



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

**Steering Group Meeting**

**5-6 February 2024**

**Hyderabad, India**



*Participants at the ICG/IOTWMS Steering Group meeting hosted by the Indian National Centre for Ocean Information Services, Hyderabad, 5-6 February 2024.*

**1. WELCOME**

The welcoming remarks were first given by the host Dr Srinivas Kumar Tummala, Director of the Indian National Centre for Ocean Information Services (INCOIS). He reaffirmed India's commitment to the ICG/IOTWMS and welcomed the opportunity to demonstrate its contributions and ongoing support. He noted that INCOIS is one of the three Tsunami Service Providers (TSPs) for the Indian Ocean, working closely together with TSPs in Australia and Indonesia to provide tsunami threat information to all Member States around the Indian Ocean.

This was followed by welcoming remarks by Professor Dwikorita Karnawati, Chair of the UNESCO-IOC Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS) and Chair of its Steering Group. Professor Karnawati noted the upcoming important events, including the 17<sup>th</sup> meeting of TOWS-WG and its Task Teams (Sendai, Japan, 19-23 February 2024), the Ocean Decade Conference (Barcelona, Spain, 10-12 April 2024), UNESCO-IOC 2<sup>nd</sup> Global Tsunami Symposium (Banda Aceh, Indonesia, 11-14 November 2024), and ICG/IOTWMS-XIV (Jakarta, Indonesia, to be confirmed). She noted this year is an extremely important milestone and opportunity, as it marks the 20<sup>th</sup> commemoration of the devastating Indian Ocean Tsunami of 2004. This must be the focus of the ICG efforts.

Mr Rick Bailey, Head of Secretariat for the UNESCO-IOC ICG/IOTWMS, welcomed the ICG/IOTWMS Officers, other Steering Group members and observers to the intersessional meeting of the ICG/IOTWMS Steering Group. Mr. Bailey noted as part of the reporting and planning process of the ICG/IOTWMS, the Steering Group is now meeting to discuss progress of the work programme of the ICG and further develop the workplan in the lead-up to ICG/IOTWMS-XIV to be held in Indonesia during November 2024.

## **2. MEETING ORGANISATION**

Prof Karnawati presented the provisional agenda to the participants (see Annex 1). The agenda was adopted, with minor change of moving item on reflections and outcomes from the Indian Ocean Regional Conference (IO-CON 2024) to Day 2 and other business to include planning for the UNESCO-IOC 2<sup>nd</sup> Global Tsunami Symposium and the 14<sup>th</sup> Session of the ICG/IOTWMS in Indonesia during November 2024.

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

Details of the participants can be found in Annex 2.

Mr Ajay Kumar Bandela provided the participants with the logistical information for the meeting.

## **3. TERM- OF-REFERENCE AND ACTIONS FROM ICG/IOTWMS-XIII**

Mr Bailey reminded the meeting that the Terms-of-Reference (ToR) of the Steering Group are to coordinate and integrate the work of ICG/IOTWMS in the inter-sessional periods, as implemented through the various Working Groups and Task Teams:

1. Oversee the execution of the Decisions and Recommendations of the ICG.
2. Monitor the overall performance of the IOTWMS.
3. Identify areas of priority for action following assessments, communications tests, exercises, and real tsunami events.
4. Ensure the IOTWMS is implemented in line with the guidance of the TOWS-WG for the harmonisation of global tsunami warning and mitigation systems.
5. Identify and assess resource requirements to support implementation of the IOTWMS.

Activities of the Steering Group may include:

1. Promote and enhance the institutionalisation of tsunami early warning systems, their implementation, exercises, and maintenance.
2. Develop and maintain the Medium-Term Strategy and Outreach Plan.
3. Identify funding priorities for the ICG/IOTWMS Work Plans, including development of Programme and Budget for subsequent inter-sessional period for review by the ICG.
4. Oversee the planning and implementation of ocean wide tsunami exercises and drills.

5. Oversee performance assessment of IOTWMS for real tsunami events, with assistance of ICG/IOTWMS Secretariat through post-event questionnaires to be completed by Member States, for finalisation and distribution within 2 months after the event.
6. Contribute to the work of the TOWS-WG to coordinate the most effective global implementation and harmonisation of tsunami warning and mitigation systems.

Membership of the Steering Group includes the ICG Chair and Vice Chairs (Officers), Chairs and Vice Chairs of the Working Groups, Member State representatives from each TSP and two other NTWCs. Invited observers include a representative from IOTIC, immediate past Chair of the ICG for one term, and other invited observers as required. The Chair of ICG/IOTWMS is the Chair of the Steering Group. The Steering Group will primarily work offline by correspondence, but meet in person at least once a year.

Mr Bailey reminded the meeting of the relevant Decisions, Recommendations and Actions from ICG/IOTWMS-XIII (see Annex 2). The meeting decided to consolidate and renew all actions for the working groups and task teams as of this meeting and include in Annex 2.

#### 4. CHAIR TOWS-WG REPORT

Dr Srinivas Kumar Tummala, Chair of the UNESCO-IOC Working Group Tsunami and Other hazards related to sea level Warning and mitigation Systems (TOWS-WG), reported on its last meeting 2-3 March 2023 (see <https://oceanexpert.org/event/3694>), including current programme, progress on current activities, and future plans. He reminded the meeting on the ToRs for TOWS-WG, membership, and the relationship to other organisations with interests in sea level related hazards (tsunami, storm surge, sea level rise). He also mentioned the work and progress of the Task Team on Tsunami Watch Operations during 27-28 February 2023 (TT TWO)(see <https://oceanexpert.org/event/3834>), Task Team Disaster Management & Preparedness during 27-28 February 2023 (TT DMP)(see <https://oceanexpert.org/event/3845>), *Ad Hoc* Team Tsunamis Generated by Volcanoes, and *Ad Hoc* Team Meteotsunamis. He made particular mention of the need to develop Standard Operating Procedures (SOPs) for tsunamis generated by seismic and complex sources, the slow but steady expansion of Tsunami Ready communities, and the planned establishment of the Tsunami Ready Coalition to help accelerated the UNESCO-IOC Tsunami Ready Recognition Programme (TRRP).

Mr Bailey suggested that it may be better for the TOWS-WG task teams to be formed as Groups of Experts. The pool of experts its limited and task team membership is only two terms, creating difficulties in identifying new members.

**Recommendation:** ICG/IOTWMS review its ToRs at its next session to make reference to TOWS-WG and the UN Ocean Decade Tsunami Programme (ODTP).

#### 5. OCEAN DECADE TSUNAMI PROGRAMME

Dr Srinivas Kumar Tummala, Chair of the Ocean Decade Tsunami Programme Science Committee (ODTP-SC), reported on its most recent meeting in Paris, France, during 25-26 January 2024 (see <https://oceanexpert.org/event/4046>). The draft report of the meeting is to be finalised next week. He reminded the meeting of the ODTP Research & Development Implementation Plan (ODTP-RDIP). He noted unfortunately there are not many tsunami related activities submitted with each Call for Action of the UN Ocean Decade. He noted the most relevant UNOD challenge is Challenge 6: Increase community resilience to ocean hazards. The UNESCO-IOC 2<sup>nd</sup> Global Tsunami Symposium is an opportunity to identify and encourage activities and projects related to the ODTP-RDIP.

Dr Tummala explained the roles of the Decade Coordination Unit (DCU), Decade Collaboration Centres (DCCs), Decade Coordination Offices (DCOs), and Ocean Decade Capacity Development Facility.

The meeting discussed the UN “Early Warnings for All” (EW4ALL) initiative. Although work of the ICG/IOTWMS through Exercise IOWave23 and also workshops on improving national tsunami warning chains and SOPs clearly contributes to the objectives of this initiative, it was unclear from recent meetings organised by WMO and UNDRR if tsunami was considered to be part of the initiative.

