Recommendations to IOTWMS in support of EW4ALL

from the 2024 IOTWMS Capacity Assessment Tsunami Preparedness

By Yuelong Miao
Vic Chair, Intergovernmental Coordination Group
Indian Ocean Tsunami Warning & Mitigation System
(ICG/IOTWMS)

Capacity Assessment Validation Workshop
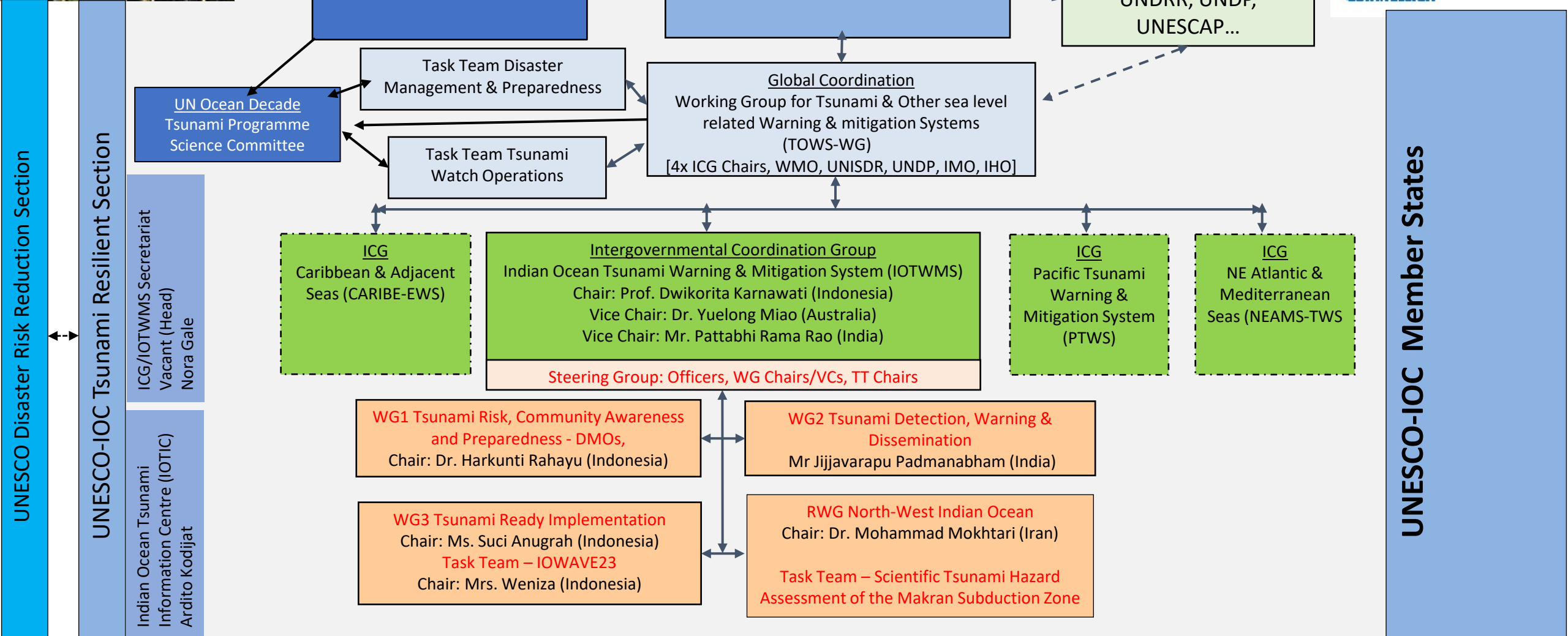Bangkok, Thailand, 4-6 September 2024

Tsunami Warning & Mitigation Global Governance

UNESCO-IOC Assembly/Executive Council

UN OCEAN DECADE

WMO, IHO, IMO, UNDRR, UNDP, UNESCAP...

