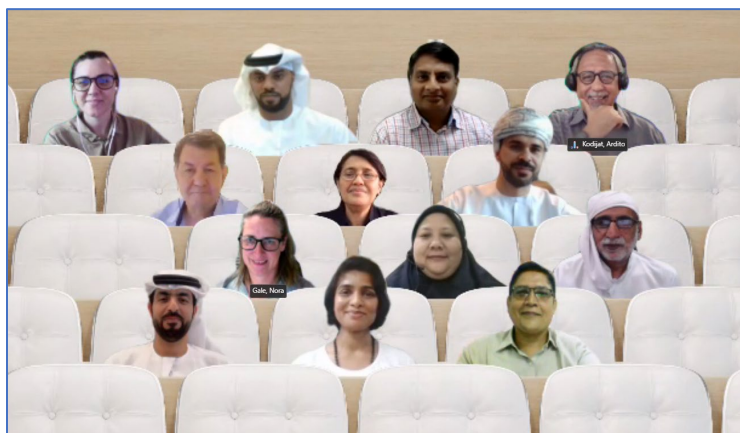


**INTERGOVERNMENTAL COORDINATION GROUP (ICG)
INDIAN OCEAN TSUNAMI WARNING & MITIGATION SYSTEM (IOTWMS)**

Regional Working Group for the North-West Indian Ocean

22 July 2024



*Participants at the intersessional meeting of the ICG/IOTWMS
Regional Working Group for the North-West Indian Ocean, 22 July 2024.*

Members

Dr Mohammad Mokhtari (Iran), WG-NWIO
Chair

Ms Sunanda Manneela (India), WG-NWIO
Vice-Chair

Dr Dipankar Saikia (India)

Dr Ali Khoshkholgh (Iran)

Mr Nasser Al Ismaili (Oman)

Mr Ameer Hyder (Pakistan)

Mr Tariq Ibrahim (Pakistan)

Mr Badr Alameri (UAE)

Mr Ali AlMehrzy (UAE)

Invited Experts

Mr Jijjavarapu Padmanabham (India), WG-2
Chair

Dr Siddharth Prizomwala (India)

Ms Suci Dewi Anugrah (Indonesia), WG-3 Chair

Dr Harkunti Pertiwi Rahayu (Indonesia), WG-1
Chair

Observer

Ms Temily Baker (UNESCAP)

UNESCO-IOC

Mr Ardito Kodijat (IOTIC)

Ms Nora Gale (ICG/IOTWMS Secretariat)

1. OPENING

Dr Mohammad Mokhtari, Chair of the Regional Working Group for the North-West Indian Ocean (WG-NWIO) welcomed all participants to the intersessional meeting of the Working Group. He noted the success of the UNESCAP project on “Strengthening tsunami warning in the North-West Indian Ocean Region through regional cooperation” in driving regional change in the region. He further noted the ICGP paleo-tsunami project work is well underway. This study contributes to the Probabilistic Tsunami Hazard Assessment (PTHA) modelling, which is expected to be available in January 2025. He acknowledged the valuable contributions of the WG-NWIO Vice-Chair, Ms Sunanda Manneela. In conclusion, Dr Mokhtari wished the participants a fantastic and smooth meeting.

The Terms of Reference and membership for the WG-NWIO were reviewed (as noted below).

The WG-NWIO shall 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 In collaboration with IOC-UNESCO IOTIC and IOC-UNESCO Secretariat for the ICG/IOTWMS, evaluate capabilities and identify 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 In collaboration Working Group 1 "Tsunami Risk, Community Awareness and Preparedness", promote and facilitate tsunami hazard and risk assessments and research in the region, including for tsunamis generated by non-seismic and complex sources.
- 3 In collaboration with Working Group 3 “Tsunami Ready Implementation”, support implementation of IOC-UNESCO TRRP or similar activities across the region to help make at-risk communities resilient and prepared for tsunamis
- 4 In collaboration with Working Group 3 “Tsunami Ready Implementation”, facilitate sharing of experiences between Member State Tsunami Ready Focal Points (TRFPs) on Tsunami Ready implementation
- 5 Facilitate cooperation in the establishment and upgrading of seismic, sea level and GNSS stations and networks and communication systems in the region
- 6 Facilitate the timely sharing of tsunami-related data and information in the region
- 7 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.
- 8 Support the implementation of IOWAVE Exercises and other similar drills across the region and encourage all Member States to participate at full level (from issuing warnings to the evacuation of the public in selected regions, at least in tsunami-ready pilot regions).

