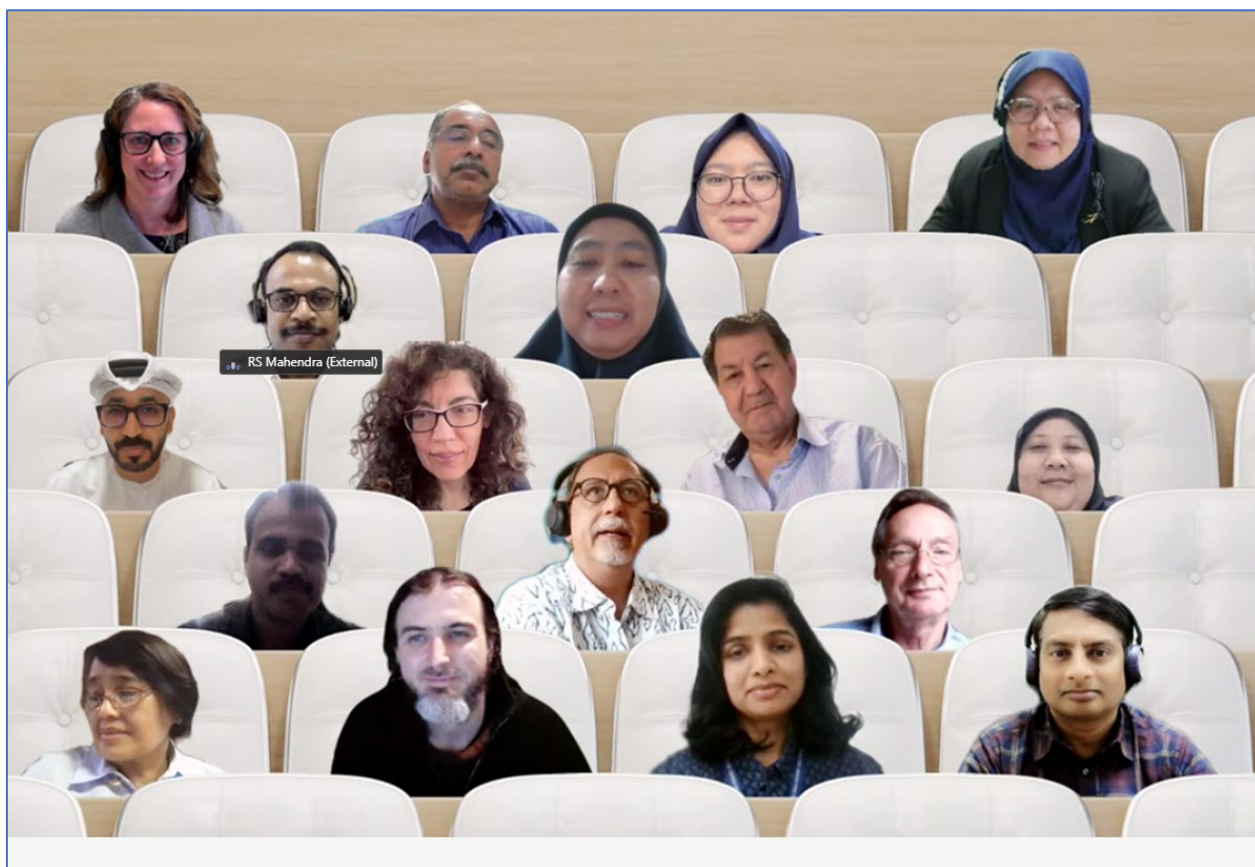


**INTERGOVERNMENTAL COORDINATION GROUP (ICG)  
INDIAN OCEAN TSUNAMI WARNING & MITIGATION SYSTEM (IOTWMS)**

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

**23 July 2025**

**Meeting Report**



**Figure 1.** Participants at the ICG/IOTWMS Working Group 1 meeting held online during 23 July 2025.

Presentations and relevant documentation for the meeting can be found on the meeting website:  
<https://oceanexpert.org/event/4057>.

## 1. OPENING REMARKS

Dr Srinivasa Kumar Tummala, Head of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS Secretariat) delivered the opening remarks and welcomed all participants to the Working Group 1 meeting. He recalled that the 14th Session of the ICG/IOTWMS held in Banten, Indonesia during 17–19 November 2024 endorsed the continuation of Working Group 1 on Tsunami Risk, Community Awareness, and Preparedness.