Dr Srinivas Kumar Tummala subsequently reported on the outcomes of the highly successful Indian Ocean Regional Conference, which was hosted by INCOIS during 1-3 February in Hyderabad (see <https://oceandecade.org/events/indian-ocean-regional-decade-conference-2024/>). As part of the Ocean Decade framework, the Decade Collaborative Centre for the Indian Ocean Region (DCC-IOR) organised the ‘Indian Ocean Regional Decade Conference 2024: Bridging Billions to Barcelona. An Official Prelude to the 2024 Ocean Decade Conference’. Participants representing international, regional, and national entities engaged in ocean-related activities will convene to address critical issues faced by the Indian Ocean and its region.

The main objectives of the conference were:

1. To involve and engage stakeholders of the Indian Ocean Region (IOR) in Ocean Decade activities;
2. To provide a platform for deliberating on the future priorities for the Ocean Decade Challenges that are emerging via the Vision 2030 process with focus to the IOR, and feed regional inputs to the 2024 Ocean Decade Conference in Barcelona in April 2024;
3. To interact and network among the IOR stakeholders, including the National Decade Committees of the region;
4. To provide a platform to voice the concerns and expectations of the stakeholders from ECOPs, academicians, industries, social scientists, NGOs, and other ocean stakeholders.
5. As an official prelude to the 2024 Ocean Decade Conference in Barcelona, Spain, the outcomes of this gathering will serve as a strategic blueprint on the road to Barcelona, amplifying the collective voice of the Indian Ocean region on the global stage.

Of relevance to the UNESCO-IOC Tsunami Programme was a session, including panel discussion on the White Paper with regards to the Ocean Decade Challenge 6: Increase community resilience to ocean hazards. Dr Tummala, Prof Karnawati and Ms Sunanda Manneela have contributed to the draft. Prof Karnawati commented the White Paper needs to also add risk communication and identify the benefits more. Dr Harkunti Rahayu suggested the White Paper needs to include a description of the role of the ODTP and provide a link to the UN Making Cities Resilient Programme. Mr Bailey noted the scope of ocean hazards was quite broad in the White Paper and could do with a greater emphasis on tsunamis. The meeting discussed a need for each hazard to have a Science Plan similar to the ODTP RDIP. This session and other sessions of the conference highlighted the need for more tsunami activities to be recognised and developed as Ocean Decade programmes and projects, which may help identify and leverage further resourcing to fill gaps identified by the 2018 IOTWMS Capacity Assessment of Tsunami Preparedness in the Indian Ocean.

**Action:** *Vice-chairs of the ICG/IOTWMS to develop a strategy to utilise UN Ocean Decade opportunities, mapping existing and new the work programme activities of the ICG.*

**Action:** *Work Programme of the ICG/IOTWMS and its working groups to integrate the Research & Development Implementation Plan of the UN Ocean Decade Tsunami Programme (ODTP-RDIP).*

**Action:** *Steering Group Members invited to provide online input by 22 February with regards to the review of the White Paper on Ocean Decade Challenge 6: Increase community resilience to ocean hazards.*

**Action:** *WG3 should initiate collaboration with Ocean Decade Coordination Centre for Coastal Resilience (DCC-CR) based at University of Bologna, Italy.*

**Action:** *Secretariat to ensure capacity assessment and status reporting activities of the ICG/IOTWMS provide baseline information to identify progress and gaps implementing the ODTP-RDIP.*

**Action:** Secretariat work with ICG/IOTWMS and Member States (including private sector) to identify projects and programmes that could address gaps identified in the upcoming 2024 UNESCO-IOC Capacity Assessment of Tsunami Preparedness in the Indian Ocean.

**Action:** Secretariat to provide advice and guidance for future “Calls for Action” of the Ocean Decade.

**Action:** Chair of TOWS-WG (Dr Srinivas Kumar Tummala) and Chair of the ICG/IOTWMS (Prof Dwikorita Karnawati) to confirm if tsunami warning and mitigation is part of the scope of the UN EW4ALL initiative.

## **6. REPORT OF WORKING GROUP 1: TSUNAMI RISK, COMMUNITY AWARENESS AND PREPAREDNESS**

The Chair of WG1, Dr Harkunti Rahayu, reported on the main issues and activities related to WG1 and contributions to global coordination through the TOWS-WG TT DMP, which Dr Rahayu also chairs. WG1 met online during 17-18 March 2023 (see <https://oceanexpert.org/event/3875>). She explained how the work of WG1 aligns with various Ocean Decade Challenges and needs to prioritise SIDS, LDCs, and develop capacity for different stakeholders in tsunami warning and dissemination. Mr Bailey noted these and Africa are also the overall priorities of UNESCO-IOC and need to be considered in every ICG/IOTWMS Working Group work programme.

There were discussions around the enhancement of efforts to focus on inclusiveness, especially with regards to disability. Mr Bailey noted that Exercise IOWave23 explicitly had an objective on this. Dr Rahayu advised the meeting of a research grant obtained for disability inclusive higher education for tsunami disaster risk reduction that she obtained with Professor Richard Haigh and Professor Dilanthi Amaratunga. Mr Ardito Kodijat asked how other members of WG1 could participate. Prof Karnawati advised that BMKG could contribute two staff. Mr Bailey recommended health specialists could also be involved.

The meeting discussed whether a newsletter should be produced to keep Member States up-to-date on tsunami warning and mitigation issues in the Indian Ocean. It was decided this would be too labor intensive and hard to maintain, with efforts better targeted towards contributions to existing modes of communication.

Mr Bailey noted the report of the TOWS-WG Ad Hoc Team on Tsunamis Generated by Volcanoes, which highlighted the need for communities to be aware of the risk and be prepared to respond to tsunamis generated non-seismic and complex sources, has been published.

It was recalled the WG1 terms-of-reference were discussed at its last meeting, noting that much work is undertaken in collaboration with IOTIC.

**Action:** WG1 to review its terms-of-reference to better reflect the relationship with IOTIC and propose changes to ICG/IOTWMS-XIV.

**Action:** WG1 and IOTIC to work together to help develop community awareness and preparedness against the risk of tsunamis generated by seismic and non-seismic sources.

**Action:** Secretariat to actively seek articles for the UNESCO-IOC Tsunami Programme website maintained by the UNESCO-IOC Tsunami Resilience Section.

**Action:** WG1 to prioritise SIDS, LDCs and Africa in its work programme.

**Action:** WG1 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.

## 7. REPORT OF WORKING GROUP 2: TSUNAMI DETECTION, WARNING, AND DISSEMINATION

The current Chair of WG2, Mr Jijavarapu Padmanabham, provided a report on the main issues and activities related to WG2 and global coordination through TOWS-WG TT TWO . Mr Padmanabham, former Vice-chair of WG2, has replaced Dr Karyono as elected chair of WG2. Dr Karyono resigned from the position due to health issues. The ICG/IOTWMS Steering Group sincerely thanked Dr Karyono for his valuable contributions to WG2 and the ICG/IOTWMS. WG2 met online during 5-6 April 2023 (see <https://oceanexpert.org/event/3876>).

