Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG)

Eighteenth Meeting

Paris, France
24–25 February 2025

UNESCO

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Executive Summary

The Eighteenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XVI) was held in hybrid format (in-person and online), during 24-25 February 2025 under the Chairpersonship of Mr Amr Zakaria Hamouda (IOC Vice-Chair). The meeting evaluated the progress made in respect to the IOC Assembly Decision A-32/4.3.1. and the Decision IOC Executive Council Decision EC-57/3.2.1.

The Group reviewed reports by the IOC Intergovernmental Coordination Groups (ICGs), the Ocean Decade Tsunami Programme Scientific Committee (ODTP-SC) as well as the Task Team on Disaster Management and Preparedness (TT-DMP) and Task Team on Tsunami Watch Operations (TT-TWO) reports.

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

- Coordination of the Wave exercises PacWave 24 (September to November 2024), the CARIBEWAVE 24 (21 March 2024), the NEAMWave 23 (6–7 November 2023) and the IOWave23 (4-25 October 2023);
- the continuous engagement of the TT-TWO in developing specialized TSP bulletins for the maritime community in consultation with the International Hydrographic Organisation (IHO) Sub-Committee on the World-Wide Navigational Warning Service (WWNWS-SC);
- the ongoing project of the Atlantic CAM Science Monitoring And Reliable Telecommunications (SMART) Subsea cable off Portugal, TAM TAM SMART cable between New Caledonia and Vanuatu, undersea cable installations being deployed and planned by Indonesia and India, the deployment of the Western Ionian Sea Infrastructure in 2023 in the Mediterranean.
- the number of Member States and communities joining the UNESCO-IOC Tsunami Ready Recognition Programme, with 100 communities from 31 countries already recognized, of which 15 are SIDS;
- publication of the Reports "*Monitoring and Warning for Tsunamis Generated by Volcanoes.* 2024. Paris, UNESCO. (IOC Technical Series No.183) and "*Meteotsunamis: definition, detection and alerting services investigation*".2025. Paris, UNESCO. (IOC Technical Series No.200), and the Summary Statement from the 2nd UNESCO-IOC Global Tsunami Symposium on Two Decades After 2004 Indian Ocean Tsunami: Reflection and Way Forward, Banda Aceh, 11–14 November 2024. Paris. UNESCO (IOC Brochure 2025-1)
- Launch of the UNESCO-IOC Tsunami Awareness and Tsunami Ready online trainings through the Ocean Teacher Global Academy (OTGA) platform.
- the Tsunami: Sea Change for Resilience, exhibition prepared in partnership with the United Nations Office for Disaster Risk Reduction (UNDRR) and Nautilus, featuring portraits by Matt Porteous and inspiring stories together with the historical and contemporary artworks which commemorate the 20th anniversary of the 2004 Indian Ocean Tsunami; organization of the 20th Anniversary of the 2004 Indian Ocean Tsunami Commemoration Event at the UNESCO Headquarters on 26 November 2024 to reflect on resilience, honour those affected, and reaffirm our commitment to disaster preparedness;

The Group accepted the invitation by UNDRR to co-develop the World Tsunami Awareness Day 2025 Theme connecting the Tsunami Ready Recognition Programme, the Making Cities

Resilient Program and the #GetToHighGround and #TsunamiReady hashtags to engage citizens on tsunami awareness;

The Group appreciated the development of Inclusive SOP and Inclusive Warning Tools for disabled children in Indonesia and the Caribbean, r**ecommended** the Indonesian inclusive SOPs to be translated to English and **encouraged** further development of inclusive SOP as official guidelines of UNESCO IOC.

The group noted the revisions on the T*sunami Watch Operations. Global Service Definition Document*. IOC Technical Series No. 130. Paris: UNESCO. (English) and endorsed the publication of a revised version of the IOC Technical Series No 130, with the updates suggested by the TT-TWO;

The group expressed its strong appreciation to the Government of Indonesia for having successfully co-hosted and organised the 2nd UNESCO-IOC Global Tsunami Symposium on Two Decades After 2004 Indian Ocean Tsunami: Reflection and Way Forward, Banda Aceh, 11–14 November 2024;

The Group recognized that the advancement of Common Alerting Protocols (CAP) implementation globally represents a significant milestone in the Early Warnings for All (EW4All) initiative, and the fact that CAP can be considered as the bridge connecting "observations, monitoring, analysis and forecasting" to "warning dissemination and communication", and that WMO is able to provide any assistance that may be required in this regard;

The Group instructed the TT-DMP to:

- Prepare a guideline for inclusive Standard Operating Procedures (SOP) building on the development of inclusive SOP and inclusive warning tools for disabled children in Indonesia and the Caribbean;

The Group instructed the TT-TWO to:

- include tsunamis generated by the submarine and subaerial landslides in its work programme and engage with the landslide hazard and early-warning scientific and operational community to address the requirements of the first objective of the ODTP to develop the warning systems' capability to issue actionable and timely tsunami warnings for tsunamis from all identified sources to 100 percent of coasts at risk;
- develop in collaboration with the WMO a global CAP template for TSPs to facilitate dissemination of bulletins from TSPs to NTWCs, between TSPs of different basins, and for public TSP bulletins, to be presented and approved by the TOWS-WG at its next session;

The Group recommended the IOC Assembly at its 33rd Session in 2025 to **approve** the Tsunami Ready Coalition Implementation Plan as reviewed by the ODTP-SC and the TT-DMP and TT-TWO including:

- The Coalition mandate and terms of reference,
- The Coalition structure, and
- The identified key Coalition Partners.

The Group recommended the IOC Assembly at its 33rd session in 2025 instruct the regional ICGs:

- Establishing arrangements among Tsunami Service Providers (TSP) within each ICG to ensure that service provision is ensured at all times for the full Area of Service of the ICG;
- to develop SOPs for volcanoes with a tsunamigenic potential within their Earthquake Source Zone (ESZ);
- that dissemination of the specialized TSP bulletins for the maritime community is tested in CARIBE-EWS, IOTWMS and NEAMTWS by at least one TSP either through the planned communication tests or tsunami exercises;
- that full operational implementation of TSP bulletins for the maritime community by at least one TSP in each ICG takes place in 2025;

The Group recommended the IOC Assembly at its 33rd session in 2025 recommend the regional ICGs:

- To create relationships between National Meteorological and Hydrological Services (NMHS) and TSPs/NTWCs in order to ensure that tsunami-specific instrumentation including Tsunameters/DART® and ocean cable systems are correctly monitored and utilized for detection of meteotsunami;
- continuation of the investigation and the possibility to adopt tsunami forecasting methods, including probabilistic methodologies, toward impact-based forecasting, that could also assist post-disaster response, recovery and needs assessment processes;
- to prioritize regional Tsunami Ready workshops or summits in 2025 and conduct further workshops or summits before 2030;

The Group recommended the IOC Assembly at its 33rd session in 2025 to **request** the IOC Member States to prioritize installation/deployment of additional coastal tide gauges and tsunami detection/observation systems in regions under high tsunami risk with priority areas with known coverage gaps (in alphabetical order: Aegean Sea, Caribbean Sea (West, North and South-East), Indian Ocean (East and North), North Africa, Philippine Sea, Solomon Sea, South China Sea, Timor Sea, and Yellow Sea), to ensure tsunami detection and verification as early as possible;

The Group further recommended the IOC Assembly at its 33rd session in 2025 to encourage the IOC Member States to monitor the health of their sea level gauges that are used for detecting and monitoring tsunamis, to restore them as quickly as possible when they fail, add sea level gauges when possible and share their data in real time, in places identified by their ICG as gaps;

The Group recommended Member States to invest more in offshore seismic and sea-level detection and observation instrumentation, such as Tsunameter/DART®/GPS buoys/cabled systems (e.g. SMART Cables), where possible, with multi-hazard observational capabilities, serving the needs of earthquake seismology, meteorology and oceanography;

The Group further recommended the IOC Assembly at its 33rd session in 2025 to encourage Member States to provide voluntary financial contributions to the IOC special account and in-kind contributions to support the Ocean Decade Tsunami Programme, the IOC Tsunami Ready Recognition Programme and the Tsunami Ready Coalition.

The Group recommended the IOC Assembly at its 33rd session in 2025 to **request** the IOC Secretariat to:

- inform Member States on the *Tsunami Ready Toolkit* availability via IOC Circular Letter to the Tsunami National Contacts, National Tsunami Ready Boards, and widely through

the attaching this as an appendix of the UNESCO-IOC Standard Guidelines for the Tsunami Ready Recognition Programme (IOC MG 74);

- disseminate to the Member States the final version of the below basic tsunami warning product/template for use by the radio amateurs, as a guidance;

> *At _(XX:XX)_ local time a magnitude _X.X_ earthquake occurred at _Lat, Lon_ with a depth of _X_ km, **_X_ km _Direction_ of _(Place)_.** The _(NTWC)_ has issued a tsunami _(level)_ for _(Place)_.*

- to finalize the Tsunami Ready Coalition Implementation Plan in consultation with the Tsunami Ready Coalition Chair the Coalition Partners, 'Ambassadors' or similar namesake, and Coalition Co-Chair;
- extend invitations to the proposed Coalition Partners and 'Ambassadors' or similar namesake, and a Coalition Co-chair, and urgently address needed resources;

The Group recommended the IOC Assembly at its 33rd session in 2025 to extend the tenure of the Inter-ICG TT-DMP and TT-TWO and recommended the approval of updated Terms of Reference for the Task Team on Tsunami Disaster Management and Preparedness as included under Appendix 1 of Annex II.

Résumé exécutif

La dix-huitième réunion du Groupe de travail sur les systèmes d'alerte aux tsunamis et autres aléas liés au niveau de la mer, et de mitigation (TOWS-WG-XVIII) s'est tenue selon des modalités hybrides (en présentiel et en ligne), les 24 et 25 février 2025, sous la présidence de M. Amr Zakaria Hamouda (Vice-Président de la COI). La réunion a permis d'évaluer les progrès réalisés au regard de la décision A-32/4.3.1 de l'Assemblée de la COI, et de la décision EC-57/3.2.1 du Conseil exécutif de la COI.

Le Groupe de travail a examiné les rapports des groupes intergouvernementaux de coordination (GIC) de la COI, du Comité scientifique du Programme relatif aux tsunamis de la Décennie de l'Océan (ODTP-SC), ainsi que des Équipes spéciales sur la gestion et la préparation en cas de catastrophe (TT-DMP) et sur les opérations de veille aux tsunamis (TT-TWO).

Le Groupe de travail a pris note avec satisfaction des progrès réalisés au cours de la période intersessions, notamment en ce qui concerne :

- la coordination des exercices de préparation aux tsunamis PacWave 24 (septembre à novembre 2024), CARIBE WAVE 24 (21 mars 2024), NEAMWave 23 (6-7 novembre 2023) et IOWave23 (4-25 octobre 2023) ;
- la participation continue de la TT-TWO à l'élaboration de bulletins spécialisés de prestataires de services relatifs aux tsunamis (TSP) à l'intention de la communauté maritime, en consultation avec le Sous-Comité sur le Service mondial d'avertissements de navigation (SMAN) de l'Organisation hydrographique internationale (OHI) ;
- le projet en cours du câble sous-marin Atlantic CAM SMART (surveillance scientifique et de télécommunication fiable) au large du Portugal, le câble TAM TAM SMART entre la Nouvelle-Calédonie et Vanuatu, les installations de câbles sous-marins actuellement déployées et prévues par l'Indonésie et l'Inde, et le déploiement en 2023 de l'infrastructure en mer Ionienne occidentale dans la Méditerranée ;
- le nombre d'États membres et de communautés ayant rejoint le programme de certification Tsunami Ready de l'UNESCO/COI, qui compte déjà 100 communautés certifiées dans 31 pays, parmi lesquelles 15 sont situées dans des PEID ;
- la publication des rapports intitulé « *Monitoring and Warning for Tsunamis Generated by Volcanoes* » 2024. Paris, UNESCO (n° 183 de la Série technique de la COI) ; et « *Meteotsunamis: definition, detection and alerting services investigation* » 2025. Paris, UNESCO (n° 200 de la Série technique de la COI), ainsi que le compte-rendu du deuxième Colloque mondial de la COI sur les tsunamis sur le thème « Vingt ans après le tsunami de 2004 dans l'océan Indien : Réflexion et perspectives », Banda Aceh, 11-14 novembre 2024. Paris. UNESCO (Brochure 2025-1 de la COI) ;
- le lancement des formations en ligne de la COI en matière de sensibilisation et de préparation aux tsunamis, par le biais de la plate-forme de l'Académie mondiale OceanTeacher ;
- l'exposition « *Tsunami: Sea Change for Resilience* », préparée en partenariat avec le Bureau des Nations Unies pour la réduction des risques de catastrophe (UNDRR) et Nautilus, qui présente des portraits réalisés par Matt Porteous et des histoires inspirantes, ainsi que des œuvres d'art historiques et contemporaines commémorant le 20e anniversaire du tsunami de 2004 dans l'océan Indien ; l'organisation de la cérémonie de commémoration du 20e anniversaire du tsunami de 2004 de l'océan Indien au Siège de l'UNESCO le 26 novembre 2024 afin de réfléchir à la résilience, de mettre à l'honneur les personnes touchées et de réaffirmer notre engagement en faveur de la préparation aux catastrophes.

Le Groupe de travail a accepté l'invitation de l'UNDRR de définir conjointement le thème de l'édition 2025 de la Journée mondiale de sensibilisation aux tsunamis en l'articulant autour du programme de certification Tsunami Ready, du Programme Pour des villes résilientes, ainsi que des hashtags #GetToHighGround et #TsunamiReady en vue de faire participer les citoyens à la sensibilisation aux tsunamis.

Le Groupe de travail a salué l'élaboration de procédures opérationnelles normalisées inclusives et d'outils d'alerte inclusifs pour les enfants en situation de handicap en Indonésie et dans les Caraïbes, **a recommandé** que les procédures opérationnelles normalisées inclusives de l'Indonésie soient traduites en anglais et **a encouragé** à continuer à élaborer des procédures standards normalisées à titre de directives officielles de la COI.

Le Groupe de travail a pris note des révisions apportées au document « *Tsunami Watch Operations : Global Service Definition Document* » (Opérations de veille aux tsunamis : Document de définition du service mondial), n° 130 de la Série technique de la COI. Paris : UNESCO (Anglais), et a approuvé la publication d'une version révisée du n° 130 de la Série technique de la COI, avec les mises à jour proposées par la TT-TWO.

Le Groupe de travail a manifesté sa vive reconnaissance au Gouvernement de l'Indonésie pour avoir organisé et accueilli conjointement et avec succès le deuxième Colloque mondial de la COI sur les tsunamis sur le thème « Vingt ans après le tsunami de 2004 dans l'océan Indien : Réflexion et perspectives », à Banda Aceh, du 11 au 14 novembre 2024.

Le Groupe de travail a reconnu que la progression de la mise en œuvre des protocoles communs d'alerte (PAC) à travers le monde constituait une étape importante en ce qui concerne l'initiative Alertes précoces pour tous ; que les PAC pouvaient être considérés comme un pont reliant « les observations, le suivi, l'analyse et la prévision » à « la diffusion et la communication des alertes » ; et que l'Organisation météorologique mondiale (OMM) était capable de fournir une aide pouvant être nécessaire en la matière.

Le Groupe de travail a chargé la TT-DMP :

- de préparer des directives en vue d'élaborer des procédures opérationnelles normalisées inclusives en s'inspirant de la mise en place de procédures opérationnelles normalisées inclusives et d'outils d'alerte inclusifs pour les enfants en situation de handicap en Indonésie et dans les Caraïbes.

Le Groupe de travail a chargé la TT-TWO :

- d'inclure les tsunamis causés par des glissements de terrain sous-marins ou terrestres dans son programme de travail et de coopérer avec la communauté scientifique et opérationnelle gérant le risque de glissement de terrain et les alertes rapides afin de répondre aux exigences du premier objectif du Programme relatif aux tsunamis de la Décennie de l'Océan, qui est de développer les capacités des systèmes d'alerte afin qu'ils soient à même d'avertir clairement et rapidement 100 % des communautés côtières menacées lorsqu'un tsunami survient, quelle que soit sa source ;
- de mettre au point, en collaboration avec l'OMM, un modèle de PAC mondial destiné aux prestataires de services relatifs aux tsunamis (TSP) afin de faciliter l'échange de bulletins entre les TSP et les centres nationaux d'alerte aux tsunamis, entre les TSP de différents bassins, ainsi que pour les bulletins publics des TSP, et de le soumettre à l'approbation du TOWS-WG à sa prochaine session.

Le Groupe de travail a recommandé à l'Assemblée de la COI, à sa 33e session (2025), **d'approuver** le Plan de mise en œuvre de la Coalition Tsunami Ready, tel que révisé par l'ODTP-SC, la TT-DMP et la TT-TWO, à savoir :

- le mandat et les attributions de la Coalition,
- la structure de la Coalition, et
- les principaux partenaires de la Coalition recensés.

Le Groupe a également recommandé que l'Assemblée de la COI, à sa 33e session (2025), donne instruction aux GIC régionaux :

- d'établir des modalités parmi les prestataires de services relatifs aux tsunamis (TSP) au sein de chaque GIC afin de garantir que la prestation de service soit assurée à tout moment pour l'ensemble de la zone desservie par le GIC ;
- d'élaborer des procédures opérationnelles normalisées relatives aux volcans à potentiel tsunamigène dans leurs foyers de séisme ;
- de veiller à ce que la diffusion des bulletins spécialisés des prestataires de services relatifs aux tsunamis (TSP) destinés à la communauté maritime soit testée dans le Système d'alerte aux tsunamis et autres risques côtiers dans la mer des Caraïbes et les régions adjacentes (CARIBE-EWS), le Système d'alerte aux tsunamis et de mitigation dans l'océan Indien (IOTWMS) et le Système d'alerte rapide aux tsunamis et de mitigation dans l'Atlantique du Nord-Est, la Méditerranée et les mers adjacentes (NEAMTWS) par au moins un TSP, soit par le biais des tests de communication prévus ou d'exercices de préparation aux tsunamis ;
- que la mise en œuvre opérationnelle totale des bulletins des TSP destinés à la communauté maritime par au moins un TSP dans chaque GIC ait lieu en 2025.

Le Groupe a également recommandé que l'Assemblée de la COI, à sa 33e session (2025), recommande aux GIC régionaux :

- d'établir des liens entre le Service météorologique et hydrologique national (SMHN) et les TSP/NTWC afin de garantir que les instruments spécifiques relatifs aux tsunamis, notamment les tsunamètres/Systèmes d'évaluation et d'enregistrement des tsunamis en mer profonde (DART)® et les systèmes de câbles océaniques soient correctement surveillés et utilisés pour la détection des tsunamis météorologiques ;
- de poursuivre l'investigation sur les méthodes de prévision des tsunamis qu'il est possible d'adopter, notamment les méthodes probabilistes, en vue d'une prévision axée sur les impacts, ce qui pourrait également contribuer aux processus d'intervention, de relèvement et d'évaluation des besoins à la suite d'une catastrophe ;
- de donner la priorité aux ateliers ou sommets régionaux relatifs au programme de certification Tsunami Ready en 2025 et de mener de nouveaux ateliers ou sommets avant 2030.

Le Groupe de travail a recommandé à l'Assemblée de la COI, à sa 33e session (2025), **de prier** les États membres de la COI de donner la priorité à l'installation/au déploiement de nouveaux marégraphes côtiers et de systèmes de détection/d'observation des tsunamis dans des régions où le risque de tsunami est élevé et qui comportent des zones prioritaires présentant des lacunes connues en matière de couverture (dans l'ordre alphabétique : Afrique du Nord, mer des Caraïbes (Nord, Ouest et Sud-Est), mer de Chine méridionale, mer Égée, océan Indien (Est et Nord), mer Jaune, mer des Philippines, mer des Salomon et mer de Timor), afin de détecter et de vérifier la survenue d'un tsunami le plus tôt possible.

Le Groupe de travail a recommandé en outre à l'Assemblée de la COI, à sa 33e session (2025), d'encourager les États membres de la COI à contrôler l'état de leurs marégraphes utilisés pour détecter et surveiller les tsunamis, afin de les réparer le plus vite possible en cas

de dysfonctionnement, d'ajouter des marégraphes lorsque cela est possible et de partager leurs données en temps réel, dans les lieux où des lacunes ont été recensées par leur GIC.

Le Groupe de travail a recommandé aux États membres d'investir davantage dans les instruments de mesure et d'observation du niveau de la mer et de l'activité sismique en mer, tels que des tsunamètres/DART®/bouées GPS/systèmes câblés (par exemple des câbles SMART), dans la mesure du possible, avec des capacités d'observation multirisque, répondant ainsi aux besoins en matière de sismologie, de météorologie et d'océanographie.

Le Groupe de travail a également recommandé à l'Assemblée de la COI, à sa 33e session en 2025, d'encourager les États membres à apporter des contributions financières volontaires au Compte spécial de la COI ainsi que des contributions en nature afin de soutenir le Programme relatif aux tsunamis de la Décennie de l'Océan, le programme de certification Tsunami Ready de la COI et la Coalition Tsunami Ready.

Le Groupe a également recommandé à l'Assemblée de la COI, à sa 33e session (2025), de **prier** le Secrétariat de la COI :

- d'informer les États membres de la disponibilité de la boîte à outils Tsunami Ready en adressant une lettre circulaire de la COI aux contacts nationaux pour les tsunamis ainsi qu'aux conseils nationaux du programme Tsunami Ready et, plus largement, en la joignant en tant qu'annexe aux « Principes directeurs pour le programme de certification Tsunami Ready » (Manuels et guides de la COI n° 74) ;
- de communiquer aux États membres la version finale du produit/modèle d'alerte aux tsunamis destiné aux radioamateurs, à titre d'orientation ;

*At _(XX:XX)_ local time a magnitude _X.X_ earthquake occurred at _Lat, Lon_ with a depth of _X_ km, **_X_ km _Direction_ of _(Place)_**. The _(NTWC)_ has issued a tsunami _(level)_ for _(Place)_.*

À *(XX:XX)* heure locale, un séisme de magnitude *X.X* est survenu à la position *Lat./Long.* à une profondeur de *X* km, à *X* km à *Direction* de *(Lieu)*. Le *(NTWC)* a émis une alerte au tsunami de *(niveau)* concernant *(Lieu)*.

- de finaliser le Plan de mise en œuvre de la Coalition Tsunami Ready en consultation avec le Président de la Coalition Tsunami Ready, les partenaires, « Ambassadeurs » ou acteurs assimilés de la Coalition, et la co-présidence de la Coalition ;
- d'envoyer des invitations aux partenaires, « Ambassadeurs » ou acteurs assimilés de la Coalition, et à la co-présidence de la Coalition, et d'aborder urgemment la question des ressources nécessaires.

Le Groupe de travail a recommandé à l'Assemblée de la COI, à sa 33e session (2025), de prolonger le mandat des Équipes spéciales inter-GIC de la TT-DMP et de la TT-TWO, et a recommandé l'approbation du mandat actualisé de l'Équipe spéciale sur la gestion et la préparation en cas de catastrophe liée à un tsunami, tel qu'il figure à l'Appendice 1 de l'Annexe 1.

Resumen ejecutivo

La 18ª reunión del Grupo de Trabajo sobre los Sistemas de Alerta contra los Tsunamis y Otros Peligros relacionados con el Nivel del Mar y Atenuación de sus Efectos (TOWS-WG-XVIII) se celebró en formato híbrido (presencial y en línea), los días 24 y 25 de febrero de 2025, bajo la presidencia del Sr. Amr Zakaria Hamouda (Vicepresidente de la COI). En la reunión se evaluaron los progresos realizados con respecto a la decisión A-32/4.3.1 de la Asamblea de la COI y la decisión EC-57/3.2.1 del Consejo Ejecutivo de la COI.

El Grupo examinó los informes de los grupos intergubernamentales de coordinación (ICG) de la COI, del Comité Científico del Programa de Tsunamis del Decenio del Océano (ODTP-SC), así como del Equipo de Trabajo sobre Gestión de Desastres y Preparación (TT-DMP) y del Equipo de Trabajo sobre Operaciones de Vigilancia de los Tsunamis (TT-TWO).

El Grupo tomó nota con aprecio de los progresos realizados durante el periodo entre reuniones, en particular:

- la coordinación de los ejercicios de preparación para los tsunamis PacWave 24 (de septiembre a noviembre de 2024), CARIBE WAVE 24 (21 de marzo de 2024), NEAMWave 23 (6-7 de noviembre de 2023) e IOWave23 (4-25 de octubre de 2023);
- la participación constante del TT-TWO en la elaboración de boletines especializados de proveedores de servicios sobre tsunamis destinados a la comunidad marítima, en consulta con el Subcomité sobre el Servicio Mundial de Radioavisos Náuticos (WWNWS-SC) de la Organización Hidrográfica Internacional (OHI);
- el proyecto en curso del cable submarino Atlantic CAM SMART (vigilancia científica y telecomunicaciones fiables) frente a Portugal, el cable TAM TAM SMART entre Nueva Caledonia y Vanuatu, las instalaciones de cableado submarino realizadas y previstas por Indonesia y la India, y la implantación en 2023 de la infraestructura del mar Jónico Occidental en el Mediterráneo;
- el número de Estados Miembros y comunidades que se han sumado al Programa de Reconocimiento Tsunami Ready de la COI/UNESCO: ya han obtenido el reconocimiento 100 comunidades de 31 países, de los cuales 15 son PEID;
- la publicación de los informes titulados "*Monitoring and Warning for Tsunamis Generated by Volcanoes*" 2024. París, UNESCO (Colección técnica de la COI nº 183), y "*Meteotsunamis: definition, detection and alerting services investigation*" 2025. París, UNESCO (Colección técnica de la COI nº 200), así como de la declaración resumida del Segundo Simposio Mundial de la COI sobre los Tsunamis sobre el tema "Dos décadas después del tsunami del océano Índico de 2004: reflexión y perspectivas", Banda Aceh, 11-14 de noviembre de 2024. París. UNESCO (Folleto de la COI 2025-1);
- la puesta en marcha de las formaciones en línea de la COI sobre sensibilización y preparación para los tsunamis mediante la plataforma de la Academia Mundial OceanTeacher;
- la exposición "Tsunami: Sea Change for Resilience", preparada en colaboración con la Oficina de las Naciones Unidas para la Reducción del Riesgo de Desastres (UNDRR) y Nautilus, en la que se presentan retratos de Matt Porteous e historias inspiradoras, junto con obras de arte históricas y contemporáneas que conmemoran el 20º aniversario del tsunami del océano Índico de 2004; la organización del acto de conmemoración del 20º aniversario del tsunami del océano Índico de 2004 en la Sede de la UNESCO, el 26 de noviembre de 2024, para reflexionar sobre la resiliencia, rendir homenaje a los afectados y reafirmar nuestro compromiso en favor de la preparación para casos de desastre.

El Grupo aceptó la invitación de la UNDRR para definir conjuntamente el tema del Día Mundial de Concienciación sobre los Tsunamis 2025, vinculando el Programa de Reconocimiento Tsunami Ready, el programa Desarrollando Ciudades Resilientes y los hashtags #GetToHighGround y #TsunamiReady para hacer participar a los ciudadanos en la sensibilización a los tsunamis.

El Grupo agradeció la elaboración de procedimientos operativos estándar inclusivos y herramientas de alerta inclusivas para niños con discapacidad en Indonesia y el Caribe, **recomendó** que los procedimientos operativos estándar inclusivos de Indonesia se tradujeran al inglés y **alentó** a que se siguieran elaborando procedimientos operativos estándar inclusivos a modo de directrices oficiales de la COI.

El Grupo tomó nota de las revisiones del documento titulado "*Tsunami Watch Operations: Global Service Definition Document*", Colección técnica de la COI nº 130. París: UNESCO (en inglés), y aprobó la publicación de una versión revisada de la Colección técnica de la COI nº 130, con las actualizaciones sugeridas por el TT-TWO.

El Grupo expresó su profundo reconocimiento al Gobierno de Indonesia por haber copatrocinado y organizado con éxito el Segundo Simposio Mundial de la COI sobre los Tsunamis sobre el tema "Dos décadas después del tsunami del océano Índico de 2004: reflexión y perspectivas", Banda Aceh, 11-14 de noviembre de 2024.

El Grupo reconoció que el avance de la aplicación de los protocolos comunes de alerta (PCA) a escala mundial representaba una etapa importante en relación con la iniciativa Alertas Tempranas para Todos (EW4All), que los PCA podían considerarse el puente que conecta "las observaciones, la vigilancia, el análisis y la previsión" con "la difusión y la comunicación de las alertas", y que la Organización Meteorológica Mundial (OMM) estaba en condiciones de prestar toda la asistencia que pudiera ser necesaria a este respecto.

El Grupo encargó al TT-DMP que:

- preparara directrices con miras a elaborar procedimientos operativos estándar inclusivos basándose en el establecimiento de procedimientos operativos estándar inclusivos y herramientas de alerta inclusivas para niños con discapacidad en Indonesia y el Caribe.

El Grupo encargó al TT-TWO que:

- incluyera los tsunamis generados por desprendimientos de tierras submarinos y subaéreos en su programa de trabajo y cooperara con la comunidad científica y operacional que se ocupa de los riesgos de deslizamientos de tierras y de la alerta temprana a fin de responder a las exigencias del primer objetivo del Programa de Tsunamis del Decenio del Océano, consistente en desarrollar las capacidades de los sistemas de alerta para emitir alertas claras y rápidas dirigidas a todas las comunidades costeras que corran peligro en caso de tsunami, cualquiera que sea su fuente;
- elaborara, en colaboración con la OMM, un modelo de PCA mundial para los proveedores de servicios sobre tsunamis (TSP), a fin de facilitar la difusión de boletines entre los TSP y los centros nacionales de alerta contra los tsunamis (NTWC), entre los TSP de diferentes cuencas, así como para los boletines públicos de los TSP, y lo sometiera a la aprobación del TOWS-WG en su próxima reunión.
    - **El Grupo recomendó** a la Asamblea de la COI que, en su 33ª reunión (2025), **aprobara** el Plan de Ejecución de la Coalición Tsunami Ready, revisado por el ODTP-SC y los TT-DMP y TT-TWO, en particular:
    - el mandato y las atribuciones de la Coalición,
    - la estructura de la Coalición, y

- los principales asociados de la Coalición movilizados.

El Grupo recomendó también a la Asamblea de la COI que, en su 33ª reunión (2025), encomendara a los ICG regionales las siguientes tareas:

- establecer modalidades entre los proveedores de servicios sobre tsunamis (TSP) dentro de cada ICG para garantizar la prestación de servicios en todo momento en la totalidad de la zona atendida por el ICG;
- elaborar procedimientos operativos estándar relativos a los volcanes con potencial tsunamigénico en sus focos sísmicos;
- velar por que al menos un TSP experimente la difusión de los boletines especializados de los proveedores de servicios sobre tsunamis destinados a la comunidad marítima en el Sistema de Alerta contra los Tsunamis y otras Amenazas Costeras en el Caribe y Regiones Adyacentes (CARIBE-EWS), el Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Océano Índico (IOTWMS) y el Sistema de Alerta Temprana contra los Tsunamis y Atenuación de sus Efectos en el Atlántico Nororiental y el Mediterráneo y Mares Adyacentes (NEAMTWS), ya sea mediante las pruebas de comunicación previstas o simulacros de tsunami;
- velar por que en 2025 al menos un TSP en cada ICG haya procedido a la implantación operacional completa de los boletines destinados a la comunidad marítima.

El Grupo recomendó además a la Asamblea de la COI que, en su 33ª reunión (2025), recomendara a los ICG regionales que:

- establecieran relaciones entre el Servicio Meteorológico e Hidrológico Nacional (SMHN) y los TSP/NTWC con el fin de garantizar que los instrumentos específicos relativos a los tsunamis, en particular los tsunámetros/Sistemas de Información y Evaluación de Tsunamis en el Fondo Marino (DART)® y los sistemas de cables oceánicos se vigilen y utilicen correctamente para la detección de tsunamis meteorológicos;
- prosiguieran las investigaciones sobre los métodos de previsión de tsunamis que podrían adoptarse, comprendidos los métodos probabilísticos, con miras a una previsión basada en el impacto, que también podría contribuir a los procesos de respuesta, recuperación y evaluación de las necesidades tras un desastre;
- dieran prioridad a los talleres o cumbres regionales sobre el Programa de Reconocimiento Tsunami Ready en 2025 y celebraran otros talleres o cumbres antes de 2030.

El Grupo recomendó a la Asamblea de la COI que, en su 33ª reunión (2025), **pidiera** a los Estados Miembros de la COI que dieran prioridad a la instalación de nuevos mareógrafos costeros y sistemas de detección/observación de los tsunamis en regiones que presenten un alto riesgo de tsunami y comprendan zonas prioritarias con deficiencias conocidas en materia de cobertura (por orden alfabético: mar Amarillo, mar Caribe (Oeste, Norte y Sudeste), mar de China Meridional, mar Egeo, mar de Filipinas, mar de las Salomón, mar de Timor, Norte de África y océano Índico (Este y Norte)), para detectar y verificar la aparición de tsunamis lo antes posible.

El Grupo recomendó también a la Asamblea de la COI que, en su 33ª reunión (2025), alentara a los Estados Miembros de la COI a controlar el estado de sus mareógrafos utilizados para detectar y vigilar los tsunamis, a repararlos lo antes posible en caso de avería, a añadir mareógrafos de ser posible y a comunicar sus datos en tiempo real, en los lugares en que su ICG hubiera observado deficiencias.

El Grupo recomendó a los Estados Miembros que invirtieran más en instrumentos de detección y observación de la actividad sísmica y el nivel del mar en alta mar, como

tsunámetros/DART®/boyas GPS/sistemas cableados (por ejemplo, cables SMART), en la medida de lo posible, con capacidades de observación de peligros múltiples, respondiendo así a las necesidades en materia de sismología, meteorología y oceanografía.

El Grupo recomendó además a la Asamblea de la COI que, en su 33ª reunión (2025), alentara a los Estados Miembros a aportar contribuciones financieras voluntarias a la Cuenta Especial de la COI y contribuciones en especie para apoyar el Programa de Tsunamis del Decenio del Océano, el Programa de Reconocimiento Tsunami Ready y la Coalición Tsunami Ready.

El Grupo recomendó a la Asamblea de la COI que, en su 33ª reunión (2025), **pidiera** a la Secretaría de la COI que:

- informara a los Estados Miembros sobre la disponibilidad del conjunto de herramientas Tsunami Ready mediante el envío de una circular de la COI a los contactos nacionales sobre los tsunamis y a las juntas nacionales de Tsunami Ready, y lo difundiera ampliamente, incluyéndolo como apéndice de las directrices generales del Programa de Reconocimiento Tsunami Ready (Manuales y guías de la COI nº 74);
- comunicara a los Estados Miembros la versión final del siguiente producto/modelo básico de alerta contra los tsunamis para su utilización por los radioaficionados, a modo de orientación;

*At _(XX:XX)_ local time a magnitude _X.X_ earthquake occurred at _Lat, Lon_ with a depth of _X_ km, **_X_ km _Direction_ of _(Place)_.** The _(NTWC)_ has issued a tsunami _(level)_ for _(Place)_.*

A las *(XX.XX)* hora local, se registró un seísmo de magnitud *X,X* en *Lat., Long.* a una profundidad de *X* km, a *X* **km en *Dirección* de *(Lugar)***. El *(NTWC)* emitió una alerta de tsunami de *(nivel)* para *(lugar)*.

- finalizara el Plan de Ejecución de la Coalición Tsunami Ready, en consulta con el Presidente de la Coalición Tsunami Ready, los asociados de la Coalición, los “Embajadores” o agentes asimilados de la Coalición y el Copresidente de la Coalición;
- cursara invitaciones a los asociados, “Embajadores” o agentes asimilados de la Coalición propuestos, y a un Copresidente de la Coalición, y abordara urgentemente la cuestión de los recursos necesarios.

El Grupo recomendó también a la Asamblea de la COI que, en su 33ª reunión (2025), prorrogara el mandato del TT-DMP y el TT-TWO, y recomendó que se aprobara el mandato actualizado del Equipo de Tareas sobre la Gestión y Preparación en caso de Desastres relacionados con Tsunamis que figura en el apéndice 1 (Anexo II).