The Working Group will be composed of members representing NTWC and Tsunami Ready Focal Point from each of the Member States of India, Iran, Oman, Pakistan, United Arab Emirates, and Yemen in the North-West Indian Ocean region and invited observers, with a chairperson and vice-chairperson to be elected.

The agenda was reviewed and adopted without modification (Annex 1).

The participant list is contained in Annex 2.

Ms Gale of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS) Secretariat provided the participants with the logistical information for

the meeting. The meeting documents and presentations are available on the website: <https://oceanexpert.net/event/4356>.

2. PROGRESS OF ACTIVITIES

2.1 Report of the Chair

Dr Mohammad Mokhtari, Chair of WG-NWIO, provided the Chair's report. He recalled the project on Strengthening Tsunami Warning in the North-West Indian Ocean through Regional Cooperation currently in Phase 2c, with Phase 3 to be assessed for funding from the ESCAP Trust Fund for Tsunami Disaster and Climate Preparedness. The Makran Probabilistic Tsunami Hazard Assessment (version 1) is complete and warning services have improved through the refinement of national tsunami warning to chains. Tsunami inundation modelling and evacuation mapping workshops were successfully held in Muscat during 21-25 April.

The West Makran paleo-tsunami investigation (IGCP project) is underway. Sediment cores have been acquired from along the Iranian coast to look for evidence of past tsunami through a variety of physical and chemical analyses.

2.2 Report of the Secretariat

Ms Nora Gale provided the report of the ICG/IOTWMS Secretariat. The terms of reference for the Secretariat are:

- 1 Support meetings of the Intergovernmental Coordination Group for the Indian Ocean Tsunami warning & Mitigation System (ICG/IOTWMS).
- 2 Facilitate the liaison among the various national contact points and national tsunami warning centres.
- 3 Maintain a current list of operational national contact points and facilities and make it available on request to all Member States.
- 4 Organize the liaison between ICG/IOTWMS and the ICG/ITSU, with the PTWC and with other tsunami warning centres to facilitate best practices in tsunami warning.
- 5 Initiate and support training activities and enhance and enrich tsunami warning in the Indian Ocean.

Ms Gale reviewed the activities held over the prior 12 months (July 2023 to June 2024) and upcoming activities. Meeting of the four ICG/IOTWMS Working Groups are being organised for July and August 2024. The Capacity Assessment of Tsunami Preparedness is underway with a meeting of the team planned for 4-6 September 2024 in Bangkok. The 2nd UNESCO-IOC Global Symposium will be held during 11-14 November 2024 in Banda Aceh prior to the 14th session of the ICG/IOTWMS to be held during 16-19 November 2024 in Jakarta. It is hoped that Indian Ocean member state representatives will be able to attend both events.

2.3 Status of the UNESCAP-funded Project

Ms Nora Gale provided the status report on the project "Strengthening Tsunami Early Warning in the North-West Indian Ocean Region through Regional Cooperation", which is funded by the ESCAP Trust Fund for Tsunami, Disaster and Climate Preparedness. The project involves capacity building for tsunami resilience in India, Iran and Pakistan with Oman and the United Arab Emirates participating on a self-funded basis. Pilot communities in each country are producing tsunami evacuation maps informed by tsunami inundation models. The maps will be tested and refined through community evacuation drills during to be held in August 2024. National (3) and international (2) consultants have been engaged to support national implementation and backstopping in the pilot communities.

In Kerala (India) pre-planning meetings have been held in 9 villages and the development of tsunami evacuation plans and maps is underway. In parallel, preliminary meetings were held in Gujarat and the identification of pilot areas is expected soon.

