INTERGOVERNMENTAL COORDINATION GROUP (ICG)

INDIAN OCEAN TSUNAMI WARNING & MITIGATION SYSTEM (IOTWMS)

Working Group 1 on Tsunami Risk, Community Awareness, and Preparedness

19 August 2024

Figure 1: *Participants at the intersessional meeting of ICG/IOTWMS Working Group 1, 19 August 2024.*

Members

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

Dr Mahendra S. Ranganahalli (India),
WG-1 Vice-Chair

Dr Ajay Kumar Bandela (India)

Ms Azahani Abd Aziz (Malaysia)

Invited Experts

Dr Gareth Davies (Australia)

Mr Harald Spahn (Germany)

Dr Aditya Gusman (New Zealand)

Prof Dilanthi Amaratunga (United Kingdom)

Prof Richard Haigh (United Kingdom)

UNESCO-IOC

Ms Nora Gale (ICG/IOTWMS Secretariat)

Mr Ardito M Kodijat (Indian Ocean Tsunami Information Centre, UNESCO Jakarta)

Ms Phone-Phet Phasay (Tsunami Resilience Section)

1. OPENING

1.1 Welcome and Opening Remarks

The Chair of Working Group 1 on Tsunami Risk, Community Awareness, and Preparedness (WG-1), Dr Harkunti P Rahayu, welcomed the working group members, invited experts and UNESCO-IOC staff to the intersessional meeting. She noted the importance of this meeting in the leadup to the 14th session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS-XIV) to be held in Jakarta, Indonesia during 16-19 November 2024. The programme for the WG-1 meeting will include activity reporting, a review of the work plan, and a discussion on the recommendations to put forward to ICG/IOTWMS-XIV. Dr Rahayu encouraged open discussion and wished all a successful meeting.

1.2 Adoption of Agenda

Dr Harkunti Rahayu reviewed the provisional agenda, which was adopted by the Working Group with a minor modification (refer to Annex 1). Mr Ardito Kodijat, Head of the Indian Ocean Tsunami Information Center (IOTIC), will also speak against agenda item 2.7 'Non-seismic tsunami hazard assessment'.

1.3 Terms of Reference and Membership

The Terms of Reference and membership for the WG-1 were reviewed (as noted below).

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 Assist, develop and strengthen the overall capacity and capability of Member States in tsunami risk assessment and mitigation, community awareness and preparedness, including for tsunamis generated by non-seismic and complex sources.

2 Encourage Member States to mainstream tsunami Disaster Risk Reduction into sustainable development to help achieve resilient communities in the region.

3 Provide advice on any future development of the IOC-UNESCO Tsunami Ready Recognition Programme.

4 Support implementation of IOWave Exercises.

5 Identify areas of priority for action following assessments, exercises, and real tsunami events.

6 Provide advice on user requirements and utility of tsunami warning products and services.

7 Provide advice to the IOC-UNESCO Indian Ocean Tsunami Information Centre (IOTIC) on educational, awareness and preparedness materials.

8 Promote collaboration among academia, research institutions and disaster management offices to encourage multidisciplinary and multi sectoral interaction in ensuring tsunami risk knowledge are streamlined to risk reduction strategies.

Activities may include:

1 Monitor, assess and routinely report to the Steering Group and ICG on the status of Tsunami Risk Assessments, Community Awareness and Preparedness in each Member State.

2 Seek resources and coordinate projects to develop guidelines and build capacity in Member States.

3 Support the organisation of workshops and symposiums for training and capability development.

4 Contribute to the conduct of regular exercises of the IOTWMS.

5 Encourage Member States to integrate tsunami risk assessment, community awareness and preparedness within national disaster risk reduction programmes for multi-hazards.

6 Stimulate and share information on best-practices between Member States.

7 Assist with the development and application of guidelines on hazard, vulnerability and risk assessment and mitigation, exercises, and post-event surveys.

8 Work closely with Working Group 3 “Tsunami Ready Implementation”, IOC-UNESCO IOTIC, and IOC-UNESCO Secretariat for the ICG/IOTWMS to help develop the capacity of Member States across the Indian Ocean to implement the IOC-UNESCO TRRP or similar initiatives.