Mr Padmanabham reported on the latest Key Performance Indicator (KPI) figures for the three Tsunami Service Providers (Australia, India, Indonesia) and the results of the 6-monthly Communication Tests (between TSPs and NTWCs) coordinated by the Secretariat in collaboration with the TSPs

The meeting discussed the need to finalise the update of the Standard Services Definition Document (SSDD) to include new Tsunami Service Provider (TSP-Australia) products for tsunamis generated by non-seismic and complex sources. The associated National Tsunami Warning Centre (NTWC) Guide also needs updating and disseminated at the same time as the SSDD. NTWCs were exposed to the new products in one of the scenarios implemented under Exercise IOWave23. Mr Bailey again noted the report of the TOWS-WG Ad Hoc Team on Tsunamis Generated by Volcanoes has been published, which highlighted the need for communities to be aware of the risk and be prepared to respond to tsunamis generated non-seismic and complex sources.

As recommended by TOWS-WG and endorsed by the UNESCO-IOC Assembly, the TSPs need to begin issuing Maritime Products for shipping and other vessels at sea, following training of NAVAREA Operators in the new products. This will be on a trial basis in 2024 with a view to full implementation sometime in 2025.

Potential cyber-attacks on TSPs were discussed. They need to be anticipated to help mitigate risk. Prof Karnawati recommended a TSP Cyber Protection Policy be developed and tested during each 6-monthly IOTWMS Communications Test.

The issue of the high costs for TSPs in issuing products via Fax as one of the four dissemination methods was discussed. Not many Member States still use Fax, but some still do and must not be disadvantaged. A plan needs to be developed to identify who still needs to receive TSP products via Fax and stop issuing to those who don't.

With new technologies coming online for detecting tsunamis (e.g. SMART cable systems), information on the opportunities needs to be shared amongst Member States. Assembly Training in seismic and sea level data analysis for tsunami warning from new and existing monitoring systems is also required for NTWCs. It was also noted that the IOC Sea Level Data Facility has not yet implemented the recommendations of TOWS-WG and endorsed by UNESCO-IOC to display data in one second sampling format to ensure tsunami signals are more easily identifiable and characterised.

TSP-Australia advised they are working towards harmonised warnings under a national Multi-Hazard Early Warning framework.

Following TOWS-WG recommendations endorsed by UNESCO-IOC Assembly, NTWCs will require training in how to better facilitate the uptake of national tsunami warnings using the Common Alerting Protocol (CAP).

Prof Karnawati noted the large work programme and large number of activities and actions related to WG2. Noting it may simply not be possible for WG2 with available resources to address all actions, she requested WG2 prioritise the actions to ensure the highest priority are achieved.

**Action:** *WG2 to prioritise the actions associated with its work programme.*

**Action:** TSP-India and TSP-Indonesia to continue work on also developing products for tsunamis generated by non-seismic and complex sources like those developed and implemented by TSP-Australia.

**Action:** WG2 to develop a TSP Cyber Protection Policy to mitigate against any potential threats

**Action:** WG2 (Mr Jijavarapu Padmanabham) with the help of the Secretariat (Ms Nora Gale) to finalise the IOTWMS Standard Services Documentation Document and associated NTWC User Guide for distribution to Member States through a Circular Letter.

**Action:** WG2 to coordinate with Secretariat and TOWS-WG TT TWO in the development of training materials and training workshops for NAVAREA operators for trial implementation of TSP Maritime Products in 2024 (including trial dissemination via IOTWMS Communications Test in December 2024) and full implementation sometime in 2025.

**Action:** WG2 in collaboration with OTGA Training Facility operated by INCOIS to develop seismic and sea level data analysis training workshop for Member States in 2025/26.

**Action:** WG2 in collaboration with TSP-India develop training at the next IOTWMS SOP Workshops for NTWCs in the dissemination of national tsunami warnings by the Common Alerting Protocol (CAP).

**Action:** Secretariat to issue Circular Letter to all Member States to advise that dissemination of TSP products via Fax will cease after three (3) months of the Circular Letter unless Member States advise still required.

**Action:** Secretariat to distribute Report of TOWS-WG Ad Hoc Team on Tsunamis Generated by Volcanoes to all WG2 members for consideration and development of detection and warning system advice for Member States.

**Action:** WG2 to work in collaboration with TOWS-WG TT TWO and the Pacific Tsunami Warning Centre (PTWC) to develop automatic alerting procedures to help detect sea level anomalies associated with tsunamis generated by non-seismic and complex sources.

**Action:** WG2 to prioritise SIDS, LDCs and Africa in its work programme.

**Action:** WG2 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

## **8. REPORT ON REGIONAL WORKING GROUP NORTH-WEST INDIAN OCEAN**

The Chair of the Regional Working Group for the North-West Indian Ocean (RWG-NWIO), Dr Mohammad Mokhtari, provided a report on the main issues and activities. The RWG-NWIO met online during 30 May 2023 (see <https://oceanexpert.org/event/3922>). He stressed the importance of the UNESCAP funded project: “Strengthening tsunami early warning in the North-West Indian Ocean region through regional cooperation” in developing capacity of Member States in the region (Iran, Indian, Oman, Pakistan, United Arab Emirates, Yemen). Hazard and risk assessment has been vastly improved for the region. National tsunami warning chains and associated SOPs have been reviewed in detail and significantly enhanced. Now training is underway in inundation mapping and evacuation planning for pilot areas. He also provided information on the IGCP Project, which is searching for paleontological evidence of tsunamis in the region in an effort to determine the maximum credible earthquake source, and hence maximum risk to the region. Disaster managers need this information in order to scale their preparedness of communities.

Free and open data exchange is improving in the region, but issues still exist. Data exchange has been best facilitated by country-to-country bilateral agreements (e.g. Oman and India) with specific conditions, rather than open and general policies.

One of the challenges is the different types of sources that could generate and also possibly combine to magnify tsunamis in the region (traditional seismic, splay faulting, landslides, etc.). Efforts continue in trying to identify and catalogue the sources and potential tsunami hazards and associated risks. It provides a good example of the need to integrate with Multi-Hazard Early Warning frameworks. Most of these sources will generate near-field tsunamis, therefore developing community awareness and preparedness for such type of events is important. With the help of UNESCAP funding, relevant guides and manuals are being translated into local languages as efforts increasingly include local communities.

Next year is the 80<sup>th</sup> anniversary of the devastating 1945 tsunami in the region. Through the UNESCAP funded project, it is hoped a successful application for Phase 3 funding will ultimately see TRRP implemented in pilot areas in each country across this region.

Mr Bailey noted that unfortunately the Secretariat received no nominations from Member States for members to enable continuation of the associated Task Team Scientific Tsunami Hazard Assessment of the Makran Source Zone. However, most of the associated work was in any respect being undertaken by the RWG-NWIO and the UNESCAP funded project, hence this Task Team is not required.

*Action: Secretariat to develop template for bilateral data exchanges.*

*Action: 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.*

## **9. UNESCAP FUNDED NWIO PROJECT**

Mr Ardito Kodijat provided a report on the UNESCAP funded project: “Strengthening tsunami early warning in the North-West Indian Ocean region through regional cooperation”. Capacity development is supported in India, Iran, and Pakistan. Oman and UAE participate with their own resources. Phase 1 focused on tsunami risk assessment and development of national tsunami warning chains. Phase 2a continued the work of Phase 1. Phase 2b focused on a gap analysis of the capability of Member States in the region to undertake inundation mapping and evacuation planning. The project is currently in Phase 2c, which was officially launched online during 15 November 2023 (see <https://oceanexpert.org/event/4007>). Phase 2c is focusing on developing the capacity of Member States through training in tsunami inundation mapping and evacuation planning applied to pilot communities. Proposed Phase 3 will focus, if funded, on finalizing Tsunami Ready Recognition for the pilot communities.