Task Team Disaster Management & Preparedness

UN Ocean Decade Tsunami Programme Science Committee

Global Coordination
Working Group for Tsunami & Other sea level related Warning & mitigation Systems (TOWS-WG)
[4x ICG Chairs, WMO, UNISDR, UNDP, IMO, IHO]

Task Team Tsunami Watch Operations

UNESCO Disaster Risk Reduction Section

UNESCO-IOC Tsunami Resilient Section

ICG/IOTWMS Secretariat Vacant (Head) Nora Gale

Indian Ocean Tsunami Information Centre (IOTIC) Ardito Kodijat

UNESCO-IOC Member States

ICG
Caribbean & Adjacent Seas (CARIBE-EWS)

Intergovernmental Coordination Group
Indian Ocean Tsunami Warning & Mitigation System (IOTWMS)
Chair: Prof. Dwikorita Karnawati (Indonesia)
Vice Chair: Dr. Yuelong Miao (Australia)
Vice Chair: Mr. Pattabhi Rama Rao (India)

ICG
Pacific Tsunami Warning & Mitigation System (PTWS)

ICG
NE Atlantic & Mediterranean Seas (NEAMS-TWS

Steering Group: Officers, WG Chairs/VCs, TT Chairs

WG1 Tsunami Risk, Community Awareness and Preparedness - DMOs,
Chair: Dr. Harkunti Rahayu (Indonesia)

WG2 Tsunami Detection, Warning & Dissemination
Mr Jijjavarapu Padmanabham (India)

WG3 Tsunami Ready Implementation
Chair: Ms. Suci Anugrah (Indonesia)
Task Team – IOWAVE23
Chair: Mrs. Weniza (Indonesia)

RWG North-West Indian Ocean
Chair: Dr. Mohammad Mokhtari (Iran)

Task Team – Scientific Tsunami Hazard Assessment of the Makran Subduction Zone

IOC Regional Programmes and Offices

UNESCO Intergovernmental Oceanographic Commission

ICG/IOTWMS Work Programmes

Working groups and task teams work across four pillars defined by EW4ALL

Pillar 1 WG 1
Disaster risk knowledge

Systematically collect data and undertake risk assessments

- Are the hazards and the vulnerabilities well known by the communities?
- What are the patterns and trends in these factors?
- Are risk maps and data widely available?

Pillar 2 WG 2
Detection, observations, monitoring, analysis and forecasting of hazards

Develop hazard monitoring and early warning services

- Are the right parameters being monitored?
- Is there a sound scientific basis for making forecasts?
- Can accurate and timely warnings be generated?

Pillar 4 WG 1 + 3
Preparedness and response capabilities

Build national and community response capabilities

- Are response plans up to date and tested?
- Are local capacities and knowledge made use of?
- Are people preapred and ready to react to warnings?

Pillar 3 WG 2
Warning dissemination and communication

Communicate risk information and early warnings

- Do warnings reach all of those at risk?
- Are the risks and warnings understood?
- Is the warning information clear and usable?
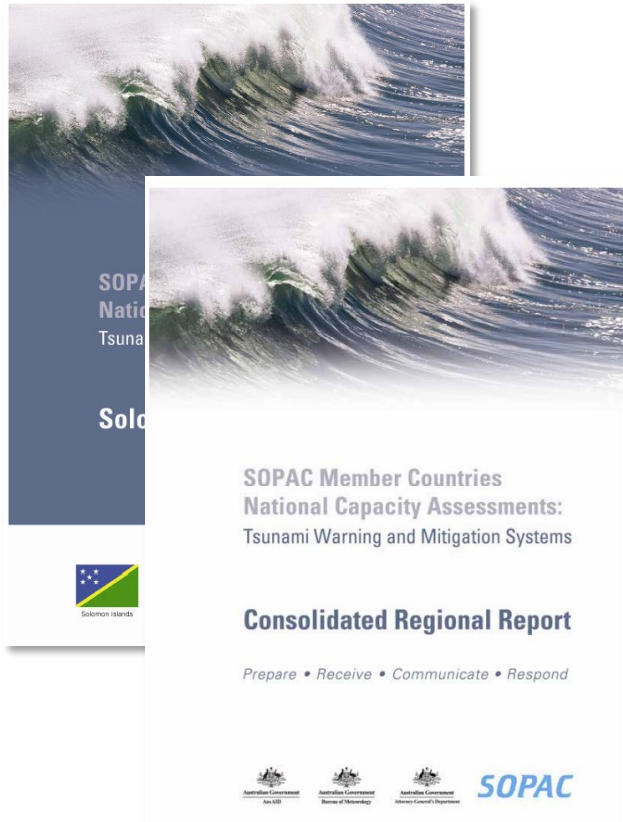
27 Member States (24 of which active)