9 Work closely with Working Group 2 "Tsunami Detection, Warning and Dissemination" and Working Group 3 “Tsunami Ready Implementation”, IOC-UNESCO IOTIC and IOC-UNESCO Secretariat for OICG/IOTWMS to help develop effective national tsunami warning chains, warning products, services, Standing Operating Procedures, and warning chains.

10 Under the direction of the Steering Group, assist with national assessments of the IOTWMS performance after each exercise and real tsunami event.

The Working Group will be composed of members nominated by Member States with expertise in tsunami risk assessment and disaster management, an invited IOTIC representative, and other invited observers as required, with a chairperson and two vice-chairpersons to be elected by the ICG.

The participant list for the intersessional meeting of the Working Group is contained in Annex 2.

1.4 Meeting Logistics

Ms Nora Gale of the ICG/IOTWMS Secretariat provided the participants with logistical information for the meeting. Meeting documents and presentations are available on the event website at https://oceanexpert.net/event/4416.

2. ACTIVITY UPDATES

2.1 Report of the Chair

Dr Harkunti P Rahayu, Chair of WG-1, provided the Chair’s report for the 2023-2024 intersessional period. Activities and progress were noted with emphasis on the 2nd UNESCO-IOC Global Tsunami Symposium, 2024 UNESCO-IOC Capacity Assessment of Tsunami Preparedness in the Indian Ocean, contributions of the Working Group on Tsunamis and Other Hazards related to Seal Level Warning and Mitigation Systems (TOWS-WG) Task Team on Disaster Management Preparedness, and the objectives of the UN Ocean Decade Tsunami Programme. A special issue journal in response to the UN Ocean Decade challenges is in preparation. An open-access book “Two Decade after 2004 Indian Ocean Tsunami: Reflection and the Way Forward” drawing upon inputs from each session will be produced.

Prof Dilanthi Amaratunga mentioned the research underway in Sri Lanka on the tsunami science book “20 years after – then and now: An explorative study of the status of communities relocated in the aftermath of the 2004 Indian Ocean Tsuna in Sri Lanka”. An additional project focuses on raising awareness and understanding of nature inspired solutions for disaster risk reduction. The Tsunami Science in Sri Lanka conference will be held in Colombo on 21 December 2024.

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 warnings 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. Indian Ocean Member State representatives will be encouraged to attend both events.

2.3 2nd UNESCO-IOC Global Tsunami Symposium

Dr Harkunti Rahayu briefed on the 2nd UNESCO-IOC Global Symposium to be held during 11-14 November in Banda Aceh, Indonesia on "Two Decades after the 2004 Indian Ocean Tsunami". She shared the agenda for the event including the opening ceremony, sessions, excursion, and closing ceremony. Side events including exhibitions, ignite stages, poster sessions, and booth displays will be held prior to the main event during 9-12 November 2024. The registration link is now open and 300 people are anticipated to join. For further event information, refer to the event website: https://globaltsunamisymposium.bmkg.go.id/.

2.4 2024 Capacity Assessment of Tsunami Preparedness in the Indian Ocean

Prof Richard Haigh and Prof Dilanthi Amaratunga of the Global Disaster Resilience Centre at the University of Huddersfield, United Kingdom presented on the 2024 UNESCO-IOC Capacity Assessment of Tsunami Preparedness in the Indian Ocean. Prof Haigh explained the background to the capacity assessment including the initial 2005 assessment of capacity building requirements for an effective and durable tsunami warning and mitigation system in the Indian Ocean. The 2018 Capacity Assessment of Tsunami Preparedness in the Indian Ocean provided a new baseline of the status of tsunami preparedness capacity in the region, identified specific gaps, and prioritised capacity development requirements.

The 2024 capacity re-assessment is being undertaken by the UNESCO-IOC through the ICG/IOTWMS Working Group 3 Tsunami Ready Implementation, with oversight and contributions by the ICG/IOTWMS Steering Group, and support from the UNESCO-IOC ICG/IOTWMS Secretariat. Further support by the UN Economic and Social Commission for Asia and the Pacific (UNESCAP) and Global Disaster Resilience Centre. Funding is being provided by the Asian Development Bank (ADB) and the Government of Switzerland. The goals for the 2024 assessment are to reflect on progress made, identify remaining gaps and prioritise capacity development requirements. The results will be presented at the 14th session of the ICG/IOTWMS (Jakarta, November 2024).