*Action: Secretariat in consultation with IOTIC, WG3 and RWG-NWIO to prepare a proposal to submit to the Annual UNESCAP Tsunami and Climate Trust Fund Council meeting in November 2024 for Phase 3 of the NWIO Project, including cost-sharing by Oman and UAE.*

*Action: Secretariat to seek other donors to support a project similar to the NWIO project for African and SIDS Member States of the ICG/IOTWMS.*

## **10. REPORT OF WG3: TSUNAMI READY IMPLEMENTATION**

The Chair of WG3, Ms Suci Anugrah, provided a report on the main issues and activities related to WG3. WG3 met online during 24 August 2023 (see <https://oceanexpert.org/event/3975>). This included training through the OTGA facility in Indonesia on Tsunami Community Preparedness at a workshop during 4-11 December 2022 (including 30 participants from Bangladesh, Indonesia, Malaysia, Philippines, Seychelles, and Thailand). Tsunami Ready training was also provided by UNESCO-IOC IOTIC and the Government of Indonesia during 3 July to 1 August 2023 in Timor Leste and Seychelles during 21-25 November 2023. NTWC staff from Oman will receive on-the-job training at BMKG in Indonesia. Training in 2024 to focus on SIDS, including Maldives in August and also potentially Mauritius and Sri Lanka subject to funding.

The UNESCO-IOC Tsunami Ready Recognition Programme (TRRP) is slowly gaining global momentum across the four ICGs and is recognised as a key component of the ongoing ICG/IOTWMS workplan. TRRP is expanding in India and Indonesia. An update was provided on the development and implementation of Tsunami Ready for Critical Infrastructure in Indonesia, with airports as an example. Through initiatives like these the private sector are also being involved.

The Steering Group reflected on the best course of action to ensure the success of the TRRP, while noting the significant ODTP goal of 100 percent of coastal communities at risk of being impacted by a tsunami becoming Tsunami Ready. The Steering Group noted the importance of National Tsunami Ready Boards (or equivalent) as an in-country mechanism for overseeing and accelerating implementation of the TRRP nationally. Membership of National Boards should include a range of stakeholders with disaster managers playing a critical role. The National Boards should assist with the Tsunami Ready community verification process, noting the Secretariat and IOTIC cannot visit all communities. The Secretariat sought nominations from Member States of a Tsunami Ready Focal Point (TRFP), who is preferably a DMO representative and member of the National Tsunami Ready Board, or at the very least a Tsunami Ready champion in that country to help advance national initiatives. The TRFP would provide an important communication pathway between the ICG/IOTWMS and its Member States. To date 9 countries have provided nominations for a TRFP: India, Indonesia, Iran, Kenya, Madagascar, Mauritius, Sri Lanka, Timor Leste, and UAE. Others are still considering a nomination (like Australia), already have similar national initiatives (but need to reviewed to decide if actually equivalent to TRRP to help reporting against 100% at-risk community target), or tsunami risk reduction is not a high enough priority within their country to support a Tsunami Ready Recognition Programme.

The meeting discussed other ways of improving national support, especially for countries with low capacity:

- a. Training of national Tsunami Ready trainers and facilitators, including certification of these trainers and facilitators to be able to undertake the huge task TRRP if successful
- b. Different levels of Tsunami Ready Recognition (i.e. a subset but not all TR Indicators)

Mr Bailey reported on the very successful online training workshops on Standard Operating Procedures SOPs for NTWCs and DMOs and detailed review of associated national tsunami warning chains. The workshops were run by the Secretariat in consultation with WG3 and IOTIC. Due to different time zones, workshops were provided to Member States in different regions on different days and times:

- a. Western Indian Ocean Member States: (preparation meeting 1 June 2023 <https://oceanexpert.org/event/3926> and workshop 3-6 July 2023 <https://oceanexpert.org/event/3940>);
- b. Eastern Indian Ocean Member States (preparation meeting 1 June 2023 <https://oceanexpert.org/event/3927> and workshop 10-13 July <https://oceanexpert.org/event/3935>);
- c. NW Indian Ocean Member States (workshop 7-8 August 2023; <https://oceanexpert.org/event/3956>)

**Action:** ICG/IOTWMS representatives (Dr Rahayu and Mr Kodijat) request TOWS-WG Task Team Disaster Management and Preparedness (TT DMP) to consider including in the TRRP: a) Tsunami Ready for Critical Infrastructure; b) Different levels of Tsunami Ready Recognition (i.e. a subset but not all TR Indicators) to facilitate greater uptake of TRRP, especially by Member States with lower capacity.

**Action:** WG3 and IOTIC to undertake Tsunami Ready training for SIDS in 2024, including the Maldives in August 2024 and Mauritius and Sri Lanka subject to funding.

**Action:** WG3 to prioritise SIDS, LDCs and Africa in its work programme.

**Action:** WG3 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.

## 11. REPORT OF TASK TEAM ON EXERCISE IOWAVE23

The Chair of the WG3 Task Team on Exercise IOWave23, Ms Weniza, provided a report on the main issues and activities related to the task team. Exercise IOWave23 (see <https://oceanexpert.org/event/3916>) was undertaken with four different scenarios on 4, 11, 18, and 25 October respectively to ensure each part of the Indian Ocean region was impacted by a tsunami. Member States were invited to participate in at least one of the four scenarios, or even all of the scenarios. The exercise included an objective to ensure warnings reached all in the community (i.e. including those with disabilities, all ages and genders).

The Task Team met several times offline and online to prepare for event including during 4 April 2023 (see <https://oceanexpert.org/event/3874>). An Exercise Manual was prepared by the Task Team. Online briefings for Member States were also provided as part of the online SOP workshops, as Exercise IOWave23 provided a wonderful opportunity for Member States to test their national tsunami warning chains and associated SOPs. Information was provided at the workshops on the different scenarios, accessing the TSP products on the registered user website, new bulletins being trialed by TSP-Australia as part of a scenario for the first-time including a volcano generating a tsunami, participation of DMOs, overall exercise planning and conduct at the national level.

A webinar was held during 12-13 December 2023 (see <https://oceanexpert.org/event/3998>) to review the outcomes from exercise. A total of 19 Member States completed the post-event survey after the exercise. Stakeholders involved nationally included NTWCs, NDMOs, P/LDMOs, Media, and the public. In fact, 11 Member States involved Local DMOS (i.e. exercised at the community level). In terms of the Early Warnings for All, at least nine (9) Member States have procedures in place to ensure tsunami warnings get to all in the community, eight (8) Member States held pre-exercises awareness activities for people with disabilities, all ages and genders. Nine (9) Member States have evacuation maps that cater for people with disabilities, all ages and gender. Notably seven (7) Member States held community evacuations incorporating a total of over 45,000 people, including India, Indonesia, Iran, Maldives, Mauritius, Sri Lanka, and the UAE. At least seven (7) Member States used the exercise to test the Tsunami Ready Indicators in at-risk communities.

The meeting discussed whether future exercises could also be multi-hazard in their implementation (e.g. tsunamis occurring at same time as a cyclone/hurricane). While implementation on an ocean basin scale and coordination of multiple injects from different programmes being coordinated under different international organisations was considered challenging, the Steering Group recommended that Member States consider holding national exercises under a multi-hazard framework.

