**DRAFT RECOMMENDATIONS**

The Sixteenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XV) was held in hybrid format (in-person and online), during 2–3 March 2023 under the Chairpersonship of Mr Alexander Frolov (IOC Vice-Chair). The meeting evaluated the progress made in respect to the Decision IOC-XXXI/3.4.1 and of the IOC Assembly at its Thirty first session (14 – 25 June 2021, Paris).

**Recalling** IOC Assembly Resolution XIV-14 proposing the establishment of a Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG).

**Further recalling** IOC Assembly Decision IOC-XXXI/3.4.1 establishing the Ocean Decade Tsunami Programme (the Programme) with TOWS-WG serving as the Global Steering Committee for the Programme.

**The Group expressed** its solidarity with the people who are affected by the Turkiye–Syria earthquake 6 February 2023.

**The Group** **reviewed** reports by the IOC Intergovernmental Coordination Groups as well as its own Task Team on Disaster Management and Preparedness (TT DMP) and Task Team on Tsunami Watch Operations (TT TWO).

**The Group noted** **with appreciation** the progress made during the intersessional period, including:

* Wave exercises conducted in the Caribbean (CARIBE WAVE 22) and Pacific (PACWAVE 22) regions;
* Work of the Ad Hoc Team on Meteo-tsunamis under the Task Team on Tsunami Watch Operations (TT TWO) and the Ad Hoc Team on Tsunamis Generated by Volcanoes;
* Continuing expansion of capabilities and services of the Tsunami Service Providers (TSPs) for each region, especially with regards to tsunami events, and including development of new products and capabilities, such as for the maritime community and growing capability in response to tsunamis generated by non-seismic and complex events;
* Enhancements to monitoring and detection capabilities, such as growing use of GNSS data and installation of pilot undersea cable systems (SMART) in Caribbean, NE Atlantic and SW Pacific oceans;
* Continued progress in the implementation of Tsunami Ready in the NE Atlantic and Mediterranean and connected seas, Indian Ocean, Pacific Ocean, and Caribbean regions;
* Efforts of the Indian Ocean Tsunami Information Centre (IOTIC) and International Tsunami Information Centre (ITIC) in preparing Tsunami Ready and Tsunami Evacuation Maps, Plans and Procedures (TEMPP) training through the Ocean Teacher Global Academy (OTGA) platform and hybrid training workshops and training videos;
* Development of a questionnaire in the Caribbean to receive feedbacks from the Tsunami Ready communities;
* Initiatives of the Hotel Resilient Programme in Bali, Indonesia as a benchmarking and certification of hotels and resorts for disaster risk management (multi-hazard including tsunami) and climate change adaptation, as well as the example for a major hotel in Waikiki, Hawaii, United States;
* Work of the PTWS to develop a National Tsunami Warning Centre (NTWC) Competency Framework (2017), and the ITIC’s leadership to pilot training courses based on the Framework;
* Activities undertaken by the respective regions for WTAD 2022, and as part of this, the strong engagement in the #GetToHighGround Initiative, and the success achieved through United Nations Disaster Risk Reduction (UNDRR) and IOC collaboration;
* Efforts of the CARIBE-EWS and the IOC Secretariat to coordinate and contribute to global initiatives related to Multi-Hazard Early Warning Systems (MHEWS).

**Further noting** the unprecedented nature of the 15 January 2022 Hunga Tonga – Hunga Ha’apai volcanic eruption and tsunami, which severed communications with the outside for nearly six weeks, c**ommends** the ICG/PTWS for immediately providing support to the Kingdom of Tonga through the provision of operational earthquake, tsunami, and volcano situational reports, and technical assistance and provision of seismic, sea-level, communication and survey equipment by the   ITIC, PTWC, NZ, AU, USA, SPC, and facilitated by the IOC Tsunami Unit in Suva, Fiji.