Capacity Assessment Tsunami Preparedness Indian & Pacific Oceans Project
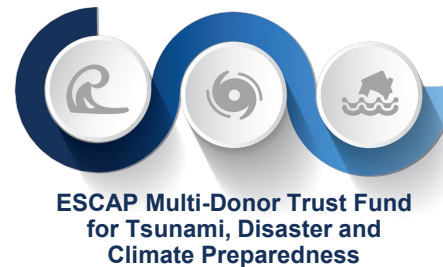
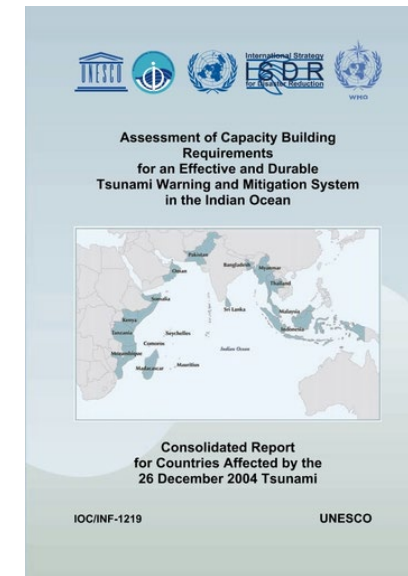# Previous Comprehensive Assessments

PTWS

National capacity assessments for 14 Pacific countries and consolidated regional report in 2009/2010 funded by Australia

ESCAP

Unmet needs survey for the region conducted in 2008 and 2011

IOTWMS

- Full capacity assessments in 2005 and 2018 and commitment to undertake 2024
- Capacity assessment framework and tools already developed

OBJECTIVES

1. To evaluate the existing technical capacity of the UNESCO-IOC Indian Ocean Tsunami Warning and Mitigation System (IOTWMS) and Pacific Tsunami Warning & Mitigation System (PTWS) and highlight the progress made since 2004 Indian Ocean Tsunami and subsequent assessments.

2. To identify specific gaps and capacity development requirements at regional and national levels for strengthening the technical and policy aspects of the tsunami warning and mitigation systems in the region

3. To reinvigorate political commitment and provide recommendations for investments in tsunami preparedness, aiming to address the identified gaps in Asia and the Pacific through regional and subregional cooperation.

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

Tsunami **Ready**

SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION 2015-2030

SUSTAINABLE DEVELOPMENT GOALS

Capacity assessment of tsunami preparedness

2024 OUTPUTS - IOTWMS

- 1.A_ Member States Survey Analysis for IOTWMS (IOC)

- 1.B_ IOTWMS assessment summary and comparative analysis (IOC)

- 3.A_ Tsunami preparedness recommendations for ASEAN policymakers (UNESCAP)

- 3.B_ Tsunami preparedness recommendations for SAARC policymakers (UNESCAP)

2025 OUTPUTS - PTWS

- 2.A_ Member State Survey Analysis for PTWS (IOC)

- 2.B_ PTWS assessment summary and comparative analysis (IOC)

- 3.C_ Tsunami preparedness recommendations for PIF policymakers (UNESCAP)

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

Tsunami **Ready**

SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION **2015-2030**

SUSTAINABLE DEVELOPMENT G☉ALS

Capacity assessment input

1. Member States Survey:
   a) The official Tsunami National Contacts (TNCs) of the UNESCO-IOC ICG/IOTWMS were requested to coordinate the completion of an online survey (based on 2018 survey to enable comparisons), in consultation with other national stakeholders involved in end-to-end tsunami early warning and mitigation within the country.
   b) 22/24 Member States completed and submitted the survey in May/June 2024.
   c) The survey data was analysed by the University of Huddersfield