**Action:** *Exercise IOWave23 Task Team to complete the event report and Secretariat to publish.*

**Action:** *Secretariat to publish Exercise IOWave23 Manual and Supplements.*

**Action:** *WG3 to ensure all future IOWave Exercises also include objectives related to tsunami warnings reaching all in the community, including those with disabilities, all ages and genders.*

**Action:** *Secretariat to identify international observers for future IOWave exercises to help better assess the national and regional effectiveness of the exercises.*

**Recommendation:** *ICG/IOTWMS to consider holding future exercise scenarios in different regions at different times of the year to avoid seasonal workload issues for DMOs and their communities.*

**Recommendation:** *ICG/IOTWMS Member States to consider holding national tsunami exercises under a multi-hazard framework, including scenarios where different hazards are occurring simultaneously or where there is a cascading effect of hazards (e.g. volcano eruption, leads to a landslide, that also leads to the generation of a tsunami)*

## 12. 2024 CAPACITY ASSESSMENT PROJECT

Mr Bailey provided an update on the WG3 UNESCO-IOC 2024 Capacity Assessment of Tsunami Preparedness of ICG/IOTWMS Member States Project, which addresses the Decision made at ICG/IOTWMS-XIII to undertake the next capacity assessment to review progress and gaps 20 years after the Indian Ocean Tsunami of 2004. The Secretariat in consultation with the Steering Group developed a joint project plan in collaboration with UNESCAP to help undertake the assessment. Through UNESCAP, funding has been obtained from the Asian Development Bank (ADB) and Government of Switzerland to facilitate a team of experts from WG3 (who are also primarily other WG chairs and members of the Steering Group) to assess the survey results and propose recommendations to the Steering Group for its endorsement. The outcomes and recommendations will be presented at the 2<sup>nd</sup> Global Tsunami Symposium and ICG/IOTWMS-XIV in Indonesia during November 2024 and to other stakeholders, such as a meeting of ASEAN Member States in October in the Philippines. ADB and Government of Switzerland are very interested in the outcomes and guidance on where further donor funding can be provided. Funding is also available to contract a consultant to help prepare the executive summary report and full report of the assessment.

The strategy is to use as many of the analysis tools and as much of the survey from the 2018 IOTWMS Capacity Assessment Tsunami Preparedness as possible to facilitate a timely completion and enable a comparison between the 2018 and 2024 results. The UNESCO-IOC IOTWMS 2024 Capacity Assessment Team has met online and some in-person to review and update the 2018 Survey of Member States, including to ensure can now clearly identify progress and gaps with regards to the TRRP implementation (which was only a pilot programme in 2018). Once the survey has been updated and distributed to Tsunami National Contacts (TNCs) to coordinate national completion and submission, the Secretariat will at the same time organise an online briefing for TNCs and other key stakeholders on the objectives of the assessment and how to complete the survey (see <https://oceanexpert.org/event/4240>).

***Action:** UNESCO-IOC IOTWMS 2024 Capacity Assessment Team of WG3 to review and update the 2018 survey for Secretariat to disseminate to National Tsunami Contacts (TNCs) of Member States to coordinate national completion and submission.*

## 13. IOTIC REPORT

Mr Ardito Kodijat, Head of the UNESCO-IOC Indian Ocean Tsunami Information Centre (IOTIC), provided a report on the main issues and activities. As well as the Tsunami Ready training undertaken with WG3 in Seychelles and Timor Leste in 2023, IOTIC provided training for 30 Tsunami Ready facilitators in Indonesia during 10 January to 24 February 2023. The focus in 2024 will be on SIDS, starting with Maldives in August and possibly also Mauritius and Sri Lanka subject to funding.

IOTIC continues to successfully develop education tools supporting tsunami awareness and community education (e.g. tsunami boardgame). IOTIC continues to support World Tsunami Awareness Day (WTAD) activities. This year the theme is “Youth and Education” and IOTIC will support a webinar on the topic. IOTIC is driving the Indian Ocean Youth Tsunami Conversation and Campaign. UNESCO-IOC Tsunami Resilience Section has engaged a filmmaker to help prepare an Eyewitness and Survivor Story and Exhibition, which IOTIC is coordinating Indian Ocean contributions. As part of this production, some of the survivors will present and be interviewed at the UNESCO-IOC Executive Council Meeting in Paris, France, in June. The UNESCO-IOC Tsunami Information Centres (TICs), including IOTIC, will be organising a joint exhibition booth at the UNESCO-IOC 2<sup>nd</sup> Global Tsunami Symposium in Banda Aceh in November 2024. IOTIC is also organising a student video competition, with the winners being announced and displayed at the Symposium.

***Action:** IOTIC to share education materials being developed for tsunamis generated by non-seismic and complex sources with all the working groups.*

## 14. OTHER BUSINESS

Dr Rahayu updated the meeting on planning for the UNESCO-IOC 2<sup>nd</sup> Global Tsunami Symposium and the planned production of an open access book in association with Professor Richard Haigh and Professor Dilanthi Amaratunga of the University of Huddersfield in the United Kingdom. A draft agenda has been developed by the Local Organising Committee. Input on the agenda will next be sought from the Programme Organising Committee (POC). Feedback and endorsement will also be sought from the upcoming TOWS-WG meetings in Sendai, Japan in February.

The meeting discussed arrangements for the ICG/IOTWMS-XIV. The meeting is to directly follow the UNESCO-IOC 2<sup>nd</sup> Global Tsunami Symposium to encourage and facilitate people from overseas attending both. It was proposed the meeting could be held in either Banda Aceh or Jakarta. Mr Bailey expressed the view of the Secretariat that it would be preferable to hold the ICG meeting in Jakarta at the BMKG facilities. The Host Country Agreement (HCA) between the Government of Indonesia and UNESCO has stringent security and logistical requirements that would be far more easily satisfied if the meeting was held in Jakarta. Also, some participants of the ICG meeting may not be travelling to Banda Aceh and Jakarta would be far easier and cheaper to fly to.

***Action:** Dr Rahayu to seek feedback from the Programme Organising Committee (POC) and endorsement from the TOWS-WG on the draft agenda for the UNESCO-IOC 2<sup>nd</sup> Global Tsunami Symposium.*

***Action:** Secretariat to advertise the UNESCO-IOC 2<sup>nd</sup> Global Tsunami Symposium more broadly once the agenda and invited speakers are finalised.*

***Action:** Secretariat to liaise and consult with BMKG on the location and dates of ICG/IOTWMS-XIV and development of the Host Country Agreement.*

## AGREE ACTIONS

The list of Recommendations and Actions can be found in Annex 2. The Chair, Prof Karnawati, summarised the priorities:

- Further development and implementation on tsunami warning and community preparedness for tsunamis generated by non-seismic and complex sources
- Expansion of TRRP across the Indian Ocean
- Preparations for UNESCO-IOC 2<sup>nd</sup> Global Tsunami Symposium and ICG/IOTWMS-XIV
- UNESCO-IOC 2024 Capacity Assessment of Tsunami Preparedness of ICG/IOTWMS Member States
- Continuation of existing projects, such as the UNESCAP funded project: “Strengthening tsunami early warning in the North-West Indian Ocean region through regional cooperation”.

## 15. CLOSING REMARKS

Mr Bailey on behalf of UNESCO-IOC, thanked all attendees for their participation in the ICG/IOTWMS Steering Group. He also thanked all organisers and the hosts INCOIS for their contributions towards a successful event. Mr. Bailey noted that the ICG will have a full workplan in the lead-up to ICG/IOTWMS-XIV.

Dr Tummala thanked everybody for their contributions and for coming to INCOIS in Hyderabad, India.

Prof Karnawati, Chair of the ICG/IOTWMS, thanked all the Steering Group members and invited experts for their contributions to a fruitful discussion. She also thanked the Secretariat for a successful meeting. Prof Karnawati again noted the substantial number of actions to progress and meetings to be held prior to the next ICG in Indonesia in November 2024.

Prof Karnawati officially closed the intersessional meeting of the ICG/IOTWMS Steering Group at 18:00 on 6<sup>th</sup> February 2024.