Резюме для руководящих органов

Восемнадцатое совещание Рабочей группы по системам предупреждения и смягчения последствий цунами и других опасных явлений, связанных с изменением уровня моря (РГ-СПЦО-XVIII), состоялось 24-25 февраля 2025 г. в смешанном формате (с очным и дистанционным участием членов группы) под председательством г-на Амра Закарии Хамуды (заместитель Председателя МОК). Участники совещания проанализировали ход выполнения решения A-32/4.3.1 Ассамблеи МОК и решения EC-57/3.2.1 Исполнительного совета МОК.

Группа рассмотрела доклады межправительственных координационных групп (МКГ) МОК, научного комитета Программы по цунами в рамках Десятилетия, посвященного науке об океане (ПЦДО), целевой группы по ликвидации последствий стихийных бедствий и обеспечению готовности к ним (ЦГ-ЛПГ) и целевой группы по наблюдениям за цунами (ЦГ-НЦ).

Группа с удовлетворением приняла к сведению результаты работы в межсессионный период, в числе которых:

- Координация проведения учений по проверке готовности к цунами «Тихоокеанская волна-24» (сентябрь-ноябрь 2024 г.), «Карибская волна-24» (21 марта 2024 г.), «CBACM/Волна-23» (6-7 ноября 2023 г.) и «Индийская волна-23» (4-25 октября 2023 г.);
- Последовательные усилия ЦГ-НЦ по разработке адаптированных бюллетеней ПДСЦ для морского сообщества в консультации с подкомитетом Международной гидрографической организации (МГО) по всемирной службе навигационных предупреждений (Пк-ВСНП);
- Текущий проект прокладки подводного кабеля у берегов Португалии (проект CAM SMART), проект TAM TAM SMART по прокладке подводного кабеля между Новой Каледонией и Вануату, подводные кабельные сети, спроектированные и развертываемые Индонезией и Индией, и прокладка в 2023 г. интеллектуального кабеля в западной части Ионического моря;
- Общее число государств-членов и территориальных сообществ, участвующих в Программе ЮНЕСКО/МОК по сертификации готовности к цунами: 100 прибрежных населенных пунктов в 31 государстве-члене, включая 15 МОСРГ;
- Публикация докладов *Monitoring and Warning for Tsunamis Generated by Volcanoes* («Мониторинг и предупреждение в отношении цунами вулканического происхождения»). 2024. Париж, ЮНЕСКО. (Серия технических докладов МОК, вып. № 183) и *Meteotsunamis: definition, detection and alerting services investigation* («Метеоцунами: определение, обнаружение и оценка службами оповещения»). 2025. Париж, ЮНЕСКО. (Серия технических докладов МОК, вып. № 200) и Итоговое заявление участников второго Всемирного симпозиума ЮНЕСКО/МОК по цунами на тему «Осмысление двух десятилетий по прошествии цунами 2004 г. в Индийском океане: что дальше?», (11-14 ноября 2024 г. Банда-Ачех, Индонезия). Париж. ЮНЕСКО (Брошюра МОК № 2025-1);
- Презентация онлайновых учебных курсов ЮНЕСКО/МОК по повышению осведомленности о цунами и программе «К цунами готов» с использованием интернет-платформы Глобальной академии «Океан-инструктор» (ГАОИ);
- Цунами: кардинальные изменения в интересах повышения жизнестойкости, выставка, подготовленная в партнерстве с Управлением Организации

Объединенных Наций по снижению риска бедствий (УСРБ ООН) и компанией Nautilus, в рамках которой были представлены портреты работы художника Мэтта Портоса, повествующие о вдохновляющих историях жизни реальных людей, а также предыдущие и новые работы, посвященные 20-й годовщине цунами 2004 г. в Индийском океане; организация в Штаб-квартире ЮНЕСКО 26 ноября 2024 г. мероприятия по случаю 20-й годовщины цунами 2004 г. в Индийском океане с обсуждением темы повышения устойчивости к рискам стихийных бедствий, церемонией поминовения жертв и подтверждением нашего обязательства содействовать готовности населения к стихийным бедствиям.

Группа приняла предложение УСРБ ООН участвовать в определении темы Всемирного дня распространения информации о проблеме цунами 2025 г. в увязке с Программой сертификации готовности к цунами и программой «Повышение жизнестойкости городов к 2030 году», с использованием хэштегов #GetToHighGround и #TsunamiReady, с целью привлечения граждан к участию в информационной кампании по проблематике цунами.

Группа высоко оценила разработку универсальных типовых инструкций (УТИ) и инструментов предупреждения об опасности для детей-инвалидов в Индонезии и странах Карибского бассейна, **рекомендовала** перевести индонезийскую УТИ на английский язык, а также **призвала** разработать УТИ в качестве официального наставления ЮНЕСКО/МОК.

Группа приняла к сведению изменения, внесенные в документ *«Деятельность по наблюдению за цунами: определение глобальных услуг»* (Серия технических докладов МОК, № 130). Париж, ЮНЕСКО (на английском языке), и **одобрила** публикацию пересмотренного варианта Серия технических докладов МОК, № 130 с внесенными изменениями, предложенными ЦГ-НЦ.

Группа выразила глубокую признательность правительству Индонезии за организацию и успешное проведение второго Всемирного симпозиума ЮНЕСКО/МОК по цунами на тему «Осмысление двух десятилетий по прошествии цунами 2004 г. в Индийском океане: что дальше?», (11-14 ноября 2024 г. Банда-Ачех, Индонезия).

Группа отметила, что повсеместное внедрение общих протоколов оповещения (ОПО) о чрезвычайной ситуации представляет собой важный шаг вперед в реализации инициативы Генерального секретаря ООН «Заблаговременные предупреждения для всех» (инициатива ЗПДВ), а также **указала**, что ОПО можно рассматривать как объединение этапа «наблюдения, мониторинга, оценки и прогнозирования» с этапом «рассылки предупреждений и передачи информации», и что ВМО имеет возможность оказать любую помощь, которая может потребоваться в этом отношении.

Группа поручила ЦГ-ЛПГ:

- подготовить методическое руководство по разработке универсальной типовой инструкции (УТИ) на основе УТИ и универсальных инструментов предупреждения об опасности для детей-инвалидов, подготовленных в Индонезии и странах Карибского бассейна.

Группа поручила ЦГ-НЦ:

- включить тематику цунами, вызванных подводными и субаэральными оползнями, в программу своей работы и взаимодействовать с научным сообществом и специалистами-практиками, занимающимся вопросами оползневой опасности и раннего предупреждения, для выполнения требований,

предусмотренных в первой цели ПЦДО, касающейся возможности систем предупреждения направлять оперативные и своевременные предупреждения о цунами любого происхождения всем подверженным риску жителям прибрежных районов;

- разработать в сотрудничестве с ВМО единую типовую форму шаблона ОПО для ПДСЦ в целях упрощения рассылки бюллетеней от провайдеров данных в национальные центры предупреждения о цунами, их распространения между ПДСЦ разных бассейнов, а также разработать форму шаблона бюллетеней ПДСЦ, предназначенных для населения, и представить их на утверждение РГ-СПЦО на ее следующей сессии.

Группа рекомендовала Ассамблее МОК утвердить на ее 33-й сессии в 2025 г. план мероприятий Коалиции по поощрению готовности к цунами, который был рассмотрен научным комитетом ПЦДО, ЦГ-ЛПГ и ЦГ-НЦ, и в который включены:

- Задачи и круг ведения Коалиции;
- Информация о структуре Коалиции;
- Информация об основных партнерах Коалиции;

Группа рекомендовала Ассамблее МОК поручить на своей 33-й сессии в 2023 г. региональным МКГ:

- создать на уровне провайдеров данных слежения за цунами (ПДСЦ) в рамках каждой МКГ механизм, который обеспечил бы предоставление ими своих услуг в любое время и для всей зоны охвата МКГ;
- разработать стандартные рабочие процедуры (СРП) в отношении вулканов, потенциально способных вызвать цунами, в пределах своей зоны мониторинга очагов землетрясения (ЗМОЗ);
- протестировать в рамках КАРИБ-СРП, СПЦСПИО и СПЦСВАСМ по меньшей мере одним ПДСЦ, либо в ходе плановой проверки функционирования систем оповещения возможность направления адаптированных бюллетеней для морского сообщества;
- внедрить в 2025 г. полноценное использование бюллетеней для морского сообщества по меньшей мере одним ПДСЦ в зоне ответственности каждой МКГ.

Группа рекомендовала Ассамблее МОК поручить на своей 33-й сессии в 2023 г. региональным МКГ:

- установление связей между национальными метеорологическими и гидрологическими службами (НМГС) и ТСП/НЦПЦ с целью обеспечения правильного мониторинга и использования приборов для обнаружения метеоцунами, включая цунаметры/DART® и океанические кабельные системы;
- продолжить исследование и изучить возможность применения методов прогнозирования цунами, включая методологии количественно-вероятностной оценки, с целью прогнозирования вероятных последствий, что может в числе прочего оказаться полезным на этапе ликвидации последствий, восстановления после стихийного бедствия и проведения оценки потребностей;
- уделить в 2025 г. первоочередное внимание проведению региональных практикумов для специалистов или саммитов по тематике готовности к цунами и продолжить их проведение вплоть до 2030 г.

Группа рекомендовала Ассамблее МОК на ее 33-й сессии в 2025 г. просить государства – члены МОК в приоритетном порядке установить/развернуть дополнительные прибрежные мареографы и системы обнаружения/наблюдения за цунами в регионах с высоким риском цунами и приоритетных районах с известными пробелами в охвате (в английском алфавитном порядке: Эгейское море, Карибское море (западная, северная и юго-восточная части), Индийский океан (восточная и северная части), Северная Африка, Филиппинское море, Соломоново море, Южно-Китайское море, Тиморское море и Желтое море), с тем чтобы обеспечить обнаружение и оценку характера цунами на максимально ранней стадии.

Группа рекомендовала также Ассамблее МОК на ее 33-й сессии в 2025 г. призвать государства – члены МОК обеспечить рабочее состояние своих датчиков уровня моря, используемых для обнаружения и мониторинга опасности цунами, максимально быстрое их восстановление в случае выхода из строя, а также по возможности увеличение числа своих датчиков уровня моря и обмен данными в режиме реального времени в районах, которые МКГ определила как неохваченные.

Группа рекомендовала государствам-членам увеличить вложение средств в морское оборудование и приборы для целей обнаружения и мониторинга сейсмических явлений и уровня моря, такие как буи Tsunameter/DART®/GPS и кабельные системы (например, интеллектуальные кабели) по возможности с функцией отслеживания комбинированных стихийных бедствий, которые обеспечили бы потребности в области сейсмологии землетрясений, метеорологии и океанографии.

Группа рекомендовала также Ассамблее МОК на ее 33-й сессии в 2025 г. призвать государства-члены вносить добровольные финансовые взносы на специальный счет МОК и взносы в натуральной форме для поддержки Программы по цунами в рамках Десятилетия, посвященного науке об океане, Программы МОК по сертификации готовности к цунами и Коалиции по поощрению готовности к цунами.

Группа рекомендовала Ассамблее МОК на своей 33-й сессии в 2025 г. просить Секретариат МОК:

- информировать государства-члены о возможности использования комплекта методических материалов по вопросам готовности к цунами посредством направления циркулярного письма МОК в адрес национальных контактов по цунами и национальных советов по обеспечению готовности к цунами, а также путем его широкого распространения в качестве приложения к разработанным ЮНЕСКО/МОК Типовым руководящим принципам участия в Программе сертификации готовности к цунами (IOC MG 74);
- распространить среди государств-членов окончательный вариант приведенного ниже базового продукта/шаблона предупреждения о цунами для использования радиолюбителями в качестве инструкции;

*At _(XX:XX)_ local time a magnitude _X.X_ earthquake occurred at _Lat, Lon_ with a depth of _X_ km, **_X_ km _Direction_ of _(Place)_.** The _(NTWC)_ has issued a tsunami _(level)_ for _(Place)_.*

В _(XX:XX)_ по местному времени в точке с координатами _широта/долгота_ на глубине _X_ км произошло землетрясение силой _X.X_ баллов, в _X_ км от _(название населенного пункта)_. НЦПЦ направил предупреждение о цунами _(уровень опасности)_ в _(название населенного пункта)_.

- завершить разработку плана мероприятий Коалиции по поощрению готовности к цунами в сотрудничестве с председателем Коалиции по поощрению готовности к цунами, партнерами Коалиции, «послами» или аналогичными лицами, а также с сопредседателем Коалиции;
- направить приглашения предлагаемым партнерам Коалиции и «послам» или аналогичным лицам, а также сопредседателю Коалиции и в максимально короткие сроки обратиться за необходимыми ресурсами.

Группа рекомендовала Ассамблее МОК на ее 33-й сессии в 2025 г. продлить срок полномочий ЦГ-ЛПГ и ЦГ-НЦ МГК, а также утвердить обновленный круг ведения целевой группы по ликвидации последствий стихийных бедствий и обеспечению готовности к ним, который приводится в приложении 1.

1. OPENING AND WELCOME

1.1 OPENING

1. The Chairperson, Prof. Amr Zakaria Hamouda, opened the Eighteenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XVIII) and welcomed the participants. In his opening remarks, he recalled that he TOWS-WG will review over 2 days the work of the four intergovernmental coordination groups (Caribbean, Indian Ocean, Mediterranean and Northeastern Atlantic and Pacific regions), and the two specialized Task Teams, to advise the IOC Assembly on relevant items for discussion.

2. Mr Vidar Helgesen, Executive Secretary of IOC, also provided welcoming remarks. Mr Helgesen began by recognizing the progress made through the publication of two technical reports on volcano and meteotsunami generated tsunamis, according to the request of Member States, and noted impressive implication of Member States and communities joining the UNESCO-IOC Tsunami Ready Recognition Programme, with 100 communities from 31 countries already recognized, of which 15 Small Island Development States (SIDS). He also highlighted the continue and improve cooperation with the United Nations Disaster Risk Reduction office (UNDRR) and the World Meteorological Organization (WMO) towards a fully comprehensive Multi-Hazard Early Warning for All.

3. Mr Helgesen next drew attention to the initial deployment of tsunami bulletins for the maritime community in consultation with the International Hydrographic Organization (IHO) Sub-Committee on the World-Wide Navigational Warning Service (WWNWS-SC).

4. He noted that new challenges arise including the rise on risk of landslide generated tsunamis due to increased localized rainfall or glacial melting as a result of global warming/climate change. He also noted opportunities including the use of machine learning and IA as promising technologies to support early warning and community preparedness.

5. He recalled that UN Ocean Decade provides an opportunity for growth of ocean science related activities and underlined the need for reinforced multilateralism.

6. In closing Mr Vidar Helgesen reported that the IOC team is currently considering how to expand early warnings to other IOC's working fields, including Harmful Algal Blooms (HABs), invasive species, biodiversity, and heat waves. Member States would surely build on the role and contributions of tsunami groups to establish EWS for other coastal hazards.

1.2 ADOPTION OF AGENDA

7. The agenda was adopted as given in Annex I, available also as Annex I of Circular Letter 3020.

1.3 WORKING ARRANGEMENTS

8. The Technical Secretary, Mr Bernardo Aliaga, provided an overview of logistic details for the meeting. All documents and presentations delivered at this meeting are available from the following website: https://oceanexpert.org/event/4652 .

2. REPORTS FROM PARTICIPANT BODIES

2.1 REPORT FROM IOC BODIES

2.1.1 Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (CARIBE-EWS)

9. Mr Gérard Metayer (Haiti), Chair of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS), presented the report on this item (available as a presentation).

10. He reported on the outcomes of the Seventeenth session of the ICG/CARIBE EWS. Hosted by the Government of Nicaragua, 6-9 May 2024, attended by 85 in-person & virtual participants from 15 Member States and Terriotories and 3 Observers. He noted that the session elected Gérard Métayer (Haiti) as Chair and Ms Regina Browne (United States Virgin Islands) Ms Marie-Noëlle Raveau (France-Martinique) and Mr Anthony Murillo (Costa Rica) as Vice Chairs.

11. Mr Metayer highlighted that, as of June 2024, 21 communities have been recognised UNESCO-IOC Tsunami Ready, He also noted that there are 49 United States TsunamiReady communities recognised in Puerto Rico and the United States Virgin Islands.

2.1.2 Indian Ocean Tsunami Warning and Mitigation System (IOTWMS)

12. Mr Pattabhi Rama Rao Eluri (India) Chair of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS) presented the report on this agenda item (available as a presentation).

13. Mr Eluri noted that in the context of the 20th commemoration of the 2004 Indian Ocean Tsunami the ICG/IOTWMS supported the UNESCO-IOC 2nd Global Tsunami Symposium, Banda Aceh, Indonesia (10-14 Nov 2024) and organised the Fourteenth session of the CG/IOTWMS, 17–19 November 2024, Banten, Indonesia, attended by 77 delegates from 19 Indian Ocean Member States, representatives of UNESCAP, 6 invited experts and 16 observers. The meeting elected Mr Pattabhi Rama Rao Eluri (India) as Chair, and Dr Yuelong Miao (Australia) and Dr Harkunti Pertiwi Rahayu (Indonesia) as Vice-chairs.

14. He provided status reports and future plans of thr three operational Tsunami Service Providers (TSPs) hosted by Australia, India, and Indonesia, and noted that 36 new communities of India (24) and Indonesia (12) were recognized as Tsunami Ready at the 2nd UNESCO-IOC Global Tsunami Symposium, to complete 48 Tsunami Ready communities recognised in the Indian Ocean.

15. He also reported on the activities of the UNESCAP project on “Strengthening tsunami warning in the North- West Indian Ocean through regional cooperation”, including a very significant work on capacity development.

16. He noted that ICG/IOTWMS conducted a 2024 UNESCO-IOC Capacity Assessment of Tsunami Preparedness in the Indian Ocean to track regional change and to identify gaps and challenges that could be addressed through future projects and activities. Survey responses from twenty-two (22) Member States were received. The University of Huddersfield analysed the data and compared it with the results of the 2018 Assessment to produce a draft report that was an input to the Capacity Assessment Team meeting in Bangkok from 4–6 September 2024, supported by the ESCAP Tsunami Trust Fund and the Asian Development Bank.

2.1.3 Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS)

17. Mr Alessandro Amato (Italy), Chair of the Intergovernmental Coordination Group for Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS). Presented the report on this item (available as a presentation).

18. Mr Amato reported on the outcomes of the Nineteenth Session of ICG/NEAMTWS, 27–29 November 2024, UNESCO Headquarters, Paris, France attended by 67 participants, including 5 online. Representatives from 17 Member States took part, including Tunisia and Algeria after a long absence. Additionally, two international organizations—DG ECHO and the Joint Research Center (JRC) of the European Commission were present.

19. He noted that the UNESCO/IOC European Union Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG-ECHO) 'CoastWAVE' project "Strengthening the Resilience of Coastal Communities in the North-East Atlantic and Mediterranean Region to the Impact of Tsunamis and Other Sea Level Related Coastal Hazard" had its final workshop Alexandria, Egypt, 24–25 May 2024. It will be followed by Phase II of the new CoastWAVE Project (CoastWAVE 2.0) 'Scaling-Up and Strengthening the Resilience of Coastal Communities in the NEAM, which has its kick-off workshop on 6 November 2024.

20. Mr Amato reported on the Stromboli Workshop, Organized by INGV, Italy, 5–7 October 2024. With 80 international experts, and focused on volcanic tsunami observations, modeling, hazard assessment, and forecasting.

21. He highlighted the confirmed initiative of a new Submarine Cable Ring connecting Portugal Mainland-Azores-Madeira (CAM), supported by Portugal, and including observing systems that would support tsunami detection, and expected to be operational in the second half of 2026. He also highlighted that two tsunami buoys will be installed in the Ionian Sea in July 2025 by INGV and MSM-Sonardyne), at 2,000 and 3,500 m depth. These will be the first tsunami buoys in the NEAM region.

2.1.4 Pacific Tsunami Warning and Mitigation System (PTWS)

22. Mr Yuji Nishimae (Japan) Chair of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS), (Japan), presented the report on this item (available as a presentation).

23. Mr Nishimae recalled that the PTWS region is served by 4 Tsunami Service providers (TSP) which include the Pacific Tsunami Warning Center (PTWC), the Northwest Pacific Tsunami Advisory Centre (NWPTAC), and the South China Sea Tsunami Advisory Center (SCSTAC). He noted that the Central America Tsunami Advisory Center (CATAC) operated by Nicaragua is fully operated (24hours/7days) on the interim service.

24. On the official starte of CATAC Mr Nishimae recalled that the Thirtieth session of the ICG/PTWS decided to admit the start of the official full functional operations of CATAC, starting after the IOC [57th Executive Council] in 2024, with the specific starting date to be decided after the coordination with the ICG/CARIBE-EWS.

25. Mr Nishimae spoke about the ESCAP Tsunami Preparedness Capacity Assessment that will evaluate the existing capacity of the Pacific Tsunami Warning and Mitigation System (PTWS), identify specific gaps and capacity development requirements at regional and national levels for strengthening the technical and policy aspects of the tsunami warning and mitigation systems in the region and provide recommendations for the next strategic phase of ESCAP's Trust Fund for

Tsunami Disaster and Climate Preparedness, aiming to address the identified gaps through regional cooperation and mainstreaming science.

26. In closing, Mr Nishimae indicated that the Thirty First session of the ICG/PTWS is scheduled on 8–11 April 2025, in Beijing, China, coinciding with the 60th Anniversary of the ICG/PTWS.

2.2 REPORT OF NON-IOC BODIES

2.2.1 World Tsunami Awareness Day (UNDRR)

27. Ms Regina Khanbekova, Campaigns and Community, United Nations Office for Disaster Risk Reduction (UNDRR) in person and Ms Jeanette Elsworth -online-, Head Communication, Advocacy and Knowledge Management Section, UNDRR, presented a report on on this item (available as a presentation).

28. They provided an overview of the World Tsunami Awareness Day 2024that continued to connect high level political support to real change making people safer. They highlighted theTsunami United project engaging with Indian Ocean schools. And the #GetToHighGround Campaig. Some achievements listed for 2024 are:

- Social media: incl website, customizable cards and 6 tsunami videos – social reach 1 million
- Art Exhibition “Tsunami: Sea Change for Resilience” (Geneva, Paris, Manilla, New York)
- #GetToHighGround activation: issuing joint invitation call to the Member States and co-organizing the campaign activations, in 2024 in Banda Aceh, Indonesia in line with the UNESCO-IOC Global Tsunami Symposium: Reflection of the Two Decades of the Indian Ocean Tsunami 2004
- Tsunami United Project: series of educational webinars on tsunami and DRR resilience for youth and children in the region of the Indian Ocean, engaging 19 countries, 59 schools, 439 students, teachers and administrators
- High School Students Summit in Japan's Kumamoto prefecture on 23 and 24 October, 526 students

29. With respect to UNDRR and IOC joint activities for 2025, Ms Khabenkova reported that they would like to suggest the following lead subjects:

- World Tsunami Awareness Day 2025 Theme Co-development
- Tsunami Ready Programme + Get to High Ground Campaign
- Making Cities Resilient Program

2.2.2 World Meteorological Organization (WMO)

30. Mr David Wyatt presented a report on this item (available as a presentation). He reported that WMO has got new Executive Management for the period 2024 to 2027 and it will be celebrating its 75th Anniversary in 2025.

31. Mr Wyat then informed the group about the second WMO-IMO Symposium on Extreme Maritime Weather (London, UK, 23–26 Sept. 2024), the WMO Integrated Processing and Prediction System (WIPPS) Compliance review Overview, the Early Warnings for All (EW4All) recent developments, and the Key Events ahead incklhding the Executive Council 79, Geneva, 16–20 June 2025.

2.2.3 International Union of Geodesy and Geophysics (IUGG) Joint Tsunami Commission (JTC)

32. Ms Laura Kong (USA, ITIC) presented the report on this item (available as a presentation).

33. Ms Kong recalled the several ongoing cooperation initiatives between IOC and JTC including during the 2nd Global Tsunami Symposium 2024, which incouded a JTC IUGG Special Session on 9 Nov. 2024, in Banda Aceh, Indonesia. Also, the work on the Tsunami Glossary 2025, and the participation of JTC members in several Working Groups and Task teams of IOC and WMO, as well as in the Ocean Decade Tsunami programme Scientific Committee (ODTP-SC). She noted that at the kind invitation of the Government of India, the Indian National Centre for Oceanography (INCOIS) will be hosting the JTC organized International Tsunami Symposium in November 2025.

2.2.4 Joint Task Force (JTF) on SMART Cables

34. Mr Juan Jose Dañobeitia presented the report on this item (available as a presentation).

3. REVIEW OF PROGRESS

3.1 STATUS OF IMPLEMENTATION OF DECISION IOC/EC-57/3.2.1

35. Mr Bernardo Aliaga reported on Decisions adopted at the 57th session of the IOC Executive Coundil (25–28 June 2024), the status of implementation of the TOWS-XVI decisions and recommendations, and provided an update of the status of implementation of Decision A-32/4.3.1 (available as a document).

4. REPORTS OF THE INTER-ICG TASK TEAMS

4.1 INTER-ICG TASK TEAM ON DISASTER MANAGEMENT AND PREPAREDNESS (TT-DMP)

36. Ms Harkunti Rahayu, Chair of the Inter-ICG Task Team on Disaster Management and Preparedness, reported on the outcomes of TT-DMP which met on 23–24 February 2025. Her report is available as a presentation. The full summary of the Task Team meeting and its recommendations are provided in Annex III of this report.

4.2 INTER-ICG TASK TEAM ON TSUNAMI WATCH OPERATIONS (TT-TWO)

37. Mr Yuji Nishimae, Chair of the Inter-ICG Task Team on Tsunami Watch Operations, reported on the outcomes of TT-TWO which met on 24–25 February 2025. His report is available as a presentation. The full summary of the Task Team meeting and its recommendations are provided in Annex IV of this report.

5. UN DECADE OF OCEAN SCIENCE FOR SUSTAINABLE DEVELOPMENT

5.1 REPORT ON THE OCEAN DECADE TSUNAMI PROGRAMME SCIENTIFIC COMMITEE (ODTP-SC)

38. Ms Silvia Chacon (Costa Rica) Chair (a.i.) of the Scientific Committee reported on the Fifth Meeting of the ODTP-SC, 16–17 January 2025; Paris, France. Her report is also available as a presentation.

5.2 REPORT ON THE PROGRESS OF THE TSUNAMI READY COALITION

39. Ms Laura Kong (USA, ITIC), Chair of the TR Coalition for the period of 2023–2024 reported on the proposed Implementation Plan for the Tsunami Ready Coalition.

40. Ms Kong importantly drew attention to the fact that the Tsunami Ready Coalition will *not* have a programmatic role with regards to Tsunami Ready; indeed, the mandate for implementation of Tsunami Ready will remain the mandate and responsibility of the TT-DMP and respective ICGs.

41. **The Group decided** that the Chair of the Tsunami Ready Coalition Ms Laura Kong, would propose a governing structure for the Tsunami Ready Coalition to the TOWS-WG-XVII (February 2024).

6. OTHER ISSUES

42. No other issues were reported.

7. DATE AND PLACE OF THE NEXT MEETING

43. The Chair and Technical Secretary proposed the date of TOWS-WG-XIX to be during the week of 16–20 February 2026, with specific dates to be confirmed by the Secretariat through a Circular Letter.

8. CLOSURE OF MEETING

44. The Eighteenth meeting of TOWS-WG in Paris, France, was closed at 12:00 CET on 25 February 2025.

ANNEX I

AGENDA

1. OPENING AND WELCOME

1.1 OPENING

1.2 ADOPTION OF AGENDA

1.3 WORKING ARRANGEMENTS

2. REPORTS FROM PARTICIPANT BODIES

2.1 REPORT FROM IOC BODIES

2.2 REPORT OF NON-IOC BODIES

- 2.2.1 World Tsunami Awareness Day (UNDRR)
- 2.2.2 World Meteorlogical Organization (WMO)
- 2.2.3 International Union of Geodesy and Geophysics (IUGG) Joint Tsunami Commission (JTC)
- 2.2.4 Joint Task Force (JTF) on SMART Cables)

3. REVIEW OF PROGRESS

3.1 STATUS OF IMPLEMENTATION OF IOC DECISION EC-57/3.2.1

4. REPORTS OF THE INTER-ICG TASK TEAMS

4.1 INTER-ICG TASK TEAM ON DISASTER MANAGEMENT AND PREPAREDNESS

4.2 INTER-ICG TASK TEAM ON TSUNAMI WATCH OPERATIONS

5. UN OCEAN DECADE TSUNAMI PROGRAMME

5.1 REPORT OF THE OCEAN DECADE TSUNAMI PROGRAMME SCIENTIFIC COMMITEE (ODTP-SC)

5.2 PROGRESS REPORT OF THE SPECIAL TSUNAMI COALITION

5.3 REPORT OF THE 2ND IOC UNESCO SCIENCE SYMPOSIUM ON ADVANCES IN TSUNAMI WARNING TO ENHANCE COMMUNITY RESPONSES

6. OTHER ISSUES

7. DATE AND PLACE OF THE NEXT MEETING

8. CLOSURE

ANNEX II

DECISIONS AND RECOMMENDATIONS

The Eighteenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XVI) was held in hybrid format (in-person and online), during 24-25 February 2025 under the Chairpersonship of Mr Amr Hamouda (IOC Vice-Chair). The meeting evaluated the progress made in respect to the IOC Decision A-32/4.3.1. of the IOC Assembly at its Thirty second session (21 – 30 June 2023, Paris) and the Decision IOC EC-57/3.2.1 at its 57th Session (25 – 28 June 2024).

The Group reviewed reports by the IOC Intergovernmental Coordination Groups (ICGs) 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:

- Coordination of the Wave exercises: the PacWave 24 (September to November 2024), the CARIBEWAVE 24 (21 March 2024), the NEAMWave 23 (6–7 November 2023) and the IOWave23 (4–25 October 2023);
- ICG/NEAMTWS investigation and possible adoption of the tsunami probabilistic forecasting method by TSPs in NEAMTWS, which may represent an improvement over the method in use with the goal of quantifying uncertainty and reducing false alarms, particularly the forecasting methods that consider tsunami numerical modelling and uncertainty quantification;
- the ICG/NEAMTWS XIX agreement to adopt the threat levels according to the revised draft version of the T*sunami Watch Operations. Global Service Definition Document*. IOC Technical Series No 130. Paris: UNESCO. (English) and that preparation of a template for the implementation of these threat levels by the NEAMTWS TSPs;
- Dissemination of CL-3006 on "*Cessation of fax transmissions of tsunami information products by Tsunami Service Providers by 31 March 2025*".
- That fax transmissions of tsunami information products by Tsunami Service Providers (TSP) will end by 31 March 2025, except for those Member States who requested the continuation of this service, for which individual arrangements between the concerned Member States and respective TSP(s) will be established bilaterally;
- the continuous engagement of the TT-TWO in developing specialized TSP bulletins for the maritime community in consultation with the International Hydrographic Organisation (IHO) Sub-Committee on the World-Wide Navigational Warning Service (WWNWS-SC);
- the trial transmission of a test message from the PTWC to the NAVAREA coordinators directly or through the NTWCs as part of PTWS Exercise Pacific Wave 2024 on 5 November 2024;
- that JATWC (Australia), ITEWC (India) as TSPs of the IOTWMS have developed the required capabilities, which will be tested during the next communication tests scheduled, while CENALT (France) as TSP of NEAMTWS aims at testing a maritime product during next NEAMWave in the Atlantic scenario;
- the ongoing project of the Atlantic CAM Science Monitoring and Reliable Telecommunications (SMART) Subsea cable off Portugal, TAM TAM SMART cable between New Caledonia and Vanuatu, undersea cable installations being deployed and planned by Indonesia and India, the deployment of the Western Ionian Sea Infrastructure in 2023 in the Mediterranean.

- the plans for deployment of two tsunami buoys in the Ionian Sea during Summer 2025;
- the number of Member States and communities joining the UNESCO-IOC Tsunami Ready Recognition Programme, with 100 communities from 31 countries already recognized, of which 15 are SIDS;
- establishing the Tsunami Ready Equivalency for the PTWS by developing a draft guidance using the Tsunami Ready indicators as a foundation;
- Publication of the Report "*Monitoring and Warning for Tsunamis Generated by Volcanoes*. 2024. Paris, UNESCO. (IOC Technical Series No.183)
- Dissemination of CL-3029 on the "IOC report on *'Monitoring and warning for tsunamis generated by volcanoes" and online webinar programme on this issue"* involving relevant Volcano Observatories and Volcanic Ash Advisory Centres (VAACs) to:
    - brief on the report on '*Monitoring and warning for tsunamis generated by volcanoes*' (IOC Technical Series No.183) and its recommendations,
    - highlight this hazard that may make Member States vulnerable,
    - initiate the desirable partnerships between National Tsunami Warning Centres (NTWC), Volcano Observatories and Volcanic Ash Advisory Centers (VAACs),
    - initiate consideration of whether TSPs may also need to provide services where tsunami generated by volcanoes may impact Member States.
- Publication of the Report "Meteotsunamis: definition, detection and alerting services investigation". 2025. Paris, UNESCO. (IOC Technical Series No.200)
- Publication of the Summary Statement from 2nd UNESCO-IOC Global Tsunami Symposium on Two Decades After 2004 Indian Ocean Tsunami: Reflection and Way Forward, Banda Aceh, 11–14 November 2024. Paris. UNESCO (IOC Brochure 2025-1)
- Launch of the UNESCO-IOC Tsunami Awareness and Tsunami Ready online trainings through the Ocean Teacher Global Academy (OTGA) platform.
- PTWS under the leadership of the ITIC to develop the Tsunami Warning Center Minimum Staff Competencies Training Course, which will consist of Tsunami and Earthquake Science, Tsunami Warning Center Operations, and National Training Modules, all to be enabled under the IOC's OTGA;
- the work commissioned by the IOC/TSR on a Methodological Protocol for Mapping, Identifying and Estimating Administrative Units ("communities") eligible for the TRRP and assess the level of risk of each community in the Caribbean Basin and its wider application in other ocean basins/ICGs;
- Activities undertaken by the respective regions for World Tsunami Awareness Day (WTAD) 2024, the strong engagement in the #GetToHighGround Initiative, the Tsunami: Sea Change for Resilience, exhibition prepared in partnership with the United Nations Office for Disaster Risk Reduction (UNDRR) and Nautilus, featuring portraits by Matt Porteous and inspiring stories together with the historical and contemporary artworks which commemorate the 20th anniversary of the 2004 Indian Ocean Tsunami; organization of the 20th Anniversary of the 2004 Indian Ocean Tsunami Commemoration Event at the UNESCO Headquarters on 26 November 2024 to reflect on resilience, honour those affected, and reaffirm our commitment to disaster preparedness;
- in developing a comprehensive Ocean Decade Tsunami Programme Research Development and Implementation (ODTP–RDI) Performance Monitoring and Tracking Tool with clear SMART (Specific, Measurable, Achievable, Relevant, and Time-bound) indicators and actions;

- the development of the Tsunami Ready toolkit.

The Group recommended to perform a scientific peer review on the Methodology for Estimating Eligibility for TRR and Assessment of Tsunami Risk at Community Level to ensure the indices developed are accepted as a scientifically credible methodology and endorsed by ICGs and **also recommended** the secretariat to prepare an IOC Technical Series document on the Methodology for Estimating Eligibility for TRR and assessment of tsunami risk at community level;

The Group approved the *Tsunami Ready Toolkit*, including an updated application form, workflow and recognition procedures with sample communication templates, folder and file naming conventions certificate and signage samples, renewal procedures, community definition and guidance, to be finalized by Tsunami Information Centres (TIC) and included as appendices to the UNESCO-IOC Standard Guidelines for the Tsunami Ready Recognition Programme (IOC MG 74) or sharing with the ICGs;

The Group requested that Tsunami Information Centres (TIC) continue developing additional tools for the Tsunami Ready Toolkit, including:

- Application Form in official UN languages
- More efficient submission procedures
- Tsunami Ready Training providing detailed implementation guidance

The Group accepted the invitation by UNDRR to co-develop the World Tsunami Awareness Day 2025 Theme connecting the Tsunami Ready Recognition Programme, the Making Cities Resilient Program and the #GetToHighGround and #TsunamiReady hashtags to engage citizens on tsunami awareness;

The Group appreciated the development of Inclusive SOP and Inclusive Warning Tools for disabled children in Indonesia and the Caribbean, r**ecommended** the Indonesian inclusive SOPs to be translated to English and **encouraged** further development of inclusive SOP as official guidelines of UNESCO IOC.