The draft analysis was completed and shared with the capacity assessment team. Currently, the focus is on an interpretation of the results and developing key recommendations. The team will meet in Bangkok during 2-4 September 2024 to review the findings and workshop key recommendations for the ICG/IOTWMS Steering Group review and endorsement.

2.5 Tsunami Warning Chains and Standard Operating Procedure Development in Indian Ocean Countries

Mr Harald Spahn reported on tsunami warning chains and Standard Operating Procedure (SOP) development in Indian Ocean Countries. He is part of the Capacity Assessment team and will join the Bangkok workshop. The SOP trainings in 2023 provided complementary information to the assessment of the in-country capacities.

The National Tsunami Warning Chain flow chart template was presented (as shown below).

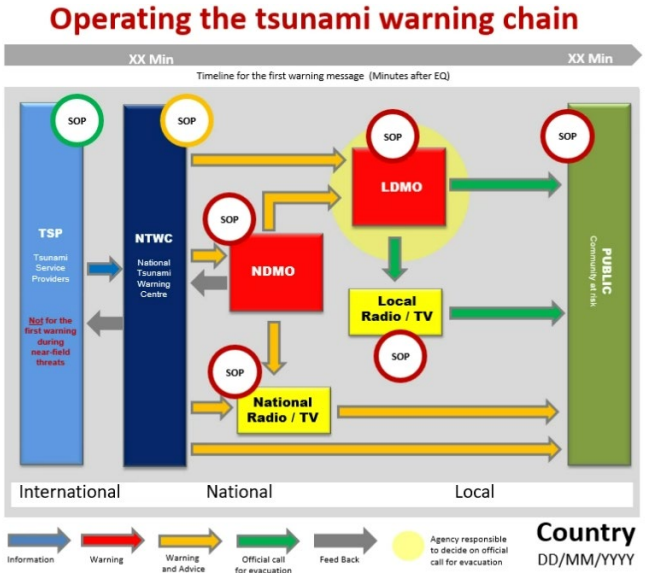

Figure 2: National Tsunami Warning Chain flow chart template including Standard Operating Procedures.

Most national tsunami warning chains are solid and include redundancy. Some countries need to add timelines aligned with the flow of information from the IOTWMS Tsunami Service Providers. Warning chains and SOPs have so far been exclusively for seismic tsunami scenarios. Examination of the SOPs shared by Member States shows that the NTWC SOPs are well developed while DMO SOPs require further work.

The recommendations include:

- Strengthening the framework conditions and multi-stakeholder processes for effective warnings through high-level political change;
- Strengthening regional cooperation (EIO, WIO, NWIO)
- Facilitate continuous and collective learning
- Focusing more strongly on the DMO SOPs
- Stronger focus on SOPs in IOWave exercises
- Learning from experience: enhancement of the IOC Post-Tsunami Survey Guidelines by including assessment of downstream processes.

Mr Spahn drew attention to the assessment tool developed in the frame of the 'TsunamiRisk' Project, an Indonesia-German research initiative between 2022 and 2024, which complements the capacity assessment mechanism.

2.6 Status of Probabilistic Tsunami Hazard Assessment

Dr Gareth Daves updated on the status of the Probabilistic Tsunami Hazard Assessment (PTHA) for the Indian Ocean. While deterministic tsunami hazard assessments involve a single or set of scenarios PTHAs involve examining the likelihood of a set of scenarios including the uncertainties. Offshore PTHAs contain many tsunami scenarios that are generally modelled in deep water and lack inundation impacts. PTHAs can be combined with an inundation model to determine local effects. In the Indian Ocean region, the 2009 PTHA was developed for the Indian Ocean and has been in use in the years since.