## **ANNEX 1: AGENDA and PARTICIPANTS**

### **MEETING OF THE STEERING GROUP**

#### **UNESCO-IOC INTERGOVERNMENTAL COORDINATION GROUP**

#### **INDIAN OCEAN TSUNAMI WARNING & MITIGATION SYSTEM (ICG/IOTWMS)**

INCOIS, Hyderabad, INDIA

5 - 6 February 2024

<b>Name</b>	<b>Country</b>	<b>UNESCO-IOC ICG/IOTWMS Role</b>	<b>Mode</b>
<b>Steering Group Members</b>			
Dwikorita Karnawati, (Chair)	Indonesia	Chair, ICG/IOTWMS	In-person
Pattabhi Rama Rao Eluri	India	Vice-Chair ICG/IOTWMS	In-person
Yuelong Miao	Australia	Vice-Chair ICG/IOTWMS	Online
Harkunti Rahayu	Indonesia	Chair, WG1 Tsunami Risk, Community Awareness and Preparedness	In-person
Mahendra Ranganahalli S.	India	Vice-Chair, WG1 Tsunami Risk, Community Awareness and Preparedness	In-person
Jijavarapu Padmanabham	India	Chair, WG2 Tsunami Detection, Warning and Dissemination	In-person
Robert Greenwood	Australia	Vice-Chair, WG2 Tsunami Detection, Warning and Dissemination	Online
Suci Anugrah	Indonesia	Chair, WG 3 Tsunami Ready Implementation	In-person
Veronique Philoe	Seychelles	Vice-Chair, WG 3 Tsunami Ready Implementation	TBC
Mohammad Mokhtari	Iran	Chair, RWG North-West Indian Ocean	In-person
Sunanda Manneela	India	Vice-Chair, RWG North-West Indian Ocean	In-person
Yedi Dermadi	Indonesia	TSP-Indonesia	In-person
<b>Invited Experts &amp; Observes</b>			

Srinivas Kumar Tummala	India	Chair TOWS-WG and ODTP Science Committee	In-person
Ardito Kodijat	UNESCO	Head, Indian Ocean Tsunami Information Centre	TBC
Weniza	Indonesia	Chair, Task Team IOWAVE23	In-person
Ajay Kumar Bandela	India	Vice-Chair, Task Team IOWAVE23	In-person
Septa Anggraini	Indonesia	BMKG	In-person
<b>Secretariat</b>			
Rick Bailey	UNESCO-IOC	Head of ICG/IOTWMS Secretariat	In-person
Nora Gale	UNESCO-IOC	ICG/IOTWMS Secretariat	In-person

**Day#1: Monday, 5 February 2024, 0930-1700 local time (UTC+5:30)**

Item	Local time (UTC+5:30)	Topic	Lead
1	0930 - 0945	<b>1. Welcome</b>	Chair Secretariat
2	0945- 1000	<b>2. Meeting Organisation</b> <ul style="list-style-type: none"> <li>• Adopt agenda</li> <li>• Logistics</li> </ul>	Chair Ajay
3	1000 - 1030	<b>3. Terms-of-Reference and Actions from ICG/IOTWMS-XIII</b>	Secretariat
	1030 - 1100	<i>Break and photo</i>	
4	1100 - 1145	<b>4. Chair TOWS-WG Report</b> <ul style="list-style-type: none"> <li>• Terms-of-Reference and global coordination objectives</li> <li>• Outcomes 2023 meetings</li> <li>• Upcoming 2024 meetings</li> </ul>	Chair, TOWS_WG Srinivas Kumar
5	1145 - 1230	<b>5. Ocean Decade Tsunami Programme</b> <ul style="list-style-type: none"> <li>• 10-Year Research and Development Implementation Plan</li> <li>• Report on last ODTP Science Committee Meeting</li> <li>• Update on Tsunami Ready Coalition</li> <li>• Reflections and outcomes from IO-CON 2024</li> </ul>	Chair, UNODTP Science Committee, Srinivas Kumar
	1230 - 1330	<i>Lunch</i>	
6	1330 - 1415	<b>6. WG1 Report</b> <ul style="list-style-type: none"> <li>• Main issues and activities</li> <li>• Work Programme</li> </ul>	Harkunti Rahayu
7	1415 - 1500	<b>7. WG2 Report</b> <ul style="list-style-type: none"> <li>• Main issues and activities</li> <li>• Work Programme</li> </ul>	Jijjavarapu Padmanabham
	1500 - 1530	<i>Break</i>	
8	1530 - 1630	<b>INCOIS tour</b>	INCOIS team
9	1630 - 1700	<b>Reflections on Day #1</b>	All
	1700	<i>Day #1 Close</i>	

**Day#2: Tuesday, 6 February 2024, 0900–1700 local time**  
(UTC+5:30)

<b>Item</b>	<b>Local Time (UTC+5:30)</b>	<b>Topic</b>	<b>Lead</b>
10	0900 - 0945	<b>8. RWG-NWIO Report</b>	Mohammad Mokhtari
11	0945 - 1030	<b>9. UNESCAP funded NWIO Project Report</b>	Ardito Kodijat
	1030 - 1100	<i>Break</i>	
12	1100 - 1145	<b>10. WG3 Report</b> <ul style="list-style-type: none"> <li>• Main issues and activities</li> <li>• Work Programme</li> </ul>	Suci Anugrah
13	1145 - 1230	<b>TT IOWAVE23 Report</b>	Weniza
	1230 - 1330	<i>Lunch</i>	
14	1330 - 1415	<b>11. 2024 Capacity Assessment Project</b> <ul style="list-style-type: none"> <li>• Survey question review</li> <li>• Assessment team plans</li> <li>• Schedule</li> </ul>	Secretariat
15	1415- 1500	<b>12. IOTIC Report</b> <ul style="list-style-type: none"> <li>• Main issues and activities</li> <li>• Training</li> <li>• Tools</li> <li>• TIC coordination</li> <li>• Work Programme</li> </ul>	Ardito Kodijat
	1500 - 1530	<i>Break</i>	
16	1530 - 1600	<b>13. Other Business</b>	Secretariat
17	1600 - 1645	<b>14. Agree Actions</b>	Secretariat
18	1645 - 1700	<b>15. Closing Remarks</b>	Dwikorita Karnawati
	1700	<i>Day #2 Close</i>	

## **ANNEX 2: PARTICIPANT LIST**

### **Intergovernmental Coordination Group (ICG) Indian Ocean Tsunami Warning & Mitigation System (IOTWMS) Steering Group Meeting 5-6 February 2024**

#### **OFFICERS**

##### **Chair, ICG/IOTWMS**

Prof. Dwikorita KARNAWATI  
Director General  
Agency for Meteorology Climatology and  
Geophysics (BMKG)  
P.O. Box 3540 Jkt.  
Jl. Angkasa I No.2 Kemayoran Jakarta Pusat  
DKI Jakarta 10720  
INDONESIA  
Email: [dwiko@bmkg.go.id](mailto:dwiko@bmkg.go.id)

##### **Vice-Chair, ICG/IOTWMS**

Mr. Pattabhi Rama Rao ELURI  
Scientist-G & Group Director  
Ocean Observations, Modelling and Data  
Assimilation (OMDA)  
Indian National Centre for Ocean Information  
Services  
"Ocean Valley",  
Pragathi Nagar (BO), Nizampet (SO)  
Hyderabad 500 090 Telangana  
INDIA  
Tel: +91-40-23895008  
Email: [pattabhi@incois.gov.in](mailto:pattabhi@incois.gov.in)

##### **Vice-Chair, ICG/IOTWMS**

Dr. Yuelong MIAO  
Co-Director, Joint Australian Tsunami warning  
Centre (JATWC)  
Manager for Tsunami and Storm Surge  
Environmental Prediction Services  
Bureau of Meteorology, Melbourne  
700 Collins Street, Docklands  
GPO Box 1289  
Melbourne VIC 3001  
AUSTRALIA  
Tel: +61 3 9669 4110  
Email: [yuelong.miao@bom.gov.au](mailto:yuelong.miao@bom.gov.au)