2. National tsunami warning chains review:
   a) As part of three SOP training workshops for all Member States in 2023, national tsunami warning chains and associated SOPs were forensically reviewed.
   b) A report was prepared on the status of national tsunami warnings and SOPs, which is used for the current capacity assessment

3. ICG/IOTWMS Work Programmes:
   Capacity gaps have been identified by the WGs and TTs of the ICG/IOTWMS and reflect Member State needs

9

Process and Recommendations

1. A team of experts from the ICG/IOTWMS, including the chairs of the Working Groups and Task Team associated with pillars of the warning & mitigation systems, met in Bangkok 4-6 September 2024 to review the analysis of the survey data and the identified gaps, along with input from the national warning chains review and other capacity gaps identified by the WGs and TT of the ICG/IOTWMS.
2. Draft recommendations to address the identified gaps have been produced during the workshop for further review by the full members of the Working Groups and Task Teams
3. The draft recommendations will then be reviewed by the Steering Group of the ICG/IOTWMS, Chaired by the Chair of the ICG/IOTWMS. The Steering Group will advise the Chair of the Steering Group whether to endorse the recommendations.
4. A full report will then be produced on the outcomes of the capacity assessment, including an Executive Summary, the results from which will be tabled at the upcoming 2nd Global Tsunami Symposium and 20th Commemoration of the Indian Ocean Tsunami of 2024 in November 2024.
5. The full report will also be reviewed in detailed at the 14th Session of the ICG/IOTWMS in November in Jakarta, Indonesia.
6. UN ESCAP is also producing a summary of the full report for policy- and decision-makers to facilitate the uptake of the outcomes of the assessment for action and hopefully funding support from key donors.

10

Tsunami Hazard and Risk Assessment

#	Recommendation	Supports	Target	Funding required (Yes or No)
THRA.1	**Update hazard assessment for Indian Ocean.** Utilise international expertise and collaboration to provide an updated best-practice tsunami hazard assessment in a multi-hazard framework across the entire Indian Ocean. Example PTHA used in NWIO	IOC Tsunami Prog. UN ODTP EW4ALL UNDRR	ICG	Y
THRA.2	Identify national authorities for risk assessment	IOC Tsunami Prog. EW4ALL UNDRR	Member States	N

11

Tsunami Hazard and Risk Assessment

#	Recommendation	Supports	Target	Funding required (Yes or No)
THRA.3	**Collect vulnerability and exposure data at the village and community levels**	IOC Tsunami Prog. UN ODTP EW4ALL UNDRR	Targeted Member States	Y
THRA.4	**Country-level training on inundation mapping.** Provide national training in inundation mapping for pilot areas (e.g. NWIO project funded by UN ESCAP)	IOC Tsunami Prog. EW4ALL MHEWS	ICG, Member States	Y

12

Tsunami Detection, Warning, and Dissemination

#	Recommendation	Supports	Target	Funding required (Yes or No)
TDWD.1	Design optimal observing networks	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	ICG	N
TDWD.2	Sustain, utilise, and expand networks	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	Member States	National commitment
TDWD.3	**Adopt new observing technologies in warnings.** Trial and adopt new technologies (such as SMART cables, GNSS network) to implement optimal seismic and sea level observing systems to quantifiably improve timeliness and accuracy of tsunami warnings	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	Member States	Y

13

Tsunami Detection, Warning, and Dissemination

#	Recommendation	Supports	Target	Funding required (Yes or No)
TDWD.4	Highlight adverse impact when data not shared	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	ICG	N
TDWD.5	**Share data.** Exchange all data required for tsunami detection, warning, and monitoring in real-time data for access by all National Tsunami Warning Centres (NTWCs) and regional Tsunami Service Providers (TSPs) to improve timeliness and accuracy of tsunami detection and warning.	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	Member States	National commitment