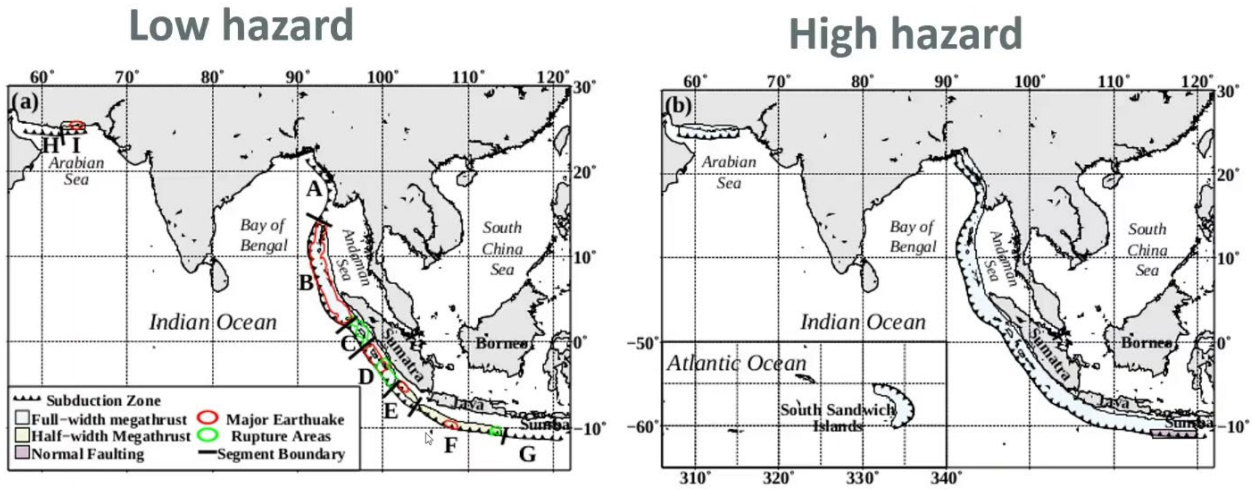

Figure 3: Alternative models of segmentation as illustrated in the 2009 Probabilistic Tsunami Hazard Assessment (PTHA) for the Indian Ocean.

In 2018, Australia published a global PTHA. The major Indian Ocean sources include the Sunda Arc, the Makran subduction zone, and the South Sandwich Islands. This is open source and can be used by Member States in the Indian Ocean.

The PTHA for the Makran region is in progress with version 1.0 complete. There are several alternative models, and the next step is consensus on the weighting of models. It is likely to be published in early 2025.

In Western Australia, tsunami inundation mapping has been completed around the greater Perth area (Geraldton to Busselton). Maps on how often areas are expected to be inundated and the uncertainties can be derived from this data. Inundation products are being developed for use by the Emergency Services during tsunami responses through a collaboration between Geoscience Australia and the Department of Fire and Emergency Services.

2.7 Non-seismic Tsunami Hazard Assessment

Dr Aditya Gusman presented an assessment of non-seismic tsunami hazards. Surface displacement models have been produced for historic volcanic eruptions including 2022 Tonga and 2023 Epi Volcano. During the 1883 Krakatau tsunami, the San Francisco tide gauge recorded the water displacement. The travel time was very fast with high waves at a large distance.

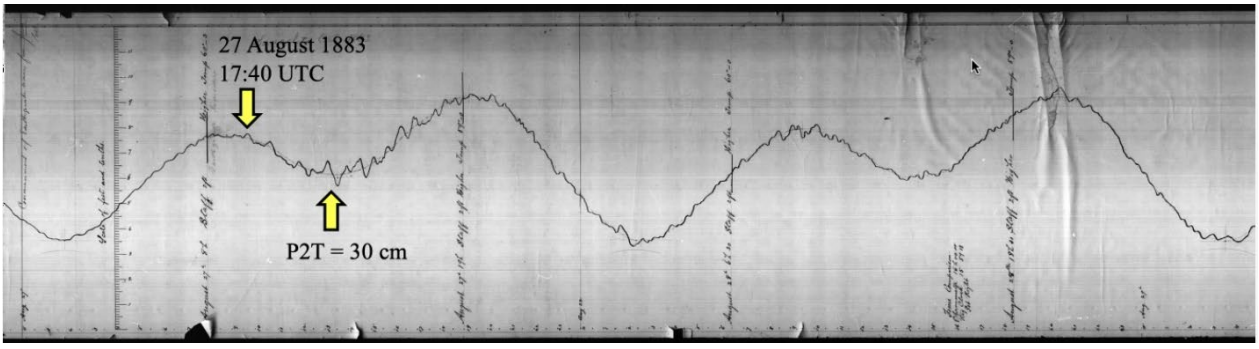

Figure 4: Tide gauge recording of the Krakatau tsunami in San Francisco, USA.