#### **MEMBERS**

##### **Chair, WG1 Tsunami Risk, Community Awareness & Preparedness**

Dr. Harkunti RAHAYU  
Institut Teknologi Bandung (Bandung Institute of  
Technology)  
Campus  
Jl. Ganesha no. 10  
Bandung  
West Java 40132  
INDONESIA  
Email: [harkunti\\_rahayu@yahoo.com](mailto:harkunti_rahayu@yahoo.com)

##### **Chair, WG2 Tsunami Detection, Warning & Dissemination**

Mr. Jijavarapu Padmanabham Senior Geophysicist  
Indian National Tsunami Early Warning Centre  
(ITEWC), Applied Research and Research to  
Operations (AOR)  
Indian National Centre for Ocean Information  
Services  
"Ocean Valley", Pragathi Nagar (BO), Nizampet (SO)  
Hyderabad 500 090  
Telangana  
INDIA  
Tel: +91-40-23886067  
Email: [padmanabham@incois.gov.in](mailto:padmanabham@incois.gov.in)

##### **Chair, WG3 Tsunami Ready Implementation**

Ms. Suci ANUGRAH  
Agency for Meteorology Climatology and  
Geophysics (BMKG)  
P.O. Box 3540 Jkt.  
Jl. Angkasa I No.2 Kemayoran Jakarta Pusat  
DKI Jakarta  
10720  
INDONESIA  
Email: [sucirahman@yahoo.com](mailto:sucirahman@yahoo.com)

**Chair, RWG for NW Indian Ocean**

Dr. Mohammad MOKHTARI  
Director of National Center for Earthquake Prediction  
Seismotectonic  
International Institute of Seismology and Earthquake  
Engineering  
Tehran,  
P.O. Box: 19537-14453  
No. 21, Arghavan St., North Dibajee, Farmanieh  
IRAN  
Tel: +98 9122115165  
Email: [m7mokhtari@gmail.com](mailto:m7mokhtari@gmail.com)

**TSP-Australia**

Dr. Adrienne Moseley  
Co-Director, Joint Australian Tsunami warning  
Centre (JATWC)  
Geoscience Australia  
Cnr Jerrabomberra Ave and Hindmarsh Drive  
Symonston  
Canberra ACT 2609  
AUSTRALIA  
Email: [adrienne.moseley@ga.gov.au](mailto:adrienne.moseley@ga.gov.au)

**TSP-India**

Mr. Patanjali Kumar CHODAVARAPU  
Senior Geophysicist  
Indian National Tsunami Early Warning Centre  
(ITEWC), Applied Research and Research to  
Operations (AOR)  
Indian National Centre for Ocean Information  
Services  
"Ocean Valley", Pragathi Nagar (BO), Nizampet (SO)  
Hyderabad 500 090  
Telangana  
INDIA  
Tel: +91-40-23886067  
Email: [patanjali@incois.gov.in](mailto:patanjali@incois.gov.in)

**TSP-Indonesia**

Mr. Yedi DERMADE  
Earthquake Management Operation Subdivision  
Earthquake and Tsunami Warning Center  
The Agency for Meteorology, Climatology and  
Geophysics, Indonesia  
Head Office Jl. Angkasa 1 No.2Kemayoran  
Jakarta Pusat  
Jakarta 10720  
INDONESIA  
Email: [ydermadi@yahoo.com](mailto:ydermadi@yahoo.com)

**Vice-Chair, WG1 Tsunami Risk, Community  
Awareness & Preparedness**

Mahendra S. RANGANAHALLI  
Indian National Tsunami Early Warning Centre  
(ITEWC), Applied Research and Research to  
Operations (AOR)  
Indian National Centre for Ocean Information  
Services  
"Ocean Valley", Pragathi Nagar (BO), Nizampet (SO)  
Hyderabad 500 090  
Telangana  
INDIA  
Tel: +91-40-23886067  
Email: [patanjali@incois.gov.in](mailto:patanjali@incois.gov.in)

**Vice-Chair, WG2 Tsunami Detection, Warning &  
Dissemination**

Dr. Robert GREENWOOD  
Joint Australian Tsunami warning Centre (JATWC)  
Bureau of Meteorology, Melbourne  
700 Collins Street, Docklands  
GPO Box 1289  
Melbourne VIC 3001  
AUSTRALIA  
Tel: +61 3 9669 4110  
Email: [robert.greenwood@bom.gov.au](mailto:robert.greenwood@bom.gov.au)

**Vice-Chair, WG3 Tsunami Ready Implementation**

Ms Veronique Philoe  
Senior Disaster Management Officer  
Disaster Risk Management Division  
P.O Box 445  
Victoria, Mahe  
SEYCHELLES  
Email: [Veronique.Philoe@drmd.gov.sc](mailto:Veronique.Philoe@drmd.gov.sc)

**Vice-Chair, RWG NW Indian Ocean**

Ms. Vijaya Sunanda MANNEELA  
Scientist  
Indian Tsunami Early Warning Centre  
Indian National Centre for Ocean Information  
Services  
"Ocean Valley", Pragathi Nagar (BO), Nizampet (SO)  
Hyderabad 500 090  
Telangana  
INDIA  
Email: [sunanda@incois.gov.in](mailto:sunanda@incois.gov.in)

**INVITED EXPERTS & OBSERVERS**

**Chair, UNESCO-IOC TOWS-WG**

Dr Srinivasa Kumar TUMMALA  
Director  
Indian National Centre for Ocean Information Services  
"Ocean Valley", Pragathi Nagar (BO), Nizampet (SO)  
Hyderabad Telangana 500 090  
INDIA  
Email: [srinivas@incois.gov.in](mailto:srinivas@incois.gov.in)

**Chair, Task Team Exercise IOWave23**

Ms. WENIZA  
Head of Tsunami Mitigation Sub-Division  
The Agency for Meteorology, Climatology and  
Geophysics, Indonesia  
Head Office, Jl. Angkasa 1 No.2Kemayoran  
Jakarta Pusat, Jakarta 10720  
INDONESIA  
TEL: +6281-215556615  
Email: [weniza@bmkg.go.id](mailto:weniza@bmkg.go.id)

**Vice-chair, Task Team Exercise IOWave23**

Mr. Ajay Kumar BANDELA  
Indian National Centre for Ocean Information  
Services  
"Ocean Valley", Pragathi Nagar (BO), Nizampet (SO)  
Hyderabad 500 090 Telangana  
INDIA  
Email: [ajay@incois.gov.in](mailto:ajay@incois.gov.in)

Ms Septa Anggraini  
The Agency for Meteorology, Climatology and  
Geophysics, Indonesia  
Head Office Jl. Angkasa 1 No.2Kemayoran  
Jakarta Pusat, Jakarta 10720  
INDONESIA  
Email: [septa.anggraini@bmkg.go.id](mailto:septa.anggraini@bmkg.go.id)

**UNESCO-IOC REPRESENTATIVES**

**Head, UNESCO-IOC ICG/IOTWMS Secretariat**

Mr. Rick BAILEY  
UNESCO-IOC Perth Regional Programme Office  
Level 3, 1 Ord Street / PO Box 1370  
West Perth, Western Australia 6872  
Australia  
Tel: +61 408027594  
Email: [r.bailey@unesco.org](mailto:r.bailey@unesco.org)

Ms. Nora GALE  
ICG/IOTWMS Secretariat  
IOC/UNESCO Perth Regional Programme Office  
Level 3, 1 Ord Street / PO Box 1370  
West Perth, Western Australia 6872  
Australia  
Email: [n.gale@unesco.org](mailto:n.gale@unesco.org)

