 unesco Intergovernmental Oceanographic Commission	MEETING OF THE INTER-ICG TASK TEAM ON DISASTER MANAGEMENT AND PREPAREDNESS INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (IOC)- UNESCO
	27 - 28 February 2023 - Hybrid

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

Harkunti Pertiwi Rahayu (Chair)	ICG/IOTWMS	Denis Chang Seng	IOC Secretariat / TT- DMP Secretariat / ICG/NEAMTWS/NEAMTIC
Laura Kong	ITIC, ICG/PTWS	Jamel Ben Abdallah	CoastWave Project Consultant
Ardito Kodijat	IOTIC, ICG/IOTWMS	Regina Khanbekova (Observer)	UNDRR/ Invited Guest
Cecilia Valbonesi (Online)	ICG/NEAMTWS	Silvia Chacón- Barrantes (Observer)	ICG/ CARIBE-EWS
Marinos Charalampakis (Online)	ICG/NEAMTWS	Ignacio Aguirre Ayerbe (Observer) (Online)	ICG/NEAMTWS
Christa von Hillebrandt- Andrade	ICG/CARIBE-EWS	Alejandro Rojas Aldana (observer)	ICG/NEAMTWS/ NEAMTIC
Alison Brome	CTIC; ICG/CARIBE- EWS		
Derya Vennin	ICG/NEAMTWS /CoastWave Project		

1. TT-DMP SESSION ORGANIZATION

Logistics, participants, agenda

Dr Harkunti Pertiwi Rahayu, the new Chair of Disaster Management and Preparedness Task Team (TT-DMP), opened the meeting and warmly welcomed all members, observers and participants of the TOWS-16 Task Team on Disaster Management and Preparedness (TT-DMP) meeting. She asked participants to introduce themselves including those participating online.

Dr Denis Chang Seng, IOC Programme Specialist and Technical Secretary supporting TT - DMP briefed the group regarding documentation and meeting logistics. All members were encouraged to contribute to the online Google summary report document. Dr Seng reported that Mr David Coetzee and Ms Ashleigh Fromont will not be able to participate due to the current situation regarding cyclone impact in New Zealand.

The Chairperson then introduced the provisional agenda. The Group examined and adopted the TT - DMP Agenda with the addition of one agenda item on the Ten-Year Research, Development and Implementation Plan for Ocean Decade Tsunami Programme (ODTP).

2. REFLECTION ON TT- DMP RECOMMENDATIONS TO TOWS-WG XV (2022)

The Chairperson and meeting participants reflected on the recommendations of the Task Team to the TOWS WG 15 session. It was pointed out that several recommendations have been addressed, including the translation of the IOC Manual Guide 86 Multi-Annual Community Tsunami Exercise Programme: Guidelines for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions into French and Spanish. It was noted that the TT-DMP will need to consider a mechanism to equate tsunami preparedness programmes in other countries that will not be implementing UNESOC/IOC Tsunami Ready Recognition Programme to UNESCO-IOC Tsunami Ready. The mechanism will be discussed under sub-agenda 3 on tools aligned with TR indicators (non-implementation of TRR) to be presented by Ms Christa von Hillebrandt- Andrade.

The Group noted that updated TORs of the IOTIC were approved by the ICG/IOTWMS at its 13th session, which took place in Bali from 28 November to 1 December 2022. The ITIC reported that ICG/PTWS-XXIX.4 (December 2021), mandates the International Tsunami Information Center (ITIC) to facilitate implementation of and documentation for IOC-UNESCO Tsunami Ready Recognition Programme and other similar initiatives in the PTWS.

3. TSUNAMI READY MANUAL, GUIDES AND SUPPORT TOOLS

The Chairperson introduced agenda 3 and the sub-agenda items.

- ***UNESCO IOC Tsunami Ready Guidelines***

The meeting noted that there are no new updates concerning UNESCO IOC Tsunami Ready Guidelines MG 74. The Group noted that MG 74 is under implementation in all four ocean basins. In addition, Dr Denis Chang Seng reported that MG 74 is currently being implemented in CoastWAVE project countries. The experiences in the NEAM region will be reported to the

TOWS Task Teams for consideration in any future revision of the Manuals and Guides 74.

- ***Tsunami Ready (TR) Communication Tools***

Mr Ardito Kodijat and Dr. Laura Kong reported that there are no new Tsunami Ready Communication tools from the Indian Ocean and the Pacific beyond those reflected in the M G 74.

- ***Tsunami Ready Procedures and Workflow***

Ms Christa von Hillebrandt reported that CARIBE EWS are updating a questionnaire to receive feedbacks from the communities as they become recognized as Tsunami Ready. She enquired if other regions are doing the same.