In Jask (Iran) community tsunami evacuation maps are being prepared. The city has been divided in four zones. Two assembly areas have been selected in addition to several vertical evacuation shelters. The map approval process by LDMO and NDMO is underway. Following this, tsunami signages will be prepared.

In Gwadar (Pakistan), the evacuation maps are being improved based on information gathered during a site visit. The criteria for vertical evacuation buildings are being assessed via consultation with government departments.

Mr Tariq Ibrahim noted that in the Gwadar pilot area stakeholder engagement extended beyond government departments to community leaders, schools, etc.

Dr Ali Khoshkholgh asked about the evacuation plans. Ms Gale explained the evacuations would test the community evacuation maps.

Ms Temily Baker congratulated the team for all for the tremendous work under this project.

2.4 Status of the ICGP-funded Paleo-tsunami Project

Dr Siddharth Prizomwala of the Institute of Seismological Research, India reported on the status of the ICGP-funded paleo-tsunami project. Shallow sedimentary cores were acquired along the Iranian shoreline for analysis (grain size, OSL dating, geochemistry, and chronology). Moreover, a letter titled “Geological footprints of the 1945 Makran tsunami from the west coast of India” was published in the journal Marine Geology. In the future studies could be conducted along the Pakistan and UAE shorelines.



Figure 1. Current project study area (red), potential future study areas (red), and another area of interest in India with of evidence of the 1945 Makran tsunami (black).

Mr Ameer Hyder responded that he hopes Pakistan can collaborate in future activities despite potential security issues.

3. COUNTRY STATUS REPORTS

3.1 United Arab Emirates

Mr Badr Alameri of the United Arab Emirates (UAE) National Center of Meteorology provided the country status report. The presentation covered warning chains and standard operating procedures, tsunami hazard assessment, inundation, awareness and preparedness (drill exercise), and the current situation and future plans.

UAE has developed the tsunami warning chain for near-field tsunamis. A tsunami hazard study has been conducted along the coast using a suite of inundation models. Exercise IOWave23 provided an opportunity to test the standard operating procedures for tsunami through a drill in Al Righailat. Future plans include conducting a table-top exercise this year and a large-scale exercise in 2025.

3.2 Pakistan

Mr Ameer Hyder of the Pakistan Meteorological Department (PMD) provided the country status report. The 2004 Indian Ocean tsunami and 2005 Kashmir earthquake prompted PMD to develop the national seismic monitoring network and tsunami early warning center in Karachi. The centre has been operational since 28 November 2008 on a 24/7 basis. Five tsunami sirens have been installed at Gwadar, Karachi, and Pasni. Four GPS stations have been installed in Gwardar, Karachi, Ormara, and Pasni.

Mr Hyder also reported on the tsunami evacuation planning in Gwadar. A team visited recently to engage with the local stakeholders. The current evacuation routes were found to be prone to congestion and flooding. Safe zone at high-ground areas have been identified and assessed. National early warning system, evacuation routes and emergency shelter locations should be indicated in the hazard map to help the population and local authorities in the event of a future tsunami occurrence.

3.3 Oman

Mr Nasser Al Ismaili of the Oman Directorate General of Meteorology and Air Navigation provided the country status report. The presentation included an overview of tsunami sources, tsunami warning system, and awareness, training and competency. There are plans to update the risk assessments maps, evacuation maps for pilot areas, tide gauge upgrade, GPS data acquisition, and continue the national awareness campaign.

Ms Sunanda Manneela enquired about the data sharing agreement between Oman and India. Mr Al Ismaili replied that he was aware and agreed to meet online with the attendance of Mr Said to discuss further. Ms Manneela replied that she would organise an official invite to meet on this topic.

3.4 Iran

Dr Ali Khoshkholgh of the Iranian National Institute for Oceanography and Atmospheric Science provided the country status report. Iran participated in the IOTWMS communications test on 12 June 2024. They concluded that the communication protocols with the TSPs need to be investigated due to lack of delivery. A colleague from Hormozgan University held a workshop on creating and evacuation plan for Jask (in addition to Chabahar which has already been done), which was successful. The guidelines for the Tsunami Ready and Preparing Communities for evacuations have been translated to Farsi and are currently being finalised. They participated in the Capacity Assessment of Tsunami Preparedness in the Indian Ocean and look forward to the results. In August they plan to test the tsunami evacuation maps for Chabahar and Jask.

