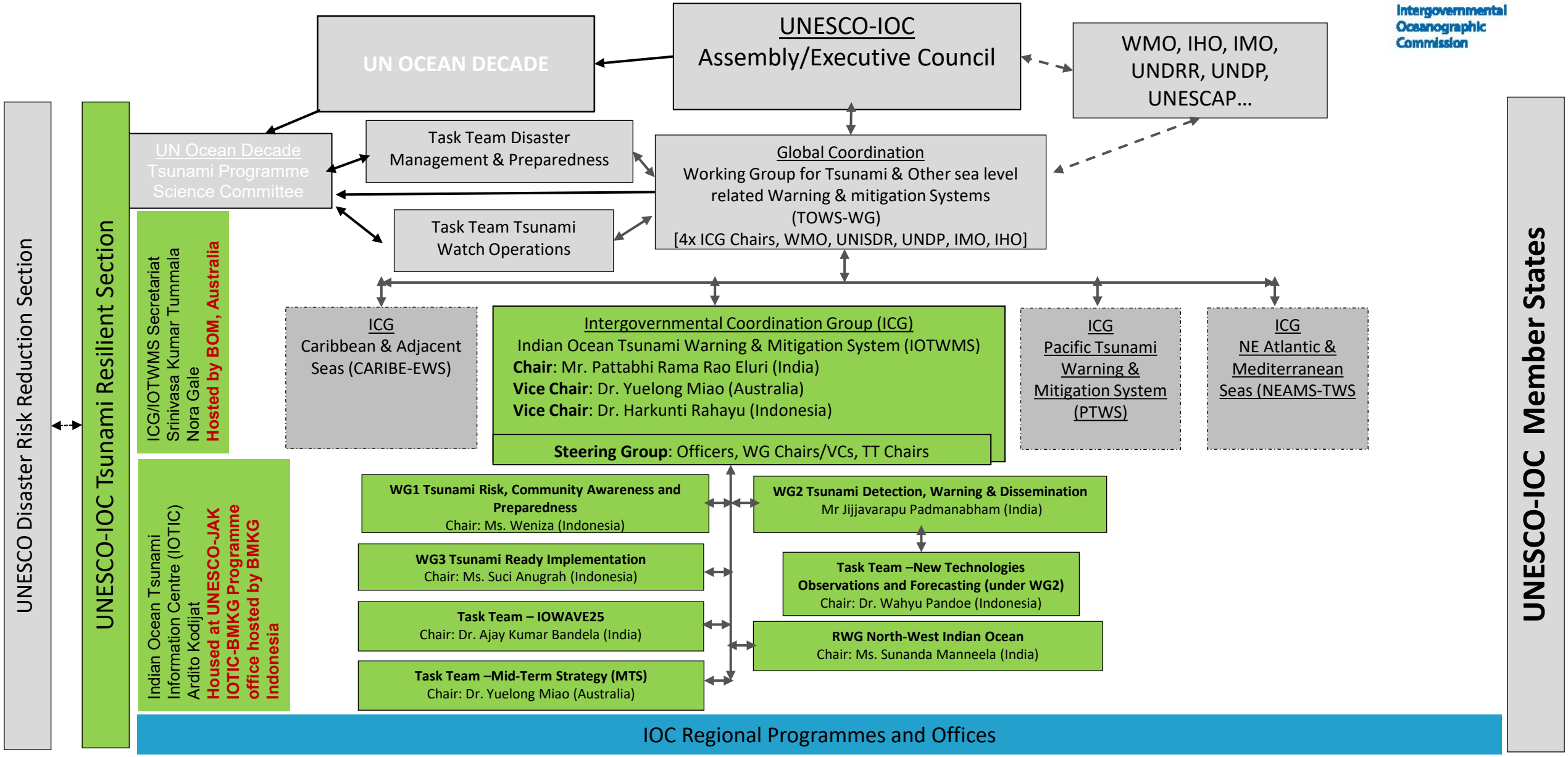
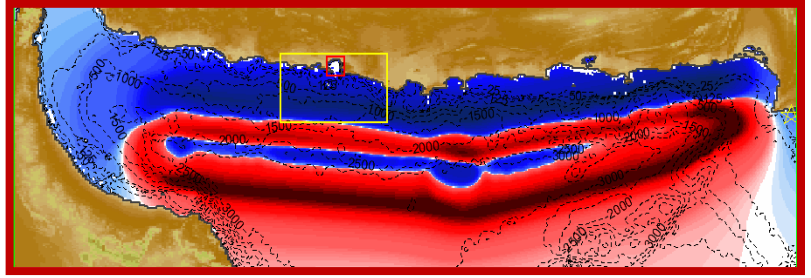
IOTWMS Governance



Risk Assessment and Reduction

The first step is to scientifically assess the tsunami hazard and potential risk

- Tools, Methods & Guidelines for Tsunami Risk Assessment published
- Indian Ocean Probabilistic Regional Tsunami Hazard Maps published
- Assessment and Awareness of Makran Tsunami Hazards
- Regional Workshops on Tsunami Risk Assessment and Modelling
- Enhancing Tsunami Risk Assessment and Management, Strengthening Policy Support and Developing Guidelines for Tsunami Exercises in Indian Ocean Countries
- PTHA - UNESCAP Makran & UKRI PC-TWIN Projects