Mr Ardito Kodijat reported that in the Indian Ocean they do not have questionnaires for feedback. However, the Tsunami Ready Recognized communities are requested to submit an annual report to update and monitor the progress. This annual report also helps to ensure there is a continuation and sustainability of the implementation of TRRP in the TR communities. The annual reporting is similar to the form the community submitted in their first application. He noted that annual reporting is not part of M & G 74, but it is very useful for the continuation of work and renewal of TRR communities. The form is also useful as it helps to identify if there is a need for external assistance and what kind of support is needed at the national and local level for implementing TRR.

Dr Denis Chang Seng reported that it is very likely that surveys will be conducted as part of potential Phase 2 of the CoastWAVE project in the NEAM TR communities. In particular, there is an interest to also assess how risk perceptions have changed after the project intervention.

Dr Laura Kong pointed out that in the absence of official communication documents e.g., Official Letter and no established NTRB, there is potential for confusion in countries. She noted that several PTWS countries are watching and planning, but lack concrete actions yet. She emphasized the importance and timeliness of establishing the NTRB.

Dr Denis Chang Seng reported that in the NEAM region, aside from Italy, all project countries implementing TR established their NTRB midway through the process, and that the NTRBs generally have a focused role compared to other regions. However, it should be noted that it is likely that the roles of NTRB in the NEAM region may expand in the future, and that countries will learn from each other how to establish NTRB earlier during the process.

Recommendations to TOWS-WG

Welcomes the development of a questionnaire in the Caribbean to receive feedbacks from the UNESCO IOC Tsunami Ready communities on their implementation process;

Recommends CTIC to share UNESCO IOC Tsunami Ready survey questionnaire and feedback forms on implementation process to receive information from the UNESCO IOC Tsunami Ready communities.

- **Update on Tsunami Ready Interactive Map Viewer**

Dr Laura Kong provided an update of the Tsunami Ready Map Viewer and Tsunami Ready website. Work is in progress to improve the organization and timeliness of documentation updates. She pointed out the challenges of the TR Map viewer for countries with many Tsunami Communities.

The Viewer groups TR communities by country and is not able to show all communities in a region at the same time, and so could provide a misleading representation of regional tsunami readiness. Member State feedback has continually noted that the TR Map viewer is not up to date. Several communities who had already submitted applications are waiting to be included in the TR Map Viewer.

Secretariat confirmed that Mr Angelos Haidar, TSU Programme Assistance is now responsible, on an interim basis, for the TR Database following the departure of Mrs Esmeralda Borja as Project Assistant.

The meeting noted that based on guidelines and best practices for example from the Indian Ocean and other regions, the Secretariat only processes applications when TRRP is completed. The TR web site, hosted by the ITIC, stands up a community web page after the Secretariat confirms that TR application is completed.

Recommendations to TOWS-WG

Requests the Secretariat to provide a timelier update of the UNESCO IOC Tsunami Ready database.

- **What is a community?**

Ms Christa von Hillebrandt addressed the question concerning what a community is in the context of Tsunami Ready. This is important for the implementation of Tsunami Ready and the Ocean Decade Tsunami Programme and its goal of “100% of at-risk communities are prepared for and resilient to tsunamis through programmes like Tsunami Ready.”

Tsunami Ready is a performance-based community recognition programme. Therefore, the selection of the appropriate community is key for the implementation and sustainability of the programme. Nevertheless, there are many different interpretations of what defines a “community”.

Among the many definitions, for Tsunami Ready, it would be most appropriate to use those that have an identifiable geographical boundary, either administrative/political boundaries and/or disaster management areas of responsibility. In addition, it is important that the communities perceive the risk for greater engagement in the implementation of Tsunami Ready. Another consideration is that the community has an established authority to apply for recognition and existing resources to implement and sustain it.

Mr Ardito Kodijat reported that in the Indian Ocean, clear boundaries (administratively or natural boundaries), the size of the community, and the characteristics of the community (rural, urban, agriculture, industrial, tourism, etc.) are key elements to consider when identifying TR communities.

The group also discussed strategies on how to best implement Tsunami Ready, e.g., use of flow charts, worksheet of activities and flyers to implement, identify target communities and achieve each TR Indicator. It was noted that implementation may be different depending on geographical and administrative differences, the size of the population, the characteristics of the communities (agriculture vs touristic), and interest of the national civil protection agencies.

Recommendations to TOWS-WG

Recommends developing additional implementation guidance documents to support the implementation of Tsunami Ready.