14

Tsunami Detection, Warning, and Dissemination

#	Recommendation	Supports	Target	Funding required (Yes or No)
TDWD.6	National Tsunami Warning Centres (NTWCs) to be fully effective must operate 24/7	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	Member States not yet 24/7	National commitment
TDWD.7	**Provide training on using observations for threat analysis.** Training for NTWCs in analysing and utilising real-time seismic and sea-level data to develop capacity to do own threat analysis	IOC Tsunami Prog. EW4ALL MHEWS	Member States in need	Y
TDWD.8	**Engage sea level network operators.** Establish collaboration channels and training for sea level network operators to create awareness on needs for tsunami detection and warning to encourage expansion and sustainability of existing networks	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	ICG Member States	N

15

Tsunami Detection, Warning, and Dissemination

#	Recommendation	Supports	Target	Funding required (Yes or No)
TDWD.9	Develop capabilities & SOPs for detection, warning, and monitoring of tsunamis generated by non-seismic and complex sources (e.g. IOC M&G 183)	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	Member States	National commitment
TDWD.10	**Develop guidelines on using artificial intelligence and machine learning for warning improvement.** To help integrate and analyse data from multiple sources to significantly enhance the accuracy of tsunami models and improve warning decision-making processes by forecasting potential tsunami impacts more effectively.	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	ICG	N

Tsunami Detection, Warning, and Dissemination

#	Recommendation	Supports	Target	Funding required (Yes or No)
TDWD.11	Develop tsunami warnings in a multi-hazard context	IOC Tsunami Prog. EW4ALL MHEWS	Member States	N
TDWD.12	Use warning chain graphics to update SOPs	IOC Tsunami Prog. EW4ALL MHEWS	ICG, Member States	N

Tsunami Detection, Warning, and Dissemination

#	Recommendation	Supports	Target	Funding required (Yes or No)
TDWD.13	Targeted regional training of SOPs	IOC Tsunami Prog. EW4ALL MHEWS	ICG	N
TDWD.14	Share SOPs	IOC Tsunami Prog. EW4ALL MHEWS	ICG, Member States	N

Tsunami Detection, Warning, and Dissemination

#	Recommendation	Supports	Target	Funding required (Yes or No)
TDWD.15	**SOPs training for seamless inter-agency information flow.** Training to improve SOPs at the interface between upstream and downstream warning processes, including the operation of a 24/7 Emergency Operations Centre (EOC), receiving information from the NTWC, communication with local government and media arrangements, response decision making, and call for evacuation SOPs.	IOC Tsunami Prog. EW4ALL MHEWS	ICG	Y

Tsunami Detection, Warning, and Dissemination

#	Recommendation	Supports	Target	Funding required (Yes or No)
TDWD.16	**Review warning dissemination and communication technologies.** Continuous review of existing (internet, GTS, SMS, satellite, radio, fax, etc) and implementation of new (social media, cell broadcast, etc) warning dissemination and operational staff communication technologies to ensure robust and timely dissemination of warnings and communications between operational staff.	IOC Tsunami Prog. EW4ALL MHEWS ITU WMO	ICG, TSPs, Member States	N
TDWD.17	**Common Alerting Protocol (CAP) training**	IOC Tsunami Prog. EW4ALL MHEWS ITU WMO	ICG, TSPs, Member States	Y

Tsunami Public Awareness, Preparedness , & Response

#	Recommendation	Supports	Target	Funding required (Yes or No)
TPAPR.1	**Training on multi-agency & cross-cutting development of national policies, action plans, guidelines, and evacuation maps.** Provide training as a priority in development of national policies, action plans, guidelines, and evacuation maps for pilot areas, engaging national authorities and stakeholders such as DMOs, research institutions, communities across national, local and community levels (e.g. NWIO project funded by UN ESCAP)	IOC Tsunami Prog. EW4ALL MHEWS	ICG, Member States	Y

21

Tsunami Public Awareness, Preparedness , & Response

#	Recommendation	Supports	Target	Funding required (Yes or No)
TPAPR.2	**Regional training workshop on vertical evacuation**. Provide regional training on best practices in different types of vertical evacuation infrastructure.	IOC Tsunami Prog. EW4ALL MHEWS	ICG, Member States	Y
TPAPR.3	**Expert support in designing vertical evacuation infrastructure.** Engage professional societies and experts in national activities to advise best practices in different types of vertical evacuation infrastructure.	IOC Tsunami Prog. EW4ALL MHEWS	Member States	Y