The group noted the revisions on the T*sunami Watch Operations. Global Service Definition Document*. IOC Technical Series No 130. Paris: UNESCO. (English) and endorsed the publication of a revised version of the IOC Technical Series No 130, with the updates suggested by the TT-TWO;

The group expressed its strong appreciation to the Government of Indonesia for having successfully co-hosted and organised the 2nd UNESCO-IOC Global Tsunami Symposium on Two Decades After 2004 Indian Ocean Tsunami: Reflection and Way Forward, Banda Aceh, 11–14 November 2024;

The Group appreciated and thanked Prof. Harkunti Pertiwi Rahayu, Research Center for Disaster Mitigation, Institute of Technology Bandung, Indonesia, for her outstanding leadership in coordinating and organizing the 2nd UNESCO-IOC Global Tsunami Symposium;

The Group appreciated the contribution of United States COMET Program to develop MetED training modules for the Tsunami Warning Center Minimum Staff Competencies Training Course, including ongoing work on updating the COMET “Tsunamis” and ‘Communicating and Understanding Tsunami Risks using IOC PTWS Tsunami Service Provider Products” module;

The Group instructed both TOWS-WG Task Teams to develop a standard reporting template for all ICGs, providing granularity on the number of participants to Wave Exercises with respect

to the type of activity they participated during an exercise, which would allow inter-ICG comparison;

The Group further instructed both TOWS-WG Task Teams to review the IOC Tsunami Post-Event Assessment process and questionnaire (IOC/TOWS-WG-VIII/3, APPENDIX V, Morioka, Japan, 12–13 March 2015) considering its use in the past decade, and consideration of other post-event processes undertaken for smaller events that did not meet the post-event assessment threshold;

The Group recalled that the Common Alerting Protocol (CAP) is the international standard format for emergency alerting and public warning, designed for all hazards, which can be used for exchanging multi-hazard emergency alerts and public warnings over all kinds of information and communications technology;

The Group also noted that CAP is now widely used in EWS and 91% of the world's population lives in a country that is implementing CAP;

The Group recognized that the advancement of CAP implementation globally represents a significant milestone in the Early Warnings for All (EW4All) initiative, and the fact that CAP can be considered as the bridge connecting "observations, monitoring, analysis and forecasting" to "warning dissemination and communication", and that WMO is able to provide any assistance that may be required in this regard;

The Group further instructed the TT-DMP to:

- Prepare a guideline for inclusive Standard Operating Procedures (SOP) building on the development of inclusive SOP and inclusive warning tools for disabled children in Indonesia and the Caribbean;
- to organize a TT DMP meeting ahead of the TOWS TTs and TOWS WG meetings by the end of October 2025 to review actions and define agenda for the February 2026 meeting and organize, online or in person meetings to discuss focus topics addressing key agenda items;

The Group further instructed the TT-TWO to:

- include tsunamis generated by the submarine and subaerial landslides in its work programme and engage with the landslide hazard and early-warning scientific and operational community to address the requirements of the first objective of the ODTP to develop the warning systems' capability to issue actionable and timely tsunami warnings for tsunamis from all identified sources to 100 percent of coasts at risk;
- investigate the status of the TSP service provisions in in the boundary of IOTWMS and PTWS that are currently outside of the framework of the IOC coordinated tsunami warning systems;
- conduct and present to TOWS-WG at its next session the result of a study on which areas met the Ocean Decade Tsunami Programme (ODTP) requirement of tsunami confirmation within 10 minutes or less of origin for the most at-risk coastlines, with reference to the sea-level stations available in the IOC's Sea Level Station Monitoring Facility;
- also include in the above study an indicative assessment on possible locations of the future sea-level station monitoring installations to ensure that this requirement is met;
- develop in collaboration with the WMO a global CAP template for TSPs to facilitate dissemination of bulletins from TSPs to NTWCs, between TSPs of different basins, and for public TSP bulletins, to be presented and approved by the TOWS-WG at its next session;

The Group welcomed the continuing collaboration with the International Union of Geodesy and Geophysics (IUGG) and **appreciated** the IUGG's contributions to tsunami science and preparedness, working with the IOC, and especially its role in the 2nd UNESCO-IOC Global Tsunami Symposium, major conferences, research on the 2022 Tonga Volcanic Eruption, and key initiatives like the UN Ocean Decade Tsunami Programme, and IOC publications on Tsunamis Generated by Volcanoes, Meteotsunamis, and the Tsunami Glossary 2025;

The Group noted progress reported by the Scientific Committee of the Ocean Decade Tsunami Programme (ODTP-SC) at its 5th session on January 16-17, 2025, and **also noted** the proposal for hosting a first ODTP Conference for 2025 in Hyderabad, alongside the IASPO/IASPEI/IAVCEI Joint Tsunami Commission (JTC) International Tsunami Symposium (ITS), India, 12-14 Nov. 2025hosted by INCOIS; It further noted the proposal to organise two webinars on the ODTP objectives during 2025;

The Group recommended the IOC Assembly at its 33rd Session in 2025 to **approve** the Tsunami Ready Coalition Implementation Plan as reviewed by the ODTP-SC and the TT DMP and TT TWO including:

- The Coalition mandate and terms of reference,
- The Coalition structure, and
- The identified key Coalition Partners.

The Group recommended the IOC Assembly at its 33rd session in 2025 instruct the regional ICGs:

- To develop and adopt a harmonized set of Key Performance Indicators (KPI) based on the harmonised set of Global Key Performance Indicators (GKPI), to support consistent and effective global reporting;
- Establishing arrangements among Tsunami Service Providers (TSP) within each ICG to ensure that service provision is ensured at all times for the full Area of Service of the ICG;
- to develop SOPs for volcanoes with a tsunamigenic potential within their Earthquake Source Zone (ESZ);
- that dissemination of the specialized TSP bulletins for the maritime community is tested in CARIBE-EWS, IOTWMS and NEAMTWS by at least one TSP either through the planned communication tests or tsunami exercises;
- that full operational implementation of TSP bulletins for the maritime community by at least one TSP in each ICG takes place in 2025;

The Group recommended the IOC Assembly at its 33rd session in 2025 recommend the regional ICGs:

- To create relationships between National Meteorological and Hydrological Services (NMHS) and TSPs/NTWCs in order to ensure that tsunami-specific instrumentation including Tsunameters/DART® and ocean cable systems are correctly monitored and utilized for detection of meteotsunami;
- continuation of the investigation and the possibility to adopt tsunami forecasting methods, including probabilistic methodologies, toward impact-based forecasting, that could also assist post-disaster response, recovery and needs assessment processes;
- to prioritize regional Tsunami Ready workshops or summits in 2025 and conduct further workshops or summits before 2030;

The Group recommended the IOC Assembly at its 33rd session in 2025 to **request** the IOC Member States to prioritize installation/deployment of additional coastal tide gauges and tsunami detection/observation systems in regions under high tsunami risk with priority areas with known coverage gaps (in alphabetical order: Aegean Sea, Caribbean Sea (West, North and South-East), Indian Ocean (East and North), North Africa, Philippine Sea, Solomon Sea, South China Sea, Timor Sea, and Yellow Sea), to ensure tsunami detection and verification as early as possible;

The Group further recommended the IOC Assembly at its 33rd session in 2025 to encourage the IOC Member States to monitor the health of their sea level gauges that are used for detecting and monitoring tsunamis, to restore them as quickly as possible when they fail, add sea level gauges when possible and share their data in real time, in places identified by their ICG as gaps;

The Group recommended Member States to consider deployment of sea level gauges close to each identified volcano with tsunamigenic potential, with real-time continuous data transmission and 1 sec sampling - 1cm accuracy for automatic detection purposes;

The Group further recommended Member States to invest more in offshore seismic and sea-level detection and observation instrumentation, such as Tsunameter/DART®/GPS buoys/cabled systems (e.g. SMART Cables), where possible, with multi-hazard observational capabilities, serving the needs of earthquake seismology, meteorology and oceanography;

The Group also recommended Member States NTWCs to work with national and local emergency management authorities to define the criteria for and institutions in charge of issuing the **All-Clear message**, as recommended also in the T*sunami Watch Operations. Global Service Definition Document*. IOC Technical Series No 130. Paris: UNESCO. (English) and Plans and Procedures for Tsunami Warning and Emergency Management. Paris, Intergovernmental Oceanographic Commission of UNESCO 2017. (IOC Manuals and Guides No.76) and include this in the respective awareness activities;

The Group further recommended the IOC Assembly at its 33rd session in 2025 to encourage Member States to provide voluntary financial contributions to the IOC special account and in-kind contributions to support the Ocean Decade Tsunami Programme, the IOC Tsunami Ready Recognition Programme and the Tsunami Ready Coalition.

The Group recommended the IOC Assembly at its 33rd session in 2025 to **request** the IOC Secretariat to:

- prepare a standard and improved methodology of collecting TNC/TWFP/NTWC contact information, in close collaboration with the TT-TWO and TT-DMP, and present its work at the next Joint TT-DMP and TT-TWO Meeting;
- inform Member States on the *Tsunami Ready Toolkit* availability via IOC Circular Letter to the Tsunami National Contacts, National Tsunami Ready Boards, and widely through the attaching this as an appendix of the UNESCO-IOC Standard Guidelines for the Tsunami Ready Recognition Programme (IOC MG 74);
- disseminate to the Member States the final version of the below basic tsunami warning product/template for use by the radio amateurs, as a guidance;

> *At _(XX:XX)_ local time a magnitude _X.X_ earthquake occurred at _Lat, Lon_ with a depth of _X_ km, **_X_ km _Direction_ of _(Place)_**. The _(NTWC)_ has issued a tsunami _(level)_ for _(Place)_.*

- to finalize the Tsunami Ready Coalition Implementation Plan in consultation with the Tsunami Ready Coalition Chair the Coalition Partners, 'Ambassadors' or similar namesake, and Coalition Co-Chair;
- extend invitations to the proposed Coalition Partners and 'Ambassadors' or similar namesake, and a Coalition Co-chair, and urgently address needed resources;

The Group recommended the IOC Assembly at its 33rd session in 2025 to extend the tenure of the Inter-ICG TT-DMP and TT-TWO and recommended the approval of updated Terms of Reference for the Task Team on Tsunami Disaster Management and Preparedness as included under **Appendix 1**;

Appendix 1

Revised Terms of Reference of the TT DMP

(i) Facilitate in collaboration with key international stakeholders and organizations (such as UNDRR, IFRC, UNDP, WMO, etc.), or initiatives (such as the Tsunami Ready Coalition, Coastal Inundation Forecasting Initiative etc.) the exchange of experiences and information on preparedness and mitigation actions, education/awareness, and other matters related to disaster management and preparedness for tsunamis and other coastal sea level related hazards;

(ii) Promote and facilitate the implementation of Tsunami Ready Recognition Programme, and similar initiatives, as well as related capacity development efforts, specifically targeting SIDS and LDCs;

(iii) Promote preparedness to build resilient coastal communities through education and awareness products and campaigns;.

(iv) Facilitate capacity development and training across ICGs to strengthen emergency response capabilities of Member States and their Disaster Management Offices;

(v) Promote existing and encourage the development of preparedness programmes and assessment tools, and synergies with other initiatives (e.g. resilient cities, safe schools etc) that have been successful in one regional Tsunami Warning and Mitigation Systems as appropriate;

(vi) Facilitate the coordination of the TICs of the ICGs and reinforce their ability to serve as a clearinghouse for the development of educational and preparedness products, and capacity development and training;

(vii) Report to the TOWS–WG.

The representatives to the Inter-ICG Task Team on Disaster Management and Preparedness shall be nominated by their respective ICG Chairpersons. The membership shall consist of two representatives from each ICG, one of which may represent the ICG's Tsunami Information Center. The IOC Chair will appoint the Chair of the Task Team.

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ANNEX III

REPORT OF THE MEETING OF THE INTER-ICG TASK TEAM ON DISASTER MANAGEMENT AND PREPAREDNESS

21–22 February 2025

Paris, France

unesco Intergovernmental Oceanographic Commission	**MEETING OF THE INTER-ICG TASK TEAM ON DISASTER MANAGEMENT AND PREPAREDNESS** **INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (IOC)- UNESCO**
	21–22 February 2025

TOWS Task Team on Disaster Management and Preparedness (TT-DMP)
Members and Observers

Contents

1.0 SESSION ORGANISATION

Dr Harkunti Pertiwi Rahayu, Chairperson of the TOWS Task Team on Disaster Management and Preparedness (TT-DMP), opened the meeting and warmly welcomed all participants.

She then introduced the provisional agenda. Aside from shifting the order of presentations, the chair requested members to consider providing a leading presentation for the round table discussion questions under agenda 4.5. The group then adopted the TT - DMP agenda.

Dr Denis Chang Seng, IOC Programme Specialist and Technical Secretary of TT-DMP briefed the group regarding documentation and meeting logistics.

2.0 DISCUSS OUTCOMES OF THE JOINT MEETING WITH TT TWO

The TT DMP enquired on the possibility to have an open expert review of the TRRP-Methodology for Estimating Eligibility for TRR and Assessment of Risk at Community Level. The meeting noted that the question is in line with the request of the 5th ODTP-SC recommendation to perform a scientific peer review to ensure the indices developed are accepted as a scientifically credible methodology. There was also a suggestion to consider preparing an IOC technical series document on the methodology for Estimating Eligibility for TRR and Assessment of Risk at Community Level.

Recommendation to TOWS WG

Requests to perform a scientific peer review on the Methodology for Estimating Eligibility for TRR and Assessment of Tsunami Risk at Community Level to ensure the indices developed are accepted as a scientifically credible methodology and endorsed by ICGs.

Recommends secretariat, once peer review is completed, to prepare an IOC Technical Series document on the Methodology for Estimating Eligibility for TRR and Assessment of Tsunami Risk at Community Level.

- ## 3.0 REVIEW KEY ACTION ITEMS (MAIN ISSUES)

Dr. Harkunti Pertiwi Rahayu requested members to review the evaluation in implementing the TT DMP 2024 actions initially prepared by the Technical Secretary based on feedback received from a few members. Members then examined and updated each of the recommendations. In particular, members highlighted for example that actions like 5.1. (a) Continued collaboration on scaling up the #GetToHighGround Campaign mobilizing action globally and (b) Further notes the planned collaboration between IOC-UNESCO and UNDRR on Eyewitness and

Survivors Project and the Indian Ocean Youth Tsunami Conversation and Campaign of IOTIC are already completed, although actions are replicable. Moreover, the group was satisfied with the level of progress achieved during the year.

Recommendation to TT DMP

Agrees to conduct an online mid-term evaluation of the new TT DMP actions to assess progress, identify unaddressed actions, propose ways to implement them and define the next TT DMP meeting agenda.

- 4.0 TSUNAMI READY

- 4.1 Tsunami Ready Implementation Status

The Chair of TT DMP requested respective ICG members to present the status of Tsunami Ready Implementation in their region.

Dr Laura Kong provided a presentation on the UNESCO-IOC Tsunami Ready Recognition Programme Global Status. A visual map was prepared and presented at the 2nd UNESCO-IOC Global Tsunami Symposium, held in Banda Aceh on 11–14 November. The map shows 100 Tsunami Ready communities recognized with 48 in India, 23 in Indonesia, 23 in the Pacific and 6 in NEAM. A summary table, as of February 2025, shows the details (TR planned, Expressions of interest, TR renewal due, TR renewal in process etc.) of TRRP Implementation Status.

GLOBAL OVERVIEW OF UNESCO-IOC TSUNAMI READY RECOGNIZED COMMUNITIES

	PL	EOI	OG	TR	RV	RD	RIP	RN	RDE	TOTAL # OF COMMUNITIES	IN # MEMBER STATES	OF WHICH # ARE SIDS
CARIBE-EWS	2	2	0	4	6	4	0	0	9	23	16	10
IOTWMS	0	0	0	36	10	2	0	0	0	48	2	0
NEAMTWS	0	0	0	6	0	0	0	0	0	6	6	0
PTWS	4	2	2	5	10	0	0	0	8	23	10	5
TOTAL	6	4	2	51	26	6	0	0	17	100	34	15

2025 FEBRUARY

Active

Need renewal

LEGEND						
PL	TR planned	TR	Initial TR recognition	RIP	TR renewal in progress
EOI	Expression of Interest	RV	TR recognition valid (incl. RN	RN	TR renewal completed
OG	Initial TR process ongoing	RD	TR renewal due	RDE	TR renewal delayed

The meeting highlighted discrepancies and inconsistencies in counting the number of Tsunami Ready communities, primarily due to the submission process of renewal applications.

TT DMP noted that the second objective of the ODTP is that 100 percent of communities at risk to be prepared and resilient to tsunamis by 2030 through efforts like the IOC-UNESCO Tsunami Ready Recognition Programme (TRRP), thus, it is important to start reporting by percent to get a better idea of what it is being measured and achieved. In order to enable this reporting in a standard way, there is an urgent need to provide methodologies for determining the total number of targeted vulnerable tsunami communities, thus making highest priority the TRRP- Methodology for Estimating Eligibility for TRR and Assessment of Risk at Community Level.

It was further noted that TR Viewer suffers from map limitations, low resolution, etc. For example, a map showing all Tsunami Ready communities, such as was made for the 2nd UNESCO-IOC Global Tsunami Symposium, is not available. The matter will be further discussed in the TICs meeting planned on 26th February 2025.

ICG/PTWS

Ms. Ashleigh Fromont provided a report on Tsunami Ready implementation in the Pacific region. The WG3 Task Team was established to coordinate efforts, promote a 100% Tsunami Ready Goal, and develop an equivalent approach for standardized preparedness reporting. As of 2024, 23 communities across 10 countries have been recognized, with ongoing expansion in several nations. Key challenges include hazard assessment limitations, a cumbersome application process, sustainability issues, and gaps in awareness and education. To improve monitoring, a regular Tsunami Ready Implementation Survey is proposed, aligning with global preparedness assessments. Additionally, efforts are underway to enhance inundation modeling through satellite-derived data and alternative methodologies. Future actions include linking Tsunami Ready with the Making Cities Resilient (2030) initiative and improving tsunami evacuation signage, particularly in areas unlikely to experience earthquake shaking.

ICG/NEAMTWS

Mr Ignacio Aguirre Ayerbe provided a report on Tsunami Ready implementation in the NEAM region. The implementation of the Tsunami Ready Recognition Programme (TRRP) in the NEAM region is generally based on a science-based approach. Stakeholder engagement and participation through a science-based, participatory decision-making approach has been successfully tested in some of the first cases of TRRP implementation in the NEAM region. He highlighted that the ICG-NEAMTWS XIX Session noted the advice of TT on Tsunami Ready to establish the role of the National Tsunami Ready Focal Point and to issue a Circular Letter (CL) to the Member States via official channels, requesting nominations for this position. It was highlighted that the support of the CoastWAVE project has been instrumental in driving and promoting the TRRP in the NEAM region. Similarly, it is recommended to produce a short report including reflections on the challenges found after the first cases in the implementation of the TRRP in the NEAM region and the ongoing work analyzed in other ICG regions, considering, among others, the following:

1. Difficulties related to the financial, technical, human and time resources required for the implementation of the TRRP.
2. Need for effective coordination between national, regional and local authorities.
3. Need to establish peer reviewed guidelines for the development of some indicators and evaluate whether MG74 should be adapted to the NEAM region.
4. Review the applicability/replicability of the MG74, for the case of a country-wide scale (not SIDs). The question is if it is necessary to create another mechanism to address a similar recognition to the TRRP in these cases, since the MG74 has a strong local component?
5. Review the applicability/replicability/adaptation of the MG74, for the case of specific strategic infrastructures (airports, ports, hazardous infrastructures). The question is if it is necessary to create another mechanism to address a similar recognition to the TRRP in these cases?
6. There is a need to standardize the TRRP application review procedure. Currently, there is no “review SOP”.
7. Review the needs regarding sustainability of the communities recognized by the TRRP. How to maintain community ownership, and the need for continued human, technical and financial support and resources?
8. Strengthen reflections and mechanisms to realistically expand the implementation of the TRRP. For instance, through the development of tools to facilitate communities to progress as much as possible in the implementation of the TRRP on their own (there

is ongoing work in this regard in the newly launched EU DG ECHO funded “NEAM COMMITMENT” project 2025-2026, and the ongoing EPOS Tsunami TCS initiatives.

ICG/IOTWMS

Mr Ardito Kodijat provided a report on the status of Tsunami Ready implementation in the Indian Ocean region. The UNESCO-IOC's "Tsunami Ready Implementation in the Indian Ocean" initiative aims to strengthen tsunami preparedness through community recognition, training, hazard mapping, and governance. As of 2023-2024, 13 new villages in Indonesia and 24 in India have been recognized, with two Indian villages receiving renewals. Capacity-building efforts include Tsunami Ready Facilitator Training in Indonesia, national training sessions in Seychelles, Timor-Leste, and the Maldives, and a regional workshop planned for Hyderabad in April 2025. A Tsunami Hazard and Inundation Mapping project, supported by UNESCAP, is being developed for North-Western Indian Ocean (NWIO) countries, including India, Iran, Pakistan, Oman, and the UAE. To enhance accessibility, key preparedness materials are being translated into Farsi and Urdu. Governance efforts include integrating tsunami preparedness into existing disaster management structures through the National Tsunami Ready Board (NTRB), ensuring sustainable implementation and local engagement

ICG/CARIBE-EWS

Ms Alison Brome provided a report on the status of Tsunami Ready implementation in the Caribbean. The Tsunami Ready (TR) Implementation Status report highlights progress, recognitions, and ongoing efforts within the CARIBE-EWS (Caribbean Early Warning System). As of 2024, several communities across the Caribbean have achieved Tsunami Ready Recognition. Additionally, numerous communities are undergoing nominations or renewals. The report also notes outstanding renewals in Grenada, Nicaragua, St. Vincent & the Grenadines, and Trinidad & Tobago. A Tsunami Ready Evaluation Survey was conducted between March and June 2024 to assess program effectiveness. Based on the results, key recommendations include translating evaluation forms into French and Spanish, establishing an annual reporting system, appointing national TR focal points, and improving data storage at the Caribbean Tsunami Information Centre (CTIC).

Despite progress, several challenges and considerations remain. There is a need for consistent reporting mechanisms, better integration of people with disabilities, and solutions to vandalism and multi-hazard risks affecting TR recognitions. Funding and staffing shortages also present obstacles, slowing down nominations and renewals. Additionally, the CTIC faces resource limitations, causing delays in implementation. The report emphasizes the importance of securing technical support from social scientists for data analysis and suggests organizing a Tsunami Ready Summit to highlight best practices, strengthen collaboration and strategy. Addressing these challenges will be crucial for maintaining and expanding Tsunami Ready initiatives across the Caribbean.

Overall Discussion

The meeting discussed the details of the DEM training in the Caribbean, noting that if there are either challenges of no data, and or the fact the training is so specialized, how productive it is. The meeting noted that this challenge also applies to NEAM. Not all Member States have capabilities in tsunami modeling. New EU funded NEAM projects will help tackle the challenges at the national level, for example by replicating a PTHA modeling and GIS approach on a large scale. The Caribbean started to work on this subject and submitted a proposal for a “DEM Developing Training Workshop” in 2020, which was updated in 2022, and it is currently searching for funding to organize it.

The meeting noted that there are several initiatives being proposed which could provide a global facility to facilitate data access and or conduct hazard assessments in a more efficient way considering that all TR communities will need hazard and risk maps to become recognized to fulfill ODTP objective 2.

The meeting also noted that it is important to develop a strategy to focus early actions on hazard and risk assessment, rather than late towards 2030, noting that hazard inundation and evacuation products are the foundations to all DRR activities, as well as TRR implementation.

The challenges of funding and staffing constraints at Member State and TIC levels were highlighted including the status of donor funding to support implementation of TR and related activities. The use of public-private partnerships particularly in respect to the manufacture and installation of signage and outreach activities as well as the need to ensure that donors reflected the values of UNESCO were discussed.

Recommendation to TOWS WG:

Appreciates the number of Member States and communities joining the UNESCO-IOC Tsunami Ready Recognition Programme, with 100 communities from 31 countries already recognized, of which 10 SIDS

Recommends

(i) To start reporting TRR communities as soon as effectively possible by percent to get a better idea of how close we are to the Ocean Decade goal of 100% percent of at-risk communities to be TR.

(ii) To produce a report including reflections on the main challenges that are being identified in the implementation of the TRRP, as well as proposals of mitigating measures to address them (considering, among others, the challenges included in the list provided by the ICG NEAM-TWS).

(iii) Exploring the creation of a global facility to facilitate data and development of inundation and evacuation maps in a more efficient way.

(iv) Developing a strategy to focus early actions on hazard and risk assessments, to enable the implementation of TR.

(v) Translating evaluation forms into French and Spanish, making the application submission more efficient, providing tools to facilitate annual reporting, identifying national TR focal points, and consistent reporting mechanisms on better integration of people with disabilities; solutions to vandalism and multi-hazard risks affecting TR recognitions.

(vi) Organizing a Tsunami Ready Summit in the Caribbean or globally, if funds are available in 2025/2026 to strengthen collaboration and strategy.

Notes the funding and staffing shortages, obstacles and challenges slowing down TR recognitions and renewals.

Further notes that all TICs face resource limitations, causing delays in implementation.

Further notes the importance of securing technical support from social scientists for data analysis.

Also notes the potential critical role of public private partnerships and the need for a high level of scrutiny to ensure the values and integrity of UNESCO are maintained.

- 4.2 Synergy with Local and National Resilient Programmes (Tsunami Parity)

Ms Ashleigh Fromont reported on the progress made regarding establishing the Tsunami Ready Equivalency for the PTWS. The PTWS Task Team Tsunami Ready, with support from Regional Working Groups and other ICG subject matter experts, have developed draft guidance for '*Tsunami Ready Equivalency*' in the Pacific. This draft will be presented and discussed at the ICG/PTWS-XXXI in April 2025, with the intent that they may be approved for

pilot implementation in a few member states with existing DRR programmes before final approval at ICG/PTWS-XXXII in 2027. The previously proposed approach has since been simplified to three steps:

1. Identify / establish national governance
2. Assess tsunami preparedness and resiliency against TRPP indicators
3. Report progress toward UNOD to ICG.

The documentation provides a 'cross-referencing' guide, using the Tsunami Ready indicators as a foundation, which is intended to be broad enough for multiple contexts while retaining a high standard of tsunami preparedness. It is a high-trust model, for example, where it is believed that the law requires certain preparedness activities to occur in a community, this is recorded as justification for an overall indicator rather than requiring a reliance on community reporting.

Key outstanding challenges include whether the guidance is usable – with the concept based primarily on the context of a few Member States. This will be the intent of a pilot implementation.

Alongside this, the PTWS will also investigate whether there is more that can be done to recognize and celebrate the benefits of formal Tsunami Ready Recognition, which is still preferred.

Recommendations to TOWS WG

Appreciates the progress made for establishing the Tsunami Ready Equivalency for the PTWS by developing a draft guidance using the Tsunami Ready indicators as a foundation.

Notes that the PTWS will explore ways to further recognize and promote the benefits of formal Tsunami Ready Recognition, which remains the preferred approach by TOWS.

- 4.3 Tsunami Ready Tool Kit

Referring to the TOWS-WG XVII recommendation, Mr. Ardito Kodijat, representing the TICs, reported on the progress of the Tsunami Ready Toolkit. The TICs have developed several toolkits for further consideration:

1. Definition and Guidance for Tsunami Ready Communities
2. Tsunami Ready Training Tools under the OTGA, covering:
    - Tsunami Awareness
    - Tsunami Ready
3. Toolkits for Tsunami Ready Application, including:
    - Application Form
    - Submission procedures and recognition workflow (need for automated tool)
    - File naming and file types (file metadata)
    - Implementation communications (sample letters and templates), including:
    - Letter of Intent
    - NTRB/RTRB establishment
    - Application submission
    - IOC acknowledgement

- Recognition and Appreciation Certificate names
- Community summary for the web page
- Recognition and Appreciation Certificates – sample templates
- Recognition Ceremony – sample agenda
- Recognition Sign – examples with accompanying safety messages
- Renewal Process

Regarding the definition of a Tsunami Ready Community, the meeting agreed that the NTRB would have the authority to determine the level of Tsunami Ready Community, following the guidance and advice of Manuals and Guides No 74. Further elaboration will be provided in the appendix of the Standard Guidelines for the Tsunami Ready Recognition Programme (IOC/2022/MG/74).

Two self-paced training courses are now available in OTGA: Tsunami Awareness and Tsunami Ready. In order to take the Tsunami Ready course, it is required to take and pass the Tsunami Awareness course. The Tsunami Ready course is recommended for primary stakeholders that will be involved in implementing Tsunami Ready.

The application form for the Tsunami Ready Recognition Programme (TRRP) follows MG74. Currently, applications are submitted through email or various file-sending methods, but future developments are planned for an electronic submission process that will automatically name files according to the naming conventions. Applications should be in English to facilitate the sharing of best practices, but supporting documentation may be in the local languages. The meeting also discussed the possibility of making the application process available in all UN official languages.

The toolkit will also provide samples and templates, such as for letters of Intent, NTRB/RTRB establishment, application submission, and IOC acknowledgement of recognition, to facilitate the application process.

A standard format for the folder and file naming for the application of the TRRP has been developed and will be further discussed at the TICs meeting for finalization and to be added as the appendix to the MG74.

A standard format for the Certificate of Recognition and Certificate of Appreciation also have been developed to ensure a standard template for all regions. This tool is for the technical secretariat and TICs who will prepare the certificates.
A standard format for Tsunami Ready signage has also been established. The meeting discussed two options for signage:

- Including the evacuation strategy guidance, which provides six different strategies based on the community's tsunami evacuation plan.
- Without evacuation strategy details, displaying only the Tsunami Ready logo and the recognition period. In this case, evacuation strategy guidance would be available on the Tsunami Ready website, accessible via a QR code on the sign.

There are three size formats for signage: Vertical, Square, and Horizontal.

Renewal Process:

In the Indian Ocean region, recognized communities are required to submit annual reports. These reports provide updates on new developments, changes, and activities conducted during the reporting year. If reports are submitted annually, renewal can be processed automatically without further review. The meeting agreed that for renewal, Tsunami Ready

Communities must submit a report summarizing accumulated developments, changes (if any), and activities required by the indicators.

Practices employed in each ICG were discussed in relation to the TRRP renewal process. It was noted that inconsistencies existed in the time used for reviewing indicators. Some ICGs conducted reviews based on the year immediately preceding renewal, while others considered the entire four-year period. As with the nomination process, all ICGs indicated that discretion was applied where validated. However, it was noted that the indicators established clear guidelines on the required frequency of select indicators, suggesting that the full four-year period should be considered. Therefore, all basins should be assessed in accordance with these parameters.

Recommendations to TOWS WG

Requests TOWS WG approval for the Tsunami Ready Toolkit, including an updated application form, workflow and recognition procedures with sample communication templates, folder and file naming conventions certificate and signage samples, renewal procedures, community definition and guidance, to be finalized by TICs and included as appendices to MG74 for submission to the ICGs.

Recommends Secretariat to inform Member States on the Toolkit's availability via IOC Circular Letter to the Tsunami National Contacts, National Tsunami Ready Board, and widely through the attaching this as an appendix of the Manual and Guide 74

Further Requests that TICs continue developing additional tools, including:

1. Application Form in official UN languages
2. More efficient submission procedures
3. Tsunami Ready Training providing detailed implementation guidance

- 4.4 Tsunami Ready Coalition Implementation Plan

Laura Kong provided a presentation on Tsunami Ready Implementation Plan. This document presents the Implementation Plan of the Tsunami Ready Coalition (TRC). It outlines its establishment, mandate, objectives, Terms of Reference (ToR), action plan, governance, proposed membership and communications plan in support of the Tsunami Ready Recognition Programme (TRRP). The TRRP, established in 2022 by the Intergovernmental Oceanographic Commission (IOC) of UNESCO, is an international community-based recognition programme that aims to build resilient communities through awareness and preparedness strategies that will protect life, livelihoods and property from tsunamis.

The TRRP is a key contribution to achieving the societal outcome for 'A Safe Ocean' of the United Nations Decade for Ocean Science for Sustainable Development 2021-2030 (Ocean Decade). In June 2021, the UNESCO-IOC Executive Council approved the Ocean Decade Tsunami Programme 2021–2030 (ODTP). One of its main objectives is to make 100% of communities at risk from tsunamis prepared and resilient to tsunamis by 2030 through the implementation of the UNESCO-IOC Tsunami Ready Recognition Programme (TRRP) and other initiatives.

As part of the ODTP governance structure, a special Coalition for Tsunami Ready (TRC) was established. The mandate for the Tsunami Ready Coalition, derived from the IOC Executive Council (IOC Decision A-31/3.4.1), the TOWS-WG-XV decisions and earlier TOWS Task Team on Disaster Management input, and the ODTP Implementation Plan (IOC Technical Series 180), is proposed as follows:

The Tsunami Ready Coalition is a collaboration between global, regional, and national stakeholders to advance and sustain the UNESCO-IOC Tsunami Ready Recognition Programme (TRRP), with a specific view on the UN Ocean Decade Tsunami Programme aim of 100% of communities at risk of tsunami are prepared for and resilient to tsunamis by 2030. The Coalition will establish a network of critical stakeholders that will advocate for and facilitate support towards the implementation and sustaining of Tsunami Ready through targeted promotion, advocacy, resource mobilization, networking, influence, and advice. Reporting to the TOWS-WG, the Coalition will have a diverse, yet relatively small, membership by invitation of the UNESCO-IOC. Membership is primarily at the institutional level.

The objectives are the TRC will be to:

1. Raise the Profile of TRRP in Collaboration with Critical Stakeholders
2. Increase Funding Resources for TRRP Implementation
3. Advocate for the conduct of Tsunami Ready Indicator Workshops in the Regions,
4. Effectively Organize the Tsunami Ready Coalition

The Implementation Plan sets up the membership and minimum organizational and meeting structure, lists relevant institutions for membership, identifies potential sources of funding for implementation and meetings for raising the TRRP profile, outlines outreach and communication strategies, and proposes indicators for monitoring and measuring progress. Activities and milestones, aligned with the objectives, are proposed, emphasizing the identification of relevant institutions for advocacy and implementation as the first critical step, followed by efforts to increase funding resources for implementation.

To support the approval and endorsement of this Implementation Plan, this Plan was commented on by the ODTP-SC in January 2025. The Plan will be shared to the TOWS TT DMP on 20–23 February 2025 for validation and presented by the TRC Chair to the TOWS-WG for endorsement of its core elements on 24-25 February 2025.

Finally, it was emphasized that the Plan, while intended to focus on actions for the UN Ocean Decade, must also include actions beyond 2030. It was emphasized that readiness must be sustained continually and beyond the Ocean Decade as tsunamis can occur at anytime and anywhere, and with long recurrence intervals such as the devastating 2004 Indian Ocean and 2011 Great East Japan tsunami,

It is intended that this Plan will remain a dynamic document to allow for updates to the Work Plan. Updates will be reflected in the Coalition's reports to the TOWS-WG.

The meeting deliberated mainly on the naming of the *'Tsunami Ready Ambassador'* and clarifying the roles and responsibilities of the proposed ambassador or similar. An ambassador is generally recognized as an accredited diplomat representing a state or organization, either as a permanent delegate or a promoter of a specific initiative but is also generally defined as *"a representative or promoter of a specified activity."* It was noted that the UN system, particularly UNESCO, has numerous goodwill ambassadors who raise awareness and advocate for various causes, indicating the broad application of the term/name. Alternative titles, such as "*Heroes*" and "*Champions*," were considered; however, these are seemingly typically linked to specific achievements or recognitions. Ultimately, the meeting decided to propose an approach and suggest optional names for endorsement.