- ***Tsunami and Critical Infrastructures***

Dr Harkunti Pertiwi Rahayu delivered a presentation on tsunamis and critical infrastructures as an important aspect of mainstreaming DRR and to respond SFDRR global target in “*reducing disaster damage to critical infrastructures and disruption of basic services, among them health and educational facilities, including through developing their resilience*”. Resilient critical Infrastructures are important for building tsunami resilience. Key lessons learned for example in Indonesia include airport and Air Traffic Control impacted by earthquakes and tsunami. Other country examples include collapsed bridges and damaged power plants leading to radiation leakage, and contamination. It is important to build resilient critical infrastructures, including airports and ports to facilitate *swift recovery*. Thus, prevention and structural mitigation are significantly important to complement preparedness and response. Initiatives in Indonesia to promote resilient infrastructures include Airport Ready to Tsunami.

Dr Denis Chang Seng noted that a lot of resilience emphasis is placed on the robustness of critical infrastructures, to minimize and prevent failures. However, critical infrastructure resilience also includes redundancy and rapid restoration time respectively when a system is unable to accommodate and absorb shocks.

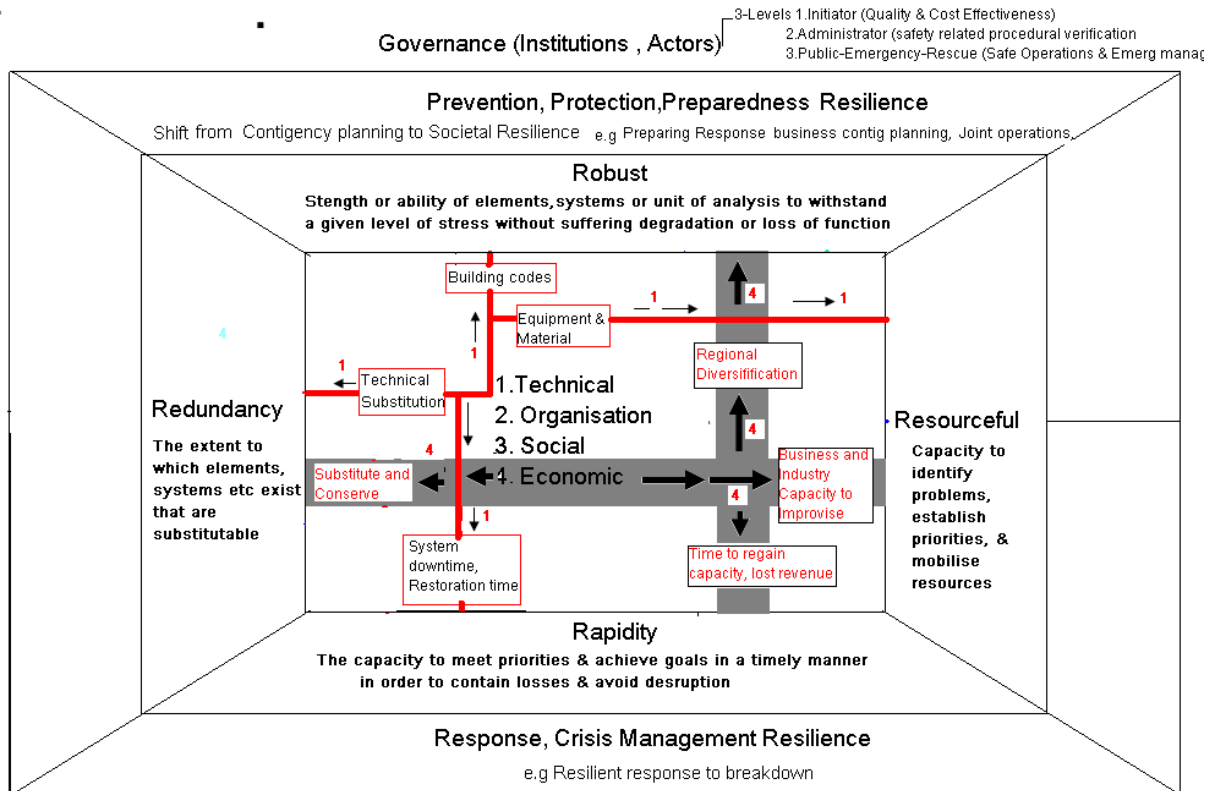


Figure 1. Typology of resilience in the context of critical infrastructure Source Embrace Project 2012

○ ***Making Cities Resilient (MCR2030)***

Dr Denis Chang Seng provided a report on the progress made towards developing partnership and future opportunities concerning Making Cities Resilient (MCR2030). Making Cities Resilient 2030 (MCR2030) is a unique cross-stakeholder initiative with the following aims:

- Improving local resilience through advocacy, sharing knowledge and experiences,
- Establishing mutually reinforcing city-to-city learning networks,
- Injecting technical expertise,
- Connecting multiple layers of government and building partnerships

He reported that he has registered IOC UNESCO as an official partner of MCR2030. The next step is to include the core business and activities of the Tsunami Resilience Section on the MCR2030 DashBoard. In particular, it is important to highlight UNESCO IOC Tsunami Ready Recognition Programme. A list of cities and partners have joined the MCR2030, and it provides a space to match common interests and needs.