22

Tsunami Public Awareness, Preparedness , & Response

#	Recommendation	Supports	Target	Funding required (Yes or No)
TPAPR.4	**Share national Tsunami Signages.** Share examples of national Tsunami Signages, including examples of best practice, taking into consideration recommendations from the TOWS-WG TTDMP.	IOC Tsunami Prog. UN ODTP EW4ALL	ICG, Member States	N
TPAPR.5	**Make IEC tsunami awareness materials widely accessible.** Utilise national and IOTIC IEC tsunami awareness materials, nationally tailored for individual stakeholders and all inclusive, for use in a wide range of formats and platforms dissemination (e.g. brochures/fliers, e-posters, booklets, e-books, YouTube, TikTok, Instagram, Facebook)	IOC Tsunami Prog. EW4ALL MHEWS UNDRR	ICG, Member States	N

23

Tsunami Public Awareness, Preparedness , & Response

#	Recommendation	Supports	Target	Funding required (Yes or No)
TPAPR.6	**Bring tsunami into school curricula.** UNDP, in consultation with IOTIC, continue to develop tsunami community awareness IEC materials for school curricula in close collaboration with the Thai Ministry of Education	IOC Tsunami Prog. EW4ALL UNDP	Member States	N
TPAPR.7	**Implement sustainable coastal management practices** that reduce vulnerability to tsunamis, such as the restoration of mangroves and coral reefs, which act as natural barriers.	IOC Tsunami Prog. EW4ALL UNDP	Member States	N

24

Tsunami Ready Recognition Programme (TRRP) or Similar National Initiatives

#	Recommendation	Supports	Target	Funding required (Yes or No)
TRRP.1	Training and capacity building, both regionally and nationally, to implement TRRP	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	ICG, Member States	Y
TRRP.2	Exchange experiences on initiating & implementing TRRP	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	Member States	N
TRRP.3	Leverage TRRP off other ocean and multi-hazard approaches	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	Member States	N

25

TRRP or
Similar National Initiatives

#	Recommendation	Supports	Target	Funding required (Yes or No)
TRRP.4	**Initiate TRRP by each country**, through • Identifying tsunami risk and educate communities and key stakeholders of the risk and value of TRRP • Investigating if TR can be integrated within a similar national initiative or obtain seed funding to start the TRRP nationally (or an equivalence) to demonstrate value in a multi-hazard context. • Establishing a Tsunami Ready National Board (NTRB) as per IOC M&G 74 or utilise similar national body	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	Member States	N

26

TRRP or
Similar National Initiatives

#	Recommendation	Supports	Target	Funding required (Yes or No)
TRRP.5	Be familiar with TRRP IEC materials and conduct gap analysis	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	Member States	N
TRRP.6	**Identify communities/villages for TRRP.** Identify and provide data on communities/villages in tsunami-prone areas (as described in MG 74) to develop a prioritised plan for implementing TRRP nationally	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	Member States	N

27

TRRP or
Similar National Initiatives

#	Recommendation	Supports	Target	Funding required (Yes or No)
TRRP.7	Provide access to TRRP IEC materials	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	ICG	N
TRRP.8	Tailor TRRP IEC materials to local context.	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	Member States	N

28

TRRP or
Similar National Initiatives

#	Recommendation	Supports	Target	Funding required (Yes or No)
TRRP.9	**Consider critical facilities and private sector in TRRP.** National authority for TRRP actively engage with the critical facilities (e.g. airports, fuel facilities, hospitals, police, fire brigade) and private sector as part of the community to accelerate the implementation of the TRRP.	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	Member States	N
TRRP.10	Support the Tsunami Ready Focal Points	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	ICG	N