3.5 India

Ms Sunanda Manneela of the Indian National Centre for Ocean Information Services provided the country status report in relation to the four pillars. Under disaster risk knowledge, INCOIS will continue the PTHA for the Indian Coast and have agreed to host the PTHA results. For detection, observations, monitoring and forecasting there are extensive networks of tsunami buoys, seismic stations (17 seismometer, 32 accelerometers) and tide gauges (36 with 14 more planned). The new Synergistic Ocean Observations

Prediction and Services Lab (SynOPS) lab was inaugurated in February 2024. Warning dissemination and communication includes Standard Operating Procedures at all levels. They have a new application for all ocean services called SAMUDRA.

As a Tsunami Service Provider, India is now generating the NAVAREA messages as per the service definition document and is ready for trial. Regarding preparedness and response capabilities India participated in Exercise IOWave23 with 40,000 persons evacuated from 42 coastal villages on the east coast of India. Tsunami Ready has started to be implemented in Kerala and Gujarat.

4. TSUNAMI INUNDATION AND EVACUATION PLANNING WORKSHOP, MUSCAT, 21-25 APRIL 2024

Mr Ardito M Kodijat, Head of the Indian Ocean Tsunami Information Centre (IOTIC), reported that phase 2c of the ESCAP-funding project on “Strengthening Tsunami Early Warning in the North-West Indian Ocean Region through Regional Cooperation” includes training and development in tsunami inundation maps and evacuation plans through regional capacity building at the national level. Two training workshops were held back-to-back in Muscat during 21-25 April 2024 including inundation mapping and evacuation planning. Mr Kodijat shared the programme of activities including learning, group work and sharing of results. There were also technical presentations and training in facilitation skills. Participants discussed how to conduct exercises to verify the evacuation map. Field visits were undertaken to Oman Civil Aviation Authority, DGMet Warning Center, Durat Al Qayat School, and Jamea Sayida Fatima Mosque.

5. TSUNAMI READY IMPLEMENTATION IN THE NORTH-WEST INDIAN OCEAN

Ms Suci Dewi Anugrah reported the lessons learnt on implementation of Tsunami Ready in the Indian Ocean. She focused on identifying the hazard to understand the risk, developing preparedness and response capacity, and mainstreaming the programme. Twelve (12) Indian Ocean communities from India (2) and Indonesia (10) have received UNESCO-IOC Tsunami Ready recognition.

The UNESCO-IOC Tsunami Ready Recognition Programme (TRRP) is an international community-based recognition programme aimed at building resilient communities through awareness and readiness strategies that will protect lives, livelihoods and property from tsunamis. The Programme is a key activity for achieving the Safe Ocean objective of the United Nations Decade of Ocean Science for Sustainable Development 2021-2030. Under the auspices of the UN Ocean Decade Tsunami Programme, the TRRP aims to help ensure that 100% of communities at risk of tsunamis are prepared for and resilient to tsunamis by 2030. Readiness is achieved through a collaborative effort among government agencies, scientists, community leaders and the public, who work together to meet an established set of 12 indicators covering Assessment, Preparedness, and Response. The UNESCO-IOC TRRP is actioned through Member State National Tsunami Ready Programmes.

6. GLOBAL TSUNAMI SYMPOSIUM

Dr Harkunti Rahayu shared that the 2nd UNESCO-IOC Global Symposium main event will be held from 11 to 14 November 2024. Pre- and post-events will be held on either side. The main event will take place in Banda Aceh, Indonesia. Travel routes are via Jakarta (Indonesia) or Kuala Lumpur (Malaysia). Dr Rahayu shared the symposium’s aims, scope, and provisional agenda.