In terms of contributions from TSU Resilience Section, he suggested that all TICs join the MCR2030 DashBoard so that they can receive information about activities and meetings organized. Many activities are apparently concentrated in SE Asia and European cities. Webinars are frequently organized to help stakeholders understand how to get involved and learn more about the Sendai Framework Voluntary Commitment process. He stressed that contributing to MCR2030 is an additional effort for the Tsunami Programme but is mutually reinforcing.

- **Hotel Resilience**

Dr Bijan Khazai, CEO of Hotel Resilient (<https://hotelresilient.org/>) presented the Hotel Resilient Programme. Hotel Resilient is a benchmarking and certification of hotels and resorts for disaster risk management (multi-hazard including tsunami) and climate change adaptation based on assessment, resilient planning, design, and operations for hotels. They support hotels from the design of crisis management systems to the implementation of protocols, facilitation of training, and completion of audits towards a certification. It was noted that they have a global tsunami risk model at a 10 km scale resolution.

- **Tsunami Response Plan for Hotels in Waikiki**

Dr Laura Kong shared the tsunami response plan example for a major hotel in Waikiki, Hawaii, United States. The plan is available for sharing as a general template, or example, for tsunami response by a large business or hotel. The plan calls for vertical evacuation to the 4th floor or higher in steel-reinforced concrete buildings higher than 10 floors. The Response Plan is developed and maintained by the hotel security department and documents the standard operating procedures to be done by all hotel staff (front desk, security, etc.) during a tsunami warning. The plan is not posted to the hotel web site but is practiced by the hotel employees regularly. It contains information on tsunami terminology, alert system, protocols for hotel and guest notification, tsunami inundation and evacuation maps, action steps, vertical evacuation plans, tsunami flood secure procedures, and post tsunami flood procedure.

The plan contains a map of sea level stations and travel times. The hotels are notified by the Pacific Tsunami Warning Center (PTWC). The guests are notified by sirens at least 5 hours before the tsunami arrival time, and the hotel manager on duty will make a Public Address (PA) announcement explaining the situation. Hotel guests will need to vertically evacuate four floors or higher. Vertical evacuation plans are designed for local events (immediate action) and events outside of the inundation zone.

ITIC noted that the TT-DMP had previously discussed and elaborated on existing materials for hotel tsunami response, including the availability of “A guide to tsunamis for Hotels” (Manuals and Guides 69) in 2012, and the 2013 ITIC “Tsunami Response Workshop for Businesses: Preparing hotels and businesses for the next tsunami: Tsunami Response - Guidance and Templates, Resource Documents” (2013, http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1877:tsunami-response-training-for-businesses&catid=2128&Itemid=2557).

Within the United States, its TsunamiReady program includes TsunamiReady supporters and TsunamiReady champions to recognize significant outstanding involvement/support in TR implementation by individuals and for stakeholders (e.g., hotels) that have taken additional steps to be prepared for tsunamis. These are in addition to TR communities.

Recommendations to TOWS-WG

Recommends to prepare a guideline for critical infrastructures from tsunami impacts e.g., AirportGetReady to Tsunami;

Recommends that TICs join the MCR2030 to explore potential regional and city interest and opportunities in tsunami preparedness and UNESCO IOC Tsunami Ready Recognition Programme;

Recommends to update the Tsunami Hotel guide (IOC Manuals and Guides 69) developed by NEAMTWS in 2012 to include the ITIC materials and other recent documents, and translate in other languages, including other lessons learned;

Further recommends to consider for the future to integrating into the UNESCO IOC Tsunami Ready Recognition Programme other options to recognize entities other than Communities.

- ***Inclusion of Other National Programmes and Initiatives in the UNESCO IOC Tsunami Ready Recognition Programme (Non-implementation of TRR)***

Ms Christa von Hillebrandt introduced the topic of how countries with strong existing tsunami programmes for tsunami preparedness can be addressed in the UNESCO IOC Tsunami Ready Recognition Programme, noting that the UN Ocean Decade Tsunami Programme's goal is that 100% of communities at risk from tsunami should be prepared and resilient by 2030.

In the Pacific and Caribbean, the ITIC noted that there are a number of countries that already have strong preparedness programmes, such as Japan, USA (Caribbean and Pacific), Chile, New Zealand, and Australia. For such countries, starting a UNESCO IOC Tsunami Ready Recognition Programme would be duplicative and burdensome, in addition to being costly.