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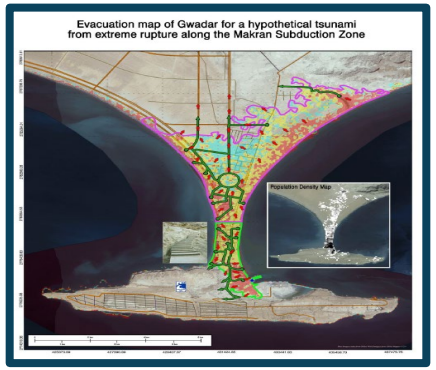
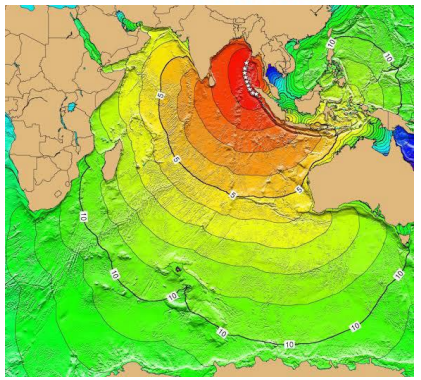
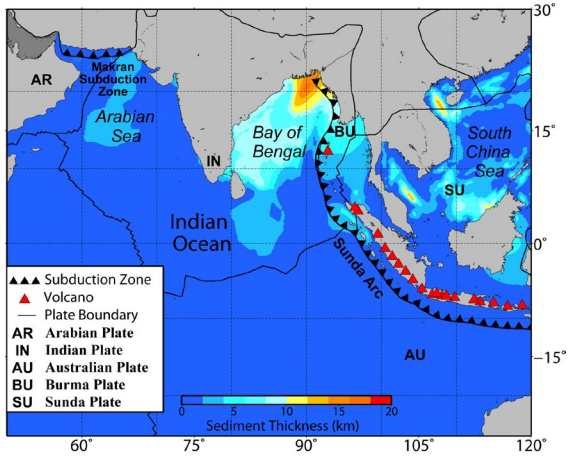
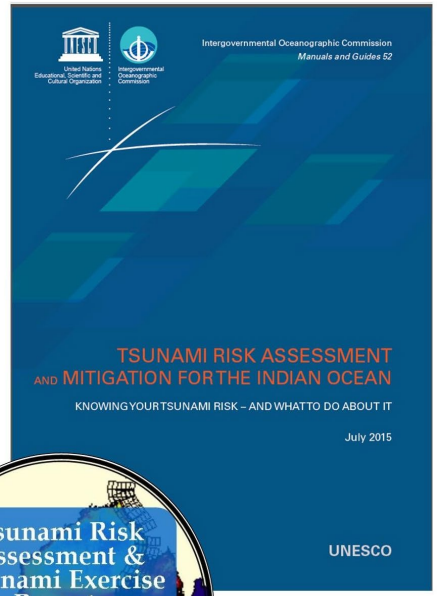
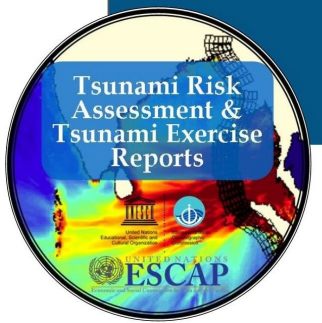
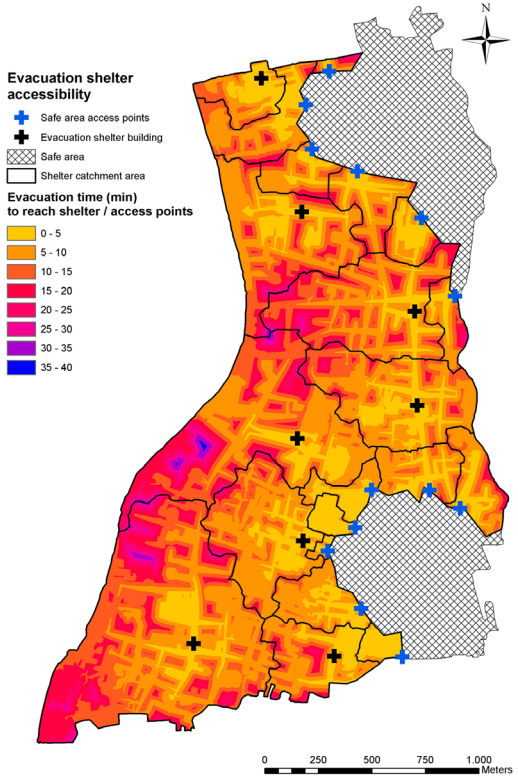