Dr Tummala noted that the response to the call for membership nominations for the intersessional period through Intergovernmental Oceanographic Commission (IOC) Circular Letter 3026 was largely successful, resulting in a diversity of members comprising experts in hazard assessment and disaster management. He emphasized the importance of aligning Working Group activities with available resources and leveraging synergies through strong collaboration with initiatives such as the People-Centred Tsunami Early Warning for the Indian Coastlines (PCTWIN) and the UNESCAP Makran projects.

Dr Tummala added that the Working Group’s activities are guided by the decisions of the 14th Session of the ICG/IOTWMS and the 19th Steering Group Meeting (Jakarta, Indonesia, 17–19 June 2025). In closing, he expressed his enthusiasm for working with all members and reaffirmed the Secretariat’s commitment to providing a collaborative platform to advance shared goals in tsunami risk reduction, community awareness, and preparedness.

## 2. INTRODUCTIONS

Participants were invited to provide brief introductions. The Working Group 1 intersessional meeting attendees included:

### **Officers**

Dr Weniza (WG1 Chair)  
Dr Mahendra S Ranganahalli (WG1 Vice-Chair)

Ms Sunanda Manneela (India, WG-NWIO Chair)  
Ms Septa Anggraini (Indonesia, TT-IOWave25 Vice-Chair)

### **Members**

Dr Gareth Davies (Australia)  
Dr Patanjali Kumar Chodavarapu (India)  
Ms Hidayanti (Indonesia)  
Ms Khazainani Salleh (Malaysia)  
Mr Khamis Alnaqbi (UAE)

Ms Suci Dewi Anugrah (Indonesia, WG3 Chair)  
Dr Harkunti Rahayu (Vice Chair ICG/IOTWMS)  
Dr Mohammad Mokhtari (Iran)  
Prof Fatemeh Jalayer (United Kingdom)

### **Observers**

Ms Afra Kansa Maimuna (Indonesia)  
Mr Rudianto (Indonesia)

### **Invited Experts**

Mr Harald Spahn (Germany)  
Dr Ajay Kumar Bandela (India, TT-IOWave25 Chair)  
Dr Padmanabham Jijjavarapu (India, WG-2 Chair)  
Dr Sudheer Joseph (India, Member TT-MTS)

### **UNESCO-IOC**

Dr Srinivasa Kumar Tummala (ICG/IOTWMS Secretariat)  
Mr Ardito Kodijat (IOTIC)  
Ms Nora Gale (ICG/IOTWMS Secretariat)

## 3. WORKING GROUP 1 BACKGROUND

Dr Weniza, Chair of ICG/IOTWMS Working Group 1 on Tsunami Risk, Community Awareness, and Preparedness provided an overview of the Working Group including terms-of-reference, membership, actions and activities.

The Terms of Reference are to 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 hazard, risk assessment and mitigation, community awareness and preparedness, including for tsunamis generated by non-seismic and complex sources and multi-hazard framework.
2. Encourage Member States to mainstream tsunami Disaster Risk Reduction into sustainable development to help achieve resilient communities in the region.
3. Support implementation of IOWave Exercises.
4. Identify areas of priority for action following assessments, exercises, and real tsunami events.
5. Provide advice on user requirements and utility of tsunami warning products and services.
6. Provide advice to and collaborate with the UNESCO-IOC Indian Ocean Tsunami Information Centre (IOTIC) on education, awareness and preparedness including for non-seismic and complex sources.
7. Provide special attention to the needs of SIDS, LDCs, Africa in the work programme.
8. Develop WG1 work plans in line with the broad objectives of ODTP RDIP, Ocean Decade Challenge 6, EW4ALL.
9. 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.

Working Group 1 is composed of members nominated by Member States with expertise in 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 Working Group 1 actions from the 14<sup>th</sup> Session of the ICG/IOTWMS (Banten, Indonesia, 17-19 November 2024) include:

- **ICG-XIV/WG1(i)** Develop guidelines for Tsunami Ready Critical Infrastructure in collaboration with WG3 and share with the TOWS-WG in their next meeting.
- **ICG-XIV/WG1(ii)** Probabilistic Tsunami Hazard Assessment for Indian Ocean including non-seismic sources.
- **ICG-XIV/WG1(iii)** Develop Inclusive People Centred Early Warning DMO SOPs for near field tsunami.
- **ICG-XIV/WG1(iv)** Develop draft assessment tool for the downstream warning process.