Recognizing this,

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Noting that some Member States already have similar tsunami hazard mitigation programmes in place that **encourages** Member States to apply other programmes, to confirm alignment with the twelve UNESCO IOC Tsunami Ready Indicators in relevant communities and report outcomes;

Requests Working Group 3 to explore, in cooperation with the TOWS Task Team on Disaster Management and Preparedness, ways to recognize communities that choose not to implement the UNESCO IOC Tsunami Ready Recognition Programme, as compliant with the Tsunami Ready indicators,

New Zealand has begun to consider this issue, using the concept of “cross-crediting” National programme indicators with those of the UNESCO IOC Tsunami Ready Recognition Programme to align and ensure the same degree of readiness in the TR “Assess, Prepare, Response” indicators.

The meeting noted that the ICG/PTWS Steering Committee will meet next week in Paris, 6-9 March 2023 to further discuss the issue, and New Zealand will further elaborate on their progress, and the ICG/PTWS-XXX Session will meet in September 2023 in Tonga.

Mr Ardito Kodijat raised the question who will decide if a national programme and or initiatives are similar to UNESCO IOC Tsunami Ready and contributes to the goal of 100% of at-risk communities prepared for and resilient to tsunami.

For these initiatives, the Tsunami Ready Map Viewer could use different colors or symbols to distinguish the different initiatives.

Recommendations to TOWS-WG

Appreciates the progress by the PTWS concerning exploring mechanisms of how to include other tsunami preparedness and readiness programmes and initiatives in the UN Ocean Decade Tsunami Programme “tsunami readiness” goal.

Recommends ICGs to explore and inform on mechanisms for recognition of UNESCO IOC Tsunami Ready similar standards already in place in some countries;

4. IMPLEMENTATION STATUS OF TSUNAMI READY PILOT PROGRAMMES, PROGRESS AND CHALLENGES

○ **ICG//NEAMTWS**

Ms Cecilia Valbonesi reported on the recent developments concerning piloting Tsunami Ready in three municipalities (Palmi, Marzanemi, and Minturno) in Italy.

Dr Derya Venin reported on the progress of the IOC DG ECHO project, “Strengthening the Resilience of Coastal Communities in the NEAM region to the Impact of Tsunamis and Other Sea Level-Related Coastal Hazards” or “CoastWAVE”. The project is implementing Global Tsunami Ready Standards and Guidelines and Tsunami Ready Recognition Programme (TRRP) at 7 communities in 7 countries: El Jadida (Morocco), Chipiona (Spain), Alexandria (Egypt), Marsaxlokk (Malta), Larnaka (Cyprus), Samos (Greece) and Istanbul, (Turkey). A first regional training workshop in NEAM region on Standard Operating Procedures (SOPs) was co-organized by IOC UNESCO and the Joint Research Centre of the European Commission (EC-JRC) in Ispra, Italy 2022. A second online training workshop on TRRP was organized mainly for project countries with the aim of providing the knowledge and tools to better implement UNESCO IOC TRRP. The training was facilitated by the support of IOTWS.

Dr Denis Chang Seng provided an overview of the status of TR implementation in the seven project CoastWAVE countries across all the twelve indicators. There is good progress of implementation for most of the Assessment, and some of the Preparedness and Response Indicators of Tsunami Ready. Overall, 70 % of indicators can be considered as work in progress. The response indicator on emergency operations plan (EOP) is still the least progress indicator subject to the development of national and local SOPs. It is to be noted that most countries have established a National Tsunami Ready Board

● **ICG/IOTWMS**

Mr Ardito Kodijat reported on the progress in implementing TRR in the Indian Ocean. In 2022 there were nine TRR communities in Indonesia. There is no additional TRR community in India. Therefore, there is a total of 11 TRR communities in the Indian Ocean. Maldives as a SIDs has indicated interest to start the TRRP in 2023. He presented several lessons learnt from Indonesia; one concern is on the Tsunami Ready signage to be used in communities who do not have higher ground (far inland) to evacuate to. The Tsunami Ready signage has been designed for people who need to evacuate to vertical evacuation buildings. The meeting noted the importance of building codes and structural checks by mandated authorities (Public works in Indonesia). The meeting agreed to use simple message such as “*go to the designated building for vertical evacuation*”.

- **IGG/PTWS**

Dr Laura Kong of ITIC reported on the progress of Tsunami Ready implementation in the ICG/PTWS. There has been official recognition (all under the pilot programme) of 10 communities in 4 countries (Honduras; El Salvador, Costa Rica, and Samoa); confirmation of plans to become recognized in 1 community (Panama); and progress in the implementation in 14 communities from 6 countries (Ecuador, Costa Rica, Marshall Islands, Federated States of Micronesia). Recognition is expected to be completed in the latter 14 communities by end of 2023 or early 2024.