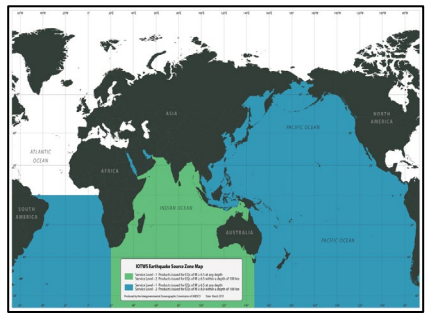


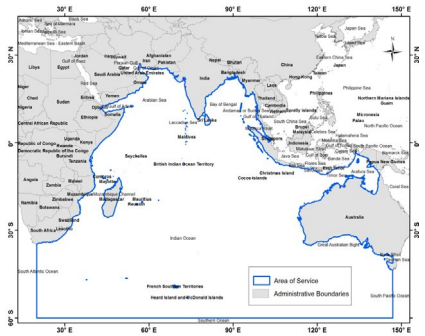


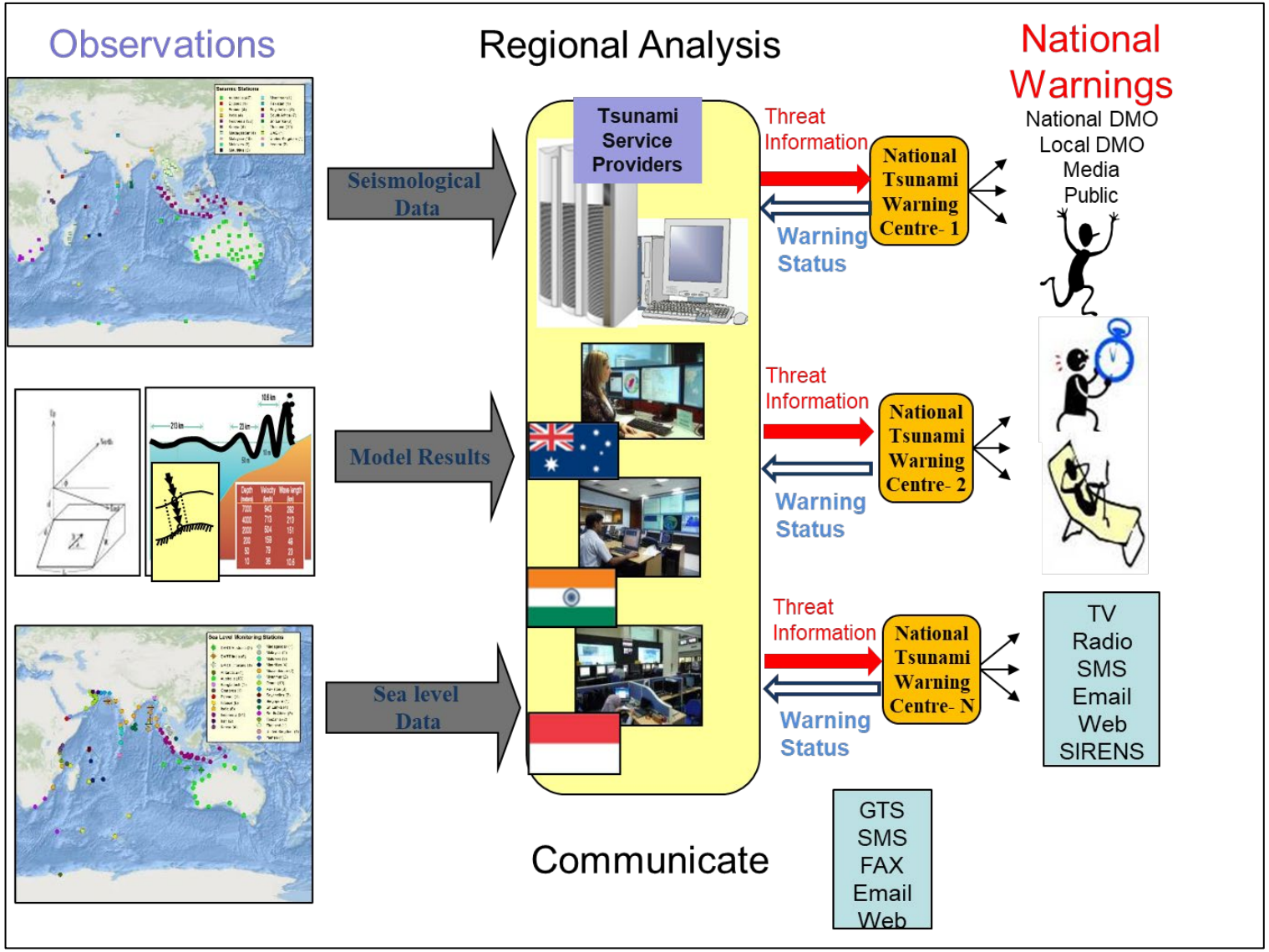


Detection, Warning and Dissemination

- Service Definition: AoS, Stations, Products, Thresholds, CFZs, Formats
- Tsunami Service Framework
  - 3 inter-operable Tsunami Service Providers (Australia, India, Indonesia)
  - Network of NTWCs, TNCs, TWFPs
- Expanded seismic and sea level monitoring networks
- Harmonised threat information by TSPs
- National warnings Sovereign responsibility of authorized national agencies
- Several Events handled - Yearly performance assessments against Key Performance Indicators
- 6-monthly communications test to identify and fix any issues
- Ongoing Work on Non-Seismic Tsunami SOPs & Maritime Products