The Working Group 1 actions from the 19<sup>th</sup> Meeting of the ICG/IOTWMS Steering Group (Jakarta, Indonesia, 17-19 June 2025) include:

- Review the draft booklet on ‘Strengthening Tsunami Warning Chains - A visual-based approach to support multi-stakeholder work processes’ for adoption as an IOTWMS document and put up to the TT-DMP for possible adoption as a global document.
- Formulate a framework to determine how the proposed assessment tool for the downstream warning process may complement and align with existing surveys and tools.

A key focus of Working Group 1 is the ongoing enhancement of tsunami warning chains and Standard Operating Procedures (SOPs) across IOTWMS Member States. This includes the publication of a Tsunami Warning Chain Booklet as an official UNESCO-IOC document. Another major initiative involves developing Inclusive, People-Centered Early Warning System SOPs for near-field tsunami risks, with the potential for adoption as a global guideline under UNESCO-IOC.

The Working Group will also consider the adoption of the Draft Assessment Tool for Tsunami Incidents and Exercises at the local level. Additionally, a significant task is the development of capacity-building

guidelines for tsunami-ready critical infrastructure. Plans are also underway to organize an online workshop in 2026 focused on Tsunami Hazard Assessment, including non-seismic tsunami sources.

Dr Weniza highlighted several collaborative efforts between Working Group 1 and other Working Groups and institutions. One such initiative is the preservation of historical tsunami data in partnership with IOTIC, planned for the 2025–2026 period. Another key activity is the Tsunami Evacuation Maps, Plans, and Procedures (TEMPP) training, which will be conducted in Hyderabad in April 2025 with participation from all Working Groups. Additionally, an SOP workshop is scheduled for 2026, to be organized in collaboration with Working Group 2.

#### **4. ASSESSMENT TOOL**

Dr Weniza reported on the draft “Assessment Tool for Tsunami Incidents and Exercises at the local level”. The assessment tool is a comprehensive guide developed under the TsunamiRisk Project (2022–2024), a collaborative Indonesian-German initiative. Its primary purpose is to evaluate community preparedness and response to tsunami-related incidents and exercises at the local level. Though based on Indonesian experiences, the tool is designed for global applicability, recognizing that tsunami preparedness challenges are often similar across regions.

The tool aims to facilitate rapid, structured assessments following tsunami incidents or exercises. It emphasizes the importance of involving local stakeholders to capture firsthand experiences and lessons that can enhance tsunami preparedness and early warning systems. It complements existing frameworks like the IOC Post-Tsunami Survey Guidelines and aligns with the IOC Tsunami Ready Initiative.

The assessment tool is structured into five main parts, each serving a distinct purpose in evaluating tsunami preparedness and response.

- Part 1 gathers context information about the incident or exercise, including the timeline, affected communities, and the national tsunami warning chain.
- Part 2 analyses the pre-existing capacities of the community, such as risk knowledge, warning systems, evacuation plans, emergency response capabilities, and public awareness.
- Part 3 assesses the actual performance during the event, focusing on how warnings were disseminated and received, the actions of local authorities and media, and the community’s response, including any confusion or panic.
- Part 4 involves evaluating the findings, identifying lessons learned, and making recommendations for improvement, using a color-coded system to rate both capacity and performance.
- Part 5 presents an overall result chart that visually summarizes the assessment outcomes, enabling quick comparisons and highlighting areas needing attention.

The tool is versatile and can be used by international teams, national agencies, local communities, or academic institutions. It supports both expert-led and self-assessment approaches. Ethical considerations and sensitivity to trauma are emphasized, especially when assessments are conducted shortly after an incident.

Ms Sunanda asked if the tool would replace the existing UNESCO-IOC surveys. Dr Weniza replied that it is not intended to replace but rather improve and fill gaps in the current surveys. Mr Harald Spahn expanded that the tool is aimed at specifically at communities and does not replace existing surveys.

Dr Mohammad Mokhtari noted the non-seismic and complex sources are becoming increasingly important for the Indian Ocean area and asked if the tool may also address these topics.

Dr Tummala noted that the tool could be tested by voluntary communities during Exercise IOWave25.

Ms Suci Dewi Anugrah noted that the tool could be used as part of the internal exercise within interested countries.