**Further Commends** the PTWS for quickly implementing Interim HTHH Volcano Tsunami Response Procedures by 15 March 2022(Circular Letter number 2882) and **recommends** that all ICG/PTWS Member States with potential hazardous volcanoes take action to implement volcano tsunami warning as soon as possible, following guidance listed in the report of the TOWS WG Ad Hoc Task Team on Tsunamis Generated by Volcanoes.

**The Group recommended** continued collaboration between the UNESCO-IOC and the UNDRR, **noting** the 2023 WTAD theme will highlight the importance of fighting inequality for a resilient future and activities will include continuing the #GetToHighGround initiative to engage citizens on tsunami awareness. The theme aligns closely with the current focus of the TOWS-WG in the context of the UN Ocean Decade, The Mid-Term Review of the Sendai Framework, and action to accelerate the implementation of the Early Warnings for All (EW4All) initiative to ensure everyone on earth is covered by MHEWS in the next four years, prioritizing the most at-risk communities. **The Group requested** the UNDRR to strengthen collaboration with respective ICGs and corresponding TICs.

**The Group recommended** the continued collaboration between the UNESCO-IOC and the World Meteorological Organization (WMO), highlighting the role that many National Meteorological and Hydrological Services (NMHS) have in tsunami early warning and the role that WMO plays in supporting the NMHS in this regard, especially as linked to infrastructure and communications.

**In particular,** **the Group recommended** using the full capacity of the WMO Information System (WIS) and its Global Telecommunications System (GTS) for tsunami warning dissemination, where appropriate, and recommended subscription through WMO Global Information System Centres (GISCs) providing access to GTS data stream and tsunami warnings via ftp, sftp and email. **The Group recommended** further coordinating with GISCs in case of delivery delays or any communication issues, and to provide feedback on the use of GTS and WMO Information System (WIS).

**The Group noted** the Call to Action on emergency alerting launched jointly by ITU, IFRC and WMO leveraging the use of the Common Alerting Protocol (CAP) format, [ITU-T Recommendation X.1303](https://www.itu.int/en/ITU-D/Emergency-Telecommunications/Documents/2020/T-REC-X.1303bis-201403-.pdf).

**The Group recommended** the TOWS-WG Task Team on Tsunami Watch Operations, in consultation with WMO and the National Tsunami Warning Focal Points/Centres, continue its work in adopting the Common Alerting Protocol (CAP) format for public tsunami warnings issued by regional Tsunami Service Providers and National Tsunami Warning Centres.

**The Group acknowledges** the gaps in the global coverage of the tsunami early warning system and **recommends** full global coverage be pursued to ensure that all coastal areas at risk are assured of access to tsunami early warnings by 2027. This is a commitment to the *UN Early Warning for All Initiative.*

**The Group commended** the work of the Ad Hoc Team on Tsunamis Generated by Tsunamis.

**The Group decided** warning systems for tsunamis generated by volcanoes should be considered and coordinated as part of the IOC-UNESCO Global Tsunami Warning and Mitigation System, and also when possible be part of a Multi-Hazard Early Warning System (MHEWS).

**The Group decided** to continue the Ad Hoc Team on Tsunamis Generated by Volcanoes in order to complete its report in time for tabling at the IOC Assembly at its 32nd Session in 2023.

**The Group commended** the work of the Ad Hoc Team on Meteotsunamis.

**The Group acknowledges** that meteotsunami are a meteorological driven phenomenon, and as such, better clarifying the roles of NMHS and WMO will be critical in supporting the development of any potential future detection and alerting service for meteotsunamis.

**The Group decided** to continue the Ad Hoc Team on Meteotsunamis to finalise its report, **recommends** that WMO experts be engaged to assist in this task, and **also acknowledges** that WMO requests the WMO-IOC Joint Collaborative Board to discuss tsunami related issues with respect to meteotsunami, to clarify the roles and responsibilities for the WMO and UNESCO-IOC, and how best to strengthen collaboration for supporting Member States.