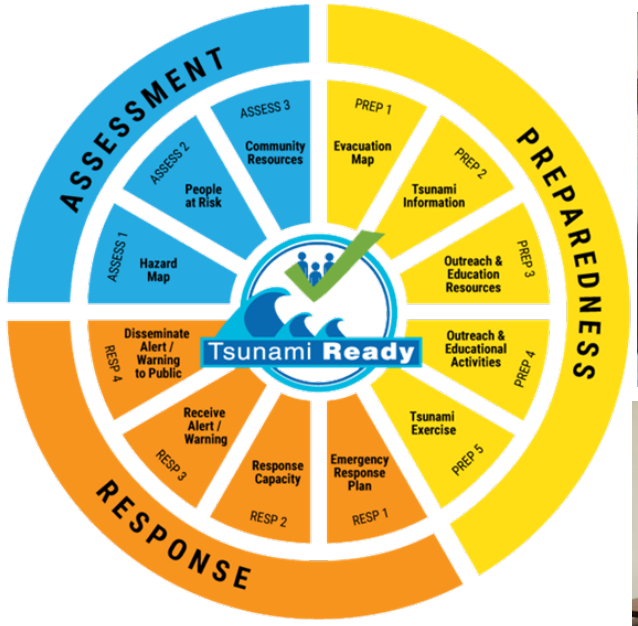


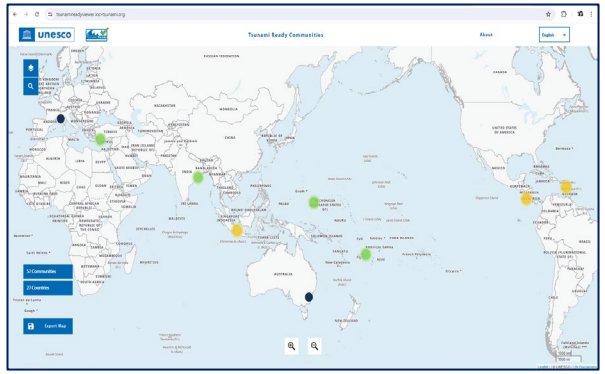


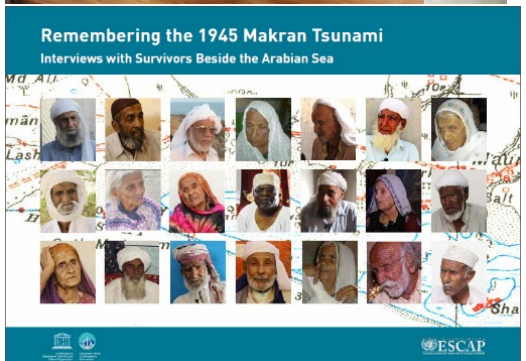
Awareness and Response

A good warning is not useful unless stakeholders and public are unaware how to respond

- Indian Ocean Tsunami Information Cente (IOTIC) and IOTIC BMKG Programme
- Indian Ocean-wide (IOWave) exercises held every two years
- UNESCO-IOC Tsunami Ready Recognition Programme (TTRP) – 48 Communities in India and Indonesia
- Education Material for NTWCs, emergency managers, communities, schools, tourism, etc.
- Capacity Building Programmes – TEMPP and SOPs for NTWC, DMO, staff and/or Media
- Documenting the impacts of past Tsunamis - Makran, Ambon, etc.
- 70th Anniversary of 1945 Makran Tsunami commemorative events
- 20th Anniversary of 2004 Indian Ocean (Aceh) Tsunami commemoration
- World Tsunami Awareness Day (WTAD) – 05 November

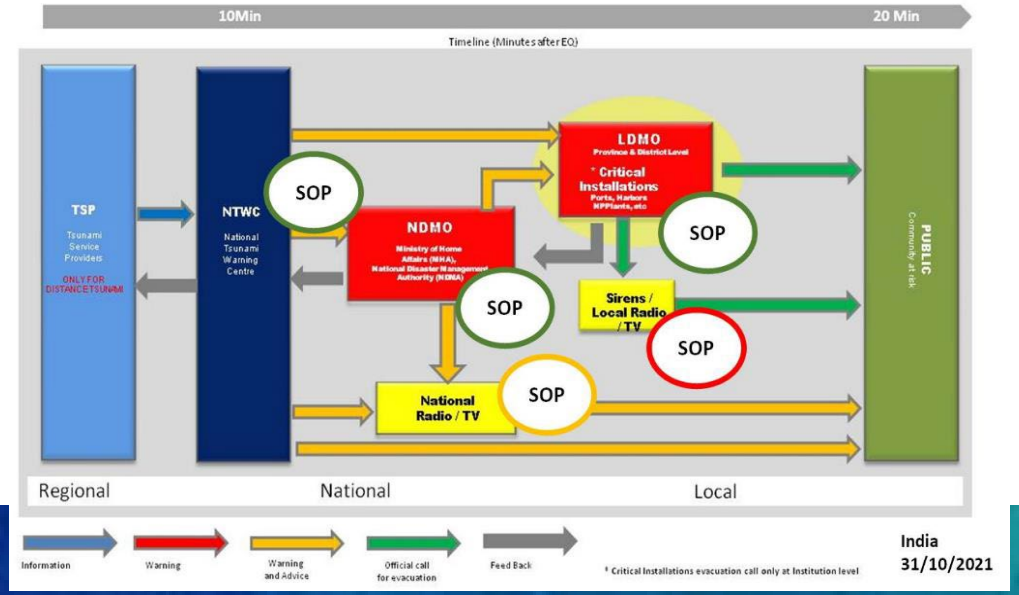






Early Warning Chains and SOPs

- Three training workshops in the western, eastern, and north-west Indian Ocean regions for the NTWCs and DMOs:
  - Western Indian Ocean Member States, 3-6 July 2023
  - Eastern Indian Ocean Member States, 10-13 July 2023
  - North-West Indian Ocean Member States, 7-8 August 2023
- Online regional workshops and in-person national workshops.
- Member States refine their tsunami SOPs and Early Warning Chains in the lead-up to Exercise IOWave23.
- Sensitized to the new TSP Australia products for non-seismic tsunami sources.