PRE-EVENT International Workshop (8-9 Nov 2024) Venue: USK Banda Aceh	2 nd UNESCO-IOC Global Tsunami Symposium Venue: Banda Aceh Convention Hall (11 – 14 November, 2024)				POST-EVENT ICG IOTWMS XIV Session Venue: BMKG Jakarta	
<i>Hosted by IABI in collaboration with TDRMC</i>	Day 1 (11 Nov 2024)	Day (12 Nov 2024)	Day 3 (13 Nov 2024)	Day 4 (14 Nov 2024)	<i>Hosted by BMKG</i>	
	Opening Ceremony	Session 3	<i>All Day Excursion</i>	Session 7		
		Session 4		Session 8		
	<i>Lunch Break (12:00 – 14:00)</i>					
	Session 1	Session 5		Closing Ceremony		
	Session 2	Session 6				
Side Events: <i>Exhibitions, Posters, Ignite Stages and "Rumah Resilience Indonesia" located at Banda Aceh Convention Hall</i>						

Figure 2. Schedule for 2nd UNESCO-IOC Global Tsunami Symposium.

Registration for the main event is available at globalsunamisymposium.bmkg.go.id.

Ms Gale explained that holding the symposium in Banda Aceh and then the 14th session of the ICG/IOTWMS in Jakarta will [hopefully] enable delegations to attend both events.

7. WORKPLAN DISCUSSION AND ACTIONS

Dr Mokhtari lead a discussion on the workplan, specifically the status of action items from the intersessional steering group meeting (Hyderabad, February 2024).

SI No.	Actions & Recommendations	Status
1	Requests the ICG/IOTWMS to encourage all Member States to work on their tsunami warning chain to minimize the number of steps (between the NTWC and the Public) in the warning chain, and with clear authorization of responsibilities amongst the NTWCs, NDMOs, LDMOs, and Public.	As part of UNESCAP Project Warning Chains of all MSZ member states were refined and SOPs are being prepared
2	NWIO-WG member states are urged to exchange real-time data with the TSPs. It is also strongly suggested to go toward the multi-lateral.	Currently bi-lateral agreements between member states is in progress
3	The reaction to non-seismic and complex tsunami source events needs to be considered more seriously and in addition, they need to be incorporated into tsunami early warning systems including community evacuation and emergency plans.	'The non-seismic events need to be further studied to incorporate them in TEWS
4	On-job training also needs to be initiated among NWIO member countries, maybe when international travel is safe we can start with one-by-one member states.	Oman personnel were given training in India (December 2023)

5	Initiate building knowledge-based database of risk assessment (approaches adopted for hazard, vulnerability and risk assessment) that is accessible to all Member States (possibly IOTIC site or other portal).	Yet to initiate. NWIO will coordinate with IOTIC
6	Paleotsunami study has been initiated in Iran by the University of Hormozgan, to be extended in the region, this can help us to know more about historical seismicity and also achieve the required Mmax for hazard studies. It requires further extension and funding	The first field visit for trenching is expected to be in June 2023 and the analysis ongoing
7	Encourage the participation of North West Indian Ocean representatives in webinars and workshops with a focus on the Makran region.	On going
8	Chairs of WG1, WG2, WG-NWIO, and Task Teams to prepare a proposal for UN Ocean Decade with support from IOTIC and the Secretariat for enhancement by the Steering Group. Consider focusing on 1) Near-field tsunami warning and mitigation including: transforming tsunami warning services through new technology (GNSS, smart cables) through to community preparedness and infrastructure; and/or 2) Tsunami monitoring gaps in NWIO. In particular enhancing the observing networks, PTHA development, and data sharing. These activities could be expanded to the entire Indian Ocean basin Continue updating the inundation and evacuation maps based on the experiences gained at the workshop conducted in Muscat recently on the pilot areas and extend that to the full NWIO area, in line with Risk Assessments and tsunami-ready exercise.	Projects that are being implemented in NWIO region will be submitted for Ocean Decade (Call of Action 7)
9	Working Groups to review the recommendations of the Capacity Assessment of Tsunami Preparedness: Status Report 2024 .	To review
10	Secretariat to develop template for bilateral data exchanges	
11	RWG-NWIO to prepare its report to ICG/IOTWMS, including update on progress and recommendations to ICG/IOTWMS-XIV, for review and consideration at the next Steering Group meeting prior to ICG/IOTWMS-XIV	In progress

Table 1. Status of Action Items

There were discussions about data sharing, on-job training exchanges, optimal monitoring network for the North-West Indian Ocean

8. RECOMMENDATIONS TO THE 14TH SESSION OF ICG/IOTWMS

The WG-NWIO has prepared the following recommendations to be presented to the 14th Session of the ICG/IOTWMS.