The UNDRR shared its experiences to help solidify administrative components of the Plan to successfully organize, establish and maintain an effective Coalition.

Recommendations to TOWS WG

Notes that TOWS-WG-XVI (2023) requested the Tsunami Ready Coalition Chair to propose a governing structure for the Tsunami Ready Coalition and that TOWS WG approval is essential for advancing the work of the Tsunami Ready Coalition.

Also notes that the Tsunami Ready Implementation Plan was reviewed by the Ocean Decade Scientific Committee (16–17 January 2025) and the TOWS-TT-DMP (21 February 2025) and is included as part of the Coalition Chair's report to TOWS-WG-XVIII).

Having considered the Tsunami Ready Coalition Implementation Plan,

- **Approves** the Implementation Plan, including:
    - The Coalition mandate and terms of reference,
    - The Coalition structure, and
    - The identified key Coalition Partners.
- **Notes** that the Plan will remain a dynamic document to allow for updates to the Plan, with updates reflected in the Coalition's reports to the TOWS-WG
- **Recommends** the Secretariat to finalize in consultation with the Tsunami Ready Coalition Chair the Coalition Partners, 'Ambassadors' or similar namesake, and Coalition Co-Chair.
- **Recommends the** IOC Executive Secretary to extend invitations to the proposed Coalition Partners and Ambassadors, and a Coalition Co-chair.
- **Requests** ICGs to prioritize regional Tsunami Ready workshops or summits in 2025 and conduct further workshops or summits before 2030.
- **Notes** resource and capacity constraints that will stymie progress of the TRC Coalition Implementation Plan, requests the IOC Executive Secretary to urgently address.

4.5 Policy and Future Implementation: Tsunami Ready

Dr Harkunti Pertiwi Rahayu moderated the *round table discussion* on policy and future implementation of Tsunami Ready by focusing on the following key questions as indicated in the agenda.

Key Question 1: *How should Tsunami Ready evolve at a policy and national level? How can UNESCO-IOC sustainably engage with both Member States and communities?*

Silvia Chacon provided a short presentation to help provide insights on the question: *How should Tsunami Ready evolve at a policy and national level? How can UNESCO-IOC sustainably engage with both Member States and communities?*

It was highlighted that a small team of four people from her organization in Costa Rica was able to advance relatively quickly on the Tsunami Ready/DRR initiative, thanks to the country's existing Risk Governance and Policy framework, National Risk Management System, and inter-institutional Multi-Hazard Early Warning System (MHEWS) approach. However, the main challenge remains the difficulty of securing a 'seat' at high-level decision-making tables, as tsunamis are infrequent and not considered a high priority.

In one case, materials were developed, but due to a lack of follow-up and resources, full implementation of activity was not achieved, leading to wasted efforts and resources.

Proposed Actions:

- Mandating Tsunami Ready by law for schools, public and private companies, and coastal communities within evacuation areas.
- Strengthening UNESCO's role as a recognized global leader in tsunami preparedness.
- Leveraging data and statistics to effectively advocate for tsunami risk awareness and preparedness.

The meeting also discussed various approaches to address these challenges, including:

- Integrating tsunami preparedness into MHEWS and mainstream policy advocacy.
- Crafting effective communication strategies for continued engagement and programme renewal.
- Strengthening connections with global initiatives such as World Tsunami Awareness Day (WTAD).
- Training a pool of dedicated personnel to effectively implement and execute Tsunami Ready Programme activities at national and local levels.

Key Question 2: *How Member States adapt/streamline the programme into their national disaster risk reduction legislative framework?*

Ms Ashleigh Fromont took the lead to address the second key question on *How Member States adapt/streamline the programme into their national disaster risk reduction legislative framework?*

She discussed the progression and next steps from two key perspectives:

- How to build tsunami initiatives
- The enabling principles and mechanisms

The TT DMP deliberated on the following:

- Effective utilization of the Tsunami Early Warning System KPI for reporting and contributing to Target G (Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030) of the Sendai Framework for DRR, and to its mid-term review and stock taking process. This will help drive impactful actions at both national and local levels.
- Leveraging tsunami risk assessments and risk knowledge information to raise awareness, ensuring that decision-makers and policymakers cannot overlook the urgency of tsunami preparedness.
- Additionally, INGV Italy offers to share a guideline on a legal case in Italy and its implications in supporting tsunami-related activities.

Recommendations to TOWS-WG

Recommends to TOWS WG and its Task Teams to effectively utilize the Tsunami Early Warning System KPI for reporting and contributing to Sendai Framework Target G. This will support the mid-term review and drive impactful actions at national and local levels.

Further recommends leveraging and integrate comprehensive tsunami risk assessments into policymaking to ensure decision-makers prioritize urgent preparedness measures.

Notes that the National Institute of Geophysics and Volcanology (INGV, Italy) will share a guideline on a legal case in Italy and its implications in supporting tsunami-related activities.

The TT DMP meeting *ran out of time and could not address* the remaining questions, which are important to be discussed. These remaining questions were focusing on reviewing the progress which has been discussed and recommended during the Meeting on Disaster Management and Preparedness of TOWS WG XVIII, Sendai Japan, 19 - 20 February 2024. Meanwhile, there is a new tool that has been developed in the Indian Ocean based UNESCO IOC survey after the Palu Tsunami event.

The remaining key questions are:

> **Key Question 3:** *How to deal with other interests & complex and particular situations (entire coast, schools etc.?) - supposed to be presented by Dr. Denis Chang Seng*
>
> **Key Question 4:** *How to deal with the interest and needs of critical infrastructure, i.e. airport and port - supposed to be presented by Dr. Harkunti P. Rahayu (Note the guideline is in progress is planned to be tested using SUSTAIN (tSUnami reSilient criTical INfrastructure) proposal in several Indian Ocean countries), and Ignacio Aguirre Ayerbe (Tsunami risk assessment in ports; current methodology being developed at IHCantabria).*
>
> **Key Question 5:** *How to deal with the interest and needs of hazardous vital infrastructure, i.e. industrial zone, power plan - supposed to be presented by Dr. Harkunti P. Rahayu. (Note it is ongoing progress).*
>
> **Key Question 6:** *TR Evaluation Survey and the Tsunami Event Post Assessment Questionnaire was also proposed.*

- 5.0 EDUCATION AND WORLD TSUNAMI AWARENESS DAY 2024 AND PLANNING FOR 2025

Ms Regina Khanbekova from UNDRR reported on the WTAD. She highlighted UNDRR's communication priorities relevant for the TT DMP work on Safe Schools (GP2025 Ministerial Session), the EW4ALL initiative, and Innovative Financing for DRR. UNDRR invited UNESCO to co-develop the WTAD 2025 theme, potentially related to Innovative Financing for DRR but not limited by it. Key WTAD activities include ongoing efforts under the #GetToHighGround initiative, aimed at connecting high level political support to real change making people safer. UNDRR has expressed its interest to bolster a connection between the Tsunami Ready Programme and #GetToHighGround Campaign.

It was noted that the 5th ODTP-SC, 16-17 January 2025 proposed making "Tsunami Ready" a permanent theme of the World Tsunami Awareness Day, similar to initiatives like *Safe Schools*, aligning with ODTP's high-level objective 2. The proposed theme could also be linked to cooperation and partnerships, including the TRC '*Ambassador*' initiative or similar and public-private collaborations.

Recommendations to TOWS WG

Recommends to UNDRR that '*Tsunami Ready*' becomes a permanent WTAD Theme similar to Safe Schools and others.

Further recommends linking Tsunami Ready theme to collaboration, partnerships, public private partnerships and the proposed TRC Ambassador.

- 6.0 INCLUSIVE SOPs

Dr Harkunti presented the Inclusive Standard Operating Procedure (SOP) for the early warning system and tsunami evacuation for Special Schools for Disabilities. This includes inclusive

warning devices/tools designed for disabled children and ensuring that special schools receive tsunami warnings. The action research project is funded by both the British Council and the Indonesian Ministry of Higher Education, Science, and Technology. Her presentation covered the development process of the inclusive SOP and warning devices/tools. She also introduced the evolving global terminology for disabled individuals, emphasizing the shift toward the term difable people—which refers to individuals with different functional abilities. While they can perform many tasks, they do so with varying capabilities. The challenges faced by disabled individuals during disasters, particularly tsunamis, were outlined as follows:

> **Accessibility to warning information** – Ensuring they receive alerts in time to respond effectively.
>
> **Mobility for evacuation** – Providing necessary support systems for safe evacuation. Different types of disabilities require different forms of assistance.
>
> **Communication** – Implementing specialized systems to educate disabled individuals about tsunamis and the appropriate response actions.

At the conclusion of her research, the inclusive SOP and warning devices were tested through a tsunami simulation involving 12 special schools, the West Sumatra Province Disaster Management Office (DMO), Padang City Local Disaster Management Office (LDMO), the West Sumatra Province Education Department, and several NGOs focused on disability inclusion. The inclusive SOP was developed in three formats to optimize low-cost technology and cater to the needs of difable individuals, who comprise approximately 8.5% of Indonesia's population (22.5 million people). The formats include:

> **Audio-Video SOP** – This format provides step-by-step audio narration, beginning with the first milestone: earthquake shaking, which serves as the signal for self-evacuation, considering Indonesia's high risk of near-field tsunamis.

The second milestone is the issuance of the first warning—earthquake information. The third milestone is confirmation of the tsunami reaching land while the fourth milestone is the "all-clear" signal, which aids search and rescue efforts.

This audio-video SOP is designed to clearly guide difable students, schoolteachers, and parents within school premises, ensuring they respond promptly to each milestone. Since time is critical in such emergencies, the SOP is also supported by sign language interpretation of the audio narration, making it accessible to students with hearing, vision, and physical impairments.

> **Hard Copy SOP** – A printed version that can be used by schools for reference and training purposes.
>
> **Inclusive Warning Tools/Devices** – A smartphone- and smartwatch-based warning system that uses vibration and sound-based alerts, catering to three categories of difable individuals.

Looking ahead, the 2025 Indian Ocean Wave Exercise (IOWAVE) will include difable students and individuals. The inclusive SOP and warning tools will be introduced and tested on a larger scale during the Inter-Sessional Steering Group meeting in March 2025 and the ICG XV meeting in November 2025 in Jakarta.

With about 1.3 billion difable people in the world (16% of global population), inclusive SOP for tsunami warning and evacuation is significantly important to reach the second objective of UNESCO IOC ODTP “100 % people at risk should be prepared and resilient to tsunami by 2030”.

During discussion Dr. Laura Kong has proposed the possibility to support the existing school program.

Recommendations to TOWS-WG

Appreciates the development of Inclusive SOP and Inclusive Warning Tools for difable children in Indonesia and the Caribbean.

Recommends the Indonesian inclusive SOPs to be translated to English.

Encourages further development of inclusive SOP as official guidelines of UNESCO-IOC.

- 7.0 REVISED TT DMP TOR

The Chair requested members to provide their inputs to revise and finalize the TT DMP ToR which was made available via Google online document. The meeting recalled that TOWS TT DMP recommendation in Sendai, Japan, 19–20 February 2024 concerning the fact that many advances have been made, and new needs have been identified particularly concerning the implementation of the Tsunami Ready Programme, Ocean Decade Tsunami Programme, capacity building and coastal resilience etc. since TT DMP ToR was prepared in 2010.

Revised Terms of Reference

NEW TOWS TASK TEAM TERMS OF REFERENCES ON DISASTER MANAGEMENT AND PREPAREDNESS

Notes through Resolution XXIV-14, the IOC Assembly at its 24th session decided on the establishment of a Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG). The group is tasked primarily to advise the IOC Governing Bodies on coordinated development and implementation activities of warning and mitigation systems for tsunamis and other hazards related to sea level of common priority to all Intergovernmental Coordination Groups of Regional Tsunami Warning and Mitigation Systems.

Further notes by its IOC Decision A-31/3.4.1 on Warning Mitigation Systems for Ocean Hazards, the IOC Assembly in 2021 reaffirmed the need for continued inter-ICG coordination through TOWS and the extended tenure of its two inter-ICG Task Teams on:

- Disaster Management and Preparedness (DMP), and
- Tsunami Watch Operations (TWO).

Notes the TOWS TT DMP recommendation in Sendai, Japan, 19 - 20 February 2024 that many advances have been made, and new needs have been identified since TT DMP ToR was prepared and the recommendation to revise TT DMP Terms of Reference.

IOC/TOWS-WG-VI/3, Annex II

Updated Terms of References for Inter-ICG Task Teams

The Inter ICG Task Team on Disaster Management and Preparedness shall:

(i) Facilitate in collaboration with key international stakeholders and organizations (such as UNDRR, IFRC , UNDP, WMO etc.), or initiatives (such as the Tsunami Ready Coalition, Coastal Inundation Forecasting Initiative, etc.) the exchange of experiences and information on preparedness and mitigation actions, education/awareness, and other matters related to disaster management and preparedness for tsunamis and other coastal sea level related hazards;

(ii) Promote and facilitate the implementation of Tsunami Ready Recognition Programme, and similar initiatives, as well as related capacity development efforts, specifically targeting SIDS and LDCs;

(iii) Promote preparedness to build resilient coastal communities through education and awareness products and campaigns;

(iv) Facilitate capacity development and training across ICGs to strengthen emergency response capabilities of Member States and their Disaster Management Offices;

(v) Promote existing and encourage the development of preparedness programmes and assessment tools, and synergies with other initiatives (e.g. resilient cities, safe schools etc) that have been successful in one regional Tsunami Warning and Mitigation Systems as appropriate;

(vi) Facilitate the coordination of the TICs of the ICGs and reinforce their ability to serve as a clearinghouse for the development of educational and preparedness products, and capacity development and training;

(vii) Report to the TOWS–WG.

The representatives to the Inter-ICG Task Team on Disaster Management and Preparedness shall be nominated by their respective ICG Chairpersons. The membership shall consist of two representatives from each ICG, if formally established one of which may represent the ICG's Tsunami Information Center. The IOC Chair will appoint the Chair of the Task Team.

Recommendations to TOWS-WG

Notes that TOWS TT DMP recommendation in Sendai, Japan, 19–20 February 2024 concerning the fact that many advances have been made, and new needs have been identified since TT DMP ToR was prepared in 2010.

Recommends approving the above proposed revised TT DMP Terms of Reference.

- 8.0 DEVELOP TT TMP WORK PLAN

The TT DMP discussed the TT Workplan and the arrangements for preparing the summary report and reporting of TT DMP chair to the TOWS-WG. Future TOWS WG and TT meetings attendance and logistical arrangements were discussed.

Recommendations to TOWS WG

Agreed to organize a TT DMP meeting ahead of the TOWS TTs and TOWS WG meetings by the end of October 2025 to review actions and define agenda for the February 2026 meeting.

Further agreed to organize short meetings, online or in person to discuss focus topics addressing key agenda items.

Recommends planning the schedule for TOWS-related meetings, preferably holding the TTs meetings from Monday to Wednesday and the TOWS-WG meetings on Thursday and Friday, leaving sufficient time in between meetings for Technical Secretaries to prepare summary report and recommendations.

- 9.0 AOB & CLOSE OF MEETING

The TT DMP chair concluded the TT DMP meeting which was extended online on Saturday at 11:00 Paris time.

LIST OF RECOMMENDATIONS

Recommendation to TOWS WG

Request to perform a scientific peer review on the Methodology for Estimating Eligibility for TRR and Assessment of Tsunami Risk at Community Level to ensure the indices developed are accepted as a scientifically credible methodology and endorsed by ICGs.

Recommendation to Technical Secretariat

Recommend secretariat, once peer review on the Methodology for Estimating Eligibility for TRR and Assessment of Tsunami Risk at Community Level is completed, to prepare an IOC Technical Series document on the Methodology for Estimating Eligibility for TRR and Assessment of Tsunami Risk at Community Level.

Recommendation to TT DMP

Agrees to conduct a mid-term evaluation of the new TT DMP actions to assess progress, identify unaddressed actions, propose ways to implement them and define the next TT DMP meeting agenda.

TSUNAMI READY IMPLEMENTATION STATUS

Recommendation to TOWS

Appreciates the number of Member States and communities joining the UNESCO-IOC Tsunami Ready Recognition Programme, with 100 communities from 31 countries already recognized, of which 10 SIDS

Recommends

- To start reporting TRR communities as soon as effectively possible by percent to get a better idea of how close we are to the Ocean Decade goal of 100% percent of at-risk communities to be TR.
- To produce a report including reflections on the main challenges that are being identified in the implementation of the TRRP, as well as proposals of mitigating measures to address them (considering, among others, the challenges included in the list provided by the ICG NEAM-TWS).
- Exploring the creation of a global facility to facilitate data and development of inundation and evacuation maps in a more efficient way.
- Developing a strategy to focus early actions on hazard and risk assessments, to enable the implementation of TR.
- Translating evaluation forms into French and Spanish, making the application submission more efficient, providing tools to facilitate annual reporting, identifying national TR focal points, and consistent reporting mechanisms on better integration of people with disabilities; solutions to vandalism and multi-hazard risks affecting TR recognitions.
- Organizing a Tsunami Ready Summit in the Caribbean? Or globally? if funds are available in 2025/2026 to strengthen collaboration and strategy.

Notes the funding and staffing shortages, obstacles and challenges slowing down TR recognitions and renewals.

Further notes that all TICs face resource limitations, causing delays in implementation.

Further notes the importance of securing technical support from social scientists for data analysis.

Also notes the potential critical role of public private partnerships and the need for a high level of scrutiny to ensure the values and integrity of UNESCO are maintained.

SYNERGY WITH LOCAL AND NATIONAL RESILIENT PROGRAMMES (TSUNAMI PARITY)

Recommendation to TOWS

Appreciates the progress made for establishing the Tsunami Ready Equivalency for the PTWS by developing a draft guidance using the Tsunami Ready indicators as a foundation.

Notes that the PTWS will explore ways to further recognize and promote the benefits of formal Tsunami Ready Recognition, which remains the preferred approach by TOWS.

TSUNAMI READY TOOL KIT

Recommendation to Secretariat

Recommends Secretariat to inform Member States on the Toolkit's availability via IOC Circular Letter to the Tsunami National Contacts, National Tsunami Ready Board, and widely through the attaching this as an appendix of the Manual and Guide 74

Recommendation to TICs

Further Requests that TICs continue developing additional tools, including:

4. Application Form in official UN languages
5. More efficient submission procedures
6. Tsunami Ready Training providing detailed implementation guidance

TSUNAMI READY COALITION IMPLEMENTATION PLAN

Recommendations to TOWS WG

Notes that TOWS-WG-XVI (2023) requested the Tsunami Ready Coalition Chair to propose a governing structure for the Tsunami Ready Coalition and that TOWS WG approval is essential for advancing the work of the Tsunami Ready Coalition.

Also notes that the Tsunami Ready Implementation Plan was reviewed by the Ocean Decade Scientific Committee (16-17 January 2025) and the TOWS-TT-DMP (21 February 2025) and is included as part of the Coalition Chair's report to TOWS-WG-XVIII).

The TOWS-WG:

- **Having considered** the Tsunami Ready Coalition Implementation Plan,
- **Approves** the Implementation Plan, including:
  - The Coalition mandate and terms of reference,
  - The Coalition structure, and
  - The identified key Coalition Partners.
- **Notes** that the Plan will remain a dynamic document to allow for updates to the Plan, with updates reflected in the Coalition's reports to the TOWS-WG.

- **Recommends** the Secretariat to finalize in consultation with the Tsunami Ready Coalition Chair the Coalition Partners, 'Ambassadors' or similar namesake, and Coalition Co-Chair.

- **Recommends the** IOC Executive Secretary to extend invitations to the proposed Coalition Partners and Ambassadors, and a Coalition Co-chair.
- **Requests** ICGs to prioritize regional Tsunami Ready workshops or summits in 2025 and conduct further workshops or summits before 2030.

- **Notes** resource and capacity constraints that will stymie progress of the TRC Coalition Implementation Plan, requests the IOC Executive Secretary to urgently address

POLICY AND FUTURE IMPLEMENTATION: TSUNAMI READY

Recommendations to TOWS-WG and TTs

Recommends to TOWS WG and its Task Teams to effectively utilize the Tsunami Early Warning System KPI for reporting and contributing to Sendai Framework Target G. This will support the mid-term review and drive impactful actions at national and local levels**.**

Further recommends leveraging and integrate comprehensive tsunami risk assessments into policymaking to ensure decision-makers prioritize urgent preparedness measures

Notes that the National Institute of Geophysics and Volcanology (INGV, Italy) will share a guideline on a legal case in Italy and its implications in supporting tsunami-related activities.

EDUCATION AND WORLD TSUNAMI AWARENESS DAY 2024 AND PLANNING FOR 2025

Recommendations to UNDRR

Recommends to UNDRR that '*Tsunami Ready*' becomes a permanent WTAD Theme similar to Safe Schools and others.

Further recommends to link Tsunami Ready theme to collaboration, partnerships, public private partnerships and the proposed TRC Ambassador.

INCLUSIVE SOPs

Recommendations to TOWS-WG

Appreciates the development of inclusive SOP warning tools for disabled children in Indonesia and the Caribbean.

Recommends the Indonesian inclusive SOPs to be translated to English

Encourages further development of inclusive SOP as official guidelines of UNESCO IOC.

REVISED TT DMP TOR

Recommendations to TOWS-WG

Notes that TOWS TT DMP recommendation in Sendai, Japan, 19 - 20 February 2024 concerning the fact that many advances have been made, and new needs have been identified since TT DMP ToR was prepared in 2010.

Recommends approving revised TT DMP Terms of Reference.

DEVELOP TT TMP WORK PLAN

Recommendations to TOWS WG

Agreed to organize a TT DMP meeting ahead of the TOWS TTs and TOWS WG meetings by the end of October 2025 to review actions and define agenda for the February 2026 meeting.

Further agreed to organize short meetings, online or in person to discuss focus topics addressing key agenda items.

Recommends planning the schedule for TOWS-related meetings, preferably holding the TTs meetings from Monday to Wednesday and the TOWS-WG meetings on Thursday and Friday, leaving sufficient time in between meetings for Technical Secretaries to prepare summary report and recommendations.

Agenda of Task Team Disaster Management and Preparedness Session

Local Time	Topic	Lead
09:00 – 09:15	**1. SESSION ORGANISATION** Logistics and agenda	Harkunti Rahayu Secretariat
09:15:10:00	**2. DISCUSS OUTCOMES OF THE JOINT MEETING WITH TT TWO**	All
10:00-10:30	**3. REVIEW KEY ACTION ITEMS (MAIN ISSUES)**	All
10:30-11:00	*Break*	
[11:00-17:00]	**4. TSUNAMI READY**	
11:00-11:45	**4.1 Tsunami Ready Implementation Status**	Presentations by TT reps each ICG
11:45-12:15	**4.2 Synergy with Local and National Resilient Programmes** [Tsunami Parity (15 min), *The progress made for establishing the Tsunami Ready Equivalency for the PTWS* MCR2030, including Tsunami and Critical Infrastructures, and ISO 22328-3 (Community-based Early Warning Systems for Tsunamis)]	Ashleigh Fromont Harkunti Rahayu Denis Chang Seng/ Ardito Kodijat Indonesia BMKG or Laura Kong
12:15-12:30	**4.3 Tsunami Ready Tool Kit**	Laura Kong and Ardito Kodijat
12:30-13:00	**4.4 Tsunami Ready Coalition Implementation Plan**	Laura Kong and David Coetzee
13:00:14:00	*Lunch Break*	
14:00-14: 15	**Tsunami Ready Coalition Implementation Plan (con't)**	Laura Kong and David Coetzee
[14:15-15:30]	**ROUND TABLE DISCUSSION**	
	4.5 Policy and Future Implementation: Tsunami Ready, **Key questions:** *i. How should Tsunami Ready evolve at a policy and national level? How can UNESCO-IOC sustainably engage with both Member States and communities?* *ii. How Member States adapt/streamline the programme into their national disaster risk reduction legislative framework?* *iii. How to deal with other interests & complex and particular situations (entire coast, schools etc.?)* *iv. How to deal with the interest and needs of critical infrastructure, i.e. airport and port*	All

	v. How to deal with the interest and needs of hazardous vital infrastructure, i.e. industrial zone, power plant	
15:30-16:00	*Break*	
16:00-16:25	**5. EDUCATION AND WORLD TSUNAMI AWARENESS DAY 2024 AND PLANNING FOR 2025**	UNDRR /All
16:25-16:45	**6. INCLUSIVE SOPs**	Harkunti Rahayu
16:40-17:10	**7. REVISED TT DMP TOR**	Chair/All
17:10-17:20	**8. DEVELOP TT TMP WORK PLAN**	Harkunti Rahayu Secretariat
17:20-17:30	**9. AOB & CLOSE OF MEETING**	Harkunti Rahayu Secretariat
	HALF DAY (SAT 22 FEB)	
10:00-13:00	**FINAL WRAP UP DISCUSSIONS & DRAFTING DECISIONS AND RECOMMENDATIONS**	All/ Secretariat

Members and Observers of TOWS Task Team on Disaster Management

Name	Country	Organisation	Region/Role
Denis Chang Seng	France	IOC	TT- DMP Technical Secretary ICG/NEAMTWS/NEAMTIC/CoastWAVE
Task Team Members			
Harkunti Pertiwi Rahayu	Indonesia	Head of Center for Earthquake and Tsunami Mitigation Institute of Technology Sumatera	ICG/IOTWMS/ Chair TT DMP
Ardito Kodijat	Indonesia	IOC	IOTIC, ICG/IOTWMS
Ignacio Aguirre Ayerbe	Spain	IH Cantabria	ICG/NEAMTWS Vice-Chair
Marinos Chalampakis	Greece	NOA	ICG/NEAMTWS
Laura Kong	USA	ITIC	ITIC, ICG/PTWS
Ashleigh Fromont	New Zealand	NEMA	ICG/PTWS
Alison Brome	Caribbean	CTIC	CTIC, ICG/CARIBE-EWS
Silvia Chacon	Costa Rica	National Tsunami Monitoring System	ICG/CARIBE-EWS
Derya Vennin	France	IOC	ICG/NEAMTWS / CoastWave Project
Invited Experts and Observers			
Regina Khanbekova	Switzerland	UNDRR	Communications
Alessandro Amato	Italy	INGV	ICG.NEAMTWS Chair
Prof Amr Hamouda	Egypt	NIOF	ICG/NEAMTWS Vice-Chair
Elena Daskalaki	Greece	NOA	ICG/NEAMTWS Co-Chair of Tsunami Ready

ANNEX IV

REPORT OF THE TOWS-WG JOINT INTER-ICG TASK TEAMs ON TSUNAMI WATCH OPERATIONS AND DISASTER MANAGEMENT AND PREPAREDNESS

20 February 2025
Paris, France

unesco
Intergovernmental Oceanographic Commission

MEETING OF THE TOWS-WG JOINT INTER-ICG TASK TEAMS ON TSUNAMI WATCH OPERATIONS AND DISASTER MANAGEMENT AND PREPAREDNESS

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION UNESCO

20 February 2025

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1.0 Welcome & Introduction

The session was jointly opened by Mr Yuji Nishimae (Chair, Task Team on Tsunami Watch Operations – TT TWO) and Dr Harkunti Rahayu (Chair, Task Team on Disaster Management and Preparedness – TT DMP).

● 2.0 Session Organisation

The chairs noted the first day is a joint meeting between TT DMP and TT TWO and they would co-chair the sessions. On the second day the two task teams were to meet separately. Participants were informed that the meeting planned on Saturday 22nd morning will be conducted online because of access to meeting room issues. The logistics for the meetings were explained, including how to join online, and information was provided on the local arrangements. The provisional agenda was tabled and approved.

● 3.0 Wave Exercises and Significant Tsunami Events in each ICG

Wave Exercises

PTWS

Dr. Laura Kong, on behalf of Ms. Margarita Martinez and Mr. Laitia Fifita, co-Chairs of the PTWS Task Team on PacWave Exercises, reported that the Pacific Wave 24 (PacWave24) exercise involved multiple components, including a live communication test from PTWS Tsunami Service Providers (TSPs) to Member States on 5 November at 0000 UTC, followed by a NAVAREA Coordinators Communication Test an hour later. From September to November 2024, participating countries conducted national and regional exercises, with regional collaboration encouraged through shared scenarios and communication protocols. Key milestones included a Pacific Island Countries and Territories Regional Exercise on 4 November, and a Southeast Pacific Regional Exercise on 21 November. After the exercise, Member States submitted post-exercise evaluation surveys and regional reports by 15 December 2024, with a draft summary report to be shared before the ICG/PTWS-XXXI meeting in April 2025 and a final version published by 30 June 2025. The exercise aims to strengthen regional cooperation, improve tsunami warning systems, and ensure that both national and regional response plans are effective and up to date.

NEAMTWS

Dr. Marinos Charalampakis reported on NEAMWave23, conducted on 6–7 November 2023. A key new objective was the participation of CoastWave project countries in the NEAM exercise. For the first time, NEAMWave23 included communities actively working towards becoming "Tsunami Ready." The exercise coincided with World Tsunami Awareness Day, celebrated annually on 5 November. The exercise featured two joint scenarios—one in the North-Eastern Atlantic and the other in the Mediterranean. A total of 15 out of 40 NEAMTWS Member States participated, engaging in various drills.

Key best practices from NEAMWave23 included:

- Utilizing online tools for registration and evaluation.
- Making only essential updates to the exercise manual (e.g., scenarios and specific objectives) to maintain general knowledge of the exercise.
- Using joint scenarios to strengthen cooperation among Tsunami Service Providers (TSPs).

Notable observations indicate that Civil Protection Agencies are "indirectly" increasing their participation through the synergy of the CoastWave project. However, evaluation feedback highlighted certain challenges, such as a lack of interaction between providers and recipients, leading to incomplete reporting. Additionally, there were suggestions to simplify the Final Evaluation Report to enhance readability and ease of preparation.

The evaluation recommends incorporating more scenarios in future NEAMWave exercise. As per ICG-NEAMTWS XIX, NEAMWave26 is scheduled for March 2026, aligning with final Tsunami Ready exercise activities under the CoastWave Project 2.0. It is proposed to adopt a more flexible schedule, such as running one scenario per week. Additionally, there is a proposal to rename the "Team on Tsunami Exercise" to the "Task Team on NEAMWave Exercise" (TT-NEAMWave) to align with other ICGs.

CARIBE-EWS

Dr. Liz Vanacore on the CARIBE Wave 24 exercise which was undertaken in March 2024 using two scenarios, an earthquake along the Puerto Rico Trench and an earthquake near Panama. Out of 48 Member States and Territories 45 participated in the exercise with the number of overall participants recorded as 470,423 based on Member States reporting and registrations on tsunamizone.org. The initial dummy message was received by 100% of the participant Member States and territories. Notably, 36% of the news media participated and most countries and territories publicized the exercise through social media to using the hashtag #CARIBEWAVE.

Currently, the CARIBE-EWS is in preparation for the CARIBE-Wave 25 exercise to be held on 20 March 2025. The scenarios to be employed are the original 2020 scenarios as that year the exercise was impacted by the COVID epidemic. As such, the scenarios are as follows: 1) An earthquake off of Portugal based on the 1755 event and 2) an earthquake located along the Enriquillo-Plantain Garden Fault Zone (EPGFZ). To date over 150,000 participants have registered on the tsunamizone.org website for this year’s exercise. A series of 2 mulit-lingual (English, French, Spanish) webinars are on-going. A post-exercise hot wash is planned for April 1, 2025 a few days before the evaluation forms from the MS and territories are due on April 4, 2025.

IOTWMS

Mr. Ardito Kodijat presented on IOWave23 exercise. He briefed that the IOWave23 tsunami exercise was successfully conducted on October 4, 11, 18, and 25, 2023, involving real-time tsunami bulletin issuance by the three IOTWMS Tsunami Service Providers (TSPs) of Australia, India, and Indonesia. The exercise simulated three earthquake-generated tsunami scenarios (Andaman Trench, Makran Trench, and Java regions) and one TGV source (Heard Island,). At least seven active Indian Ocean Member States involved community participation, and nine countries had procedures in place to ensure tsunami warnings reached vulnerable populations, including people with disabilities, different genders, elderly, and youth. A total of 19 IOTWMS Member States participated in an online survey to assess the effectiveness of the exercise.

Key recommendations from IOWave23 include conducting biennial exercises at alternative times of the year to enable full participation of Member States, as September–October coincides with other hazard response activities. National or sub-regional exercises were encouraged in alternate years to ensure regular preparedness. Future exercises will prioritize inclusivity, particularly engaging people with disabilities. Tsunami scenarios should be inclusive and suitable for all Member States, with a mix of seismic and non-seismic events. Recommendations for upstream tsunami warning components (TSPs and NTWCs) emphasize regular updates of contact information, reviewing and updating SOPs based on lessons learned, and developing products for non-seismic tsunami sources. For downstream

components (DMOs, communities, and media), strengthening the Tsunami Ready Recognition Programme, improving public awareness, and ensuring effective stakeholder communication were highlighted as critical actions toward achieving the UN Ocean Decade Tsunami Programme goal of 100% at-risk communities prepared by 2030.

Recommendations to TOWS-WG

Appreciates the execution of the Wave exercises, PacWave 24 (September to November 2024), the CARIBE-Wave 24 (21 March 2024), the NEAMWave 23 (6–7 November 2023) and the IOWave23 (4–25 October 2023).

Notes the upcoming CARIBE-Wave 25 exercise scheduled for March 20, 2025, and NEAMWave 26 planned for March 2026.

Significant Tsunami Events

IOTWMS

Jijjavarapu Padmanabham (INCOIS) presented an overview of the events that occurred in the IOTWMS ESZ Indian Ocean, Pacific Ocean, and South Atlantic Ocean) in 2024. A total of 22 earthquakes (M≥6.5) were monitored within the ESZ, and bulletins were issued to IO member states as per the SOP defined in the Service Definition Document in the reporting period. One event occurred in the Indian Ocean (M 6.6 - South of Africa, 2024-07-10 04:55:41 (UTC) 53.309°S 25.348°E; 4.0 km depth) for which the TSPs issued a "No Threat" bulletin. TSP – Australia issued a “No Tsunami Threat Bulletin” for the Indian Ocean in response to the eruption of Volcanic Eruption at Mt. Ruang on 29 April 2024, which was the first non-seismic product issued by a TSP for the Indian Ocean.

NEAMTWS

Dr. Helene Hebert (CEA) presented an overview of the events that occurred in the NEAMTWS ESZ. Ten earthquakes (11 in 2023) occurred within the reporting period with 7 in the NE Atlantic (4 in 2023), 3 in the East Mediterranean (3 Central, 4 East NE Atlantic) only at information level, as the events were in the magnitude of 5.5 to 6.0.

Additionally, by request of TOWS Task Teams, Dr. Marinos Charalampakis (NOA) provided an overview of the ongoing seismic activity in the Santorini-Kolumbo volcanic setting, which belongs to the volcanic back-arc of the Hellenic Subduction Zone in the Mediterranean region, which is characterized with a high-level seismicity. An increase in the seismicity was observed at the end of January 2025. The Santorini-Kolumbo volcanic complex is also characterized by normal faults in connection with the seismo-tectonic extension regime of the region. Up to now, the total energy released in these earthquakes exceeds the energy that can be released by a single M6 earthquake. While most of the focal mechanism solutions indicate a normal fault mechanism, a small number of earthquakes with strike-slip focal mechanisms have also been observed. Both GNSS and INSAR show that the 4cm uplift since August has reversed. Now there is vertical subsidence and significant NE horizontal movements mostly on the north part of the island (from GNSS).GNSS sensors have been deployed on Santorini and some other nearby Islands, together with some sea-level monitoring devices. The 1956 Amorgos earthquake resulted in a tsunami more than 10m in the region. The eruption of 1650 at Kolumbo Island also resulted in a tsunami at Santorini. The apocalyptic event of 1650 BC at the Santorini should also be noted. Possible scenarios include

- Possible triggering of the Amorgos fault, which is not likely because of 1956 event
- Landslide triggered by an earthquake

- Volcanic eruption in Kolumbo or Santorini
- Gradual decrease in the seismicity and end of the swarm

Seismic and volcanic scientific communities have been established in Greece and are conducting regular meetings to assist the Disaster & Emergency Management Authorities. TSPs operate for earthquake triggered tsunamis, and currently no procedures exist for volcano triggered tsunamis. ICG/NEAMTWS in its last session had already established a dedicated Task Team on non-seismic tsunamis, and a closed meeting organised by IOC ICG-NEAMTWS Secretariat took place last week to discuss the details of this ongoing phenomenon.