Tsunami Evacuation Maps, Plans and Procedures

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- Several TEMPP Trainings organised focusing on a) Tsunami Inundation Modelling, b) Tsunami Evacuation Maps, Plans and Procedures & c) the UNESCO-IOC Tsunami Ready Recognition Programme
  - 4 Regional trainings in India and Indonesia since 2017. Latest held at INCOIS, Hyderabad during 15 – 23 April 2025 with 35 Participants from 17 countries and 14 trainers from UNESCO-IOC, India, and Indonesia.
  - 1 Sub-regional training in Oman
  - 3 National trainings held in Maldives, Seychelles & Timor Leste

Timor Leste, July 2023

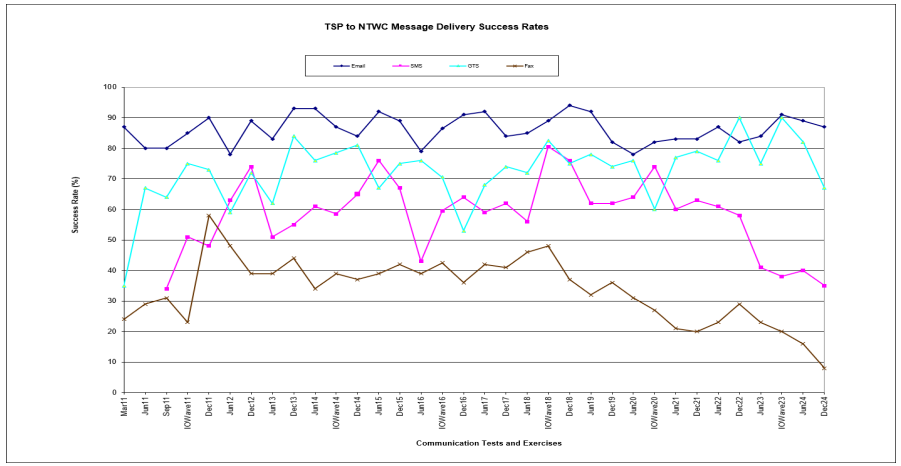
Oman, April 2024

Seychelles, November 2023

Maldives, August 2024

Indian Ocean Wave Exercises

Scenario	1. Andaman Trench	2. Makran Trench	3. Heard Island Volcano	4. Java Trench
Date	4 October 2023 (Wednesday)	11 October 2023 (Wednesday)	18 October 2023 (Wednesday)	25 October 2023 (Wednesday)
Time	04:00 UTC	06:00 UTC	06:00 UTC	02:00 UTC
Magnitude	~M9	~M9	n/a	~M9
Depth	10 km	10 km	n/a	10 km
Latitude	7.20N	24.80N	53.10S	10.40S
Longitude	92.90E	58.20E	73.52E	112.80E
Location	Off west coast of Nicobar Islands, India	North-West Indian Ocean	Kerguelen Islands Region, Southern Ocean	South of Java, Indonesia



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IOWave 23

- 4 Scenarios including 1 Non Seismic
- 20 countries
- Community evacuations in 8 Member States (~45,000 people)
- Tsunami Ready indicators tested in 7 Member States
- New non-seismic products produced by TSP Australia
- IOWave 23 Lessons Learnt Webinar, 12-13 Dec 2023

IOWave25

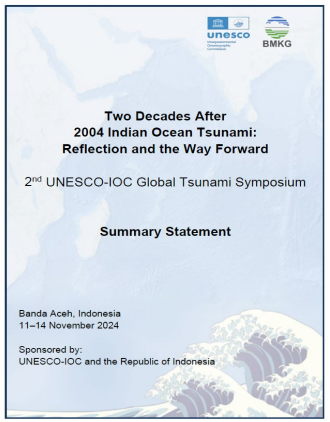
- September 25 to November 05 2025; 4 Scenarios
- 1 Non-seismic event and outside of working hours
- Non-seismic and NAVAREA products
- Encourage the Member States to ensure the participation of TR recognised communities
- Pre-IOWave SOP & Post-IOWave25 Lessons Learnt Workshops

IOTWMS Capacity Assessment of Tsunami Preparedness Global Tsunami Symposium

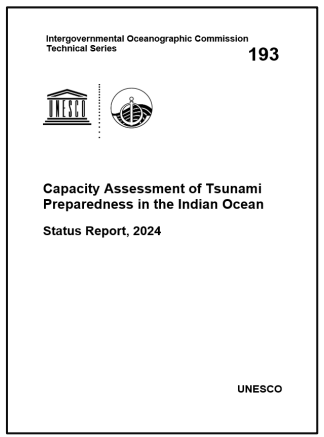
IOTWMS Capacity Assessment 2024: Significant progress since 2004. In the last 5 years there has been considerable progress in downstream community awareness and preparedness initiatives while the upstream warning and detection system has plateaued

Banda Aceh Statement: Global Tsunami Warning and Mitigation: Building Sustainability for The next decade through Transformation and Innovation. UNESCO and its partners call on States and civil society to drastically step up their investments and efforts to achieve 100% of Tsunami Ready Communities across the world by 2030.