**The Group noted** the unresolved issue from the IOC Executive Council #55 in 2022 with regards to the ICG/Pacific extending its Earthquake Source Zone (ESZ) to include the South Atlantic and **requested** the IOC Secretariat to develop a paper through wide consultation on the requirements for access by other basins to earthquake source data from the South Atlantic Ocean, due to the impacts of tsunamis generated in this area on coasts in the Pacific and Indian oceans, for presentation to IOC Assembly at its 32nd Session in 2023.

**The Group welcomed** the continuing collaboration with the International Union of Geodesy and geophysics (IUGG) and **noted** the:

* Recent EGU 2022 meetings on Tsunamis from source processes to coastal hazard and warning;
* Publication of IUGG concerning the Sulawesi/Palu (2018) and Anak/Krakatau (2018) Tsunamis;
* Support provided by IUGG to IOC on the tsunami glossary update in 2019 and report on meteotsunamis.

**The Group further welcomed** the:

* Engagement of TOWS-WG Task Team members at the 28th IUGG General Assembly, 11-20 July 2023 at the Messe Berlin, City Cube, Germany;
* Proposed joint IUGG and IOC meetings in September 2023 in Tonga.

**The Group noted** the satellite services to be offered by Galileo in 2024 for the dissemination of alerts to the population and the Galileo demonstration examples to be carried out in France, Germany, Cyprus, and Belgium and the workshop planned in February 2024 and **welcomed** the offer of the Galileo Programme to provide relevant documents, storylines, protocols, guidelines and manuals to support the design of the demonstration examples.

**The Group recommended** the IOC Assembly at its 32nd session in 2023 to instruct the regional ICGs:

* Ensure sea level data is sampled at one second intervals and transmitted in real-time as a matter of priority, given the critical need to resolve and understand the near-field threat to high at-risk communities where a tsunami may arrive in 5-30 minutes;
* Encourage sea-level network operators to undertake regular and routine calibration of their sea-level monitoring instrumentation, following recommendations of IOC Manuals & Guides No #3 and No. 14 (Volumes I–V);
* Routinely monitor the status of seismic and sea level related observing networks to identify and better help rectify gaps in coverage and free and open data exchange;
* Tsunami Service Providers (TSPs) and NTWCs identify all coastal areas or near-shore faults that could generate large earthquakes that generate submarine landslides and be prepared to issue warnings as appropriate;
* Consider and implement the recommendations of the Ad Hoc Team on Tsunamis Generated by Volcanoes with respect to the hazard assessment, monitoring and warning requirements, including costs of deploying and maintaining such systems. Where identified TGVs may impact multiple Member States, Tsunami Service Providers (TSPs) for the relevant ocean basin tsunami warning and mitigation systems should consider if they need to be involved in monitoring and provision of threat advice;
* TSPs in collaboration with NAVAREA operators test the tsunami maritime safety products in 2023/24, with a view to operationally implementing in 2024;
* Add the task to facilitate the UNESCO/IOC Tsunami Ready Recognition Programme to the Terms of Reference of each ICG TIC;
* Undertake sub-regional exercises as an efficient way to further engage Member States on exercises;
* Follow the initiative of ICG/PTWS sub-regions to enable live information sharing during tsunami events to inform neighbouring country decision-making;
* Relevant ICG Working Groups explore, in cooperation with the TOWS Task Team on Disaster Management and Preparedness, ways to recognize communities that choose not to implement the UNESCO/IOC Tsunami Ready programme, as compliant with the Tsunami Ready indicators;
* TICs share Tsunami Ready survey questionnaire and feedback forms to receive information from the Tsunami Ready communities on implementation status;
* Avoid confusion by simplifying the text in the Tsunami Ready signage for vertical evacuation, such as “Go to the designated building for vertical evacuation”;
* Properly inform the public on the validity of the recognition, the period of recognition is indicated on the Tsunami Ready recognition certificate under the tsunami ready logo;
* ITIC utilise Pacific NTWC Competency Framework to develop a global framework for all ICGs to use.