CARIBE-EWS

Dr Charles McCreery, Director of PTWC, reported on significant tsunami events in the Caribbean. He noted that the Caribbean region generally has fewer large earthquakes than other regions and that only two events in the past year warranted products from PTWC as the CARIBE-EWS TSP. The first of these was for a magnitude 6.8 earthquake near Cuba on November 10, 2024, that resulted in a Tsunami Information Statement indicating no tsunami threat. The second event was more significant, a magnitude 7.6 earthquake between Honduras and the Cayman Islands on February 8, 2025, that produced a small tsunami and prompted a series of 5 Tsunami Threat Messages from PTWC. Dr. McCreery provided an overview of the messages issued by the PTWC for the M7.6 8 February 2025 event. The event occurred on 23:23:14 UTC in south-west of Cayman Islands / north-eastern Honduras on a transform fault, which defines the plate boundary between the Caribbean and North American plates. This strike-slip event is most likely associated with the Swan Islands transform fault and has similar characteristics of a nearby event that occurred in 2018. The first alarm at PTWC was triggered 1 min 33 sec after the event origin time and the analyses gave the earthquake a preliminary magnitude of 8.0 and a depth of 33 km. The first CARIBE-EWS Threat Message was issued 6 min 7 sec after the earthquake origin time at 23:29 UTC with these parameters, indicating the possibility of hazardous tsunami waves from this earthquake within the next three hours along some coasts of Cayman Islands, Jamaica, Cuba, Mexico, Honduras, Bahamas, Haiti, Turks and Caicos, Belize, Dominican Republic, Panama, Puerto Rico, Costa Rica, Aruba, Bonaire, Curacao, US Virgin Islands, British Virgin Islands and Saba (Netherlands). CARIBE-EWS Tsunami Threat Message #2 was issued at 23:42 UTC lowering the earthquake magnitude to 7.6. This change modified the list of countries with a potential tsunami threat to those within 1,000 km of epicenter (Bahamas, Belize, Cayman Islands, Costa Rica, Cuba, Haiti, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, and Panama).

PTWC tried to also call the earliest arrival countries but were not successful as many of the lines were busy or unresponsive. This is understandable, as each agency was busy with monitoring and responding to the event. He then showed the current status of the sea-level stations and stated that if more station data were timely available, a confirmation of the tsunami threat would have been possible much earlier.

The PTWC CMT computation completed providing an earthquake source mechanism which indicated a M7.6 in agreement with the preliminary USGS CMT value. It further confirmed that the mechanism was a strike-slip, in agreement with the local tectonics with less tsunamigenic potential. Using this CMT, two RIFT tsunami forecasts were run, evaluated, and the more conservative of the two, which was the one in agreement with the tectonics, was judged acceptable to use in the products.

CARIBE-EWS Tsunami Threat Message #3 was issued at 00:24 UTC, including the aforementioned RIFT forecast. Based on that run, the only countries having forecast coastal amplitudes above the minimum hazard amplitude of 0.3 m were the Cayman Islands, Cuba and Honduras. It was noted that no sea-level readings were yet available to validate the forecast, but such data were expected in the next 30 minutes to an hour.

Dr. McCreery also provided a brief description of the PTWC Enhanced Products. At 01:21 UTC, CARIBE-EWS Tsunami Threat Message #4 was issued. It included the same RIFT forecast and the sea-level reading from Isla Mujeres, Mexico. It noted that the threat would continue until additional sea-level data were received to confirm the threat had passed. After this, additional data was received from the gauge at Isla Mujeres, and the tsunami arrived on two other gauges in the region with no discernible amplitude. A CARIBE-EWS Final Tsunami Threat Message #5 was issued at 02:00 UTC. It included an updated sea-level reading from Isla Mujeres of 0.04m. It was noted that based on all sea level data the threat had now largely passed and that only additional minor sea level fluctuations might occur over the next few hours.

Alison Brome reported on the follow-up actions, including the “hot-wash” webinar organized by the Secretariat on 12 February 2025, in which at least 106 representatives (some connections were from video-conference rooms) from 25 ICG/CARIBE-EWS Member States participated, and also efforts towards a possible post-event assessment survey and reminded the group on the background. The IOC Assembly accepted a Post-Event Assessment Questionnaire which was designed and recommended by the TOWS-WG Task Teams on Tsunami Watch Operations and Disaster Management and Preparedness. This questionnaire was further approved by the Working Group on Tsunami and other Hazards related to Sea-Level Warning and Mitigation Systems (IOC/TOWS-WG-VIII/3) at its Eighth session in 2015. The criteria for the triggering of an assessment were approved by IOC/TOWS-WG-VIII and endorsed, together with the questionnaire, at the 28th session of the IOC Assembly, Paris, 18–25 June 2015 (IOC-XXVIII/3), as follows:

> *The Task Teams further recommend that the trigger for implementing an assessment should be a tsunami threat of >1 m amplitude forecast in 1 or more countries in a region. Over and above this trigger level, the final decision to implement a survey should be decided by the regional Tsunami Information Centre (TIC) in consultation with the ICG Steering Group and Secretariat taking into consideration whether the tsunami resulted in a national response in one or more countries.*

In PTWC Tsunami Threat Messages numbers 3 and 4, it was indicated that “TSUNAMI WAVES REACHING 1 TO 3 METERS ABOVE THE TIDE LEVEL ARE POSSIBLE ALONG SOME COASTS OF CUBA”. The maximum instrumental sea-level observation was reported as 0.04 m at Isla Mujeres, Mexicoin Tsunami Threat Message number 5.The Steering Committee of the ICG/CARIBE-EWS is now evaluating the need for a post-assessment survey, and if yes, whether it should include all ICG/CARIBE-EWS Member States or only a sub-set of them as listed in the PTWC messages. A timeline for reporting by ICG/CARIBE-EWS XVIII (tentatively scheduled for 5-7 & 9 May 2025) was also proposed to the Steering Committee, in case a decision is made on proceeding with the survey.

Dr Necmioglu reported that one of the most important feedback received from the hot wash webinar was the complexities and challenges arising from the dissemination of all-clear messages from other countries in the region propagating widely through the social media channels. A suggestion was made that no Member State should announce an all-clear message prior the final message of the TSP (in this case PTWC) is issued. He further invited the group to advise on which bulletin a decision on the need for a post-event assessment survey needs to be made, noting that the initial and follow-up bulletins may include different forecast/threat levels.

Dr Necmioglu further reminded on the continuing challenges in maintaining an accurate TNC/TWFP/NTWC contact database through the Secretariat, which is not a 7/24 operational entity. Currently, the collection of the TNC/TWFP/NTWC data is governed through CL-

2558 and CL-2563, and he feels that there is a strong need to revisit how we collect/compile/serve such data, taking into considerations recent developments, such as cease of fax dissemination, but also some additional roles that have been defined in some ICGs (such as Tsunami Ready Focal Point in the IOTWMS), which does not necessarily exist (yet) in other ICGs. Some Member States have more than one TNC, and while to a certain degree it can be agreed to have two TNCs for a given Member State to balance the requirements of the upstream and downstream components of tsunami resilience. In some Member States there are more than 3 TNCs, and similar cases exist also for TWFPs up to 5 TWFPs for certain Member States. Hence it would be highly advisable that the TTWO and perhaps even better the Joint TTDMP-TTTWO consider this issue in its work programme with the aim for developing a revised form to collect TNC/TWFP/NTWC data from Member States and agree on a mechanism that would simplify and standardize the procedures both in collecting and making this data available to TSPs and TNCs. Highlights of such an effort could include clear separation of the roles, such as elimination of the request for section 3 (Designated Communication Method Information (operational on 7/24 Basis)", which introduces an ambiguity) with section 2 (Tsunami Warning Focal Point (TWFP) for receiving Tsunami Bulletins).

Dr. Laura Kong commented that each ICG should have the liberty to decide on a post-event assessment survey based on their need and does not necessarily have to follow the survey structure as defined by the TOWS-WG in 2015. She also commented that it may be useful to revisit the post-event assessment survey trigger threshold and questionnaire using the experiences and lessons learnt from the last 10 years. She clarified that the trigger forecast amplitude is usually based on the earthquake magnitude, and it is that magnitude value that should be used for survey decision making purposes.

Silvia Chacon-Barrantes commented that the first message for 8 February 2025 was disseminated by CATAC, with a lower magnitude in comparison to the final magnitude of the PTWC, but also the magnitude values published by the USGS had a significant variation during the course of the event. She underlined the importance for CARIBE-EWS being prepared to get different messages from different TSPs that may not necessarily present a uniform threat assessment. Yuji Nishimae commented that it would be advisable that agencies consider the worst-case approach in their decision-making process during such cases. Dr Charalampakis underlined the importance of making use of different earthquake magnitude reports as a measure of uncertainties involved and NEAMTWS TSPs have developed some experience and documentation on the matter that can be shared.

Recommendations to Member States

Recalled the critical importance of coastal tide gauges and offshore tsunami detection/observation systems for tsunami detection and verification,

Requested the Member States to prioritize installation/deployment of additional coastal tide gauges and tsunami detection/observation systems in regions under high tsunami risk with priority areas with known coverage gaps (in alphabetical order: Aegean Sea, Caribbean Sea (West, North and South-East), Indian Ocean (East and North), North Africa, Philippine Sea, Solomon Sea, South China Sea, Timor Sea, and Yellow Sea), to ensure tsunami detection and verification as early as possible.

PTWS

During the reporting period 41 bulletins were issued for 28 events by the PTWC, out of which 16 were tsunami threat messages and 25 were tsunami information statements. This list of most significant events are shown in the table below.

	date	time (UTC)	latitude	longitude	depth(km)	mag	mag type	places	Max. tsunami height (m)
1*	2024/4/2	23:58:12.173Z	23.84	121.6	40	7.4	mww	15 km S of Hualien City, Taiwan	1*
2*	2024/6/28	05:36:36.902Z	-15.83	-74.45	24	7.2	mww	10 km WSW of Atiquipa, Peru	0.2*
3*	2024/7/11	02:13:18.585Z	6.08	123.15	640	7.1	mww	106 km WSW of Sangay, Philippines	No Tsunami
4*	2024/7/19	01:50:48.571Z	-23.08	-67.84	127	7.4	mww	41 km ESE of San Pedro de Atacama, Chile	No Tsunami
5*	2024/8/8	07:42:55.206Z	31.76	131.5	24	7.1	mww	Hyuganada Sea, Japan Earthquake	0.51**
6*	2024/12/17	01:47:25.741Z	-17.69	168.08	54	7.3	mww	24 km WNW of Port-Vila, Vanuatu	0.25*

*) Earthquake Source Parameters by USGS
**) Earthquake Source Parameters by Japan Meteorological Agency

Tsunami height by;
*: NGDC/WDS Global Historical Tsunami Database
**: Japan Meteorological Agency

The earthquake with a JMA magnitude (Mjma) of 7.1 occurred in the Hyuganada Sea off SE Kyushu in the Nankai Trough around 4:42 p.m. on August 8 (JST). Tsunami waves were observed from Chiba to Kagoshima. Seismic activity increased immediately after the earthquake, then the number of earthquakes decreased over time.

After this earthquake, JMA issued “Nankai Trough Earthquake Extra Information (Under Analysis)” because this earthquake occurred in the possible source area for Nankai Trough Earthquake.Nankai Trough is located where the Philippine Sea plate subducts under the continental plate at the southwest of Japan. Earthquakes occurred in the Nankai Trough mainly are the interplate earthquake type caused by the subduction of the Philippine Sea Plate under the continental plate. Nankai Trough Earthquakes occur with a cycle of roughly 100-150 years in the region ranging from Suruga Bay to the Hyuganada sea with various repetition intervals and source areas. About 80 years have passed since the latest massive earthquake of 1944 Showa Tonankai and 1946 Showa Nankai earthquakes. This suggests that another mega earthquake is imminent. In some cases, multiple earthquakes occur within a certain period, and in others most of the trough can rupture at once. For example, in 1854, 32 hours after an earthquake occurred on the east side of the plate, another earthquake occurred on the west side. Ninety years later, an earthquake occurred on the east side of the plate, and two years after that on the west side. A Nankai Trough mega-earthquake could cause severe damage over a wide area due to strong shaking and subsequent tsunami. Strong shaking is estimated to occur over the Main Island, Shikoku Island and Kyusyu Island. Tsunamis exceeding 10 meters in height are estimated to occur over large areas along the Pacific coast. The number of potential victims in the worst-case scenario is estimated at more than 320,000. The damages by the Nankai Trough mega earthquake could be greatly reduced by taking countermeasures in advance, such as preparedness and evacuation.

Nankai Trough Earthquake Extra Information

JMA monitors the Nankai Trough around the clock. In the event of anomalies, JMA convenes the Nankai Trough Earthquake Assessment Committee for discussions on the expected potential for an earthquake and issues “Nankai Trough Earthquake Extra Information”as needed. Nankai Trough Earthquake Extra Information provides the probability of a mega-earthquake occurring assessed to be relatively higher than usual. It should be noted that this information does not necessarily mean that the Nankai Trough Earthquake will actually strike. In order to reduce damage, based on a law, the Japanese government has designated areas where earthquake disaster prevention measures should be promoted in preparation for a Nankai Trough earthquake.

Three cases of anomalous phenomena are assumed, indicating an increased potential for a Nankai Trough earthquake. The first case is the occurrence of the large-scale earthquake with a moment magnitude of 8.0 or higher, with serious damage. This figure shows an example that a magnitude 8-class earthquake may ? occur on the east side of the Nankai Trough. Based on the statistics, in this case, the probability of a mega earthquake occurring along the other side of the Nankai Trough is considered to be higher than normal. The second case is the occurrence of the earthquake with a moment magnitude between 7.0 and 8.0. In this case a magnitude 7.0 -class earthquake occurs along the Nankai Trough.

There is a possibility that this earthquake is a foreshock of the mega earthquake. The third case is an unusual slow slip event. Normally, at the Nankai Trough, the Philippine Sea plate is subducting under the continental plate and the boundary between the two plates is strongly attached. The continental plate is dragged in, and strains build up. Slow slip occurs when strains build up to the limit. It is similar to a mega-earthquake in that the strain exceeds a limit, but the slip on the fault plane in a slow-slip. The JMA monitors slow slip with strainmeters.

If anomalous phenomena (JMA magnitude 6.8 or higher, or unusual slow slip) are observed in the Nankai Trough, "Nankai Trough Earthquake Extra Information (Under Analysis) "is issued. The JMA then holds a meeting of the Nankai Trough Earthquake Assessment Committee to analyze the anomalous phenomena and probability of the Nankai Trough Earthquake. The committee is composed of six researchers. In order to use the observation data along the Nankai Trough in the assessment, research institutes in Japan participate in the activities of the committee. After the Assessment Committee meeting, "Nankai Trough Earthquake Extra Information" with keywords (Megathrust Earthquake Alert, Megathrust Earthquake Attention, and Analysis Complete) is issued. On the occasion of Megathrust Earthquake Alert or Megathrust Earthquake Attention, the government calls for special attention to be prepared for an earthquake for at least one week.

This earthquake in the Hyuganada Sea corresponds to the "Case of the occurrence of the earthquake with a moment magnitude between 7.0 and 8.0 because this earthquake had a moment magnitude of 7.0 and occurred in the possible epicenter area for Nankai Trough Earthquake. In this case there is a possibility that this earthquake is a foreshock of the great Nankai Trough earthquake. So, the JMA issued the information of Megathrust Earthquake Attention.

An earthquake with a magnitude of 7.3 occured on 17 December 2024 01:47 (UTC) offshore Port Vila, Vanuatu (USGS) resulted in a TSUNAMI THREAT MESSAGE issued by the Pacific Tsunami Warning Center (PTWC), Tsunami Service Provider (TSP) of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS), 5 min after the event indicating the possibility of hazardous tsunami waves for coasts located within 300 km of the earthquake epicenter along the coasts of Vanuatu. Initial tsunami amplitude forecasts were issued by the PTWC directly to the Tsunami Warning Focal Points (TWFP) of the ICG/PTWS after 34 min of event origin time, indicating the possibility of tsunami waves reaching 0.3 to 1 meters above the tide level to Vanuatu and less than 0.3 meters above the tide level for the coasts of Fiji, Kermadec Islands, Kiribati, New Caledonia, Papua New Guinea, Solomon Islands, Tuvalu, and Wallis And Futuna. At 0221 UTC, 1h 34 min after the event, PTWC updated the tsunami forecast based on the sea-level recording of 0.25m in Vanuatu, stating that tsunami waves reaching 0.3 to 1 meters above the tide level are possible for some coasts of Vanuatu. At 03:14 UTC, PTWC issued FINAL TSUNAMI THREAT MESSAGE indicating that there is no longer a tsunami threat from this earthquake. A total of 14 fatalities and more than 265 injuries have been confirmed due to this earthquake. 1,092 people were temporarily displaced; 570 houses have been damaged affecting 2,850 people. 110 classrooms across 45 schools have been partially or completely damaged.

A Tsunami Advisory was issued for the Earthquake (Mw 5.7) near Sumisujima (Smith Rock) on 24 September, which is related to volcanic activity in the region. In this region, similar events have repeatedly occurred. The JMA issued the tsunami advisory based on past experiences.

Dr. Necmioglu also reminded the group of the M7.0 earthquake on 5 December 2024 18:44 (UTC) offshore Cape Mendocino, California which resulted in a TSUNAMI THREAT MESSAGE issued by the Pacific Tsunami Warning Center (PTWC). Evacuation orders were issued for some areas in the larger San Francisco, and a cancellation message was issued 80

min after the earthquake origin time stating that tsunami warning is canceled for the coastal areas of California and Oregon and no tsunami observations are available to report. There was a very-high level of media coverage for this earthquake and the tsunami, which was at the range of 9 cm around Arena Cove, Mendocino County at 19:46 UTC.

Dr Harkunti Rahayu inquired about the status of the PTWS Tsunami Preparedness Capacity Assessment. Dr. Laura Kong responded that the assessment was recently initiated: the survey was launched on 5 February through IOC Circular Letter 3027 with a deadline on 4 March. The survey questions were from the 2025 Indian Ocean Tsunami Preparedness Capacity Assessment, with modifications for the Pacific. A preliminary compilation of the survey results will be presented at the 31st Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXXI), 7–11 April 2025 in Beijing, China, followed by a dedicated ICG/PTWS Steering Committee Workshop, 14–16 May 2025 in Manila, Philippines. The draft technical report of this capacity assessment will be made available to the forthcoming IOC Assembly (25 June–3 July 2025), upon which a policy report will be submitted to the ICG/PTWS Steering Committee in September 2025 for its final review before publication. All reports from this capacity assessment will be distributed to ICG/PTWS Member States in October 2025. Dr Rahayu stressed the importance of aligning these efforts, including a set of questions, among the ICGs, to ensure global comparability.

Dr. Necmioglu proposed the group to consider regular capacity assessment initiatives starting 2030, marking the end of the Ocean Decade Tsunami Programme. Dr. Denis Chang Seng underlined the importance of the ongoing work on the development of Global KPIs which will also serve the ODTP, as a basis of future capacity assessment initiatives, and mentioned that similar assessments will be considered at the ICG-NEAMTWS-XX session in November 2025 for implementation in 2026 after the closure of CoastWAVE 2.0 project.

- 3.1 Global criteria and methodology to report on WAVE EXERCISE

Dr Marinos Charalampakis inquired details about the CARIBE WAVE 25 registrations. Dr Ocal Necmioglu responded that while so far reported numbers were based on registrations, the Task Team on Caribe Wave Exercise decided in 2024 that Member States reports should be taken into account for official reporting purposes, while number of registrations can be used as a complementary indicator. He further added the need to have a standard reporting template for all ICGs, providing granularity on the number of participants with respect to the type of activity they participated during an exercise, which would allow inter-ICG comparison. Ms Ashleigh Fromont and Dr Denis Chang Seng emphasized the importance of standardization in all types of reporting, especially considering the fact that some Member States are reporting to more than one ICG. Dr. Elizabeth Vanacore commented on the usefulness of the registration info, as it allows stakeholders to approach registered institutions to verify their actions.

Recommendations to TOWS-WG

Recommends Member States monitor the health of their sea level gauges that are used for detecting and monitoring tsunamis, to restore them as quickly as possible when they fail, and add sea level gauges when possible in places identified by their ICG as gaps.

Recommendations to TOWS Task Teams

Recommends the TTWO and or Joint TTDMP-TTTWO to consider this issue in its work programme with the aim for developing a revised form to collect TNC/TWFP/NTWC data from Member States and agree on a mechanism that would simplify and standardize the procedures both in collecting and making this data available to TSPs and TNCs

Recommends the review of the IOC Tsunami Post-Event Assessment process and questionnaire (TOWS 2015, PAE) considering its use in the past decade, and consideration of other post-event processes undertaken for smaller events that did not meet the PEA threshold.

Further recommends having a standard reporting template for all ICGs, providing granularity on the number of participants with respect to the type of activity they participated during an exercise, which would allow inter-ICG comparison.

- 4.0 Planning for Ocean Decade
- 4.1 Ocean Decade Tsunami Programme (Report of the ODTP -SC)

Dr Silvia Chacon, interim chairperson of the Ocean Decade Tsunami Programme Scientific Committee (ODTPSC) reported on the key highlights of the 5th ODTP-SC meeting organized between 16-17 January 2025. Key achievements include new Tsunami Ready Recognized communities, additional seismic devices, and the development of a global real-time tsunami alarm software. The meeting discussed a comprehensive Tsunami Performance Monitoring & Tracking Tool, aligning various key performance indicators (KPIs) to streamline assessments and reporting. ODTP's recent actions cover hazard risk knowledge, monitoring and detection, and preparedness, with significant financial investments to support these initiatives. Coordination efforts are set for 2025, including webinars and conferences in November Hyderabad, India, fostering collaboration across endorsed projects. The Tsunami Ready Coalition's implementation plan was refined to focus on sustainability, governance, and communication, with a revised draft expected in early 2025.

- 4.2 Ocean Decade: Safe Ocean (Resilient Communities Actions)

Dr Denis Chang Seng reported on the Ocean Decade Tsunami Programme related actions submitted based on call 7 and 8. Seven projects were submitted under call 7 and one contribution. Two of these actions have already been approved while others are still being reviewed.

- **IOC DG ECHO Project**: *Scaling-up and strengthening the resilience of coastal communities in the North-Eastern Atlantic and Mediterranean regions to the impact of tsunamis and other sea level-related coastal hazards (CoastWAVE 2.0, July 2024-July 2026) (approved 18 dec 2024).*
- **Tokushima University Contribution**: *Development of comprehensive tsunami software, 2024-2030 (approved 8 Jan 2025).*

He highlighted that the Tsunami Resilience Section has been informed that three new projects have been submitted under the call 8 for the ODTP.

1. **SUSTAIN (tSUnami reSilient criTicAl Infrastructure)** to benefit four Indian ocean region countries
2. **Global Tsunami Model Association**, North Atlantic Ocean, South Atlantic Ocean, North Pacific Ocean, South Pacific Ocean, Indian Ocean, Southern Ocean, Mediterranean Sea,
3. **NEAM-COMMITMENT**, NEAM region countries

Experts will be identified to review the submitted actions for endorsement by the ODU. The total estimated investment for all these new projects is estimated at close to 20 million Euros.

He informed in a meeting that UNESCO DRR Unit organized, it was suggested to increase the focus of DRR actions on the application on AI across different sectors, and it may be a good idea to recommend an ODTP call to focus on A.I, noting there is already an endorsed ODTP project (GREAT)focused on machine learning to improve tsunami forecast and warning.

Recommendations to TOWS-WG

Notes and appreciates the increased Ocean Decade actions submitted contributing to the ODTP.

Recommends experts (to be identified) to support the review of the three new ODTP actions for endorsement by Ocean Decade Unit.

Further recommends a future OD-ODTP call to focus on A.I application in Tsunami Early Warning Systems.

- 4.3 TRRP- Methodology for Estimating Eligibility for TRR and Assessment of Risk at Community Level

Dr Matthieu Péroche and Dr Marion Le Texier introduced the ongoing work in developing a Methodological Protocol for Tsunami Risk Ranking at the Community Level in the Caribbean Basin, with the potential for global scaling if feasible, commissioned by the TSR. The main objective is to determine the number and population of communities that could apply for IOC-UNESCO Tsunami Ready recognition, rank evacuation needs, rank Tsunami Hazard Exposure and rank Tsunami Risk. Further information is available at the 5th ODTP-SC .

The TOWS Joint Task Team discussed the following:

- Risk of underestimating the hazard. There are over 100 scenarios for just Puerto Rico deterministic models and thousands in the case of probabilistic approaches). Those in CatSAM are limited and thus the full hazard is not accounted for. Member States should be encouraged to use this method as a rough estimate as a starting point only as it does underestimate exposure due to the limited scope of models.
- Initially, more scenarios were included, but experts were reluctant to use them due to a lack of validation. Non-validated scenarios were removed.
- Notes that the methodology should be consistently applied across other ocean basins/ ICGs.
- Probabilistic approach: What are the key drivers and methodology?
- A mechanism should be presented, allowing each Member State to determine thresholds.
- Interpretations will vary, so flexibility is essential.
- Peer review of methodology (see TT DMP recommendation)

Recommendations to TOWS-WG

Appreciates the work commissioned by the IOC/TSR on a Methodological Protocol for mapping, identifying and estimating administrative units (“communities”) eligible for the TRRP and assess the level of risk of each community in the Caribbean Basin and its wider application in other ocean basins/ICGs.

Recommendations to TOWS-WG (as per TT DMP report)

Requests to perform a scientific peer review on the Methodology for Estimating Eligibility for TRR and Assessment of Tsunami Risk at Community Level to ensure the indices developed are accepted as a scientifically credible methodology and endorsed by ICGs.

Recommends secretariat, once peer review is completed, to prepare an IOC Technical Series document on the Methodology for Estimating Eligibility for TRR and Assessment of Tsunami Risk at Community Level.

- 4.4 The Development of ODTP Tracking and Monitoring Tool & Global Tsunami Performance Monitoring Framework (of the PTWS)

Dr Denis Chang Seng provided a presentation on the work on ODTP RDI Monitoring and Tracking Tool. He noted that TOWS TT DMP recommendation in Sendai, Japan, from 19 to 20 February 2024 requested the Secretariat to develop a reporting mechanism to enable ICGs to report progress on related projects within the Ocean Decade and in alignment with the ODTP RDI KPIs, ensuring coherence with the proposed Global KPI Framework for the UNESCO-IOC Tsunami Programme.

The IOC/TRS Secretariat is actively preparing to develop the Performance Monitoring and Tracking Tool for ODTP actions, following an unsuccessful attempt to recruit a consultant. This tool is designed to closely align with both the Monitoring and Evaluation Framework of the United Nations Decade of Ocean Science for Sustainable Development (2021–2030) and the Global Tsunami Performance Monitoring Framework. The design concept prioritizes the efficient integration of KPIs from multiple assessment frameworks, ensuring streamlined assessments and reporting while minimizing duplication. The overarching goal is to create a unified Tsunami Performance Monitoring and Tracking Tool that offers users the flexibility to choose their assessment application—whether using ICG-KPIs, ODTP-KPIs, or other relevant indicators, from detailed micro-level to broader macro-level applications. The Pacific/ICG-KPI serves as the foundational layer for this tool, with additional layers incorporating KPIs derived from the ODTP RDI and other relevant frameworks. A key remaining task is the alignment and mapping of ODTP-RDI and Vision 2030 indicators onto the ICG-KPI structure. A proposed work plan includes the following milestones:

- Gathering feedback from ODTP-SC and TOWS meetings, as well as online feedback, by August 2025.
- Developing an online platform tool by September with the expertise of a consultant.
- Testing by November 2025.
- Operationalizing the tool by January 2026 to align with the next Ocean Decade Monitoring and Tracking annual exercise, considering the possibility of using a testing group of Member States

There are two levels of questions requiring attention. At the operational level, key considerations include determining who will conduct the assessments, what training will be necessary, and the timeline for operationalizing the tool. At the strategic level, the focus is on how the TRS can effectively and sustainably manage the tool to ensure standardization and alignment with best practices for KPIs and performance measures. This encompasses data collection, analysis, knowledge dissemination, and continuous adaptation. Additionally, strategies and resource planning approaches are needed to support the coordination and management of such an important initiative.

He reported the outcomes of the 5th ODTP-SC discussion, which included the following points:

- The SC emphasized the critical role of Tsunami National Contacts (TNCs) as primary national representatives. However, it recommended that requests be communicated through Circular Letters (CLs) to ensure Tsunami Warning Focal Points (TWFPs), National Tsunami Warning Centers (NTWCs), and IOC Focal Points are also informed. An alternative suggestion was to leverage ICG structures, particularly their Working Groups (WGs), to conduct assessments.

- The SC welcomed the proposal for flexible data entry by various stakeholders in coordination with TNCs, as successfully demonstrated in past IOTWMS survey practices. It agreed that assessments should move beyond simple "tick-box" exercises and include concise narrative responses to KPI surveys. Clarifications are needed regarding how Member States with memberships in multiple ICGs or territories will respond to these surveys, with the SC expressing a preference for an ICG-based approach.

In addition, Dr. Necmioglu provided the following, as reflected in IOC/TOWS-WG-XV/3 (2022) which will now be aligned with the proposed Global Tsunami Performance Monitoring Framework. In February 2019 'Action Item 6' from the 'Report of the Inter-ICG Task Team on Disaster Management and Preparedness' stated:

- Develop key performance indicators that are harmonized with the goals and actions of the Sendai Framework for Disaster Risk Reduction.
- Review the current PTWS performance monitoring framework and compare this with other, similar ICG initiatives; and
- Develop a consistent global performance monitoring framework, which includes data collection tools/questionnaire and reporting formats.

To achieve the above, a Task Team was formed from members of the CARIBE- EWS, PTWS, IOTWMS and NEAMTWS. All meetings of this Task Team have occurred online due to the global pandemic. The Task Team have developed a global framework with goals, targets and corresponding measures. The mission of this work is to promote a "...modern and effective global tsunami warning and mitigation system based on global ICG and Member State participation. A key focus is to substantially improve community access to tsunami hazard and risk information, resulting in prepared, aware and resilient countries at risk of tsunami.

The framework aligns with the Sendai Framework for Disaster Risk Reduction 2015–2030; United Nations Decade of Ocean Sciences for Sustainable Development – A Safe Ocean; IOC Tsunami Programme; Tsunami Ready – enabling communities to reach a high level of tsunami resilience, current ICG Strategy's and the ICG/PTWS KPI Framework completed in 2018/2019. It is anticipated that countries with responsibilities to report on other international frameworks or programmes of work, will have a much simpler task with the development of the online service.

Once the overall framework is approved, next steps include the development of an online survey (hosted by IOC) to be developed that corresponds with the targets of the framework. The survey will require user information to be input, and a specific user interface will then be presented with subsequent Q and A's. We envisage this will be dependent on country size and capability and capacity for tsunami hazard risk management including tsunami hazard risk assessment; warning system requirements; community awareness and preparedness; and planning.

Other materials, guidance and standards will need to be developed that support the global assessment process. This will also include national report changes, monitoring and evaluation and potential differences between inter-ICG reporting. This work can and will be undertaken by the Task Team responsible for developing this framework.

The expectations of IOC-ICG Member States are that they will monitor and evaluate progress against the new global framework and provide yearly reports via the annual ICG meeting structures. These will replace the current national reporting process. Participation in annual TOW's meetings/workshops will allow gaps, opportunities, improvement and successes to be discussed, specific to their ICG countries evaluation against the framework. ICG Steering

Committee meetings across the four ICG's will also work on the same evaluation results in their early reporting.

Recommendations to TOWS-WG

Acknowledges the ongoing efforts in developing the ODTP Tracking and Monitoring Tool and the Global Tsunami Performance Monitoring Framework (PTWS)

Notes the opportunity to TOWS Task Teams to engage and contribute through an online meeting in August 2025 on the ongoing work.

Recommends ICGs to develop and adopt a harmonized set of KPIs based on the GKPI, to support consistent and effective global reporting.

- 4.5 Tsunami Ready Coalition

Dr Laura Kong reported to the Implementation Plan for TR Coalition (see TT DMP report for updates)

The meeting noted:

- Value of engaging with High-End Businessmen or Private Sector as partners.
- Coalition aims at discovering new entities that accelerate and upscale TRRP implementation efforts.
- TRRP must continue beyond 2030, so the initiative is not only about securing financial support but also about providing advocacy and promoting UNESCO-IOC Tsunami Ready Programme.
- Important to describe a clear process for the Partners to join the Coalition.
- Advantages and benefits of joining the Coalition should be highlighted.
- Important to note that the Coalition reports to the TOW WG, and its role is not technical. The TRRP technical considerations are the responsibility of the TOWS Task Teams, who represent the ICGs.
- Coalition 'Ambassador' terms of reference may be confused with UN Ambassador definition, so it may be wise to use a different name. Suggestions included Champions and Heros."TR Coalition Champion" could be used to differentiate it from existing TR Champions at the local level. Further discussion and proposals were addressed by the TT-DMP.
- The Coalition Ambassador should not be confused with Tsunami Ready Focal Point (TRFP), which is the national contact for Tsunami Ready. This currently exists only in the Indian Ocean (IO) region, but is under discussion in NEAM. Further discussion and recommendation for TRFP by the TT DMP.

Recommendations to TOWS WG [As per TT DMP]

Notes that TOWS-WG-XVI (2023) requested the Tsunami Ready Coalition Chair to propose a governing structure for the Tsunami Ready Coalition and that TOWS WG approval is essential for advancing the work of the Tsunami Ready Coalition.

Also notes that the Tsunami Ready Implementation Plan was reviewed by the Ocean Decade Scientific Committee (16-17 January 2025) and the TOWS-TT-DMP (21 February 2025), and is included as part of the Coalition Chair's report to TOWS-WG-XVIII).

Having considered the Tsunami Ready Coalition Implementation Plan,

- **Approves** the Implementation Plan, including:
    - The Coalition mandate and terms of reference,
    - The Coalition structure, and
    - The identified key Coalition Partners.
- **Notes** that the Plan will remain a dynamic document to allow for updates to the Plan, with updates reflected in the Coalition's reports to the TOWS-WG.
- **Recommends** the Secretariat to finalize in consultation with the Tsunami Ready Coalition Chair the Coalition Partners, 'Ambassadors' or similar namesake, and Coalition Co-Chair.
- **Recommends** the IOC Executive Secretary to extend invitations to the proposed Coalition Partners and Ambassadors, and a Coalition Co-chair.
- **Requests** ICGs to prioritize regional Tsunami Ready workshops or summits in 2025 and conduct further workshops or summits before 2030.
- **Notes** resource and capacity constraints that will stymie progress of the TRC Coalition Implementation Plan, requests the IOC Executive Secretary to urgently address.

- 4.6 Online Coordination Webinar

Mr Bernardo Aliaga provided a presentation on the proposal for the ODTP Webinars and Conference for 2025. He outlined a comprehensive plan, with key milestones including the World Tsunami Awareness Day (WTAD) events, regional engagements, and high-level lectures. The 5th ODTP Steering Committee refined an initial proposal and shaped the 2025–2027 plan accordingly and suggested three conferences in this period.

- **June 2025:** Webinar on ODTO High Level Objective 11 at the IOC Assembly, ICG reporting,
- **Between July-November**: Webinar onODTP High Level Objective 2,
- **November 10–11, 2025**: First ODTP Conference in Hyderabad, alongside IUGG-JTC (Nov 12–14, 2025) to be hosted by INCOIS focusing on both ODTP High Level Objectives.