A total of 5 Member States have expressed interest to implement Tsunami Ready: Vanuatu, Solomon Islands, Tonga, Samoa, and France (French Polynesia and Caledonia). Most countries have already achieved some of the TR indicators. Implementation will be done in a multi-hazard context where there already exists Community Based Disaster Risk Management Programmes (some in place since 2010), or Community Climate and Disaster Risk Management Programmes (for example, since 2015).

The ITIC and IOTIC conducted a 3-day Regional Tsunami Ready Training for the Pacific Island Countries and Territories (PICT) from 30 January to 1 February 2023, bringing together 11 countries and participants from disaster management offices, tsunami warning centres, and geological services. Training materials were based on materials developed for the Ocean Teacher Global Academy Tsunami Ready training that had been used in the Indian Ocean. Following, the PICT TR training materials were shared to the NEAMTWS who conducted an adapted NEAM Tsunami Ready training under the COASTWAVE Project.

PTWS TR funding for implementation has been or will be a combination of national resources and donor support (DIPECHO, USAID, SPC, NORAD (Norway), AUSAID, UNDP, UNDRR).

- **ICG/CARIBE-EWS**

Ms Alison Brome reported a total of 15 communities from 12 countries have been recognized as TR in the Caribbean. Renewals discussions have started in 2 communities in Grenada and 1 in Anguilla. There are pending discussions for renewals to be initiated in 2 communities from Nicaragua, 3 from Honduras (2 in Caribbean and 1 in Pacific), and 1 from Haiti.

In addition, projects are contributing to the implementation of Tsunami Ready mainly: 1). Strengthening capacities for tsunami early warning in Grenada; 2). Towards a safer ocean in the Caribbean through tsunami-ready communities (NORAD project communities in Barbados, Jamaica and Trinidad and Tobago); 3). UNESCO-IOC EWS Dominican Republic; and 4). and ITIC-CAR USAID/BHA project in four communities (Barbados, Dominica, Saint Lucia and Saint Vincent and the Grenadines, Dominica)

The hiring of local and/or national consultants to work with the community is a learned best practice.

- **Other Challenges**

The meeting also discussed the challenges in the TR renewal process. Commonly the renewal has taken a similar level of resources and engagement as the initial recognition process. The conduct of tsunami exercises and education/awareness activities regularly support the sustainability for Tsunami Ready communities. Ardito Kodijat highlighted that in the Indian Ocean, the TRR community is required to submit an annual report to update their activities, the progress, and improvements. The annual report helps to check if there is sustainability of the Tsunami Ready in the community.

The meeting also discussed and noted the challenges in the TR application process as this requires a significant amount of document submission and processing, which is time consuming and requires human resources. The meeting noted that much of the submission process could be done through online tools and automatic file processing.

Recommendations to TOWS-WG

Appreciates continued progress in the implementation of UNESCO IOC Tsunami Ready in the Caribbean regions, the Indian Ocean, the Northeast Atlantic, Mediterranean and connected seas and Pacific Ocean;

Recommends additional guidance to be provided by UNESCO IOC on the renewal process of UNESCO IOC Tsunami Ready Recognition Programme and TICs to organize an online meeting on the renewal of UNESCO IOC Tsunami Ready Recognition Programme;

Notes the importance to properly inform the public on the validity of the recognition, currently indicated on the UNESCO IOC Tsunami Ready Recognition signage and certificate under the UNESCO IOC Tsunami Ready Recognition logo;

Notes the new tsunami signage developed by IOTIC for vertical evacuation when there is no high ground and/or could not go inland;

Recommends the development of standard text in the UNESCO IOC Tsunami Ready signage for vertical evacuation and request the TT DMP members to take stock of its region for discussion at next TT meeting;

Request Secretariat to explore and implement more efficient ways in which to process the UNESCO IOC Tsunami Ready application and renewal system, such as through automation.

5. TRAINING AND GUIDANCE

- **IOC Ocean Teacher Global Academy: ITIC and Indonesia BMKG as OTGA STC – reports (via IOTIC)**

Dr Laura Kong provided an update on the progress of the ITIC training courses under the IOC Ocean Teacher Global Academy (OTGA) platform. The courses will cover: Tsunami Awareness; Tsunami Early Warning Systems; Tsunami Evacuation Maps, Plans and Procedures; Tsunami Warning Center and Emergency Management Response SOPs; and

Tsunami Warning Center Competencies.

The Tsunami Awareness course is close to complete. The challenge has been to create a self-paced interactive online course. Currently, there is a need to update tsunami hazard maps to 2022 and to conduct a test of the course before going live. The course will be self-paced, without interaction of a trainer. Students will take a post-test, and if they pass, will receive a Certificate of completion. Tsunami Awareness course completion will be a pre-requisite for all subsequent OTGA tsunami courses.