**The Group recommended** the IOC Assembly at its 32nd session in 2023 to **request** the IOC Secretariat to:

* Provide a timelier update of the Tsunami Ready database;
* Explore how to develop an automated application system for Tsunami Ready application and renewal;
* Clarify the renewal process of Tsunami Ready and learning about the renewal experience in the United States;
* Facilitate the finalization of the OTGA basic tsunami training materials as soon as possible to support the UNESCO IOC Tsunami Ready Recognition Programme;
* Explore the possibilities to organize Tsunami Ready expert meetings to finalize the OTGA training programme;
* Develop a paper through wide consultation on whether a tsunami warning and mitigation system is needed to cover at-risk coasts around the South Atlantic Ocean;
* Expand and explicitly state the role of the ICGs, their Working Groups, Tsunami National Contacts, National Tsunami Warning Centers, Tsunami Warning Focal Points, Tsunami Service Providers, and Tsunami Information Centres in the Governance and Implementation chapters of the ODTP Science, Development and Implementation Plan;
* Help inform Member States widely on the potential tsunami hazard from volcanoes:
* Publish the TGV report as an IOC-UNESCO publication in 2023
* Provide the TGV Report, including the List of Tsunamigenic Volcanoes to Volcano Observatories
* Distribute the TGV Report, including the List of Tsunamigenic Volcanoes to IOC-UNESCO Member States

**The Group recommended** the IOC Assembly at its 32nd Session in 2023 **to endorse** the 10-Year Research, Development and Implementation Plan of the Ocean Decade Tsunami Programme with the proposed modifications, including those proposed by the inter ICG Task Teams;

**The Group noted with appreciation** the nomination of Dr Laura Kong as the chair of the Tsunami Ready Coalition

**The Group decided** to organize a Scientific Symposium and recommended an Organizing Committee be composed by two Co-chairs nominated by the Task Team on Tsunami Watch Operations and Task Team on Disaster Management and Preparedness, the Chair of the UN Ocean Decade Tsunami Programme Scientific Committee, a representative of the IUGG-Joint Tsunami Commission, and a representative of each of the Tsunami Information Centres (TICs). **The Group accepted** the offer of the Government of the Republic of Indonesia to host the symposium in December 2024 as part of the plans by the ICG/IOTWMS to commemorate the 20th Anniversary of the Indian Ocean Tsunami of 2004.

**The Group accepted** the reports and recommendations from the Inter-ICG Task Team on Disaster Management & Preparedness and Task Team on Tsunami Watch Operations and **decided** to continue both with their same Terms of Reference.

**The Group** **instructed** both TOWS-WG task teams to continue efforts for also monitoring and responding to tsunamis generated by non-seismic and complex sources and possible integration into tsunami watch operations and community preparedness activities.

**The Group further instructed** the Task Team on Disaster Management to:

* Prepare a guideline for mainstreaming tsunami disaster risk reduction for coastal urban development planning;
* Develop additional implementation guidance, such as flow chart, worksheets, and flyers, to support the implementation of Tsunami Ready;
* Prepare a guideline for critical infrastructures from tsunami impacts e.g., AirportGetReady to Tsunami;
* Updatethe Tsunami Hotel Guide developed by NEAMTWS in 2012 to include the ITIC materials and other recent documents, and translate in other languages, including other lessons learned;
* Work with the PTWS Working Group 3 to propose mechanisms by which National tsunami preparedness and readiness programmes and initiatives will be able to fully participate and contribute to the UN Ocean Decade Tsunami Programme’s UN Ocean Decade Tsunami Programme’s “prepared for and resilient to Tsunamis” goal.

 **The Group further instructed** the Task Team on Tsunami Watch Operations to:

* Monitor and participate in developments in the detailed design of a robust, risk-based detection and monitoring network for tsunami warning, as outlined in the Ocean Decade Tsunami Programme Research and Development Implementation Plan in support of the “enhance timeliness and accuracy of tsunami warnings” goal.