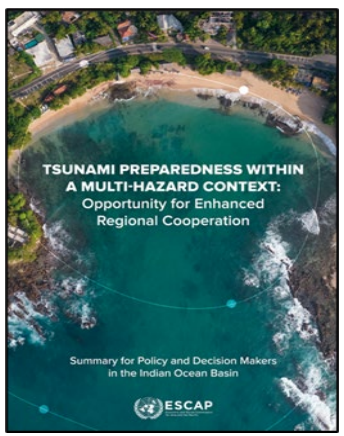
GTS Banda Aceh
32 Countries
682 in-person
170 online
1200 YouTube



IOTWMS CATP
22 Countries



UNESCAP Summary
for Policy Makers



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Governance, Policies, Plans & Guidelines

- Globally, 4 IOC coordinated ICGs established. Strong collaboration with global and regional partners
- 91% of reporting IO countries have national tsunami policies, but only 50 % have community-level tsunami plans
- Secure sustainable funding; Strengthen regional and subnational partnerships; Integration of tsunami policies and plans into multi-hazard DRR frameworks

Tsunami Risk Assessment & Reduction

- Major advances in seismic modeling, probabilistic assessments, and risk mapping.
- 96% of reporting IO countries conducted hazard assessments but at varying spatial scales.
- Build capacity for PTHA, local level risk mapping & improve data availability (historical events, bathymetry)

Tsunami Detection, Warning & Dissemination

- Seismic and sea-level monitoring and modeling improved,
- All IO countries can assess tsunami threats. 91% operate 24/7 NTWCs with SOPs and less than 50% have robust dissemination systems
- Build capabilities for non-seismic tsunamis; implement GNSS and SMART cables; real-time data sharing, last-mile communication, NTWC training

Tsunami Awareness, Preparedness & Response

- Awareness improved through WTAD, 96% of reporting IO countries participated in IOWave, SOP & TEMPP Trainings
- Only 2 IO Countries implemented TRRP, many communities lack local SOPs and signages
- Expand training on evacuation planning, TRRP implementation, Drills and community-based risk education.

ICG Key Decisions & Projects

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14th Session of ICG/IOTWMS
Banten, Indonesia (17-19 Nov 2024)

- Appreciated the contributions of stakeholders
- Continued existing Working Groups and established new Task Teams on IOWave25, New/Emerging Technologies and MTS
- Approved IOWave23 and 2024 Capacity Assessment reports
- Continue Capacity Development related to SOPs, TEMPP, TRRP and on-the-job training
- Conduct IOWave25
- Design optimal sea level and seismic networks
- Extend the TSP services to tsunamis generated by non-seismic and complex sources
- Continue expansion of TRRP
- Prioritise the needs of SIDS, LDCs, Africa and recommendations of governing bodies and capacity assessment results in workplans.

19th Meeting of the Steering Group
Jakarta, Indonesia (17-19 Jun 2025)

- Approved the 2025-26 WG/TT work plans and activities.
- Progressed work on the medium-term strategy.
- Define methodology for optimal monitoring networks.
- Organise regional webinars on TGV and NAVAREA.
- Conduct Exercise IOWave25 and pre/post-exercise workshops
- Implement TSP Bulletins for NAVAREAS
- Finalise TSP SOPs for non-seismic tsunamis and update the SDD and NTWC User Guide
- Progress TRRP equivalency, assessment tool for downstream warning, and tsunami early warning chain work process.
- Explore new technologies for tsunami detection
- Appreciated the contributions of Ardito M Kodijat and requests UNESCO and IOC to prioritise recruitment

ODTP Endorsed Initiatives

- Tsunami Ready Odisha
- People Centered Tsunami Early Warning for India (PCTWIN)
- Tsunami Potential Coastal Area of Indonesia Mountain Anak Krakata, Banten, Sunda Strait
- INCOIS Submarine Cable Multi-Parameter Observatory

New Project Proposals

- Flanders UNESCO Science Trust Fund project on Strengthening Community Resilience to ocean hazards through implementation of TRRP in SIDS and Africa (Madagascar & Seychelles)
- Phase 3 UNESCAP Trust Fund Project on Strengthening Tsunami Warning in the North-West Indian Ocean through Regional Cooperation (India, Iran, Maldives, Pakistan, Sri Lanka + Oman, UAE)