Mr Kodijat shared that the draft booklet titled 'The Unforeseen Threat: Preparing Against Non-Seismic Tsunami' has been developed by UNESCO-IOC IOTIC in conjunction with UNESCO, BMKG and U-INSPIRE. The draft has been circulated to the ICG/IOTWMS Working Groups for feedback. The intention is to launch the booklet during the 2nd UNESCO-IOC Global Tsunami Symposium.

2.8 UN Ocean Decade Discussion on Working Group 1 Contributions

Dr Harkunti Rahayu led a discussion on the Working Group 1 contributions to the UN Ocean Decade Tsunami Programme (ODTP). The issues and challenges in response to ODTP were discussed including:

1. *The awareness, preparedness and response capabilities of a community will depend on (a) risk perception and awareness, (b) community wide preparedness actions, and (c) effective response planning and capabilities.*

   Mr Kodijat noted that the multi-hazard framework is adopted in SIDs and LDCs and support is required to focus on tsunamis.

   Prof Haigh noted that the capacity assessment has identified SIDs as needing capacity support.

2. *Implementation measures including by 2030 (a) all at-risk communities have tsunami evacuation maps and (b) communities have access to an inventory of best practices of plans and structural and nature-based solutions and more communities have implemented plans and measures to minimize impacts to critical infrastructure and marine assets from tsunamis and other coastal hazards, and importantly mainstreaming disaster risk reduction into urban planning.*

   Mr Spahn noted that tsunami evacuation maps are a key element for community preparedness. He recalled that the multi-national approach in the North-west Indian Ocean training workshops on inundation modelling evacuation mapping proved useful and could be adopted in other regions of the Indian Ocean.

   Dr Rahayu commented that mainstreaming disaster risk reduction into urban planning is not always a priority and presents challenges.

   Dr Mahendra reported that INCOIS has completed high-resolution 3D GIS mapping of coastal cities, which will provide inputs to urban planning.

3. *To ensure investment in capacity development of the different stakeholders involved in the tsunami warning and dissemination processes*

   Prof Haigh noted the 2024 capacity assessment will provide a basis for engaging with donors on capacity development projects.

4. *To encourage and promote inclusiveness and gender diversity, and that youth and early career professionals*

5. *To ensure investment in capacity development for different stakeholders involved in tsunami warning and dissemination processes, for example, through OTGA-STC's online tsunami awareness training.*

   Mr Kodijat shared that the OTGA training on tsunami awareness is available online. The OTGA training on Tsunami Ready is progressing but is not yet available.

6. *To emphasise awareness and preparedness initiatives on non-seismic tsunamis.*

   Dr Mahendra noted that the International Training Facility for Operational Oceanography operated by INCOIS conducts courses related to ocean hazards and geospatial applications including tsunami hazard mapping.

   Mr Kodijat recalled that the booklet entitled 'The Unforeseen Threat: Preparing Against Non-Seismic Tsunami' is under development by UNESCO-IOC IOTIC.

   Mr Spahn noted that in the framework of the 'TsunamiRisk' project, the stakeholder developed a policy brief on how to deal with non-seismic tsunamis with a specific section on community preparedness, which could be used as a reference.

3. WORKPLAN DISCUSSION AND ACTIONS

Dr Rahayu led a discussion on the Working Group 1 workplan and actions. The Working Group 1 workplan focuses on the key activities:

1. Capacity Assessment of Tsunami Preparedness Report
2. Updating Probabilistic Tsunami Hazard Assessment
3. Disaster Risk Reduction into Spatial Planning
4. Update Annual Journal

The Working Group 1 actions include:

Action 1: *Endorse the recommendations of the Capacity Assessment of Tsunami Preparedness [Status Report 2018 and updated 2024] related to:*

a. risk assessment and reduction and
b. awareness, preparedness and response for consideration in the WG-1 work plan.