Recommendation: *Progress bi-lateral data sharing between North-West Indian Ocean countries (e.g., India and Oman).*

Recommendation: *North-West Indian countries to work together on a regional Paleo-tsunami study proposal for funding and in contribution to the UN Ocean Decade Tsunami Programme.*

Recommendation: *Continue updating the inundation and evacuation maps based on the experiences gained at the Muscat training workshops (21-25 April 2024) in the pilot areas and extend to the full North-West Indian Ocean area, in line with risk assessments and UNESCO-IOC Tsunami Ready Recognition Programme.*

Recommendation: *Determine the optimal instrument networks for tsunami monitoring in the North-West Indian Ocean region including for non-seismic and complex source tsunamis.*

Recommendation: *Arrange for bi-lateral exchange of on-job training between National Tsunami Warning Centre representatives.*

9. CLOSING REMARKS

Dr Mohammad Mokhtari provided closing remarks. He thanked the Working Group members, invited experts, and the Secretariat for their participation and contributions in the intersessional meeting.

Dr Mokhtari officially closed the intersessional meeting of the ICG/IOTWMS WG-NWIO at 12:30 UTC.

ANNEX 1: AGENDA

**Intergovernmental Coordination Group (ICG)
Indian Ocean Tsunami Warning & Mitigation System (IOTWMS)
Regional Working Group for the North-West Indian Ocean**

22 July 2024

Chair: Dr. Mohammad Mokhtari (Iran)

Vice-Chair: Ms. V. Sunanda Manneela (India)

Time (UTC)	Agenda	Topic	Speaker
07:00 – 07:30	1	Opening	
		Welcome and Opening Remarks	Dr Mohammad Mokhtari
		Review of TORs	Ms Nora Gale
		Adoption of Agenda	Dr Mohammad Mokhtari
		Designation of the Rapporteur	Dr Mohammad Mokhtari
		Conduct of the meeting, Timetable, and Documentation	Ms Nora Gale
07:30 – 8:30	2	Progress of Activities	
07:30 – 07:45		Report of the Chair	Dr Mohammad Mokhtari
07:45 – 08:00		Report from the Secretariat	Ms Nora Gale
08:00 – 08:15		Status of the UNESCAP Project	Ms Nora Gale
08:15 – 08:30		Status of the IGCP Paleo-tsunami Project	Dr Siddharth Prizomwala
08:30 – 9:45	3	Country Status Reports	
08:30 – 08:45		UAE	Mr Badr Alameri
08:45 – 09:00		Pakistan	Mr Ameer Hyder
09:00 – 09:15		Oman	Mr Nasser Al Ismaili
09:15 – 09:30		Iran	Dr Ali Khoshkholgh
09:30 – 09:45		India	Ms Sunanda Manneela

09:45 – 10:10		Group Photo & Break	
10:10 – 10:25	4	Report of Tsunami Inundation and Evacuation Planning Workshop in Oman	Mr Ardito Kodijat
10:25 – 10:40	5	Tsunami Ready Implementation in NWIO	Ms Suci Dewi Anugrah
10:40 – 10:55	6	Global Tsunami Symposium	Dr Harkunti Rahayu
10:55 – 11:15	7	Workplan discussion and actions	All
11:15 – 11:35	8	Recommendations to 14 th session of ICG/IOTWMS	Dr Mohammad Mokhtari
11:35 – 11:45	9	Closing Remarks	Dr Mohammad Mokhtari

ANNEX 2: PARTICIPANT LIST

Intergovernmental Coordination Group (ICG)

Indian Ocean Tsunami Warning & Mitigation System (IOTWMS)

Regional Working Group for the North-West Indian Ocean

22 July 2024

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