The webinar on the ODTP High Level Objective 2is not defined yet. The meeting noted that the webinars will be opened but subject to some management of participants and the first ODTP agenda and programme is still being refined.

Recommendations to TOWS-WG

Notes the proposal for the ODTP Webinars on each of the high-level objectives of the ODTP and the first ODTP Conference for 2025 in Hyderabad, alongside IUGG-JTC (Nov 12–14, 2025) possibly hosted by INCOIS.

Agrees to make connections with other relevant webinars (volcano among others).

- 4.7 Roles for TT TWO and TT DMP

The meeting discussed new roles of the two task teams in relation to the ODTP. It was noted that the Technical Secretary of TT TWO and TT DMP are already requested to report to the ODTP-SC. The meeting noted that the TT DMP is revising their ToR. The Joint Task Team agreed to revise respective ToRs to maintain consistency.

Recommendation to TOWS Joint Task Teams

Recommends to revise both TOWS Task Team Terms of Reference to reflect the fact that many advances have been made, and new needs have been identified particularly concerning the implementation of the Tsunami Ready Programme, Ocean Decade Tsunami Programme, capacity building and coastal resilience etc. since TTs ToR were prepared in 2010.

- 5.0 Update on PTWS NTWC Competency Framework and Development of Global Framework

The ICG/PTWS-XXX (2023) approved the PTWS National Tsunami Warning Centre competencies framework, and training requirements, and welcomed the ITIC proposal to pilot the PTWS Minimum NTWC Competency Framework through the development and conduct of a training course covering the Core Competencies and to pilot it for a small cohort from the Pacific Island Countries.From the TOWS-WG-XVI (2023), the importance and value of establishing minimum tsunami warning center competencies under a global framework was noted. The Minimum Staff Competency Level for National Tsunami Warning Centre Operations Staff addresses Knowledge, Operations, and National Agency competencies, and divides these into Core (basic) and Advanced (comprehensive) modules. The training will be part of the OceanTeacher Global Academy UNESCO-IOC Tsunami Training Course. The Tsunami Warning Centre Minimum Staff Competencies (TWC-MSC) training course will consist of a series of individual modules covering the Core Competencies; trainees will need to receive a passing grade in the previous module to proceed to the next module. Module formats will start with self-paced courses, then to hybrid, and culminate in a 3-4 week in-person training at the ITIC and PTWC During October to December 2024, the ITIC hosted two IOC Ocean Training Interns, who worked on the OTGA Tsunami Ready and OTGA TWC-MSC Core Tsunami and Earthquake Science modules. Funding was received from USAID in 2024, and the ITIC engaged two experienced tsunami subject matter experts to lead the project. Funding is now paused and if not continued will result in large delays in course completion.

A Kick-off meeting took place during 15–17 July 2024 in Wellington, New Zealand, hosted by the New Zealand National Emergency Management Agency (NEMA), in which existing schema and training material from Australia, New Zealand, USA were reviewed, OTGA modules discussed, and requests made to include their material An Expert Panel will be established comprised representatives from Australia, New Zealand, USA, and other experienced NTWCs. The TWS-MSC modules will also include training modules developed in collaboration with the USA MetEd COMET training program.

OTGA Core Tsunami Science Competencies will utilize materials from the Bureau of Meteorology (BOM - Australia), and focus on the science needed to support operational tsunami warning centre decision-making. The OTGA Core Earthquake Science training course topics and knowledge have been compiled using a number of reference sources. In addition, the TWC-MSC training course will use the USA COMET MetEd “Tsunamis” course which addresses generation, initiation, propagation, inundation, and long-term effects of tsunamis. MetEd is a free collection of hundreds of training resources intended for the geoscience community. “Tsunamis” will be updated to include the 2018 Palu tsunami and Hunga Tonga 2022 eruption and tsunami. The COMET TWC Operations course, “Communicating Threats and Impacts During Tsunami Events using the IOC PTWS Tsunami Service Provider products”, will include an interactive tsunami event exercise where trainees role play as TWC staff responding to a local, regional or distant tsunamif.

Recommendations

Notes the importance and value of establishing minimum tsunami warning center competencies under a global framework

Acknowledges the progress of the PTWS under the leadership of the ITIC to develop the Tsunami Warning Center Minimum Staff Competencies (TWC-MSC) Training Course, which will consist of Tsunami and Earthquake Science, Tsunami Warning Center Operations, and National Training Modules, all to be enabled under the IOC's OceanTeacher Global Academy.

Appreciates the contribution of the IOC Ocean Training Internship Programme to provide interns from Indonesia and Tonga to the ITIC in 2024 to work on the development of the OTGA UNESCO-IOC Training Courses on Tsunami Ready and Tsunami Warning Center Minimum Staff Competencies.

Further appreciates the contribution of United States COMET Program to develop MetED training modules for the TWC-MSC Training Course, including modules on "Tsunamis" and 'Communicating and Understanding Tsunami Risks using IOC PTWS Tsunami Service Provider Products"

Further notes that the OTGA PTWS TWC-MSC Training Course Pilot is expected to be ready to receive a small cohort in 2026, pending funding and ITIC staff resources.

- 6.0 Tsunami Glossary Update

Dr Laura Kong reported on the Tsunami Glossary update to the 2019 version. Edits were approved by the TOWS-WG-XVII (2024) and currently with the IOC for final layout and publication in English, French, Spanish, Arabic and Chinese (UN languages). The update to "meteotsunami" definition was not approved, and is under further discussion, noting that IOC TS 200 on Meteotsunamis was published in 2025.

At the TOWS-WG-XVI (2023), the IUGG Joint Tsunami Commission (JTC) and ITIC were requested to undertake review to advise on whether the existing tsunami glossary is sufficient to meet the needs of the scientific community, tsunami stakeholders, and other practitioners, or if is a new version or versions are required.

The ITIC and Chair of the IUGG JTC Working Group on Terminology responded that there is no compelling need nor request for additional versions. The IOC Tsunami Resilience Section confirmed that no requests had been received. It was noted that it may be difficult to agree on short clear, simple definitions for some words in the Glossary. Additionally, there are already many correct 'simple' versions in use, and there may be a challenge to ensure everyone uses the Glossary version. It was suggested that simpler definitions may be useful for some terms, and that this can be addressed in the future.

Joint Task Teams Recommendations

Notes with appreciation the work of the IUGG Joint Tsunami Commission and the ITIC for reviewing and recommending updates to the *Tsunami Glossary* of the IOC.

Notes the approved edits of the 2025 Tsunami Glossary Update excludes meteotsunamis.

Notes the Tsunami Glossary will be published in Quarter 1 of 2025 by the IOC.

Further notes that there are no specific requests of the need to change the format and style of the existing Tsunami Glossary.

- 7.0 IUGG update

Dr Laura Kong, on behalf of the IUGG Chair and Vice-Chairs, provided an update on IUGG. The IUGG Joint Tsunami Commission (JTC), established in 1960, promotes global collaboration on tsunami science and hazard mitigation. It consists of around 70 member

countries and operates through specialized working groups focused on tsunami terminology, science-based warning systems, tsunami magnitude studies, GNSS data utilization, meteotsunamis, and data management. Recent and upcoming key events include the 2nd UNESCO-IOC Global Tsunami Symposium in Banda Aceh (Nov. 2024), the 60th Anniversary of the ICG/PTWS in China (April 2025), and the International Tsunami Symposium (ITS 2025) in Hyderabad, India. The commission also contributes to major international conferences and scientific publications, including research on the 2022 Tonga Volcanic Eruption.

JTC plays a vital role in tsunami preparedness and risk reduction through its involvement in the UN Ocean Decade Tsunami Programme, the IOC Tsunami Ready Recognition Programme, and the development of the Tsunami Glossary 2025 in multiple languages. It actively collaborates with organizations such as UNESCO, ITIC, WMO, and IGCP to advance scientific research, capacity development, and early warning initiatives. Additionally, JTC members support projects like the SMART Subsea Cables Initiative for real-time tsunami detection. Through its research, publications, and international partnerships, JTC aims to enhance global resilience against tsunami hazards.

Recommendations to TOWS-WG

Appreciates the continued efforts and contributions of IUGG on promoting global collaboration on tsunami science, hazard assessment, mitigation, and preparedness.

Further appreciates IUGG's contributions to tsunami science and preparedness, working with the IOC, and especially its role in the 2nd UNESCO-IOC Global Tsunami Symposium, major conferences, research on the 2022 Tonga Volcanic Eruption, and key initiatives like the UN Ocean Decade Tsunami Programme, and IOC publications on Tsunamis Generated by Volcanoes, Meteotsunamis, and the Tsunami Glossary 2025.

8.0 Update UN Sec General “Early Warnings For All” Initiative and 8th GPDRR

Dr Denis Chang Seng reported on the upcoming events on Early Warnings For Al Multistakeholder Forum and the 8th Global Platform for Disaster RIsk Reduction (GDRR) to be held between 2–6 June 2025, Geneva, Switzerland. IOC/TRS is co-organizer with UNDP and WMO for thematic session 5 on Fostering international, regional and national cooperation and partnerships. The next step is to participate in planning meetings to prepare session concept notes and propose speakers etc.

In the case of the 8th Global Platform for Disaster Risk Reduction (GPDRR, 2028), the meeting noted that a TSR side event proposal was not successful. The meeting further noted that the Executive Secretary may be invited by UNDRR as a speaker on the High-Level Dialogue scheduled between 4–6 June 2025, and the subject could focus on Indian Ocean Tsunami-20 years after. TSR has been successful in having two spots for Ignite Stage focused on the CoastWAVE project and Tsunami Ready.

Recommendations to TOWS-WG

Notes that IOC/ TRS is a co-organizer with UNDP and WMO for thematic session 5 on fostering international, regional and national cooperation and partnerships (2–3 June 2025) and the likely participation of the IOC Executive Secretary in the High-Level Dialogue of the 8th GPDRR (4–6 June 2025) and TRS participation in the Ignite stage events.

- ## 9.0 Review of Outcomes from the 2nd Global Tsunami Symposium in Indonesia in November 2024

Dr Harkunti Rahayu presented the agenda item. The symposium on ‘Two Decades After the Indian Ocean Tsunami: Reflection and Way Forward’ took place during 11–14 November 2024 in Banda Aceh, Indonesia and was attended by 682 in-person participants from 54 countries

and 170 online participants. The symposium was hosted by the Republic of Indonesia through its Agency of Meteorology, Climatology, and Geophysics (BMKG) in collaboration with the UNESCO-IOC Tsunami Resilience Section and IUGG Joint Tsunami Commission. The symposium brought together tsunami warning specialists, disaster managers, scientists, engineers, disaster risk reduction practitioners, and policymakers from around the world to discuss the status of tsunami warning systems and the latest advances in tsunami science and engineering to help globally enhance tsunami disaster preparedness and mitigation.

The symposium also served as a global platform to review the contributions of each regional tsunami warning and mitigation system towards achieving the objectives of the UN Ocean Decade Tsunami Programme (ODTP) under the "Safe Ocean" outcome of the UN Decade of Ocean Science for Sustainable Development by 2030. The Summary Report and the Statement of the 2nd UNESCO-IOC Global Tsunami Symposium Two Decades After 2004 Indian Ocean Tsunami: Reflection and the Way Forward is now available. The corresponding Banda Aceh statement underlined the need to build sustainability for the next decade through Transformation and Innovation. UNESCO and its partners call on States and civil society to drastically step up their investments and efforts to strengthen Tsunami Early Warning Systems and achieve 100% of Tsunami Ready Communities across the world by 2030.

The meeting confirmed that the summary report is published and available online.

Recommendations to TOWS-WG

Appreciates and thanked Harkunti Pertiwi Rahayu, Research Center for Disaster Mitigation, Institute of Technology Bandung, Indonesia, for her outstanding leadership in coordinating and organizing the 2nd UNESCO-IOC Global Tsunami Symposium.

LIST OF TOWS JOINT TASK TEAMS RECOMMENDATIONS

Wave Exercises

Recommendations to TOWS-WG

Appreciates the execution of the Wave exercises, PacWave 24 (September to November 2024), the CARIBE-Wave 24 (21 March 2024), the NEAMWave 23 (6–7 November 2023) and the IOWave23 (4–25 October 2023).

Notes the upcoming CARIBE-Wave 25 exercise scheduled for March 20, 2025, and NEAMWave 26 planned for March 2026.

Significant Tsunami Events

Recommendations to Member States

Recalled the critical importance of coastal tide gauges and offshore tsunami detection/observation systems for tsunami detection and verification.

Requested the Member States to prioritize installation/deployment of additional coastal tide gauges and tsunami detection/observation systems in regions under high tsunami risk with priority areas with known coverage gaps (in alphabetical order: Aegean Sea, Caribbean Sea (West, North and South-East), Indian Ocean (East and North), North Africa, Philippine Sea, Solomon Sea, South China Sea, Timor Sea, and Yellow Sea), to ensure tsunami detection and verification as early as possible.

- **Global criteria and methodology to report on WAVE EXERCISE**

Recommendations to TOWS-WG

Recommends Member States monitor the health of their sea level gauges that are used for detecting and monitoring tsunamis, to restore them as quickly as possible when they fail, and add sea level gauges when possible in places identified by their ICG as gaps.

Recommendations to TOWS Task Teams

Recommends the TTTWO and or Joint TTDMP-TTTWO to consider this issue in its work programme with the aim for developing a revised form to collect TNC/TWFP/NTWC data from Member States and agree on a mechanism that would simplify and standardize the procedures both in collecting and making this data available to TSPs and TNCs.

Recommends the review of the IOC Tsunami Post-Event Assessment process and questionnaire (TOWS 2015, PAE) considering its use in the past decade, and consideration of other post-event processes undertaken for smaller events that did not meet the PAE threshold.

Further recommends having a standard reporting template and platform for all ICGs, providing granularity on the number of participants with respect to the type of activity they participated during an exercise, which would allow inter-ICG comparison.

● Planning for Ocean Decade

Recommendations to TOWS-WG

Notes and appreciates the increased Ocean Decade actions submitted contributing to the ODTP.

Recommends experts (to be identified) to support the review of the three new ODTP actions for endorsement by Ocean Decade Unit.

Further recommends a future OD-ODTP call to focus on A.I application in Tsunami Early Warning Systems

● TRRP- Methodology for Estimating Eligibility for TRR and Assessment of Risk at Community Level

Recommendations to TOWS-WG

Appreciates the work commissioned by the IOC/TSR on a Methodological Protocol for Mapping, Identifying and estimating administrative units (“communities”) eligible for the TRRP and assess the level of risk of each community in the Caribbean Basin and its wider application in other ocean basins/ICGs.

Recommendations to TOWS-WG (as per TT DMP Report)

Requests to perform a scientific peer review on the Methodology for Estimating Eligibility for TRR and Assessment of Tsunami Risk at Community Level to ensure the indices developed are accepted as a scientifically credible methodology and endorsed by ICGs.

Recommends secretariat, once peer review is completed, to prepare an IOC Technical Series document on the Methodology for Estimating Eligibility for TRR and Assessment of Tsunami Risk at Community Level.

● The Development of ODTP Tracking and Monitoring Tool & Global Tsunami Performance Monitoring Framework (of the PTWS)

Recommendations to TOWS-WG

Acknowledges the ongoing efforts in developing the ODTP Tracking and Monitoring Tool and the Global Tsunami Performance Monitoring Framework

Notes the opportunity to TOWS Task Teams to engage and contribute through an online meeting in August 2025 on the ongoing work.

Recommends ICGs to develop and adopt a harmonized set of KPIs based on the GKPI, to support consistent and effective global reporting.

- **Tsunami Ready Coalition (see TT DMP Report)**

- **Online Coordination Webinar**

Recommendations to TOWS-WG

Notes the proposal for the ODTP Webinars on each of the high-level objectives of the ODTP and the first ODTP Conference for 2025 in Hyderabad, alongside IUGG-JTC (Nov 12–14, 2025) hosted by INCOIS.

Agrees to make connections with other relevant webinars (volcano among others).

- **Roles for TT TWO and TT DMP**

Recommendation to TOWS Joint Task Teams

Recommends to revise both TOWS Task Team Terms of Reference to reflect the fact that many advances have been made, and new needs have been identified particularly concerning the implementation of the Tsunami Ready Programme, Ocean Decade Tsunami Programme, capacity building and coastal resilience etc. since TTs ToR were prepared in 2010 .

- **Update on PTWS NTWC Competency Framework and Development of Global Framework**

Notes the importance and value of establishing minimum tsunami warning center competencies under a global framework

Acknowledges Notes the progress of the PTWS under the leadership of the ITIC to develop the Tsunami Warning Center Minimum Staff Competencies (TWC-MSC) Training Course, which will consist of Tsunami and Earthquake Science, Tsunami Warning Center Operations, and National Training Modules, all to be enabled under the IOC's OceanTeacher Global Academy.

Appreciates the contribution of the IOC Ocean Training Internship Programme to provide interns from Indonesia and Tonga to the ITIC in 2024 to work on the development of the OTGA UNESCO-IOC Training Courses on Tsunami Ready and Tsunami Warning Center Minimum Staff Competencies.

Further appreciates the the contribution of United States COMET Program to develop MetED training modules for the TWC-MSC Training Course, including modules on ongoing work on updating the COMET "Tsunamis" and 'Communicating and Understanding Tsunami Risks using IOC PTWS Tsunami Service Provider Products" module with the aim to complete by early second quarter of 2025.

Further notes that the Work on OTGA PTWS TWC-MSC Training Course Pilot is expected to be ready to receive a small cohort in 2026, pending funding and ITIC staff resources.

- **Tsunami Glossary Update**

Recommendations to TOWS Joint Task Teams

Notes with appreciation of the work of the IUGG Joint Tsunami Commission and the ITIC for reviewing and recommending updated to the Tsunami Glossary of the IOC

Notes the approved edits of the 2025 Tsunami Glossary Update excludes meteotsunamis,

Notes the Tsunami Glossary will be published in Quarter 1 of 2025 by the IOC,.

Further notes that there are no specific requests of the need to change the format and style of the existing Tsunami Glossary.

● IUGG update

Recommendations to TOWS-WG

Appreciates the continued efforts and contributions of IUGG on promoting global collaboration on tsunami science, hazard assessment, mitigation and preparedness.

Further appreciates IUGG's contributions to tsunami science and preparedness, working with the IOC, and especially its role in the 2nd UNESCO-IOC Global Tsunami Symposium, major conferences, research on the 2022 Tonga Volcanic Eruption, and key initiatives like the UN Ocean Decade Tsunami Programme, and IOC publications on Tsunamis Generated by Volcanoes, Meteotsunamis, and the Tsunami Glossary 2025.

● Update UN Sec General "Early Warnings For All" Initiative and 8th GPDRR

Recommendations to TOWS-WG

Notes that IOC/ TRS is a co-organizer with UNDP and WMO for thematic session 5 on fostering international, regional and national cooperation and partnerships (2–3 June 2025) and the likely participation of the IOC Executive Secretary in the High-Level Dialogue of the 8th GPDRR (4–6 June 2025) and its participation in the Ignite stage events.

● Review of Outcomes from the 2nd Global Tsunami Symposium in Indonesia in November 2024

Recommendations to TOWS-WG?

Appreciates and thanked Harkunti Pertiwi Rahayu, Research Center for Disaster Mitigation, Institute of Technology Bandung, Indonesia, for her outstanding leadership in coordinating and organizing the 2nd UNESCO-IOC Global Tsunami Symposium

Thursday, 20 February 2025, 0900-1730 Local Time

- Agenda of Joint Session of Task Team Tsunami Watch Operations and Task Team Disaster Management and Preparedness

Item	Local time	Topic	Lead
1	0900-0915	**1. Welcome & Introductions**	Head, IOC-TRS Chairs TTs Members
2	0915-0930	**2. Session Organisation** Logistics and agenda	Chairs TTs Moderate Secretariat
3	0930-1030	**3. Wave Exercises and Significant Tsunami Events in each ICG** 3.1 Global criteria and methodology to report on WAVE EXERCISEs (share outcomes, lessons learned, and coordination on exercise surveys)	Chair TT TWO Moderate Joint presentations by TT reps each ICG [Nishimae to chair 3.0 Denis to provide text for report for Wave Exercises, otherwise Ocal lead on 3.0 for summary report]
	1030-1130	***Break and photo***	
	1130-1145	**Wave Exercises and Significant Tsunami Events in each ICG (Con't)**	
	1145-1300	**4. Planning for Ocean Decade**	[Harkunti Chair for 4.0 and Denis Secretariat support to prepare summary report]
		4.1 Ocean Decade Tsunami Programme (Report of the ODTP - SC)	New Chair of ODTP-SC
		4.2 Ocean Decade: Safe Ocean (Resilient Communities Actions)	Denis
		4.3 TRRP- Methodology for Estimating Eligibility for TRR and Assessment of Risk at Community Level	Bernardo
		4.4 The Development of ODTP Tracking and Monitoring Tool & Global Tsunami Performance Monitoring Framework (of the PTWS)	Denis & Bernardo
	1300 - 1430	***Lunch***	

		Planning for Ocean Decade (Con't)	

	1430-1510	4.5 Tsunami Ready Coalition	Laura
	1510-1520	4.6 Online Coordination Webinar	Bernardo
	1520-1530	4.7 Roles for TT TWO and TT DMP	All
	1530-1600	***Break***	
6	1600-1630	**5. Update on PTWS NTWC Competency Framework and Development of Global Framework**	Laura [Nishimae to chair 5, 6. and 7. Ocal Secretariat for summary report]
7	1630-1640	**6. Tsunami Glossary Update**	Laura
8	1640-1650	**7. IUGG update**	Laura /IUGG Officers
9	1650-1705	8. **Update UN Sec General "Early Warnings For All" Initiative and 8th GPDRR**	Denis Bernardo Ocal /WMO, UNDRR Harkunti Chair for 8.0 and Denis Secretariat support to prepare summary report]
10	1705-1300	**9. Review of Outcomes from the 2nd Global Tsunami Symposium in Indonesia in November 2024**	Bernardo & Harkunti [Nishimae to chair 9. Ocal Secretariat for summary report]
		END OF TOWS JOINT TASK TEAM MEETING	
	1730	***Day close***	Chairs TTs

- Members and Observers of TOWS Task Team on Disaster Management

Name	**Country**	**Organisation**	**Region/Role**
Denis Chang Seng	France	IOC	TT- DMP Technical Secretary ICG/NEAMTWS/NEAMTIC / CoastWAVE
Task Team Members			

Harkunti Pertiwi Rahayu	Indonesia	Research Center for DM Institute of Technology	ICG/IOTWMS/ Chair TT DMP
Ardito Kodijat	Indonesia	IOC	IOTIC, ICG/IOTWMS
Ignacio Aguirre Ayerbe	Spain	IH Cantabria	ICG/NEAMTWS Vice-Chair
Marinos Charalampakis	Greece	NOA	ICG/NEAMTWS
Laura Kong	USA	ITIC	ITIC, ICG/PTWS
Ashleigh Fromont	New Zealand	NEMA	ICG/PTWS
Alison Brome	Caribbean	CTIC	CTIC, ICG/CARIBE-EWS
Silvia Chacon Barrantes	Costa Rica	National Tsunami Monitoring System	ICG/CARIBE-EWS
Derya Vennin	France	IOC	ICG/NEAMTWS / CoastWave Project
Invited Experts and Observers			
Regina Khanbekova,	Geneva	UNDRR	Communication, Advocacy, Knowledge Management and Ict UNDRR, Geneva.
Alessandro Amato	Italy	INGV	ICG/NEAMTWS Chair
Elena Daskalaki	Greece	NOA	ICG/NEAMTWS co-chair TT-Tsunami Ready
Prof Amr Hamouda	Egypt	NIOF	ICG/NEAMTWS Vice-Chair

- Members and Observers of TOWS Task Team on Tsunami Watch Operations

Name	**Country**	**Organisation**	**Region/Role**
Öcal Necmioğlu	Türkiye	IOC	TT- TWO Technical Secretary ICG/PTWS and ICG/CARIBE-EWS
Task Team Members			
Yuji Nishimae	Japan	JMA	Chair of TT-TWO Chair of ICG/PTWS
Nasser Al Ismaili	Oman	DGMAN	ICG/IOTWMS

Helene Hebert	France	CEA	ICG/NEAMTWS
Charles McCreery	USA	NOAA/PTWC	ICG/CARIBE-EWS
Jijjavarapu Padmanabham	India	INCOIS	ICG/IOTWMS
Alessio Piatanesi	Italy	INGV	ICG/NEAMTWS
Elizabeth Vanacore	USA	University of Puerto Rico	ICG/CARIBE-EWS
Dakui Wang	China	NMEFC	ICG/PTWS
Invited Experts and Observers			
Bruce Howe	USA	University of Hawaii	SMART Cables JTF
Ceci Rodriguez Cruz	USA	University of Hawaii	SMART Cables JTF

ANNEX V

REPORT OF THE TOWS-WG INTER-ICG TASK TEAM ON TSUNAMI WATCH OPERATIONS

21–22 February 2025
Paris, France

unesco Intergovernmental Oceanographic Commission	**MEETING OF THE INTER-ICG TASK TEAM ON TSUNAMI WATCH OPERATIONS** **INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (IOC) of UNESCO**
	21–22 February 2025

UNESCO/IOC Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG):
Task Team on Tsunami Watch Operations (TT-TWO)

Contents

1. Welcome and Introductions

The session was jointly opened by Mr Yuji Nishimae (Chair, Task Team on Tsunami Watch Operations – TT TWO), filled by the introduction of the TT-TWO Members, Observers, and the Technical Secretary.

2. Session Organisation (Logistics and agenda)

The Chair informed the participants on the agenda and provided information on the logistics. The agenda was approved as it was presented.

3. Discussion on the outcomes of the joint Meeting with TT-DMP

One important issue for this agenda item was the possible complexities and challenges which may arise from the “All Clear” messages issued by the National Disaster/Emergency Management Organizations (ND/EMO) of Member States and widely disseminated through social media, for others that may not have done so yet. Dr. McCreery reminded the advisory nature of the TSP messages, and Dr Vanacore underlined that the issuance of the “All Clear” message is the responsibility of the local D/EMO, if not the ND/EMO. Dr Hebert further reminded the group that this issue is also addressed in the GSDD, where it was recommended to NTWCs to work with national and local emergency management authorities to define the criteria for and institutions in charge of issuing the “All Clear”. Mr Padmanabham informed the group on the existing feedback mechanism in the IOTWMS between the TSps and NTWCs, and the TSP’s responsibility is limited to inform that the threat has passes, whereas issuance of the “All Clear” message is the responsibility of the sovereign nation and its responsible institutions.

The second issue was on the continued challenges in maintaining an accurate TNC/TWFP/NTWC contact database. Currently, the collection of the TNC/TWFP/NTWC data is governed through CL-2558 and CL-2563, and there is a strong need to revisit how we collect/compile/serve such data, taking into considerations recent developments, such as cease of fax dissemination, but also some additional roles that have been defined in some ICGs (such as Tsunami Ready Focal Point in the IOTWMS), which does not necessarily exist (yet) in other ICGs. Some Member States have more than one TNC, and while to a certain degree it can be agreed to have two TNCs for a given Member State to balance the requirements of the upstream and downstream components of tsunami resilience, in some Member States there are more than 3 TNCs, and similar cases exist also for TWFPs up to 5 TWFPs for a given Member States. In this respect, the Secretariat recalled its appeal made during the Joint TTDMP-TTTWO meeting on 20 February 2025 that the TTWO and perhaps even better the Joint TTDMP-TTTWO jointly could consider this issue in its work programme with the aim for developing a revised form to collect TNC/TWFP/NTWC data from Member States and agree on a mechanism that would simplify and standardize the procedures both in collecting and making this data available to TSPs and TNCs. In response to Dr McCreery’s

question on who has the main responsibility of maintaining this database, Technical Secretary Dr Öcal Necmioğlu stated that while the overall responsibility lies within the Secretariat, it's also important to note that the Secretariat is not a 7/24 entity and there is need to establish a direct connection between the TSPs and its "customers". Dr. Vanacore pointed out the need for using a simple language in the forms used to collect such data, and also use of centralized/generic e-mail addresses to reduce the dependencies to the e-mail addresses of the individuals, and Mr Zuniga pointed to the importance of regular communication tests for the verification of correctness of the TWFP/NTWC contact information. Dr. McCreery reported that efforts are in place to seek such feedback from communication teste through online forms, but no real improvements regarding the low-level response should be expected. In response to Dr. Vanacore's comments, Dr. Sato confirmed the use of centralized/generic e-mail addresses in the operations.

4. Review of TTTWO Action Items

The Chair presented the current version of the TT-TWO Action Monitor and the group collectively updated the document. The updated version of the TT-TWO Action Monitor can be found here, reflecting also the additional actions as agreed during the 18th Session of the TOWS-WG Meeting. As of 25 February 2025, 3 actions are delayed, 4 actions are in progress, and there are 8 new actions. 5 actions from the previous intersessional period have been migrated (integrated) into these new actions, in accordance with the considerations of the TT-TWO during the current meeting. 8 actions were successfully completed.

5. Tsunami Watch Operations status and plans in all ICGs

5.1 ICG/CARIBE-EWS

Dr. McCreery introduced the agenda item, available as a presentation. The US Tsunami Program has embarked on a multi-year effort to better synchronize its two tsunami warning centers (PTWC and US NTWC) to facilitate more seamless backup, more efficient and effective operations, and more efficient enterprise support. The effort also includes ITIC for more coordinated training and decision-support to customers. This effort includes:

- Design, construction and implementation of an enterprise supported Common Analysis System with new features including probabilistic tsunami forecasting.
- Design, construction, and implementation of a common product generation and dissemination software
- Design, construction and implementation of a new "tsunami.gov" website for posting products and lots of other information regarding US Tsunami Program services
- Reorganization of the US Tsunami Program under a common management structure.

PTWC has also briefed the ICG/CARIBE-EWS on a variety of changes to its products – mostly a restructuring to make them easier to quickly understand. These changes have been included in a new User's Guide to PTWC Procedures and Products for the CARIBE-EWS.If accepted at the next ICG/CARIBE-EWS Session in 2025/05, the changes will be implemented at a designated date.

Dr Vanacore reported on the detection capability of the seismic network in the Caribbean region and also informed the group on the ongoing study to demonstrate improvement in tsunami early warning times with two to four variations on SMART Cable designs. A code has been written to determine improvements in detection time for seismic sources. and Dr Vanacore will create a GitHub to publicly share code. Dr. Vanacore also highlighted the ongoing challenges with the unavailability of sea-level data from the north, west, and south of Caribbean which drastically reduces the operational capabilities of the TSPs and NTWCs of the region. Lastly, Dr. Vanacore reported on the ongoing efforts for the conduct of a Sea Level

Training Course in English, to be hosted in Puerto Rico during 7–11 July 2025 by PRSN and CariCOOS, in close collaboration with the UNESCO-IOC, NOAA and IHO. The training course is expected to be announced through a Circular Letter in 2025/03.

5.2 ICG/IOTWMS

Mr Padmanabham introduced the agenda item, available as a presentation. Under ICG/IOTWMS, there are 3 Tsunami Service Providers (TSPs) (Australia, India, Indonesia) to provide tsunami threat information to National Tsunami Warning Centres (NTWCs). NTWCs operate within multi-hazard frameworks. Maritime products for NAVAREAs to be trialed and implemented in 2025 by TSPs. Competency training framework being developed for NTWCs. TSP operations are ISO compliant: ISO 9001 (India & Australia), ISO 22328-3 (Indonesia).

TSP-Australia and TSP-India have implemented NAVAREA product issuance, set to be tested in the upcoming COMMS test. TSP-Australia is operationally issuing bulletins for TGVs, while TSP-India and TSP-Indonesia are in development. TSP-India introduced the SAMUDRA Mobile App as a comprehensive multi-hazard early warning app to the coastal communities about oceanic threats; established the cutting-edge SynOPS Lab to advance ocean monitoring and predictive capabilities and HPC facility “TARANG” at INCOIS dedicated to real-time tsunami inundation modeling, operational oceanography, and advanced simulations. 4000 TsunAWI scenarios were added into TOAST at TSP-Indonesia. Number of seismometers increase progressively and now reached 534. Indonesia Tsunami Non-Tectonic monitoring system (InaTNT) is now in place to monitor the sea-level anomalies. A National Consortium of the EQ and Tsunami Experts has been established, which also supported the development of the impact based real time system of InaTEWS.

TSP Australia will integrate, test and operationalise seismic array processing as input to rapid earthquake detection and characterization and will commence work towards ISO 9001 accreditation for GA-JATWC systems. TSP India is developing SOPs and implementing products for non-seismic tsunamis; utilizing GNSS & SMA for precise rupture characterization; establishing the GPS co-located tide Gauges along the Indian coast; archiving Makran source PTHA data for access to member states; establishing new technologies (undersea cable) for rapid tsunami detection; and providing on-the-job training for IO member states. TSP Indonesia will deploy 100 tsunami gauges, start with the utilization of GNSS data for earthquake parameter calculation, continue with the research on non seismic tsunamis, and will work on development of a processing system for Earthquake Early Warning.

INCOIS (India) is hosting the International Tsunami Symposium 2025 ITS 2025 and the portal will be available for accepting the abstracts and registrations from the participants.

ICG/IOTWMS conducted the 2024 UNESCO-IOC Capacity Assessment of Tsunami Preparedness in the Indian Ocean to track regional change and to identify gaps and challenges that could be addressed through future projects and activities. Survey responses from twenty-two (22) Member States have been received. The University of Huddersfield analysed the data and compared it with the results of the 2018 Assessment to produce a draft report. The Capacity Assessment Team, supported by the ESCAP Tsunami Trust Fund and the Asian Development Bank, convened a meeting in Bangkok from 4–6 September to formulate recommendations. The preliminary draft report is now available for review on the meeting website.

Major Decisions from the 14th Session of ICG/IOTWMS (14–19 Nov 2024, Jakarta, Indonesia) include i) extension of the TSP services to include tsunamis generated by non-seismic and complex sources, and ii) establishing a new intersessional Task Team on New/Emerging Technologies for Observations and Forecasting under the WG2.

Mr Nishimae expressed his interest in the SOPs developed for the TGVs and Mr Padmanabham informed that he will share the current version being developed by the WG2, noting that the process is ongoing. WG2 also has plans to create an atlas for volcanoes with tsunamigenic potential, through which a rough estimate of the tsunami arrival times can be presented.

5.3 ICG/NEAMTWS

Dr Alesio Piatanesi introduced the agenda item, available as a presentation. He pointed out the critical importance of the instrumental observations gap in North Africa. All TSPs are using the same 3 levels at the forecast points, namely:

INFORMATION: no damage or relevant effect expected
ADVISORY: wave height < 0.5 m and/or runup < 1 m
WATCH: wave height > 0.5 m and/or runup > 1 m

ICG/NEAMTWS-XIX (2024/11) agrees to adopt the threat levels according to the request by the TT-TWO which is reflected in the draft of the new Global Service Definition Document (GSDD). TT Operations is currently preparing a template for the implementation of the threat levels in the TSP messages for consideration and feedback of the ICG/NEAMTWS WG4

All TSPs are using Decision Matrices (DMs) (differentiating between NE Atlantic and Mediterranean Sea). ICG/NEAM XIX (2025/11) welcomed the continued progress of the investigation and the possibility to adopt tsunami forecasting methods by TSPs which represent an improvement over DMs presently in use with a view to reducing uncertainty and false alarms, particularly the forecasting methods which consider tsunami numerical modeling and uncertainty quantification (e.g., the Probabilistic Tsunami Forecasting (PTF), pre-calculated scenario databases, etc.)

EPOS-ON Horizon Europe project funds the development of the TSP-IOT prototype. This service is a virtual access to a web service including a common database (forecast points, sensor locations, bathymetry and topography models, etc.) that, along with additional tools will help warning centres to make their early warning operations interoperable and consistent, and to increase redundancy and fall-back solutions during event processing. This activity is supported in the framework of EPOS (European Plate Observing System) – The European distributed Research Infrastructure for solid Earth science.