Mr Ardito Kodijat reported that the Tsunami Ready training under the OTGA platform is still ongoing. All presentations for the training materials are already developed. These materials were tested in a number Tsunami Ready events in the different regions such as the Indian Ocean Tsunami Ready Workshop in November 2022, the Pacific Island Countries and Territories Tsunami Ready Training in January 2023, the Fiji National Tsunami Ready Training in February 2023, and in the CoastWAVE Tsunami Ready Workshop in February 2023. The IOTIC also conducted online training for Indonesian Tsunami Ready facilitators between January and February 2023 with the objective to try out the presentations in terms of duration, and to develop quizzes for the lectures, and assignments.

Based on these testing, the Tsunami Ready OTGA training can be simplified from the initial plan to have three courses and three modules: Tsunami Ready Training for Decision Makers and Community and Training for Tsunami Ready Facilitators with two courses: Introduction to Tsunami Ready and the Indicators and Facilitating Tsunami Ready.

Mr Ardito Kodijat suggested that to move forward with the Tsunami Ready OTGA training, it would be ideal for a small group of Tsunami Ready practitioners from different regions to work together in order to allow maximum inclusion of global examples of TR activities. Dr Laura Kong confirmed that it may be more productive for a small group to meet in person to finalize the OTGA training documents (modules, activities, tests, resource materials, etc.). At a minimum, the IOTIC and ITIC plan to closely collaborate to finish the OTGA Tsunami Ready course in the next six months.

Appreciates efforts of the Indian Ocean Tsunami Information Centre (IOTIC) and International Tsunami Information Centre (ITIC) in preparing Tsunami Awareness, UNESCO IOC Tsunami Ready and Tsunami Evacuation Maps, Plans and Procedures (TEMPP) training through the Ocean Teacher Global Academy (OTGA) platform and hybrid training workshops and training videos.

Requests the finalization of the OTGA basic tsunami training materials as soon as possible to support the UNESCO IOC Tsunami Ready Recognition Programme.

Requests Secretariat to facilitate the organization of a UNESCO IOC Tsunami Ready expert meeting to finalize the OTGA Tsunami Ready training programme.

- **Tsunami in School Programme**

The meeting reported that there is no new development concerning tsunamis in the school programme. Mr Ardito Kodijat highlighted that the request to compile educational materials has already been completed.

6. WTAD 2022

Ms Regina Khanbekova (UNDRR), reported that World Tsunami Awareness Day 2022 advocated reducing tsunami risk globally through increasing access to early warning systems. The UN Secretary-General, Antonio Guterres launched the Early Warnings For All Action Plan (EW4ALL) to achieve early warning for all in 5 years. This will save lives and protect livelihoods. In addition, the UNDRR event in New York on “Early Warning and Early Action Before Every Tsunami” served to build partnerships and leverage data to ensure no one is left behind, and minimize the risks posed by tsunamis and other hazards.

Citizen engagement to build a culture of the tsunami and other coastal hazards awareness for all the people at risk took place with the conduction of the #gettohighground public-facing campaign, where citizens participated in fun walks of tsunami evacuation routes at the local level. The campaign was supported by Member States such as Indonesia, Samoa, Ecuador, the Cook Islands, Portugal, and Mauritius. Approximately 4000 people participated. It was noted that for some communities, the option to go to higher ground is not feasible, and in this case “GetToHighPlace” may be more relevant and inclusive”.

For the 2023 campaign, the theme will focus on fighting inequality for a resilient future. It inspires to engage with more Member States, Making Cities Resilient (MCR) 2030, and advocate decision makers on the importance of EWS coverage using strategic communications, and through a series of events in partnership with Japan to promote the World Tsunami Museum Conferences. WTAD 2023 will maintain the strong synergy between partners such as UNESCO-IOC, WMO and UN System.

Ms Christa von Hillebrandt suggested that for WTAD, UNDRR also consider promoting the hashtag #tsunamiready and that for exercises like CARIBE WAVE, the UNDRR hashtags also be used.

Mr Ardito Kodijat raised the question on how to engage with UNDRR regional office to strengthen the collaboration on organizing WTAD in the different regions.

TICs, TT-DMP representatives reported on the key activities and achievements of WTAD 2022.