***Action:** Secretariat to circulate the assessment tool along with existing UNESCO-IOC surveys to WGI members for feedback to enable the formulation of a framework recommended by the SG-19*

***Action:** WGI members are requested to facilitate and encourage testing the tool in communities participating in the IOWave25 exercise to test the functionality and provide feedback to assist formulation of the framework recommended by the SG-19*

## **5. EARLY WARNING CHAIN BOOKLET**

Mr Harald Spahn, invited expert from Germany, presented the booklet on "Strengthening Tsunami Warning Chains – A visual based approach to support multi-stakeholder work processes". The booklet contains a practical, visual-based methodology to strengthen tsunami warning chains through improved multi-stakeholder collaboration. It emphasizes the importance of clearly defined roles, timely communication, and redundancy in warning systems to ensure communities at risk receive accurate and actionable information in time, especially during near-field tsunami threats where every minute counts.

The approach centres on using graphical representations of the warning chain to clarify institutional roles, decision-making responsibilities (such as issuing evacuation orders), and the flow of warning messages. These visual tools help stakeholders build a shared understanding of the warning process and identify areas for improvement. A color-coded system is used to distinguish between different types of messages (i.e., warnings, advice, official evacuation calls, and feedback loops) and to highlight the timeline for message dissemination.

A key feature is the editable warning chain template, which stakeholders can adapt to reflect their national or local context. This template serves as a foundation for discussion, verification, and consensus-building among all involved institutions. The process of customizing and validating the warning chain is often time-consuming but essential for ensuring clarity, feasibility, and operational readiness.

The document also stresses the importance of Standard Operating Procedures (SOPs) at every level of the warning chain. SOPs must be timeline-driven, integrated across institutions, and regularly reviewed. A visual status map of SOP development can help monitor progress and identify weak links in the system.

For both real incidents and tsunami exercises, the visual approach supports performance evaluation by documenting actual timelines of message transmission and reception. This allows for a detailed analysis of the warning chain's effectiveness and helps guide improvements.

The visual method has been successfully implemented in 24 countries around the Indian Ocean and is being tested in other regions, including Europe and Latin America. Its adaptability to other hazards and universal visual language make it a powerful tool for enhancing early warning systems globally.

Dr Mokhtari noted that he shared the warning chain template with his colleagues and received positive feedback, especially on the colours.

Dr Tummala recalled the method has been tested extensively through various workshops over many years. Most Member States have tested the tool and used it to illustrate their SOP readiness. He thanked Mr Spahn. He also noted that Dr Harkunti Rahayu could take the document to the TOWS-WG.

Mr Ardito Kodijat added that the upcoming pre-IOWave25 workshops in early August 2025 will utilise the warning chain and SOP templates. Input and suggestions from the previous iteration will be sent to Member States for review and updates. During the workshops, Day-2 will consist of a national workshop to discuss the national warning chain and SOPs with updates to be shared in plenary on Day-3.

Ms Anugrah congratulated Mr Spahn on the success of this document noting its benefit to Member States. She suggested that a warning chain tool for the community level would be useful as a future endeavour. Mr Spahn agreed that the booklet has potential to be applied at local level.

Dr Mokhtari suggested that an extra graphic for the community could be included.

***Action:** Secretariat to circulate the draft booklet on ‘Strengthening Tsunami Warning Chains - A visual-based approach to support multi-stakeholder work processes’ to WG1 members for feedback and adoption as an IOTWMS document and put up to the TT-DMP for possible adoption as a global document as recommended by the SG-19*

## **6. TSUNAMI READY FOR CRITICAL INFRASTRUCTURE**

Ms Suci Dewi Anugrah, Chair of ICG/IOTWMS Working Group 3 on Tsunami Ready Implementation, presented progress on advancing Tsunami Ready initiatives for critical infrastructure. She highlighted the significant impact of past tsunamis in Indonesia, including the 1992 Flores, 1996 Biak, 2004 Aceh, and 2018 Palu events, on essential facilities.

To enhance community preparedness, Indonesia is piloting Tsunami Ready implementation across five critical infrastructure sites. The standard indicators have been tailored to suit the specific functions of various infrastructure types, such as airports, ports, and industrial zones. Ms Anugrah reviewed all twelve Tsunami Ready indicators, illustrating how each can be adapted to meet the unique needs of critical infrastructure.

Dr Tummala expressed his appreciation to Ms Anugrah for her insightful presentation and the clear mapping of Tsunami Ready indicators for critical infrastructure. He inquired whether a brief document summarizing Indonesia’s experience could be prepared for wider dissemination. Such a document could be reviewed by the Steering Group and subsequently presented to the TOWS-WG for potential adoption.