Ongoing activities include PROBABILISTIC TSUNAMI FORECASTING, COASTAL TSUNAMI FORECAST and NON-SEISMIC TSUNAMI SOURCES. Regarding PROBABILISTIC TSUNAMI FORECASTING, the case of 2023/02 earthquake in Türkiye was presented, where DM resulted in a basin wide Watch, whereas PROBABILISTIC TSUNAMI FORECASTING would have provided a threat level assessment that is in compliance with the observations, which were less than 50 cm.

The ICG/NEAMTWS at the February 2024 session decided to establish a new Task Team on Non-Seismic Tsunami. An international workshop was held in Stromboli (5–7 October 2024) on volcano tsunamis. Among other issues, this TT will be important to foster the integration of TWS specifically conceived for non-seismic tsunami with those already operating for seismic tsunami: Stromboli volcano is a good case-study for such a task.

New Submarine Cable Ring connecting Portugal Mainland-Azores-Madeira, supported by Portugal, is expected to be operational in the second half of 2026. A CABLED DEEP OCEAN OBSERVATORY in the Western Ionian Sea was deployed in December 2023 (50 km from the coast, about 2000 m depth). Two (+2 spare) tsunami buoys will be installed in the Ionian sea during summer 2025. Exact location and the technical requirements are to be determined yet.

In response to the information provided on the better assessment of the tsunami forecast through probabilistic framework, as demonstrated in the case of the 2023/02 earthquake in Türkiye, Dr. Necmioğlu underlined the fact that such a probabilistic framework is not currently capable of capturing the possibility of tsunami generation by landslides triggered by earthquakes, for which historical cases exist in the region, and reminded that the DM thresholds were kept conservative to accommodate such cases. Dr. Piatanesi responded that while landslide generated tsunamis should be considered as a local phenomenon, probabilistic framework is capable to capture the complexities and uncertainties of the earthquake source in a given tectonic setting, hence and there is a need to move away from DM approach, which cannot address such complexities and uncertainties.

5.4 ICG/PTWS

Mr Yuji Nishimae introduced the agenda item, available as a presentation. He informed on the ICG/PTWS XXXI session (8-11 April 2025) and Joint Tsunami Workshop in collaboration with the IUGG-JTC (7 April 2025) focusing on the 60th Anniversary of the ICG/PTWS - Past and Future , both in Beijing-China. A pre-webinar for this workshop will be organized on 1 April (online)i

ESCAP Phase II Tsunami Preparedness Capacity Assessment for the Pacific region has started in 2025/01 and will be completed in 2025/09. A survey was announced on 5 Feb through CL-3027 with a deadline on 4 March.

The key objectives of this assessment have been identified as follows:

- To evaluate the existing capacity of the UNESCO-IOC Indian Ocean Tsunami Warning and Mitigation System (IOTWMS) (Phase I) and Pacific Tsunami Warning and Mitigation System (PTWS) (Phase II) and highlight the progress made since 2004 IOT and subsequent assessments.
- To identify specific gaps and capacity development requirements at regional and national levels for strengthening the technical and policy aspects of the tsunami warning and mitigation systems in the region.
- To provide recommendations for the next strategic phase of ESCAP's Trust Fund for Tsunami Disaster and Climate Preparedness, aiming to address the identified gaps through regional cooperation and mainstreaming science.

At ICG/PTWS-XXX in 2023/09, the ICG Decided to admit the start of the official full functional operations of CATAC, starting after the IOC governing body meeting in 2024, with the specific starting date to be decided after the coordination with the ICG/CARIBE-EWS, but ICG/CARIBE-EWS-XVII in May 2024 Recommended that CATAC continues full functionality in an interim manner an consider CATAC as a TSP in its XVIII Session in 2025 to enable the IOC Assembly to consider the final admission of CATAC as TSP in June 2025.

Based on the TOWS-WG Group recommended to Intergovernmental Coordination Groups (ICGs), TSPs identified for each ICG were asked to trial dissemination of maritime bulletins to respective NAVAREA operators in their Area of Service (AoS) in the second half of 2024 for full operational implementation in 2025. At ICG/PTWS-XXX in 2023/09, ICG/PTWS Recommended the PTWC to finalize necessary preparations to provide special tsunami maritime safety products specifically for ships for all NAVAREA Coordinators in the Pacific and in the Southwest Atlantic (e.g. NAVAREAs VI, X, XI, XII, XIII, XIV, XV, and XVI) to transmit to the NTWCs to be forwarded to the NAVAREA Coordinators of their countries, or upon their request directly to the NAVAREA Coordinators in the absence of a NTWC. Trial Transmission of these products were tested in the PacWave 24 on 5 November 2024. A meeting was organized with the Chair of the Sub-Committee on the World-Wide Navigational Warning

Service (WWNWS-SC) on 6 February 2025, in which PTWC obtained necessary clarification toward the finalization of the operational product. WWNWS-SC will review the final product in its meeting in 2025/09 and full scale operationalization is expected to start as of 1 October 2025. Work is in progress ICG/PTWS TSP Users' Guide with the Common Format to be presented to the ICG/PTWS XXXI

6. Tsunami Updates to Area of Coverage and ESZ Maps of the ICGs

No updates were reported by the members, but the need to update the global Area of Service map with the changes reflecting the Interim Service Provided by the Central America Tsunami Advisory Center / Nicaraguan Institute for Territorial Studies (CATAC/INETER) for both ICG/PTWS and ICG/CARIBE-EWS and CATAC service area (coasts of Costa Rica, El Salvador, Honduras, Guatemala, Nicaragua, Panama) was noted.

7. Tsunami Service Provision Considerations for Events Outside ICG Earthquake Source Zones

Mr Yuji Nishimae presented an overview of the Earthquake Source Zone Maps for all ICGs (Regional Tsunami Warning Systems - RTWS) and associated magnitude criteria for issuing bulletins. It was noted that in the draft version of the GSDD, two criteria was presented, as follows:

- TSP products in all RTWSs may also be issued for earthquakes outside of their ESZ when there are either forecast or observed tsunami waves with amplitudes of 30 cm or more along that TSP's AoS, or
- whenever a large earthquake located outside the ESZ might cause concern to the AoS about whether there is a tsunami threat. Such exceptions are necessary to cover cases like the 2004 Indian Ocean tsunami that was recorded deep inside.

Dr. Necmioğlu argued that a "concern" cannot be quantified and such a criterion may cancel the previous criterion, namely the threshold of 30cm. Dr Mc Creery argued that in his view, these two criteria do not cancel each other, but rather complemented. He further argued that while for all other ICGs there zones were defined (green as the primary ESZ, blue as the secondary ESZ subject to higher magnitude thresholds, and white as regions outside the ESZ, which are the regions subject to discussion under this agenda item. He further pointed out the need to investigate the status of the service provisions in areas that are within the ICGs but outside of the framework of the IOC coordinated tsunami warning systems. It was agreed to remove the second criterion from the GSDD.

8. Updates on Products for Maritime Community

Dr. McCreery introduced the agenda item, available as a presentation. Maritime tsunami products were requested of TSPs in all ocean basins through the TOWS-WG by the IHO's World-Wide Navigational Warning System (WWNWS) to aid to their NAVAREA Coordinators in advising ships at sea about potential tsunami hazards when ships are approaching ports that may be affected. Some general guidelines on the content and procedures for TSP implementation were constructed with input from the WWNWS. Within the PTWS, PTWC agreed to be the only TSP to implement these products since it covers the entire PTWS service area. A test on the dissemination of these products was conducted during the Pacwave 24 exercise. PTWC developed the software and a draft guide on the products to include as an annex to the User's Guide for PTWC Products for the PTWS. Some final questions regarding the products and their procedures were addressed in a call with representatives of the WWNWS on February 6, 2025. With approval from the TOWS-WG, PTWC will brief the ICG/PTWS on these products in their next meeting in April and decide on a date to implement this service. PTWC is a Tsunami Service Provider for the Pacific Tsunami Warning and

Mitigation System of UNESCO/IOC. In this role, PTWC issues operational tsunami products as advice to the Member States of the PTWS regarding potential and confirmed tsunami threats. The Maritime Message would be issued following a large earthquake when tsunami amplitudes are forecast to be 0.3m or larger (hazardous size) along any coasts in the Pacific or its marginal seas. It would name the affected NAVAREAS and countries or territories or places adjacent to those NAVAREAS that have a forecast of 0.3m or greater. The Maritime Message would be updated and re-issued if the tsunami forecast changes. A Final Maritime Message would be issued when PTWC issues its final advice product for the PTWS. Content of the Maritime Messages was made very concise. and maritime Messages would be disseminated only by email.

None additional content in the product has been requested at this time. Messages hould be sent to NAVAREA Coordinators of the affected NAVAREAs, only. Ships entering an affected NAVAREA will receive the message when they enter the affected NAVAREA as long as a final message has not yet been issued. There is also a 500 km extension (buffer) zone around all NAVAREAS for receiving products. The message can be sent directly to NAVAREA Coordinators as well as to their country TWFPs and NTWCs.

Regarding the TOWS-WG-XVII recommendation on the organisation of webinars in coordination with IHO for the NAVAREA operators and back-up METAREA operators to introduce the new service and products for the maritime community, and obtain and advise TSPs of the contact information for their respective NAVAREA and METAREA operators to disseminate the new maritime bulletins, inlight of the experiences gained through the PacWave24, and exchanges with the representatives of the WWNWS on February 6, 2025, TT-TWO considered that further engagement on the dissemination of the specialized TSP bulletins for the maritime community should be done through the testing in CARIBE-EWS, IOTWMS and NEAMTWS by at least one TSP either via the planned communication tests or upcoming tsunami exercises.

9. Optimal Seismic and Sea level Monitoring Networks

Mr Nishimae introduced the agenda item, available as a presentation. The first objective of the ODTP is to develop the warning systems' capability to issue actionable and timely tsunami warnings for tsunamis from all identified sources to 100 percent of coasts at risk. Most urgently, the ODTP will endeavor to provide tsunami confirmation within 10 minutes or less of origin for the most at-risk coastlines. The observation network of an earthquake and a tsunami is essential for the early tsunami warning system. The data of the coastal tide gauges are being shared through the IOC web site.

The coastal tide gauges are operated by the various authorities for their own purposes. In the case of Japan, the coastal tide gauge data are shared each other and the gaps of observation are covered.

The data sampling interval and transmission interval are appropriate for respective organizations, and they may not be appropriate for tsunami monitoring. That tsunami is observed at the coast means that tsunami already reaches the coast. In order to detect the tsunami before arriving at the coast, offshore observation is essential. Particularly, in the case of non-seismic tsunamis, it could be crucial to detect a tsunami as close to its source as possible. For this purpose, the offshore tsunami meters are very effective for early detection of tsunami generated by non-seismic events. As of now, some offshore tsunami meter networks have been operated and cabled ocean bottom pressure sensors such as the SMART cables have been deployed and planned. Efforts are in place to develop Standard Operating Procedures (SOP) for tsunamis generated by volcanoes. Relation between the Tsunami Warning Centers and the volcanic authorities such as the Volcano Ash Advisory Canters and the volcano observatories should be deepened and enhanced for an appropriate tsunami

warning by volcanoes. Regarding local earthquakes, tsunami warning center should issue a tsunami warning as quick as possible. But the determination of the size of megathrust earthquakes, such as 2004 and 2011 earthquakes, is not an easy task. Recently, usefulness of the GNSS has been highlighted to assist quick determination of the size of an earthquake with tsunamigenic potential.

Dr. Hebert informed the members that the IOC Sea Level Station Monitoring Facility hosted by the Flanders Marine Institute (VLIZ) will be updated through the EU funded GEOinquire project and asked whether such functionalities can be embedded during this upgrade. Dr. Necmioğlu responded that he is not aware of this initiative and will investigate internally. Dr. Piatanesi asked whether such functionality should be integrated only in this facility, and Dr. Necmioğlu responded that he does not see any reason why such capabilities cannot be provided through the TSP-IOT prototype currently being developed under the EPOS-ON Horizon Europe project, as long as it is openly and publicly accessible. Dr. McCreery informed that such maps were produced in the maps by the PTWC, and that he will investigate and report back.

Regarding the TOWS-WG-XVII recommendation for the TT-TWO to review the previously recommended data format for sea level data (IOC Manual on sea level measurement and interpretation, v. IV (SC.2006/WS/38) and update as required to ensure measurement and facilitate exchange of data at required resolutions and sampling rates, and to ensure data format contains metadata to enable TSPs and NTWCs to determine level of individual station suitability for tsunami detection and warnings, members concluded that standardization of the sea-level data format is not within the capabilities of the TT-TWO, and that this task should be canceled from TT-TWO's work programme.

10. Discussion on SOPs for Tsunamis Generated by non-seismic sources

10.1 Tsunami Generated by Volcanoes

Mr Yuji Nishimae introduced the agenda item, available as a presentation. Hunga Tonga Hunga Ha'apai Volcano Permanent Monitoring and Warning Procedures of the Pacific Tsunami Warning Center (OTWC) (IOC/2024/TS/188) was disseminated to Member States through IOC CL-2984.IOC report on 'Monitoring and warning for tsunamis generated by volcanoes' (IOC/2024/TS/183) was also disseminated to the Member States through IOC CL-3029. At the same time Member States were informed on the organisation of online webinars (tentatively on 6 and 23 April 2025) for each of the Intergovernmental Coordinating Groups (ICG) of regional Tsunami warning Systems involving relevant Volcano Observatories and Volcanic Ash Advisory Centres (VAACs) to:

a) brief on the report on 'Monitoring and warning for tsunamis generated by volcanoes' (IOC/2024/TS/183) and its recommendations,

b) highlight the hazard and vulnerable Member States,

c) initiate the required partnerships between National Tsunami Warning Centres (NTWC) and Volcano Observatories and VAACs,

d) initiate consideration of whether Tsunami Service Providers may also need to provide services where tsunami generated by volcanoes may impact several Member States.

In terms of Monitoring and Warning, as a first step, organisation(s) should be designated for monitoring and warning of Tsunamis Generated by Volcanoes (TGV). The second and third steps are to install monitoring instrumentation and develop Standard Operating Procedures (SOPs) to handle volcanic tsunamis. TGV monitoring and warning system should be implemented by, or in cooperation with the National Tsunami Warning Centre (NTWC) and regional Tsunami Service Provider (TSP) and national and regional Volcano Service Providers,

where such exist. All volcanoes mentioned in the TGV report should be monitored and have processes in place to warn for tsunamis. Should other, potentially tsunamigenic volcanoes begin erupting, these should also be monitored and included within the tsunami warning process. Detect/warn geophysical (seismology, GNSS, tiltmeter, barometric and sea level data streams need to be available to the designated tsunami monitoring/warning agency (and possibly also to the volcano monitoring agency). As well as monitoring systems for volcano activity and potential far-field propagation of sea level signal, a sea level gauges network with real-time continuous data transmission should be deployed close to each identified volcano to verify risk and then ongoing monitoring and warning. One second sampling with 1cm accuracy (< 1 mm sampling) is recommended for recording and automatic detection. Data transmission through radio or microwave links, fiber optic, or dedicated telephone lines, or other modes should be implemented to ensure the data is transmitted and received and widely shared with the international community in a timely manner. Methods to also specifically alert persons in remote areas (such as scientific teams in the field, or recreational hikers) should be considered. TGV SOPs for tsunami warning should be linked with existing Volcano Alert Activity scales.

In terms of Risk Assessment and Preparedness, a TGV hazard and risk assessment should be undertaken to determine vulnerable areas. For TGV, multi-stakeholder meetings should be convened that included science agencies, volcano and tsunami warning operations centres, and disaster management agencies. For each identified potential source, worst-case and credible scenario planning discussions should start as soon as possible. During a period of heightened TGV hazard, consider closing access to vulnerable areas. When an eruption is imminent and then tsunami hazard is high, consider evacuating populations from vulnerable locations. Specific TGV signage and evacuation routes should be implemented in all areas that may be impacted by tsunamis generated by volcanoes. TGV public awareness campaigns should be conducted regularly – the type and frequency of awareness activities may be different for the local population compared to transient populations such as tourists.

During the discussions on Tsunamis Generated by Volcanoes (TGV), the TT-TWO Chair acknowledged the efforts of IOTWMS TSPs in developing a Standard Operating Procedure (SOP) for volcanic tsunamis and inquired about the current SOP practices at TSP-Australia. In response, Mr. Padmanabham provided a briefing on the existing approach, explaining that TSP Australia relies on VAAC and volcanic advisories to assess eruption status. If tsunami generation is confirmed near a volcano, TSP Australia immediately issues a potential threat bulletin, initially covering 3-hour tsunami travel time zones, which is later updated to 6-hour zones based on observed tsunami behavior. It is also mentioned that TSP-India is currently working on the formulation of SOP. Despite the inherent challenges in forecasting volcanic tsunamis, every effort is made to provide timely advisories.

Dr. Piatanesi underlined the unique character of each volcano, which makes it very difficult to design a generic SOP applicable for each case, and highlighted the critical importance of sea-level observations as close as possible to the potential sources. Dr. Vanacore and Mr Nishimae emphasized the need for MoUs between NTWCs and national Volcano Observatories.

10.2 Meteo-tsunami

Mr Yuji Nishimae introduced the agenda item, available as a presentation. IOC/2025/TS-200 on "Meteotsunamis: Definition, Detection and alerting services investigation" has been published. He summarized the Organizational Relationships between TSPs, NTWC and Regional/National Hydro-Meteorological Services. Since 'MT' are hazards driven by weather conditions, warning responsibility lies solely with the servicing NMHSs. However, since NWP-based 'MT' detection and forecast systems are imperfect, particularly as they do not normally provide direct tsunami detection and measurement, there are instances when monitoring tsunami-specific instruments such as deep ocean tsunameters and tsunami capable tide gauges can provide support to NMHSs. While operational tsunami forecast and warning

activities such as IOC-designated Tsunami Service Providers (TSPs) or National Tsunami Warning Centres (NTWCs) will play no role in real-time operational alerting, the Ad Hoc Team on MT does advise that NMHS' create working relationships with overlapping TSPs and/or NTWCs to become more familiar with monitoring tsunami-specific instrumentations. While 'MTs' are known to occur along many coastlines, only infrequently do they pose a significant risk to life and property. This typically occurs in areas where transiting weather disturbances move over shallow-water regions at precise speed and strength values as to create relatively large, long-wave resonances (e.g. the Mediterranean Sea, Great Lakes, Yellow Sea, East China Sea, and some areas of the North and Baltic Sea). 'MTs' only form under a narrow range of parameters related to water depth and the translational speed of the source disturbance. This makes it possible to characterize the 'MT' risk for virtually any coastline in the world. Local understanding of the 'MT' threat posed to a given coastline is critical to ensuring the phenomena is addressed. Some guidance systems have been developed that rely heavily on identifying the meteorological parameters necessary for 'MT' development through NWP schemes. These systems have shown promise in providing advance notice on 'MT' development. However, since they are based on forecasted parameters and not actual 'MT' detection, false alarm rates are not insignificant. In some cases, tsunami-specific instrumentation can play a supporting role in terms of detection, though even in such rare cases, this will not typically be sufficient to fully characterize the wave field and support precise coastal impact forecasts. Nevertheless, there is value in creating relationships between NMHS' and TSPs/NTWCs to ensure these instruments are correctly monitored and utilized.

In consultation with the Joint WMO-IOC Collaboration Board (JCB), discuss use of the term 'meteotsunami', to understand its implications and ensure common vocabulary is agreed among UN agencies, recognizing the WMO's role as the authoritative voice on climate, water, and weather and noting that the agency does not presently recognize the term. Although the IOC/TOWS-WG IOC Technical Series, 200 page 14 awaits further guidance on this issue from the JCB, it is the consensus opinion of the Ad Hoc Team on Meteotsunami that the responsibility for issuing public alerts based on 'MT' threats be addressed wholly through NMHSs under WMO guidance. The detection of 'MT' should be considered in global tsunami instrumentation strategy. Tsunami detection and measurement capabilities are rapidly improving, and this is expected to accelerate under the UN Ocean Decade. It is now possible to consider non-seismic tsunami sources in the global instrumentation strategy, including 'MT'. Input from NMHS would be particularly useful as a new generation of tsunami detection and measurement networks are deployed. Evaluate requirements and capabilities for improved early warnings and alerts requires combining the direct tsunami detection capability of tsunami-specific instrumentation with the NWP-based algorithms tuned to 'MT' prediction may deliver significant advances in NMHS' global MT forecast and warning capability. However, current operational global NWP models are not capable of resolving adequate pressure disturbances for 'MT' generation, nor could they be developed and operationally run within presently available resources.

10.3 Other non-seismic sources

Dr Necmioğlu introduced the agenda item, available as a presentation. He presented some examples of landslide generated tsunamis, available in the scientific literature. A large landslide occurred November 21, 2000 at Paatuut, facing the Vaigat Strait on the west coast of Greenland. 90 million m3 (260 million tons) of mainly basaltic material slid very rapidly (average velocity 140 km/h) down from 1,000–1,400 m altitude. Approximately 30 million m3 (87 million tons) entered the sea, creating a tsunami with an run-up height of 50 m close to the landslide and 28 m at Qullissat, an abandoned mining town opposite Paatuut across the 20 km wide Vaigat strait (Trine Dahl-Jensen, 2003). In the case of the 2007 Patagonian Fjordland seismic crisis in Aisén, Chile, the epicentre of the long-lasting seismic crisis started on the evening of January 22, 2007 and it was located 20 km to the west of Puerto Chacabuco in the Patagonian fjordland, Chile. Approximately 7,000 events were recorded up to early May, four

of which reached magnitudes greater than 5 (Richter), with local intensities up to VII in Puerto Chacabuco and Puerto Aisén and VI in Coihaique. The seismic swarm was located within the Liquiñe-Ofqui Fault Zone (LOFZ), which controls the emplacement of several monogenetic volcanic cones and larger stratovolcanoes. The January 23 (Ms 5,2) and April 1 (Ms 5,4) events caused minor damages in salmon industry installations near the epicentral zone, however the earthquake that occurred at 13:54 hours (local time) on April 21 (Mw 6,2) triggered various mass movements on the Fiordo Aisén slopes and generated tsunamis. Debris flows and tsunami waves caused the death of three people and the disappearance of seven, in addition to severe damages to the salmon industry installations. A similar phenomenon had occurred in 1927, but then fewer people inhabited the area (Naranjo et al., 2009).

Greenland's Karrat Fjord in 2017 flooded the village of Nuugaatsiaq, destroying 11 houses and killing four people (Paris et al., 2019).On January 15, 2022, the eruption of the Hunga-Tonga volcano unleashed a tsunami that rapidly traversed the Pacific Ocean, soon reaching the Sulzberger Ice Shelf (SIS), West Antarctica. In the aftermath, the West Sulzberger Ice Shelf (WSIS) experienced a significant calving event, shedding 106 km2 of ice and reducing its size to the smallest recorded since 1948. While the tsunami had an effect on the ice shelf, the relatively small tsunami-induced flexural strains in the ice shelves suggest that the tsunami itself may not have been sufficient to cause the calving of stable ice shelves. However, for ice shelves already prone to calving, the additional stresses imposed by the tsunami may act as the final trigger for calving (Zhao et al, 2024). On 16 September 2023, a mega-tsunami ripped through eastern Greenland. The waters reached 200 metres high in some places and damaged an empty military base (Carrillo-Ponce et al., 2024).

Dr. Necmioğlu concluded his presentation, emphasizing that the tsunami risk can be considered on the rise as a result of landslides due to increased rainfall or glacial melting as a result of global warming/climate change and noting that tsunamis generated by landslides (in a non-volcanic setting) remains as a challenge. Antarctica's continental margins may pose an unknown submarine landslide-generated tsunami risk to Southern Hemisphere populations and infrastructure and the issue of landslide generated tsunamis in the glacial context (tsunamis created by glacier break-up) may need closer attention, both from the scientific/resilience and intergovernmental point of view.

Dr. Vanacore commented that in addition to the examples presented, submarine landslides should not be neglected and the narrative should be formulated with reference to both "submarine and subaerial" landslides with tsunamigenic potential.

11. Common Format for the TSPs' Tsunami Products

Mr Nishimae reminded TT-TWO memmbers on the recommendation at the last TOWS-WG, namely that operational tsunami information products also be disseminated in XML format such as Common Alerting Protocol (CAP) Standard format, and that TT-TWO should develop a global CAP template for TSPs to facilitate exchange of bulletins between basin TSPs and their NTWCs, between TSPs of different basins, and for public TSP bulletins (e.g. for IOTWMS).

According to WMO the references, Common Alerting Protocol (CAP) is identified as the international standard format for emergency alerting and public warning, designed for all hazards, which can be used for exchanging multi-hazard emergency alerts and public warnings over all kinds of information and communications technology and that CAP is now widely used in EWS and 91% of the world's population lives in a country that is implementing CAP. Furthermore, the advancement of CAP implementation globally represents a significant milestone in the Early Warnings for All (EW4All) initiative, and the fact that CAP can be considered as the bridge connecting "observations, monitoring, analysis and forecasting" to "warning dissemination and communication".

Dr. Piatanesi reported that in the case of Italy, CAP is a requirement of the National Civil Protection Authority. Dr Hebert added that CAP is also a requirement in the EU's Emergency Warning framework. Mr Padmanabham added that CAP is targeting national arrangements and allows regional filtering.

Dr Necmioğlu reminded that NOAA/PTWC in 2013 provided details and rationale for an initial version of a tsunami profile for CAP.

12. Updates on the Global Service Definition Document

Dr. McCreery introduced the agenda item, available as a presentation. The Tsunami Watch Operations Global Services Definition Document (GSDD) was written and first published as IOC Technical Document 130 in December of 2016 to describe the basic capabilities and services of the TSPs in the four regional Tsunami Warning Systems coordinated by the IOC. Changes in the four Systems and their respective TSPs warranted a revision of the GSDD. A draft update was written and distributed last year to get feedback before a final acceptance and re-publication by the IOC. Goals of the revision was

- Update old or incorrect information
- Make the GSDD more descriptive and less prescriptive
- Align terms and definitions with the Tsunami Glossary

Feedback has now been incorporated, and with the exception of a few additional minor edits to include IOC content, it is ready for final approval. A figure in section 4 of the GSDD was as an example from the CARIBE-EWS of the flow of information to the community from various sources as part of their tsunami warning process. A bullet point in Section 11 was added to note the elimination of fax service from TSPs unless it is requested as essential. Section 10.4 was changed from Procedures for Hunga Tonga to Procedures for Non-Seismic Events. Lastly, the reference to the GTS and internet dissemination requirement was updated as "and/or" in Section 5.4.

Mr Aliaga, Head of IOC Tsunami Resilience Section proposed the removal of the reference to the CARIBE-EWS in the Tsunami Service Model figure, to keep it generic. He underlined the need to elaborate in detail the back-up arrangements between TSPs and proposed that in the future, the verification of tsunami in less than 10min, as reflected in the first objective of the ODTP, could be included as a KPI, but TSPs can already start reporting on this in their respective ICG sessions.

Dr Necmioğlu informed that the Global Telecommunication System (GTS) will be decommissioned by 2030, and National Meteorological and Hydrological Services (NMHSs) will use the WIS 2.0 platform for data exchange. Regarding Mr Aliaga's proposal on back-up arrangements between TSPs, he emphasised the need that service provisions needs to be ensured for all sub-areas of the ICG Area of Service, and that such bilateral arrangements are of critical importance in sub-areas where services are provided only one TSP. The GSDD was updated during the meeting in accordance with these feedbacks provided.

In response to Mr Zuniga's question on how often this document needs a revision and whether it's considered as a living document, Dr. Necmioğlu informed that the document provides a generic guidance and is not considered as a living document, where the last revision was in 2016, and perhaps another revision can be anticipated around 2030.

13. Support for Ocean Decade Tsunami Programme Research & Development Implementation Plan

Members noted that the development of SOPs for TGVs and associated activities, such as organization of webinars; publication of documentation related to TGVs and meteotsunamis; consideration of landslide sources from the perspective of their tsunamigenic potential; the 1st ODTP Scientific Conference that is being planned to be organized back-to-back with the IOGG-JTC Symposium in India in 2025/11; development of ODTP KPIs as a subset of Global KPIs, and development of sea-level detection monitoring capability maps to verify the current networks' compliance with the first objective of the ODTP related to the verification of tsunami in less than 10min are all directly relevant and in support of the ODTP.

Mr Padmanabham proposed the development of a KPI dashboard. Dr Necmioğlu responded that this is indeed being planned, inspired from the layout and the functionalities of the EW4All Dashboard, noting that in the case of IOC's tsunami programme, only the ODTP KPIs may be presented publicly.

14. TT-TWO Work Plan

The Chair of the TT-TWO, Mr Nishimae, requested the Secretariat to include all action items that are currently ongoing or have not started, in the TT-TWO's work plan for the upcoming intersessional period. All actions that have not started yet have been migrated into a new action item, in accordance with the discussions and considerations that have taken place during the current meeting. In addition, new actions items are also added. The current list of action items are available here. An overview of the actions to be included in the work program is provided below:

DELAYED:

- Provide the updated Tsunami Watch Operations: Global Service Definition Document to the Member States
- TT-TWO develop a global CAP template for TSPs to facilitate exchange of bulletins between basin TSPs and their NTWCs, between TSPs of different basins, and for public TSP bulletins (e.g. for IOTWMS)
- TT-TWO evaluate tsunami probabilistic forecasting methods and provide advice to TSPs and NTWCs in all ICGs

ONGOING:

- Develop a reporting mechanism to allow ICGs to report progress on related projects within the Ocean Decade and against the ODTP-RDIP KPIs, aligning this with the proposed Global KPI Framework for the UNESCO-IOC Tsunami Programme
- Organise online webinars for each ICG involving relevant Volcano Observatories and Volcanic Ash Advisory Centers (VAACs)
- TT-TWO and TT-DMP to develop KPIs for the relevant sections of the ODTP - Research, Development and Implementation plan to monitor progress
- TT-TWO and TT-DMP to explore requirements and existing methods to warn people with disabilities and underserved communities, especially given WTAD objective 2023 "fighting inequality for a resilient future

NOT STARTED (NEW ACTION ITEMS):

- Secretariat in close collaboration with the TT-TWO and TT-DMP to revise, simplify and standardise the format and the methodology of collecting TNC/TWFP/NTWC contact information, and present its work at the next Joint TT-DMP and TT-TWO Meeting
- TT-TWO to conduct and present to TOWS-WG at its next session the result of a study on the existing sea-level detection monitoring capability to verify the current networks compliance with the first objective of the ODTP related to the verification of tsunami in less than 10min
- Dissemination of the specialized TSP bulletins for the maritime community is tested in CARIBE-EWS, IOTWMS and NEAMTWS by at least one TSP either through the planned communication tests or planned tsunami exercises.
- Each ICG to develop SOPs for volcanoes with a tsunamigenic potential within their Earthquake Source Zone (ESZ).
- TT-TWO investigate the status of the TSP service provisions in the boundary of IOTWMS and PTWS but outside of the framework of the IOC coordinated tsunami warning systems
- TT-TWO investigate the status of the TSP service provisions in the boundary of IOTWMS and PTWS but outside of the framework of the IOC coordinated tsunami warning systems
- Distribute the final version of the radio product/template to the Member States as a guidance.
- TT-TWO to engage with the landslide hazard and early-warning scientific and operational communities

15. AOB

Under this agenda item, Mr Nishimae presented an overview of the responses he has received regarding the radio product/template, available as a presentation. Dr McCreery suggested the use of location names instead of lat/lon information. Dr Vanacore underline the need for simplification of the language, if the target user is the public. Mr Padmanabham pointed out that the template is currently addressing only earthquake generated tsunamis and inquired whether there are any plans to develop templates for non-seismic tsunamis. Dr Vanacore underlines that this template is only for guidance purposes and radio operators may not necessarily follow this guideline exactly. The following is the agreed format for the product/template for radio broadcasting.

> *At _(XX:XX)_ local time a magnitude _X.X_ earthquake occurred at _Lat, Lon_ with a depth of _X_ km, **_X_ km _Direction_ of _(Place)_.** The _(NTWC)_ has issued a tsunami _(level)_ for _(Place)_.*

16. Recommendations and Report to the TOWS-WG

The draft Recommendations to to the TOWS-WG-XIII are summarized below:

[GSDD]

Recommendation to the ICGs

Notes the revisions on the Global Service Definition Document (GSDD);

Notes that in some ICGs segments of Area of Services are subject to the services of only one Tsunami Service Provider;

Further notes that the Global Area of Service map needs to be updated with the changes reflecting the Interim Service Provided by the Central America Tsunami Advisory Center / Nicaraguan Institute for Territorial Studies (CATAC/INETER) for both ICG/PTWS and ICG/CARIBE-EWS and CATAC service area (coasts of Costa Rica, El Salvador, Honduras, Guatemala, Nicaragua, Panama) should also be reflected;

Recommends establishing arrangements among TSPs within each ICG to ensure that service provision is ensured at all times for the full Area of Service of the ICG;

Recommends the approval of the revised GSDD with the updates as noted above;

[ALL CLEAR MESSAGES]

Recommendation to the ICGs

Noted the possible complexities and challenges which may arise from the All Clear messages issued by the NDMO/CPA of Member States and widely disseminated through social media, for others that may not have done so yet,

Noted that ICGs could consider announcement of such messages only after the issuance of the final message of the TSP(s)

Recommended Member States NTWCs to work with national and local emergency management authorities to define the criteria for and institutions in charge of issuing the All Clear message, as recommended also in the GSDD

[LANDSLIDE]

Recommendation to TT-TWO

Notes that tsunami risk can be considered on the rise as a result of landslides due to increased rainfall or glacial melting as a result of global warming/climate change;

Further notes that tsunamis generated by landslides (in a non-volcanic setting) remains as a challenge for the Global Tsunami Warning and Mitigation System (GTWMS);

Recommends the Task Team on Tsunami Watch Operations to include tsunamis generated by the submarine and subaerial landslides in its work programme and engage with the landslide hazard and early-warning scientific and operational community to address the requirements of the first objective of the ODTP to develop the warning systems' capability to issue actionable and timely tsunami warnings for tsunamis from all identified sources to 100 percent of coasts at risk;

[TNC/TWFP/NTWC CONTACT INFO]

Request to the Secretariat

Notes that Member States does not necessarily follow the guidance on the updates of TWFP and NTWC contact information as provided through CL-2558 and CL-2563 issued in 2015;

Further notes the developments since 2015, such as the cessation of fax dissemination as announced through the CL-3006, but also inclusion of additional roles that have been defined

in some ICGs (such as Tsunami Ready Focal Point (TRFP) in the IOTWMS), which does not necessarily exist (yet) in other ICGs;

Recognizes the need to revise, simplify and standardise the format and the methodology of collecting TNC/TWFP/NTWC/TRFP contact information, which is essential not only for the IOC's tsunami programme, but for the operations of Tsunami Service Providers to ensure that their messages reach the end-users;

Requests the Secretariat in close collaboration with the TT-TWO and TT-DMP to revise, simplify and standardise the format and the methodology of collecting TNC/TWFP/NTWC contact information, and present its work at the next Joint TT-DMP and TT-TWO Meeting;

[MARITIME PRODUCTS]

Recommendation to ICGs

Notes the continuous engagement of the TT-TWO in developing specialized TSP bulletins for the maritime community in consultation with the International Hydrographic Organisation (IHO) Sub-Committee on the World-Wide Navigational Warning Service (WWNWS-SC);

Notes with appreciation the trial transmission of a dummy message from the PTWC to the NAVAREA coordinators directly or through the NTWCs as part of PTWS Exercise Pacific Wave 2024 on 5 November 2024;

Notes that JATWC(Australia), ITEWC(India) and CEA as TSPs of the IOTWMS and NEAMTWS, respectively, have developed the required capabilities;

Recommends that dissemination of the specialized TSP bulletins for the maritime community is tested in CARIBE-EWS, IOTWMS and NEAMTWS by at least one TSP either through the planned communication tests or tsunami exercises;

Further recommends that full operational implementation of such services by at least one TSP in each ICG takes place in 2025;

[FORECASTING METHODS]

Recommendation to ICGs

Notes the continuous need for more accurate and precise tsunami forecasts, especially in the complex tectonic context;

Notes the progress made within the ICG/NEAMTWS investigation and possible adoption of the tsunami probabilistic forecasting method by TSPs in NEAMTWS, which may represent an improvement over the method in use with the goal of reducing uncertainty and false alarms, particularly the forecasting methods that consider tsunami numerical modelling and uncertainty quantification;

Strongly recommends continuation of the investigation and the possibility to adopt tsunami forecasting methods, including probabilistic methodologies, toward impact-based forecasting, that could also post-disaster response, recovery and needs assessment processes;

[OFFSHORE TSUNAMI DETECTION AND OBSERVATIONS]

Recommendation to Member States

Notes the critical importance of offshore seismic and sea-level detection and observation instrumentation, such as DART/GPS buoys or cabled systems (e.g. SMART Cables);

Further notes the progress made in the ongoing project of the CAM SMART cable off Portugal, TAM TAM SMART cable between New Caledonia and Vanuatu, undersea cable installations being deployed by Indonesia and India;

Notes with appreciation the deployment of the Western Ionian Sea Infrastructure in 2023 in the Mediterranean, and the plans for deployment of 2 tsunami buoys in the Ionian sea during Summer 2025;

Recommends Member States to invest more in such offshore measurement systems, where possible with multi-hazard observational capabilities, serving the needs of earthquake seismology, meteorology and oceanography, where possible;

[THREAT LEVELS]

Notes with appreciation the ICG/NEAMTWS XIX agreement to adopt the threat levels according to the revised draft version of the Global Service Definition Document (GSDD);

Further notes that preparation of a template for the implementation of these threat levels by the NEAMTWS TSPs;

[RADIO MESSAGES]

Recommendation to the Secretariat

Notes the considerations and review of the TT-TWO on the basic tsunami warning product/template for use in radio developed by the ICG/CARIBE EWS;

Recommends that the final version of this product/template to be disseminated to the Member States as a guidance;

[CAP]

Request to TT-TWO

Notes that the Common Alerting Protocol (CAP) is the international standard format for emergency alerting and public warning, designed for all hazards, which can be used for exchanging multi-hazard emergency alerts and public warnings over all kinds of information and communications technology;

Also notes that CAP is now widely used in EWS and 91% of the world's population lives in a country that is implementing CAP (Reference);

Recognizes that the advancement of CAP implementation globally represents a significant milestone in the Early Warnings for All (EW4All) initiative (Reference), and the fact that CAP can be considered as the bridge connecting "observations, monitoring, analysis and forecasting" to "warning dissemination and communication".