Action 2: *Working Group 1 to support the developing and harmonizing local capacities for the tsunami early warning project being undertaken with ITB and the University of Huddersfield with a case study taken in Indonesia with funding from 2020 Newton Prize Winner (Harkunti P. Rahayu and Richard Haigh).*

Action 3: *Working Group 1 to support the integration of pandemic, tsunami and other multi-hazard preparedness into the Early Warning and Urban Planning project being undertaken in 2021-2021 by ITB and the University of Huddersfield, with a major survey to be undertaken in the Indian Ocean and case studies to be undertaken in Indonesia and Sri Lanka.*

Action 4: *Revise Terms of Reference for ICG/IOTWMS-XIV including to better reflect the relationship with IOTIC.*

Action 5: *Prepare the WG-1 report to ICG/IOTWMS including updates on progress and recommendations to ICG/IOTWMS-XIV for adoption.*

Action 6: *Provide feedback on the UNESCO-IOC draft booklet 'The Unforeseen Threat: Preparing Against Non-Seismic Tsunami' with a view to finalised for the 2nd UNESCO-IOC Global Symposium.*

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

Working Group 1 discussed the recommendations to be presented to the 14th Session of the ICG/IOTWMS, which Dr Rahayu will progress.

Recommendation 1: *Adopt the revised WG-1 Terms of Reference that better reflect the working relationship with IOTIC.*

Recommendation 2: *Implement community awareness and preparedness against the risk of tsunamis generated by both seismic and non-seismic tsunami sources.*

Recommendation 3: *Prioritise SIDS, LDCs and Africa in the work programme.*

5. CLOSING REMARKS

Dr Harkunti Rahayu provided closing remarks. She thanked the Working Group members, invited experts, and the Secretariat for their participation and contributions in the intersessional meeting of Working Group 1 on Tsunami Risk, Community Awareness, and Preparedness. She looks forward to seeing many people face-to-face in the coming months at various events including (i) Tsunami Capacity Assessment Validation Workshop for Indian and Pacific Oceans, Bangkok, 4-6 September 2024, (ii) 2nd UNESCO-IOC Global Tsunami Symposium "Two Decades After 2004 Indian Ocean Tsunami: Reflection and the Way Forward", Banda Aceh, 11-14 November 2024, and (iii) 14th Session of the ICG/IOTWMS, Jakarta, 16-19 November 2024. Dr Rahayu closed the meeting at 10:02 UTC.

ANNEX 1: AGENDA

Intergovernmental Coordination Group (ICG)

Indian Ocean Tsunami Warning & Mitigation System (IOTWMS)

Working Group 1 on Tsunami Risk, Community Awareness and Preparedness

19 August 2024

Chair: Dr Harkunti Pertiwi Rahayu (Indonesia)

Vice-Chair: Dr Mahendra S. Ranganahalli (India)

Time (UTC)	Agenda	Topic	Speaker
07:00 – 07:30	**1**	**Opening**	
	1.1	Welcome and Opening Remarks	Dr Harkunti Rahayu
	1.2	Adoption of Agenda	Dr Harkunti Rahayu
	1.3	Terms of Reference and Membership	Dr Harkunti Rahayu
	1.4	Meeting Logistics	Ms Nora Gale
07:30 – 8:15	**2**	**Activity Updates**	
07:30 – 07:45	2.1	Report of the Chair	Dr Harkunti Rahayu
07:45 – 08:00	2.2	Report of Secretariat	Ms Nora Gale
08:00 – 08:10	2.3	2nd UNESCO-IOC Global Tsunami Symposium	Dr Harkunti Rahayu
08:10 – 08:40	2.4	2024 Capacity Assessment of Tsunami Preparedness in the Indian Ocean	Prof Richard Haigh Prof Dilanthi Amaratunga

08:40 – 09:00	**Group Photo & Break**		
09:00 – 09:10	2.5	Tsunami warning chains and SOP development in Indian Ocean countries	Harald Spahn
09:10 – 09:20	2.6	Status of Probabilistic Tsunami Hazard Assessment	Dr Gareth Davies
09:20 – 09:30	2.7	Non-seismic Tsunami Hazard Assessment	Dr Aditya Gusman Mr Ardito Kodijat
09:30 – 09:40	2.8	UN Ocean Decade discussion on WG1 contributions	Dr Harkunti Rahayu
09:40 – 10:00	**3**	**Workplan discussion and actions**	All
10:00 – 10:20	**4**	**Recommendations to 14th session of ICG/IOTWMS**	All
10:20 – 10:30	**5**	**Closing Remarks**	Dr Harkunti Rahayu

ANNEX 2: PARTICIPANT LIST

Intergovernmental Coordination Group (ICG)

Indian Ocean Tsunami Warning & Mitigation System (IOTWMS)

Working Group 1 on Tsunami Risk, Community Awareness, and Preparedness

19 August 2024

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