**Head of the UNESCO-IOC Indian Ocean Tsunami  
Information Centre (IOTIC)**

UNESCO Office Jakarta  
Jl. Galuh II no 5  
Kebayoran Baru  
Jakarta Selatan  
DKI 12110  
Indonesia  
Tel: +62-21-7399818 Ext 878  
Email: [a.kodijat@unesco.org](mailto:a.kodijat@unesco.org)

### ANNEX 3: CONSOLIDATED RECOMMENDATIONS AND ACTIONS

<b>Reference</b>	<b>RECOMMENDATIONS to ICG/IOTWMS</b>
SG02/24-R1	<i>ICG/IOTWMS review its ToRs at its next session to make reference to TOWS-WG and the UN Ocean Decade Tsunami Programme (ODTP).</i>
SG02/24-R2	<i>ICG/IOTWMS in future hold scenarios in different regions at different times of the year to avoid seasonal workload issues for DMOs and their communities.</i>
SG02/24-R3	<i>ICG/IOTWMS Member States consider holding national tsunami exercises under a multi-hazard framework, including scenarios where different hazards are occurring simultaneously or where there is a cascading effect of hazards (e.g. volcano eruption, leads to a landslide, that also leads to the generation of a tsunami)</i>

<b>Reference</b>	<b>ACTIONS for WG1</b>
SG02/24-1	<i><b>Action:</b> WG1 to review its terms-of-reference to better reflect the relationship with IOTIC and propose changes to ICG/IOTWMS-XIV.</i>
SG02/24-2	<i><b>Action:</b> WG1 and IOTIC to work together to help develop community awareness and preparedness against the risk of tsunamis generated by seismic and non-seismic sources.</i>
SG02/24-3	<i><b>Action:</b> WG1 to prioritise SIDS, LDCs and Africa in its work programme.</i>
SG02/24-4	<i><b>Action:</b> WG1 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.</i>

<b>Reference</b>	<b>ACTIONS for WG2</b>
SG02/24-5	<i><b>Action:</b> WG2 to prioritise the actions associated with its work programme.</i>
SG02/24-6	<i><b>Action:</b> TSP-India and TSP-Indonesia to continue work on also developing products for tsunamis generated by non-seismic and complex sources like those developed and implemented by TSP-Australia.</i>

SG02/24-7	<b>Action:</b> WG2 to develop a TSP Cyber Protection Policy to mitigate against any potential threats
SG02/24-8	<b>Action:</b> WG2 (Mr Jijavarapu Padmanabham) with the help of the Secretariat (Ms Nora Gale) finalise the IOTWMS Standard Services Documentation Document and associated NTWC User Guide for distribution to Member States through a Circular Letter.
SG02/24-9	<b>Action:</b> WG2 to coordinate with Secretariat and TOWS-WG TT TWO in the development of training materials and training workshops for NAVAREA operators for trial implementation of TSP Maritime Products in 2024 (including trial dissemination via IOTWMS Communications Test in December 2024) and full implementation sometime in 2025.
SG02/24-10	<b>Action:</b> WG2 in collaboration with OTGA Training Facility operated by INCOIS to develop seismic and sea level data analysis training workshop for Member States in 2025/26.
SG02/24-11	<b>Action:</b> WG2 in collaboration with TSP-India develop training at the next IOTWMS SOP Workshops for NTWCs in the dissemination of national tsunami warnings by the Common Alerting Protocol (CAP)
SG02/24-12	<b>Action:</b> WG2 to work in collaboration with TOWS-WG TT TWO and the Pacific Tsunami Warning Centre (PTWC) to develop automatic alerting procedures to help detect sea level anomalies associated with tsunamis generated by non-seismic and complex sources.
SG02/24-13	<b>Action:</b> WG2 to prioritise SIDS, LDCs and Africa in its work programme.
SG02/24-14	<b>Action:</b> WG2 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

Reference	ACTIONS for WG3
SG02/24-15	<b>Action:</b> WG3 should initiate collaboration with Ocean Decade Coordination Centre for Coastal Resilience (DCC-CR) based at University of Bologna, Italy.
SG02/24-16	<b>Action:</b> WG3 and IOTIC to undertake Tsunami Ready training for SIDS in 2024, including the Maldives in August 2024 and also Mauritius and Sri Lanka subject to funding
SG02/24-17	<b>Action:</b> WG3 to prioritise SIDS, LDCs and Africa in its work programme.
SG02/24-18	<b>Action:</b> WG3 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

SG02/24-19	<b>Action:</b> WG3 to ensure all future IOWave Exercises also include objectives related to tsunami warnings reaching all in the community, including those with disabilities, all ages and genders
SG02/24-20	<b>Action:</b> UNESCO-IOC IOTWMS 2024 Capacity Assessment Team of WG3 to review and update the 2018 survey for Secretariat to disseminate to National Tsunami Contacts (TNCs) of Member States to coordinate national completion and submission.

<b>Reference</b>	<b>ACTIONS for RWG-NWIO</b>
SG02/24-21	<b>Action:</b> 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

<b>Reference</b>	<b>ACTIONS for TT IOWave23</b>
SG02/24-22	<b>Action:</b> Task Team Exercise IOWave23 to complete the event report and Secretariat to publish

<b>Reference</b>	<b>ACTIONS for Secretariat</b>
SG02/24-23	<b>Action:</b> Secretariat to ensure capacity assessment and status reporting activities of the ICG/IOTWMS provide baseline information to identify progress and gaps implementing the ODTP-RDIP.
SG02/24-24	<b>Action:</b> Secretariat work with ICG/IOTWMS and Member States (including private sector) to identify projects and programmes that could address gaps identified in the upcoming 2024 IOTWMS Capacity Assessment of Tsunami Preparedness
SG02/24-25	<b>Action:</b> Secretariat to provide advice and guidance for future “Calls for Action” of the Ocean Decade.
SG02/24-26	<b>Action:</b> Secretariat to actively seek articles for the UNESCO-IOC Tsunami Programme website maintained by the UNESCO-IOC Tsunami Resilience Section.
SG02/24-27	<b>Action:</b> Secretariat to issue Circular Letter to all Member States to advise that dissemination of TSP products via Fax will cease after three (3) months of the Circular Letter unless Member States advises still required.
SG02/24-28	<b>Action:</b> Secretariat to distribute Report of TOWS-WG Ad Hoc Team on Tsunamis Generated by Volcanoes to all WG2 members for consideration and development of detection and warning system advice for Member States.
SG02/24-29	<b>Action:</b> Secretariat to develop template for bilateral data exchanges

SG02/24-30	<b>Action:</b> Secretariat in consultation with IOTIC, WG3 and RWG-NWIO to prepare a proposal to submit to the Annual UNESCAP Tsunami and Climate Trust Fund Council meeting in November 2024 for Phase 3 of the NWIO Project, including cost-sharing by Oman and UAE.
SG02/24-21	<b>Action:</b> Secretariat to seek other donors to support a project similar to the NWIO project for African and SIDS Member States of the ICG/IOTWMS
SG02/24-32	<b>Action:</b> Secretariat to publish Exercise IOWave23 Manual
SG02/24-33	<b>Action:</b> Secretariat identify international observers for future IOWave exercises to help better assess nationally and regionally the effectiveness of the exercises.
SG02/24-34	<b>Action:</b> Secretariat to liaise and consult with BMKG on the location and dates of ICG/IOTWMS-XIV and development of the Host Country Agreement.

Reference	ACTIONS for IOTIC
SG02/24-35	<b>Action:</b> IOTIC to share education materials being developed for tsunamis generated by non-seismic and complex sources with all the working groups.