Dr Mokhtari inquired specifically about the consultation process with the community in relation to airport preparedness. In response, Ms Anugrah explained that in the case of Yogyakarta Airport, collaboration with the community is conducted in parallel. For example, the airport also serves as a designated tsunami evacuation shelter for the surrounding population.

Dr Sudheer Joseph noted the existing signage for other hazards. Ms Anugrah replied that the multi-hazard approach could be integrated into the communities.

Dr Padmanabham reminded of a key TOWS-WG recommendation from 2024 on IOTWMS sharing the document on tsunami ready for critical infrastructure. Ms Anugrah thanked him for the reminder.

***Action:** WG1 in collaboration with WG3 to produce the draft guideline document for Tsunami Ready Critical Infrastructure to share with TOWS-WG in their next meeting as recommended by the SG-19*

## **7. HAZARD ASSESSMENT**

Dr Mahendra S Ranganahalli presented an update on tsunami hazard assessment efforts. The Probabilistic Tsunami Hazard Assessment (PTHA) provides scientifically grounded information to support the development of earthquake-tsunami scenarios for onshore hazard evaluations. The model is built on contributions from a network of experts across multiple institutions and countries.

A comprehensive PTHA study for the Indian Ocean was conducted by Geoscience Australia. In the northwest Indian Ocean region, a PTHA was developed under a UNESCAP-supported project. Dr Ranganahalli outlined the methodology behind the Makran PTHA, which involved the computation of over five million scenarios. As a result of this work, seismic source parameters for the Gujarat coast were revised.

He noted that while re-running the scenarios, the modelling domain could be expanded to include other key areas or countries. Dr Ranganahalli further highlighted that the PCTWIN project is actively addressing the need for expanded tsunami hazard modelling through the objectives of Work Package 1, which could be leveraged for continued development. He emphasized the importance of transferring this knowledge to other IOTWMS Member States to enhance regional tsunami preparedness.

Prof Fatemeh Jalayer of University College London thanked Dr Ranganahalli for his comprehensive presentation, particularly the insights related to Work Package 1 of the PCTWIN activities. She noted the strong alignment across the PCTWIN work packages and shared that a comprehensive survey is currently underway to assess perceptions of tsunami risk, human behaviour, and aspects of inclusion. This includes evaluating complementary indicators that reflect the inclusivity of tsunami planning within communities.

Prof Jalayer also expressed interest in the Tsunami Ready recognition for critical infrastructure, noting that a dedicated PCTWIN task on this topic is scheduled to begin in September 2025.

Dr Mokhtari praised the presentation for its quality and insights. He emphasized that western India is particularly vulnerable to the Makran subduction zone and noted that acquiring more detailed information on the segmentation of this zone would significantly enhance understanding of the associated tsunami hazard.

***Action:** Working Group 1 to continue strong collaborations with the PCTWIN, UNESCAP and other relevant global, regional and national initiatives to enhance tsunami hazard / risk knowledge and for the utilisation of the knowledge / products as a scientific basis for tsunami preparedness activities in the Member States.*

## **8. PROJECT COLLABORATIONS (PCTWIN, UNESCAP & FUST)**

### **People-Centred Tsunami Early Warning for the Indian Coastlines (PCTWIN)**

Prof. Fatemeh Jalayer highlighted the strong collaboration between the PCTWIN project and IOTWMS, noting that a key area of joint work focuses on source characterization not only along the Indian coastline but across the broader region. She mentioned that the monthly PCTWIN Work Package meetings include participation from experts within the IOTWMS Working Groups, and that this collaboration will be further deepened starting in August.

She also emphasized the importance of participatory approaches in people-centered tsunami early warning systems. This includes sharing workshop protocols to enable their replication at larger scales. Additionally, Prof Jalayer noted that the development of inclusivity indicators for tsunami warning systems should incorporate input from Working Group 1 to ensure a comprehensive and representative approach. Dr Weniza replied that Working Group 1 is very eager to collaborate with the PCTWIN project.

Dr Tummala thanked Prof Jalayer for her briefing and expressed appreciation for the invitation extended to IOTWMS to participate in the Kochi meeting. He noted the strong alignment between IOTWMS and PCTWIN activities, which was intentional by design. He affirmed that collaboration would continue through active participation in the monthly PCTWIN Work Package meetings and by inviting PCTWIN stakeholders to IOTWMS Working Group meetings to further strengthen cooperation.

Dr Mokhtari suggested that paleotsunami data could offer valuable complementary insights and should be considered for integration into the PCTWIN project.