Notes that NOAA/PTWC in 2013 provided details and rationale for an initial version of a tsunami profile for CAP;

Requests the TT-TWO to develop a global CAP template for TSPs to facilitate exchange of bulletins between basin TSPs and their NTWCs, between TSPs of different basins, and for public TSP bulletins, to be presented and approved by the TOWS-WG at its next session;

[OPTIMUM SEA-LEVEL NETWORK]

Request to TT-TWO

Recalls that the first objective of the ODTP also requires provision of tsunami confirmation within 10 minutes or less of origin for the most at-risk coastlines;

Recognizes the need to conduct a study on in which areas this requirement is met and not met;

Recognizes huge costs to install and to maintain sea level stations, especially in remote areas;

Requests TT-TWO to conduct and present to TOWS-WG at its next session the result of this study with reference to the sea-level stations available in the IOC's Sea Level Station Monitoring Facility;

Encourages the TT-TWO to also include in this study an indicative assessment on possible locations of the future sea-level station monitoring installations to ensure that this requirement is met;

[TGV SOPs]

Recommendation to the ICGs

Notes that Hunga Tonga Hunga Ha'apai Volcano Permanent Monitoring and Warning Procedures of the Pacific Tsunami Warning Center (OTWC) ((IOC/2024/TS/188) was disseminated to Member States through IOC CL-2984;

Notes with appreciation that the IOC report on 'Monitoring and warning for tsunamis generated by volcanoes' (IOC/2024/TS/183) was also disseminated to the Member States through IOC CL-3029;

Also notes with appreciation that at the same time Member States were informed on the organisation of online webinars (tentatively on 6 and 23 April 2025) for each of the Intergovernmental Coordinating Groups (ICG) of regional Tsunami warning Systems involving relevant Volcano Observatories and Volcanic Ash Advisory Centres (VAACs) to:

e) brief on the report on 'Monitoring and warning for tsunamis generated by volcanoes' (IOC/2024/TS/183) and its recommendations,

f) highlight the hazard and vulnerable Member States,

g) initiate the required partnerships between National Tsunami Warning Centres (NTWC) and Volcano Observatories and VAACs,

h) initiate consideration of whether Tsunami Service Providers may also need to provide services where tsunami generated by volcanoes may impact several Member States.

Also notes the challenges to develop general guidelines on SOPs to warn for volcano generated tsunamis due the unique characteristics and mechanisms related to their tsunamigenic potentials;

Recommends each ICG to develop SOPs for volcanoes with a tsunamigenic potential within their Earthquake Source Zone (ESZ);

Recommendation to the Member States

Recommended Member States to consider deployment of sea level gauges close to each identified volcano with tsunamigenic potential, with real-time continuous data transmission and 1 sec sampling 1cm accuracy for automatic detection purposes;

[METEOTSUNAMI]

Recommendation to the ICGs

Notes with appreciation that the IOC report on 'Meteotsunamis: definition, detection and alerting services investigation' (IOC/2025/TS/200) was published;

Notes that since meteotsunami are hazards driven by weather conditions, warning responsibility lies solely with the servicing NMHSs and TSPs or NTWCs play no role in real-time operational alerting;

Notes that tsunami-specific instrumentation including DART and ocean cable system can play a supporting role in terms of detection of meteotsunami;

Recommends each ICGs to create relationships between NMHS' and TSPs/NTWCs in order to ensure these instruments are correctly monitored and utilized for detection of meteotsunami.

[CESSATION OF FAX DISSEMINATION]

Recommendation to the TSP(s)

Noted that the IOC CL-3006 on the Cessation of fax transmissions of tsunami information products by Tsunami Service Providers by 31 March 2025 was issued on 27 September 2024,

Further noted that only one Member State requested the need to continue receipt of tsunami information products through fax,

Noted that fax transmissions of tsunami information products will en by Tsunami Service Providers by 31 March 2025, except for those Member State who requested the continuation of this service, for which individual arrangements between the concerned Member State and respective TSP(s) will be established bilaterally;

[TSUNAMI SERVICE PROVISION CONSIDERATIONS FOR EVENTS OUTSIDE ICG EARTHQUAKE SOURCE ZONES]

Request to TT-TWO

Noted that there is a region in the boundary of IOTWMS and PTWS but outside of the framework of the IOC coordinated tsunami warning systems,

Requested the TT-TWO investigate the status of the TSP service provisions in this region.

Thursday, 20 February 2025, 0900-1730 Local Time
Friday, 21 February 2025, 0900-1230 Local Time

AGENDA OF TEAM TSUNAMI WATCH OPERATIONS

21 February 2025

1. Welcome and Introductions (0900-0915)
2. Session Organisation (Logistics and agenda) (0915-0930)
3. Discussion on the outcomes of the joint Meeting with TT-DMP (0930-1000)
4. Review of TTTWO Action Items (1000-1030)

Coffee Break and Group Photo (1030-1100)

5. Tsunami Watch Operations status and plans in all ICGs (1100-1200)
   - 5.1. ICG/CARIBE-EWS
   - 5.2. ICG/IOTWMS
   - 5.3. ICG/NEAMTWS
   - 5.4. ICG/PTWS
6. Updates to Area of Coverage and ESZ Maps of the ICGs (1200-1215)
7. Tsunami Service Provision Considerations for Events Outside ICG Earthquake Source Zones (1215-1230)
8. Updates on Products for Maritime Community (1230-1245)
9. Optimal Seismic and Sea level Monitoring Networks (1245-1300)

Lunch Break (1300-1430)

10. Discussion on SOPs for Tsunamis Generated by non-seismic sources (1430-1530)
    - 10.1. Tsunami Generated by Volcanoes
    - 10.2. Meteo-tsunami
    - 10.3. Other non-seismic sources

Coffee Break (1530-1600)

11. Common Format for the TSPs' Tsunami Products (1600-1630)
12. Updates on the Global Service Definition Document (1630-1730)

22 February 2025

13. Support for Ocean Decade Tsunami Programme Research & Development

Implementation Plan (0900-0930)
14. TT-TWO Work Plan (0930-1030)

Coffee Break (1030-1100)

15. AOB (1100-1115)

16. Recommendations and Report to the TOWS-WG (1115-1230)

MEMBERS AND OBSERVERS OF TOWS TASK TEAM ON TSUNAMI WATCH OPERATIONS

Name	Country	Organisation	Region/Role
Öcal Necmioğlu	Türkiye	IOC	TT-TWO Technical Secretary ICG/PTWS and ICG/CARIBE-EWS
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Yuji Nishimae	Japan	JMA	Chair of TT-TWO Chair of ICG/PTWS
Nasser Al Ismaili	Oman	DGMAN	ICG/IOTWMS
Helene Hebert	France	CEA	ICG/NEAMTWS
Charles McCreery	USA	NOAA/PTWC	ICG/CARIBE-EWS
Jijjavarapu Padmanabham	India	INCOIS	ICG/IOTWMS
Alessio Piatanesi	Italy	INGV	ICG/NEAMTWS
Elizabeth Vanacore	USA	University of Puerto Rico	ICG/CARIBE-EWS
Dakui Wang	China	NMEFC	ICG/PTWS
Invited Experts and Observers			
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Ceci Rodriguez Cruz	USA	University of Hawaii	SMART Cables JTF
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ANNEX VI

LIST OF PARTICIPANTS

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ANNEX VII

LIST OF ACRONYMS

AGU	American Geophysical Union
BMKG	Indonesian Agency for Meteorological, Climatological and Geophysics
CAP	Common Alert Protocol
CATAC	Central America Tsunami Advisory Center
CARIBE-EWS	Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions
CARIBE WAVE	Caribbean Wave Exercise
CENALT	CENtre d'Alerte aux Tsunamis, France
CPPS	Permanent Commission for the Southeast Pacific
DART	Deep-ocean Assessment and Reporting of Tsunamis
DCC-CR	Decade Collaborative Centre for Coastal Resilience
DG-ECHO	Directorate-General for European Civil Protection and Humanitarian Aid Operations (of the European Commission)
DIMAR	Dirección General Marítima (of Colombia)
EGU	European Geophysical Union
ESZ	Earthquake Source Zone
EW4ALL	EarlyWarningforAll Initiative
GOOS	Global Ocean Observing System (IOC)
GTS	Global Telecommunication System (WMO)
HTHH	Hunga Tonga - Hunga Ha'apai
IASPEI	International Association of Seismology and Physics of the Earth's Interior
IAPSO	International Association for the Physical Sciences of the Oceans
IAVCEI	International Association of Volcanology and Chemistry of the Earth's Interior
ICG	Intergovernmental Coordination Group
ICG/CARIBE-EWS	Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions
ICG/IOTWMS	Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System
ICG/NEAMTWS	Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas
ICG/PTWS	Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System
IFRC	International Federation of Red Cross and Red Crescent Societies
IHO	International Hydrological Organization
INCOIS	Indian National Centre for Ocean Information Services
INFCOM	WMO Infrastructure Commission
INGV	Istituto Nazionale di Geofisica e Vulcanologia (Italy)

INOCAR	Instituto Oceanografico de la Armada (of Ecuador)
IOC	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data and Information Exchange
IOTIC	Indian Ocean Tsunami Information Centre
IOTWMS	Indian Ocean Tsunami Warning and Mitigation System
IOWave	Indian Ocean Wave Exercise
ITU	International Telecommunications Organization
IUGG	International Union of Geodesy and Geophysics
JATWC	Joint Australian Tsunami Warning Centre
JCB	WMO-IOC Joint Collaborative Board
JMA	Japanese Meteorological Agency
JRC	Joint Research Centre
KPI	Key Performance Indicators
LDCs	least developed countries
MHEWS	Multi-Hazard Early Warning Systems
MQTT	Message Queuing Telemetry Transport
MoU	Memorandum of Understanding
METAREA	METeorological AREA (geographical for marine meteorological information)
NAVAREA	Navigational Area (within the World Wide Navigational Service)
NCEI/WDS	National Centers for Environmental Information World Data System
NEAM	North-eastern Atlantic, the Mediterranean and Connected Seas
NEAMTIC	Tsunami Information Centre for the North-eastern Atlantic, the Mediterranean and Connected Seas
NEAMTWS	Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas
NEAMWave	NEAM Tsunami Exercise
NGA	National Geospatial-Intelligence Agency (USA)
NMHS	National Meteorological and Hydrological Services
NOAA	National Oceanic and Atmospheric Administration
NORAD	Norwegian Agency for Development Cooperation
NWPTAC	Northwest Pacific Tsunami Advisory Centre
NTWC	National Tsunami Warning Center
OBIS	Ocean Biodiversity Information System
OBPS	GOOS/IODE Ocean Best Practices System
ODIS	IOC Ocean Data and Information System Project
ODTP	Ocean Decade Tsunami Programme
ODTP-SC	Ocean Decade Tsunami Programme Scientific Committee
ORSNET	Oceania Regional Seismic Network
OTGA	Ocean Teacher Global Academy
PacWave	Pacific Wave Exercise
PICT	Pacific Island Countries and Territories
PTWC	Pacific Tsunami Warning Centre
PTWS	Pacific Tsunami Warning and Mitigation System

SC-DRR	Standing Committee on Disaster Risk Reduction and Public Services (in SERCOM, WMO)
SC-MMO	Standing Committee on Marine Meteorological and Oceanogrpahic Services (in SERCOM, WMO)
SCSTAC	South China Sea Tsunami Advisory Center
SDGs	Sustainable Development Goals
SEP	South-East Pacific
SERCOM	Commission for Weather, Climate, Water and Related Environmental Services and Applications (WMO)
SFDRR	Sendai Framework for Disaster Risk Reduction
SIDS	Small Island developing States
SMA	Sesmic Margin Assessment
SOP	Standard Operating Procedure
SRC	Seismic Research Center
TOWS-WG	Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems
TSP	Tsunami Service Provider
TSR	Tsunami Resilience Section of UNESCO/IOC
TT	Task Team
TT-DMP	Task Team on Disaster Management and Preparedness
TT-TWO	Task Team on Tsunami Watch Operations
UN	United Nations
UNDRR	United Nations Office for Disaster Risk Reduction
UNESCAP	UN Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USA	United States of America
USAID	United States Agency for International Development
WG	Working Group
WIS	WMO Information System
WMO	World Meteorological Organization
WOD	World Ocean Database
WTAD	World Tsunami Awareness Day
WWMIWS	WMO Advisory Group on the Worldwide Met-Ocean Information Warning Service
WWNWS	World-Wide Navigational Warning Service

In this Series, entitled

Reports of Meetings of Experts and Equivalent Bodies, which was initiated in 1984 and which is published in English only, unless otherwise specified, the reports of the following meetings have already been issued:

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans S. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' ***(Also printed in Spanish)***
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP(SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping ***(Also printed in French and Spanish)***
12. Joint 100-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
16. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
17. Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
18. Second Session of the IOC Group of Experts on Effects of Pollutants
19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica ***(Spanish only)***
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
24. Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources ***(Also printed in French and Spanish)***
25. Third Session of the IOC Group of Experts on Effects of Pollutants
26. Eighth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
27. Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans ***(Also printed in French)***
28. Second Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
29. First Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
30. First Session of the IOCARIBE Group of Experts on Recruitment in Tropical Coastal Demersal Communities ***(Also printed in Spanish)***
31. Second IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
32. Thirteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asia Tectonics and Resources
33. Second Session of the IOC Task Team on the Global Sea-Level Observing System
34. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
35. Fourth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
36. First Consultative Meeting on RNODCs and Climate Data Services
37. Second Joint IOC-WMO Meeting of Experts on IGOSS-IODE Data Flow
38. Fourth Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
39. Fourth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
40. Fourteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
41. Third Session of the IOC Consultative Group on Ocean Mapping
42. Sixth Session of the Joint IOC-WMO-CCPS Working Group on the Investigations of 'El Niño' (***Also printed in Spanish)***
43. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
44. Third Session of the IOC-UN(OALOS) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
45. Ninth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
46. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
47. Cancelled
48. Twelfth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
49. Fifteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
50. Third Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
51. First Session of the IOC Group of Experts on the Global Sea-Level Observing System
52. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean
53. First Session of the IOC Editorial Board for the International Chart of the Central Eastern Atlantic ***(Also printed in French)***
54. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico ***(Also printed in Spanish)***
55. Fifth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
56. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
57. First Meeting of the IOC *ad hoc* Group of Experts on Ocean Mapping in the WESTPAC Area
58. Fourth Session of the IOC Consultative Group on Ocean Mapping
59. Second Session of the IOC-WMO/IGOSS Group of Experts on Operations and Technical Applications
60. Second Session of the IOC Group of Experts on the Global Sea-Level Observing System

61. UNEP-IOC-WMO Meeting of Experts on Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change
62. Third Session of the IOC-FAO Group of Experts on the Programme of Ocean Science in Relation to Living Resources
63. Second Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
64. Joint Meeting of the Group of Experts on Pollutants and the Group of Experts on Methods, Standards and Intercalibration
65. First Meeting of the Working Group on Oceanographic Co-operation in the ROPME Sea Area
66. Fifth Session of the Editorial Board for the International Bathymetric and its Geological/Geophysical Series
67. Thirteenth Session of the IOC-IHO Joint Guiding Committee for the General Bathymetric Chart of the Oceans ***(Also printed in French)***
68. International Meeting of Scientific and Technical Experts on Climate Change and Oceans
69. UNEP-IOC-WMO-IUCN Meeting of Experts on a Long-Term Global Monitoring System
70. Fourth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
71. ROPME-IOC Meeting of the Steering Committee on Oceanographic Co-operation in the ROPME Sea Area
72. Seventh Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' ***(Spanish only)***
73. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico ***(Also printed in Spanish)***
74. UNEP-IOC-ASPEI Global Task Team on the Implications of Climate Change on Coral Reefs
75. Third Session of the IODE Group of Experts on Marine Information Management
76. Fifth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
77. ROPME-IOC Meeting of the Steering Committee for the Integrated Project Plan for the Coastal and Marine Environment of the ROPME Sea Area
78. Third Session of the IOC Group of Experts on the Global Sea-level Observing System
79. Third Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
80. Fourteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
81. Fifth Joint IOG-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
82. Second Meeting of the UNEP-IOC-ASPEI Global Task Team on the Implications of climate Change on Coral Reefs
83. Seventh Session of the JSC Ocean Observing System Development Panel
84. Fourth Session of the IODE Group of Experts on Marine Information Management
85. Sixth Session of the IOC Editorial Board for the International Bathymetric chart of the Mediterranean and its Geological/Geophysical Series
86. Fourth Session of the Joint IOC-JGOFS Panel on Carbon Dioxide
87. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Pacific
88. Eighth Session of the JSC Ocean Observing System Development Panel
89. Ninth Session of the JSC Ocean Observing System Development Panel
90. Sixth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
91. First Session of the IOC-FAO Group of Experts on OSLR for the IOCINCWIO Region
92. Fifth Session of the Joint IOC-JGOFS CO, Advisory Panel Meeting
93. Tenth Session of the JSC Ocean Observing System Development Panel
94. First Session of the Joint CMM-IGOSS-IODE Sub-group on Ocean Satellites and Remote Sensing
95. Third Session of the IOC Editorial Board for the International Chart of the Western Indian Ocean
96. Fourth Session of the IOC Group of Experts on the Global Sea Level Observing System
97. Joint Meeting of GEMSI and GEEP Core Groups
98. First Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
99. Second International Meeting of Scientific and Technical Experts on Climate Change and the Oceans
100. First Meeting of the Officers of the Editorial Board for the International Bathymetric Chart of the Western Pacific
101. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
102. Second Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
103. Fifteenth Session of the Joint IOC-IHO Committee for the General Bathymetric Chart of the Oceans
104. Fifth Session of the IOC Consultative Group on Ocean Mapping
105. Fifth Session of the IODE Group of Experts on Marine Information Management
106. IOC-NOAA *Ad hoc* Consultation on Marine Biodiversity
107. Sixth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
108. Third Session of the Health of the Oceans (HOTO) Panel of the Joint Scientific and Technical Committee for GLOSS
109. Second Session of the Strategy Subcommittee (SSC) of the IOC-WMO-UNEP Intergovernmental Committee for the Global Ocean Observing System
110. Third Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
111. First Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate
112. Sixth Session of the Joint IOC-JGOFS C02 Advisory Panel Meeting
113. First Meeting of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS)
114. Eighth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of "El Niño" ***(Spanish only)***
115. Second Session of the IOC Editorial Board of the International Bathymetric Chart of the Central Eastern Atlantic ***(Also printed in French)***
116. Tenth Session of the Officers Committee for the Joint IOC-IHO General Bathymetric Chart of the Oceans (GEBCO), USA, 1996
117. IOC Group of Experts on the Global Sea Level Observing System (GLOSS), Fifth Session, USA, 1997
118. Joint Scientific Technical Committee for Global Ocean Observing System (J-GOOS), Fourth Session, USA, 1997
199 First Session of the Joint 100-WMO IGOSS Ship-of-Opportunity Programme Implementation Panel, South Africa, 1997
120. Report of Ocean Climate Time-Series Workshop, Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate, USA, 1997
121. IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional Global Ocean Observing System (NEAR-GOOS), Second Session, Thailand, 1997
122. First Session of the IOC-IUCN-NOAA *Ad hoc* Consultative Meeting on Large Marine Ecosystems (LME), France, 1997

123. Second Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), South Africa, 1997

124. Sixth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico, Colombia, 1996 ***(also printed in Spanish)***

125. Seventh Session of the IODE Group of Experts on Technical Aspects of Data Exchange, Ireland, 1997

126. IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), First Session, France, 1997

127. Second Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 1998

128. Sixth Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1997

129. Sixth Session of the Tropical Atmosphere - Ocean Array (TAO) Implementation Panel, United Kingdom, 1997

130. First Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 1998

131. Fourth Session of the Health of the Oceans (HOTO) Panel of the Global Ocean Observing System (GOOS), Singapore, 1997

132. Sixteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), United Kingdom, 1997

133. First Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1998

134. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IOC/EB-IBCWIO-IW3), South Africa, 1997

135. Third Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), France, 1998

136. Seventh Session of the Joint IOC-JGOFS C02 Advisory Panel Meeting, Germany, 1997

137. Implementation of Global Ocean Observations for GOOS/GCOS, First Session, Australia, 1998

138. Implementation of Global Ocean Observations for GOOS/GCOS, Second Session, France, 1998

139. Second Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Brazil, 1998

140. Third Session of IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), China, 1998

141. Ninth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Ecuador, 1998 ***(Spanish only)***

142. Seventh Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Croatia, 1998

143. Seventh Session of the Tropical Atmosphere-Ocean Array (TAO) Implementation Panel, Abidjan, Côte d'Ivoire, 1998

144. Sixth Session of the IODE Group of Experts on Marine Information Management (GEMIM), USA, 1999

145. Second Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), China, 1999

146. Third Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Ghana, 1999

147. Fourth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC); Fourth Session of the WCRP CLIVAR Upper Ocean Panel (UOP); Special Joint Session of OOPC and UOP, USA, 1999

148. Second Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1999

149. Eighth Session of the Joint IOC-JGOFS CO2 Advisory Panel Meeting, Japan, 1999

150. Fourth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Japan, 1999

151. Seventh Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1999

152. Sixth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 1999

153. Seventeenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), Canada, 1999

154. Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y el Golfo de Mexico (IBCCA), Septima Reunión, Mexico, 1998

IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (IBCCA), Seventh Session, Mexico, 1998

155. Initial Global Ocean Observing System (GOOS) Commitments Meeting, IOC-WMO-UNEP-ICSU/Impl-III/3, France, 1999

156. First Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Venezuela, 1999 ***(also printed in Spanish and French)***

157. Fourth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), China, 1999

158. Eighth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Russian Federation, 1999

159. Third Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), Chile, 1999

160. Fourth Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS). Hawaii, 2000

161. Eighth Session of the IODE Group of Experts on Technical Aspects of Data Exchange, USA, 2000

162. Third Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 2000

163. Fifth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Poland, 2000

164. Third Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 2000

165. Second Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Cuba, 2000 ***(also printed in Spanish and French)***

166. First Session of the Coastal Ocean Observations Panel, Costa Rica, 2000

167. First GOOS Users' Forum, 2000

168. Seventh Session of the Group of Experts on the Global Sea Level Observing System, Honolulu, 2001

169. First Session of the Advisory Body of Experts on the Law of the Sea (ABE-LOS), France, 2001 ***(also printed in French)***

170. Fourth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, Chile, 2001

171. First Session of the IOC-SCOR Ocean CO_2 Advisory Panel, France, 2000

172. Fifth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Norway, 2000 ***(electronic copy only)***

173. Third Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, USA, 2001 ***(also printed in Spanish and French)***

174. Second Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Italy, 2001

175. Second Session of the Black Sea GOOS Workshop, Georgia, 2001

176. Fifth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2000

177. Second Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Morocco, 2002 ***(also printed in French)***

178. Sixth Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Australia, 2001 ***(electronic copy only)***

179. *Cancelled*

180. Second Session of the IOC-SCOR Ocean CO_2 Advisory Panel, Honolulu, Hawaii, U.S.A, 2002 ***(electronic copy only)***

181. IOC Workshop on the Establishment of SEAGOOS in the Wider Southeast Asian Region, Seoul, Republic of Korea, 2001 (SEAGOOS preparatory workshop) ***(electronic copy only)***

182. First Session of the IODE Steering Group for the Resource Kit, USA, 19–21 March 2001

183. Fourth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), France, 2002

184. Seventh Session of the IODE Group of Experts on Marine Information Management (GEMIM), France, 2002 ***(electronic copy only)***

185. Sixth Session of IOC/WESTPAC Coordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2001 ***(electronic copy only)***

186. First Session of the Global Ocean Observing System (GOOS) Capacity Building Panel, Switzerland, 2002 ***(electronic copy only)***

187. Fourth Session of the ad hoc Advisory Group for IOCARIBE-GOOS, 2002, Mexico ***(also printed in French and Spanish)***

188. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IBCWIO), Mauritius, 2000

189. Third session of the Editorial Board for the International Bathymetric Chart of the Western Pacific, Chine, 2000

190. Third Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Vietnam, 2002

191. Eighth Session of the IOC Consultative Group on Ocean Mapping, Russian Federation, 2001

192. Third Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Lisbon, 2003 ***(also printed in French)***

193. Extraordinary Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Chile, 1999 ***(Spanish only; electronic copy only)***

194. Fifth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, France, 2002

195. Sixth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, South Africa, 2003

196. Fourth Session of the Coastal Ocean Observations Panel, South Africa, 2002 ***(electronic copy only)***

197. First Session of the JCOMM/IODE Expert Team On Data Management Practices, Belgium, 2003 *(also JCOMM Meeting Report No. 25)*

198. Fifth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2003

199. Ninth Session of the IOC Consultative Group on Ocean Mapping, Monaco, 2003 ***(Recommendations in English, French, Russian and Spanish included)***

200. Eighth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 2003 ***(electronic copy only)***

201. Fourth Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Greece, 2004 ***(also printed in French)***

202. Sixth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2004 ***(electronic copy only)***

203. Fifth Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Argentina, 2005 ***(also printed in French)***

204. Ninth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 2005 ***(electronic copy only)***

205. Eighth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), China, 2003 ***(electronic copy only)***

206. Sixth Meeting of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Spain, 2006 ***(also printed in French)***

207. Third Session of the Regional Forum of the Global Ocean Observing System, South Africa, 2006 ***(electronic copy only)***

208. Seventh Session of the IOC-UNEP-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2005 ***(electronic copy only)***

209. Eighth Session of the IOC-UNEP-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2006 ***(electronic copy only)***

210. Seventh Meeting of the IOC Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Gabon, 2007 ***(bilingual English/French)***

211. First Meeting of the IOC Working Group on the Future of IOC, Paris, 2008 ***(Executive Summary in English, French, Russian and Spanish included)***

212. First meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 3–4 April 2008 ***(Executive Summary in English, French, Russian and Spanish included)***

213. First Session of the Panel for Integrated Coastal Observation (PICO-I), Paris, 10–11 April 2008 ***(electronic copy only)***

214. Tenth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), Paris, 6–8 June 2007 ***(electronic copy only)***

215. Eighth Meeting of the IOC Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Paris, 21–25 April 2008 ***(bilingual English/French)***

216. Fourth Session of the Global Ocean Observing System (GOOS) Regional Alliances Forum (GRF), Guayaquil, Ecuador, 25–27 November 2008 ***(electronic copy only)***

217. Second Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 27 March 2009 ***(Executive Summary in English, French, Russian and Spanish included)***

218. Ninth Meeting of the IOC Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Paris, 30 March–3 April 2009 ***(bilingual English/French)***

219. First Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 3), Broomfield, Colorado, U.S.A., 1 October 2005 ***(electronic copy only)***

220. Second Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 6), Paris, France, 20 April 2007 ***(electronic copy only)***

221. Third Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 10), Villefranche-sur-mer, France, 3–4 October 2008 ***(electronic copy only)***

222. Fourth Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 15), Jena, Germany, 14 September 2009 ***(electronic copy only)***

223. First Meeting of the joint IOC-ICES Study Group on Nutrient Standards (SGONS) (also IOCCP Reports, 20), Paris, France, 23–24 March 2010 *(Executive Summary in E, F, R, S included)*

224. Third Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Lisbon, Portugal, 5–6 May 2010 ***(Executive Summary in English, French, Russian and Spanish included)***

225. Eleventh Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), Paris, 13–15 May 2009 ***(electronic copy only)***

226. Second Session of the Panel for Integrated Coastal Observation (PICO-II), Paris, 24–26 February 2009 ***(electronic copy only)***

227. First meeting of the Task Team on Seismic Data Exchange in the South West Pacific of the ICG/PTWS Regional Working Group for the Southwest Pacific, Port Vila, Vanuatu, 19–20 October 2009 ***(electronic copy only)***

228. Fourth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, France, 20–21 March 2011 ***(Executive Summary in English, French, Russian and Spanish included)***

229. Second Session of the IODE Steering Group for Ocean Teacher (SG-OT), Miami, Florida, 11–15 April 2011

230. First Meeting of the Inter-ICG Task Team 1 on Sea Level Monitoring for Tsunami (Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Seattle, USA, 29 November–1 December 2010

231. First Meeting of the Inter-ICG Task Team 2 on Disaster Management and Preparedness (Working Group on Tsunamis and Other Hazards Related to

Sea-Level Warning and Mitigation Systems (TOWS-WG), Seattle, USA, 29 November–1 December 2010

232. First Meeting of the Inter-ICG Task Team 3 on Tsunami Watch Operations (Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Seattle, USA, 29 November–1 December 2010

233. Primera Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), Managua (Nicaragua) del 4 al 6 de noviembre de 2009 ***(Resumen dispositivo en español e inglés)***

234. Segunda Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), San Salvador (El Salvador) del 28 al 30 de septiembre de 2011 ***(Resumen dispositivo en español e inglés)***

235. First Session of the Joint IODE-JCOMM Steering Group for the Global Temperature-Salinity Profile Programme (SG-GTSPP), 16–20 April 2012, Ostend, Belgium

236. Ad hoc Session of the Joint JCOMM-IODE Steering Group for the Ocean Data Standards Pilot Project (SG-ODSPP), 23–25 April 2012, Ostend, Belgium

237. First Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Sanya, China, 12–14 December 2011

238. First Meeting of the IODE Steering Group for OceanDocs (SG-OceanDocs), 24–27 January 2012, Ostend, Belgium

239. Fifth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Tokyo, Japan, 15 February 2012 ***(Executive Summary in English, French, Russian and Spanish included)***

240. Ad hoc Session of the IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices (GE-BICH), Ostend, Belgium, 25 October 2012

241. Twelfth Session of the IODE Group of Experts on Marine Information Management (GE-MIM), Miami, USA, 22–25 January 2013

242. Twelfth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), Paris, 9–11 November 2011 ***(electronic copy only)***

243. Meeting of the Pacific Tsunami Warning System Working Group 2 on Detection, Warning and Dissemination Task Team on PacWave11, Honolulu, USA, 21 May 2012 ***(electronic copy only)***

244. Sixth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 20–21 February 2013 ***(Executive Summary in English, French, Russian and Spanish included)***

245. Second Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Petaling Jaya, Malaysia, 16–18 October 2012 ***(electronic copy only)***

246. Seventh Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems, UNESCO, Paris, 12–13 February 2014 ***(Executive Summary in English, French, Russian and Spanish included)***

247. Third Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Hong-Kong, China, 6–7 April 2014 ***(electronic copy only)***

248. Tercera Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), Managua, Nicaragua, del 29 al 30 de septiembre de 2014 ***(Resumen dispositivo en español e inglés)***

249. Workshop on Tsunami Modelling and Mitigation of the ICG/CARIBE-EWS Working Group 2: Tsunami Hazard Assessment, 1–3 December 2014, Cartagena de Indias, Colombia ***(electronic copy only)***

250. Fourth meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Jakarta, Indonesia, 11–12 February 2015 ***(electronic copy only)***

251. Eighth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 12–13 March 2015 ***(Executive Summary in English, French, Russian and Spanish included)***

252. Ninth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems, UNESCO, Paris, 25-26 February 2016 ***(Executive Summary in English, French, Russian and Spanish included)***

253. Fifth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Manila, Philippines, 2–3 March 2016 ***(electronic copy only)***

254. Second Meeting of the Regional Working Group for the North West Indian Ocean (WG-NWIO), Tehran, Islamic Republic of, 27–28 February 2017 ***(electronic copy only)***

255. Sixth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Shanghai, China, 1–3 March 2017 ***(electronic copy only)***

256- Tenth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 23–24 February 2017 ***(Executive Summary in English, French, Russian and Spanish included)***

257. First Meeting of the Group of Experts on Capacity Development (GE-CD), Paris, 21–23 March 2018 ***(electronic copy only)***

258. Eleventh Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 16–17 February 2018 ***(Executive Summary in English, French, Russian and Spanish included)***

259. Seventh Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Hanoi, Vietnam, 6–8 March 2018 ***(electronic copy only)***

260. Cuarta reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), Managua (Nicaragua) el 11 de febrero de 2019 ***(Resumen dispositivo y recomendación en español e inglés)***

261. Eighth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Jakarta, Indonesia, 4–6 March 2019 ***(electronic copy only)***

262. First Joint Meeting of the Task Teams of the IOC Group of Experts on Capacity Development: Capacity development requirements of Member States and implementation of a Clearing House Mechanism (CHM) for the Transfer of Marine Technology, UNESCO, Paris, 13–14 March 2019 ***(electronic copy only)***

263. Twelfth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XII), Paris, 21–22 February 2019 ***(Executive Summary in English, French, Russian and Spanish included)***

264. Seventh Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the Pacific Islands Countries and Territories (PICTs-WG), 8 March 2019, Noumea, New Caledonia ***(electronic copy only).***

265 Thirteenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XIII), Paris, 20–21 February 2020 ***(Executive Summary in English, French, Russian and Spanish included)***

266 Second Meeting of the Group of Experts on Capacity Development (GE-CD), 26 October 2020, (online). ***(electronic copy only)***

267 Fourteenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XIV), Online, 25–26 February 2021 ***(Executive Summary in English, French, Russian and Spanish included)***

268 Eighth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the Pacific Islands Countries and Territories (PICTs-WG), 29 March–1 April 2021 (online)

269. Tenth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), 28 and 30 September 2021 (online)

270. Fifteenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XV), 24–25 February 2022 (online)

271. Quinta Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), 15 de noviembre de 2021 (En línea)

272. Sixteenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XVI), Paris, 2–3 March 2023 ***(Executive Summary in English, French, Russian and Spanish included)***

273. Sexta Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), Heredia, Costa Rica, 24 de abril 2023 ***(Executive Summary and recommendation in English included)***

274. Fifth Session of the IOC Group of Experts on Capacity Development (GE-CD), Paris, 27–29 February 2024

275. Twelfth Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (WG-SCS), Jakarta, Indonesia, 7 & 8 November 2024

276 Eighteenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XVIII), Paris, 24–25 March 2025 ***(Executive Summary in English, French, Russian and Spanish included)***