29

TRRP or
Similar National Initiatives

#	Recommendation	Supports	Target	Funding required (Yes or No)
TRRP.11	**Empower local communities in owning TRRP.** Empower local communities to take ownership of TRRP by increasing local engagement, providing training so they can independently organise drills, exercises, and public outreach activities related to Tsunami Readiness and commit to sustaining it.	IOC Tsunami Prog. UN ODTP EW4ALL MHEWS	Member States	N

30

Tsunami Exercises

#	Recommendation	Supports	Target	Funding required (Yes or No)
TE.1	Conduct exercise outside normal working hours	IOC Tsunami Prog. EW4ALL MHEWS ITU WMO	Member States	N
TE.2	Schedule two different times/seasons for IOWave	IOC Tsunami Prog. EW4ALL	Member States	N
TE.3	Include an objective to test SOPs in future IOWave exercises.	IOC Tsunami Prog. EW4ALL	Member States	N

31

Tsunami Exercises

#	Recommendation	Supports	Target	Funding required (Yes or No)
TE.4	**Develop guidance to design exercises for SOPs update.** In addition to IOC MG58 and MG86, develop guidance on how to the conduct tabletop or similar tsunami warning exercises to review and test SOPs, helping to reduce the potential for complacency among countries that have not experienced a recent tsunami event.	IOC Tsunami Prog. EW4ALL MHEWS	Member States	N
TE.5	**Establish in-country exercise calendar.** Establish regular programme of tsunami exercises into cities, villages, communities and schools as a key to community preparedness, including conduct of national exercises between IOWAVE exercises	IOC Tsunami Prog. EW4ALL MHEWS	Member States	N

32

Tsunami Plans and Policies

#	Recommendation	Supports	Target	Funding required (Yes or No)

TPP.1	**Develop City-level DRR Plan**, covering
	• Prevention Mitigation Plan:
	   • DRR Based Urban Planning for City level/District level (scale 1:25,000)
	   • Detailed spatial plan for Sub-districts (scale 1:5000)
	• Preparedness Plan: Contingency Plan
	• Emergency Response Plan: Operation Plan
		IOC Tsunami Prog.
		EW4ALL
		MHEWS
		UNDRR
			Member States	N

Tsunami Plans and Policies

#	Recommendation	Supports	Target	Funding required (Yes or No)
TPP.2	**Develop and provide training for tsunami PPRR guidelines**, either within Multi-Hazard or stand-alone, guided by TRA. The guidelines should cover • Prevention and Mitigation: Tsunami Building Code, Critical Facilities Tsunami Ready Guide, Hotel Ready for Tsunami • Preparedness: Contingency plan development guidelines • Emergency: Operation plan development guidelines • Rehab Recon: Post recovery plan and Pre-disaster recovery plan	IOC Tsunami Prog. EW4ALL MHEWS UNDRR	Targeted Member States	Y

34

Tsunami Plans and Policies

#	Recommendation	Supports	Target	Funding required (Yes or No)
TPP.3	**Urban planning considering tsunami risk.** Urban planning authorities should integrate tsunami risk reduction strategies into their planning processes for mitigation and preparedness. This includes influencing zoning laws that prevent construction in high-risk areas and the development of tsunami-resistant infrastructure	IOC Tsunami Prog. UNDRR EW4ALL UNDRR	Member States	N
TPP.4	Improve cross-border coordination in tsunami warning, preparedness and response	IOC Tsunami Prog. EW4ALL UNDRR	Member States	N

Tsunami Plans and Policies

#	Recommendation	Supports	Target	Funding required (Yes or No)
TPP.4	**Improve cross-border coordination** in tsunami warning, preparedness and response for ccountries sharing coastlines. This includes hazard assessment procedures, harmonising early warning systems, joint exercises, and shared evacuation plans. A good example is NWIO.	IOC Tsunami Prog. EW4ALL UNDRR	Member States	N
TPP.5	**Ensure active women and all-inclusive participation** in all tsunami-related activities, including scientific research, evacuation planning, and post-disaster management.	IOC Tsunami Prog. UNDRR EW4ALL UNDRR	Member States	N

We all need
work together to make
the world's
at-risk coastal communities
Tsunami Ready