### **United Nation's Economic and Social Commission for Asia and the Pacific (UNESCAP)**

The IOTWMS has benefited from sustained funding support from the UNESCAP over several years. Phase 3 of the Makran project is now in its final stages of approval. This phase will focus on implementing Tsunami Ready in selected pilot communities and will also include an assessment of non-seismic tsunami sources.

## **Flanders UNESCO Science Trust Fund (FUST)**

A FUST project has secured funding to support the implementation of Tsunami Ready in Maldives and Seychelles.

The UNESCAP and FUST projects are both joint initiatives between IOTIC and the ICG/IOTWMS Secretariat.

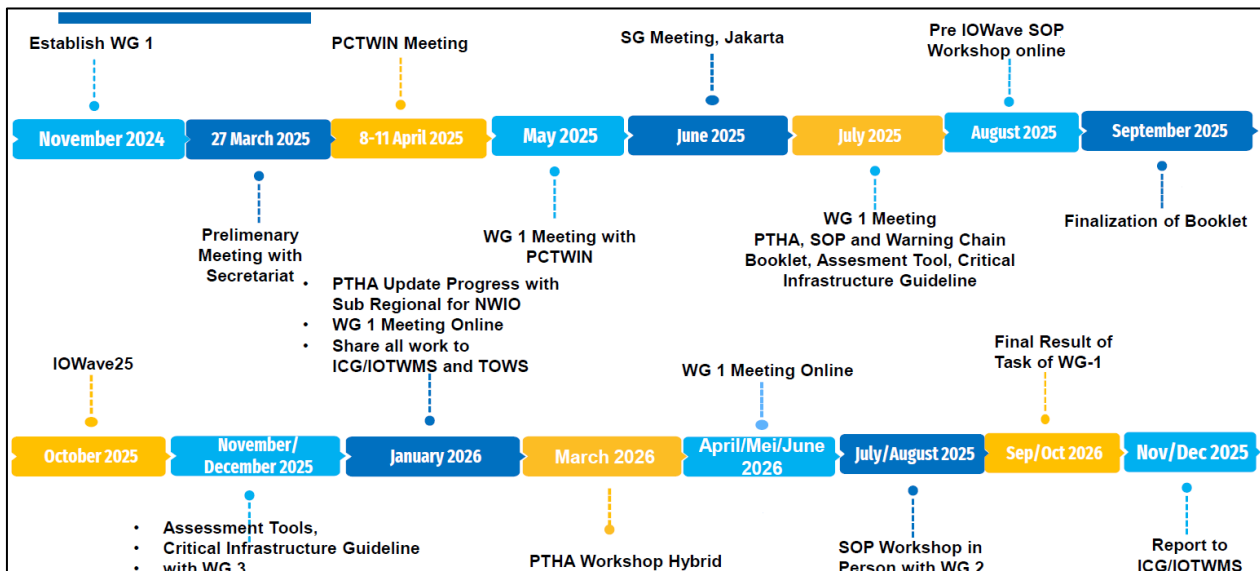
***Action:** Secretariat to continue to facilitate linkages with the key stakeholders and activities of the PCTWIN, UNESCAP, FUST and other collaborative initiatives in the IOTWMS to enable implementation of the mandate of the Working Group 1.*

## **9. WORKPLAN FOR 2025-2026**

Dr Weniza reviewed the future work plan of Working Group 1 (Figure 2).

The upcoming activities include (i) pre-IOWave25 workshops in August 2025, (ii) Finalisation of the warning chain booklet by September 2025, ahead of the IOWave25 exercise, (iii) Review of the Community Assessment Tool framework by November 2025, (iv) preparation of a draft guideline for tsunami ready critical infrastructure by December 2025, (v) Ongoing collaboration with PCTWIN and organisation of a hybrid PTHA Workshop in March 2026, (vi) in-person SOP workshop and WG1 meeting in July/August 2026.

Key documents highlighted at ii, iii and iv above will be shared with the IOTWMS Steering Group and then with the TOWS-WG Task Team on Disaster Management Preparedness in January 2026.



**Figure 2.** ICG/IOTWMS Working Group 1 calendar of activities.

*Action:* Members agreed on the Work Plan presented by the Chair and decided to proceed with the implementation in coordination with other Working Groups, Task Teams, IOTIC and Secretariat.

## **10. CLOSING**

In closing, Dr Weniza thanked all participants for the engaging reports and discussions on Working Group 1 activities. She expressed her anticipation for continued close collaboration within the group throughout the sessional period.