2023-2025 Key Activities: Snapshot of Member State Engagement

IOTWMS Member States

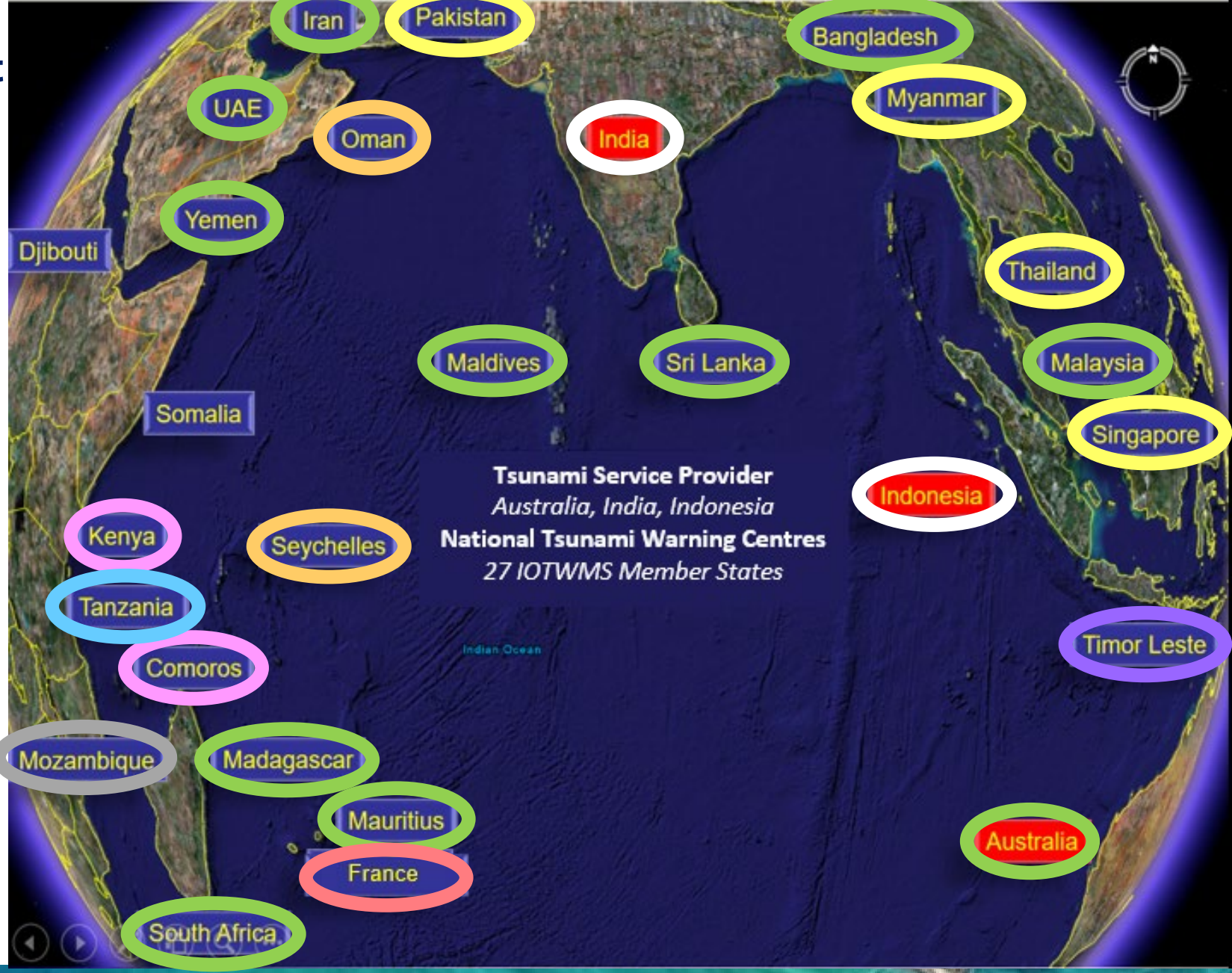
- Exercise IOWave23 (20)
- Standard Operating Procedure Training (17)
- TEMPP Training (17)
- Capacity Assessment of Tsunami Preparedness (22)
- TRRP Implementation (2)

LEGEND

- All above activities
- IOWave, SOPs, TEMPP, CATP
- IOWave, TEMPP, CATP
- IOWave, SOPs, CATP
- IOWave, CATP
- TEMPP, SOPs
- TEMPP, CATP
- IOWave
- CATP

Regional Collaborations

- IOCAFRICA (10)
- SIDS (6)
- Other ICGs (3)
- IOGOOS (14)
- IOCINDIO (9)
- WMO PTC (11)



Roadmap 2025-2026

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- Launch of UNESCAP Phase 2c Makran Project (November 2023)
- Post-IOWave23 Webinar (December 2023)

SOP Training Workshops (July-Aug 2023)

NWIO Workshops on inundation modelling & evacuation mapping (April 2024)

- Pre-IOWave25 Workshop
- TGV + NAVAREA Webinar
- Post-IOWave25 Webinar

- TEMPP Workshop, Hyderabad, India
- Global TGV Webinars

- SOP Workshop
- Hazard Assessment Training
- TRRP Facilitators & Community Training

2027 & beyond

2026

2025

2024

2023

Capacity Development

Warning System & Governance

- IOTWMS Intersessional Meetings
- ICG/IOTWMS-XV, Muscat, Oman

- ODTP Conference & ITS2025
- IIOSC Conference

- Exercise IOWave 2025

- IOTWMS Communications Test (June 2025)
- TSP testing of NAVAREA products
- Steering Group Meeting (June 2025)
- Intersessional Meetings

- IOR-DCC & Steering Group Meetings (February 2024)
- IOTWMS Communications Test (June 2024)
- Intersessional Working Group Meetings (July & August 2024)

- Exercise IOWave 2023
- TSP Australia commenced issuing products for Tsunamis Generated by Volcanos (TVGs)

- Indian Ocean Capacity Assessment of Tsunami Preparedness
- Global Tsunami Symposium, Banda Aceh (November 2024)
- ICG/IOTWMS-XIV, Banten, Indonesia
- 48 Tsunami Ready Communities: India (26) & Indonesia (22)

Acknowledgement of Key Contributions

- **Australia** – IOTWMS Secretariat, TSP
- **India** – TEMPP, TSP, PCTWIN
- **Indonesia** – IOTIC BMKG, TSP, GTS2, ICG-XIV
- **Oman** – ICG-XV hosting offer
- **UNESCAP TTF** – NWIO Makran Project, CATP
- **Uni of Huddersfield, Italy, Switzerland, ADB** – CATP
- **Uni College London** - PCTWIN
- **FUST** - TRRP in SIDS and Africa
- **IOTWMS Member States**
- **Tsunami Ready Communities**
- **CTBTO, UNDP, UNDRR, WMO, other partners**

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THANK YOU

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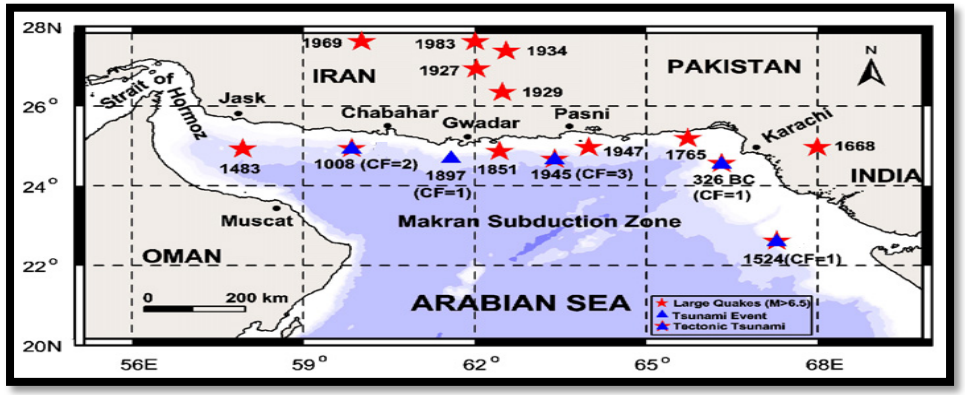
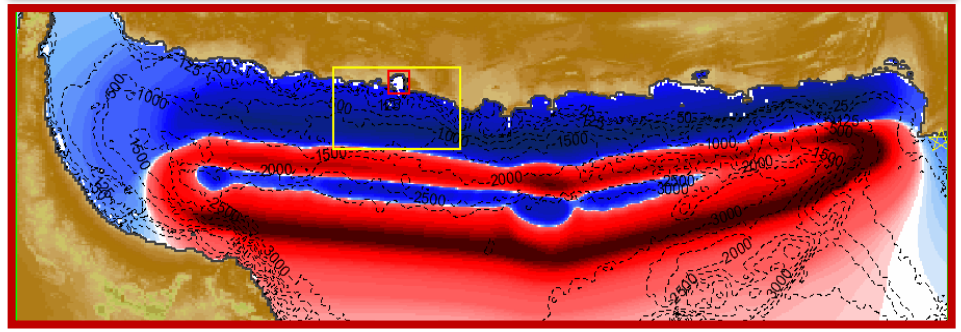
Strengthening tsunami warning in the North-West Indian Ocean through regional cooperation

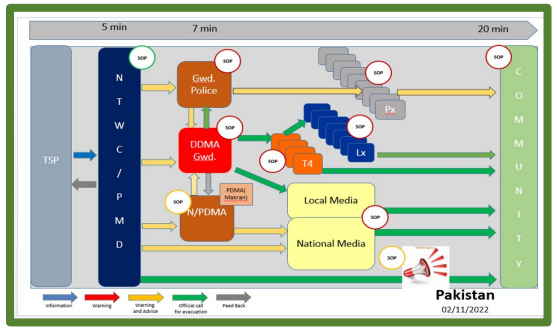
Funded by the UNESCAP Multi-Donor Trust Fund, the project resulted in a unified Makran assessment, updated national tsunami warning chains, translated guidelines, and development of inundation & evacuation maps in North-West Indian Ocean Countries (India, Iran, Pakistan, Oman, UAE)

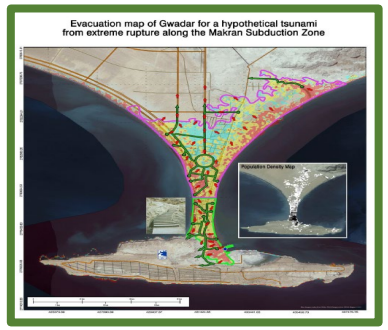
Taking a Programmatic Approach

Regional	**Better understand near-field tsunami risk in the Makran region**	Phase 1 Completed 2019-21
National	**Build national tsunami warning chains**	
National / Local	**Assess inundation and evacuation mapping capability**	Phase 2ab Completed 2021-23
Local	**Train best-practice inundation and evacuation mapping**	Phase 2c Completed 2023-25
Local	**Prepare at-risk communities to be Tsunami Ready across all indicators**	Phase 3 Submitted for funding 2025-26









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TRUST FUND FOR TSUNAMI, DISASTER AND CLIMATE PREPAREDNESS

ESCAP
Economic and Social Commission for Asia and the Pacific