ICG/NEAMTWS

Ms Cecilia Valbonesi (NEAM) reported that Sesimbra, Portugal participated in the “*gettohighground*” campaign. The Secretary of State for Home Affairs Ms Patricia Gaspard participated. To celebrate its 10 years in operations, KOERI organized a WTAD Tsunami Drill Exercise on 4 November 2022 in the CoastWAVE project municipality of Büyükçekmece. The tsunami drill exercise was followed by an exercise evaluation meeting and a Tsunami Early Warning and Risk Mitigation Workshop on 5 November. Italy also conducted exercises and activities in the three pilot Tsunami Ready communities. A video on [tsunami risk in the Mediterranean](#) was also prepared jointly with the UNDRR.

ICG/IOTWMS

Mr Ardito Kodijat reported that Indonesia organized a Tsunami Fun Drill on the World Tsunami Awareness Day in the nine villages recognized as UNESCO IOC Tsunami Ready. A total of 3500 people including people with disabilities participated. In addition, the tsunami fun drill also involved two airports and 12 hotels located in the Tsunami Ready community villages.

ICG/PTWS

Dr Laura Kong summarized the contributions of the PTWS to the WTAD 2022. These included numerous national activities, including the UNDRR - UNESCO IOC video on the [Tsunami in Tonga](#), and the SPC DRR Senior Advisor participation to the global Early Warning Early Action Before Every Tsunami Webinar on 4 November 2022 in Bangkok.

Previously, the UNDRR-UNESCO IOC WTAD short videos on joining the Global Tsunami Ready Community in the Pacific have been featured: Tonga (2022), New Zealand and Solomon Islands (2021), Costa Rica, New Zealand, Fiji, Philippines, Samoa, Tonga, Hawaii, and Vanuatu (2020). In 2021, the ITIC organized Tsunami Ready 'shout-outs' (Be Aware, Be Prepared, Be Tsunami Ready) by PTWS countries in the Western Pacific, Pacific Islands, and Eastern Pacific.

Since 2016, the ITIC has summarized tsunami activities and the UNDRR-UNESCO IOC short videos through dedicated web pages at:

http://itic.ioc-unesco.org/index.php?option=com_content&view=category&layout=blog&id=2262&Itemid=2782

Caribe-EWS

CTIC collaborated with UNDRR for the development of a video highlighting how countries and communities help prepare for tsunami risk in the Caribbean (<https://youtu.be/XbV1bV0JHdM>). In addition, ITIC-CAR participated in the UNDRR Americas Office launch of the documentary "Forget me Not" on the unexpected friendship between a survivor in Japan and a couple in Alaska who found and returned a tsunami debris.

Recommendations to TOWS-WG

Notes the activities undertaken by the respective regions for WTAD 2022, and as part of this, the strong engagement in the #GetToHighGround initiative, and the success achieved through the United Nations Disaster Risk Reduction (UNDRR), and IOC collaboration;

Further notes to build connections with EW4ALL, Multi- Hazard approach and coastal risk and Making Cities Resilient (MCR2030);

Recommends continued collaboration between the UNESCO-IOC and the UNDRR, noting the 2023 WTAD theme will highlight the importance of fighting inequality for a resilient future

and activities will include continuing the #GetToHighGround initiative and the #TsunamiReady to engage citizens on tsunami awareness. The theme aligns closely with the current focus of the TOWS-WG in the context of the UN Ocean Decade, The Mid-Term Review of the Sendai Framework, and action to accelerate the implementation of the Early Warnings for All (EW4All) initiative to ensure everyone on earth is covered by MHEWS in the next four years, prioritizing the most at-risk communities.

The Group **requested** the UNDRR to strengthen collaboration with respective ICGs and corresponding TICs and use the hashtag #TsunamiReady.

7. TEN YEAR RESEARCH, DEVELOPMENT AND IMPLEMENTATION PLAN FOR THE OCEAN DECADE TSUNAMI READY PROGRAMME

Ms Christa von Hillebrandt reported on the Ten-Year Research, Development and Implementation Plan (RDI) for the ODTP. The plan is developed and structured in the following four key chapters.

1. Risk Knowledge
2. Warning and Dissemination and communication
3. Preparedness and Response
4. Implementation and Mitigation Measures- including urban planning

The ODTP Research, Development and Implementation Plan overarching considerations include a focus on Capacity Development – ensure investment in capacity development for the different stakeholders including the generators and the users of the tsunami early warning system and governance, including the connections with Decade Programmes, Projects, Contributions, Decade Coordination Centres and Communities of Practice:

- Multi-hazard framework – UNDRR, Early Warnings for All
- International Cooperation – Scientific Committee, TR Coalition
- Inclusiveness, gender diversity and youth involvement
- Accountability

The document includes pathways to implementation through the IOC Programme, countries/Member States, ICGs and its TICs. It is important to highlight and clarify the essential role and contributions of TICs for implementing TR, as well as TSPs and Working Groups within the ICG framework. It was noted that TICs are currently not explicitly mentioned.

Recommendations to TOWS-WG

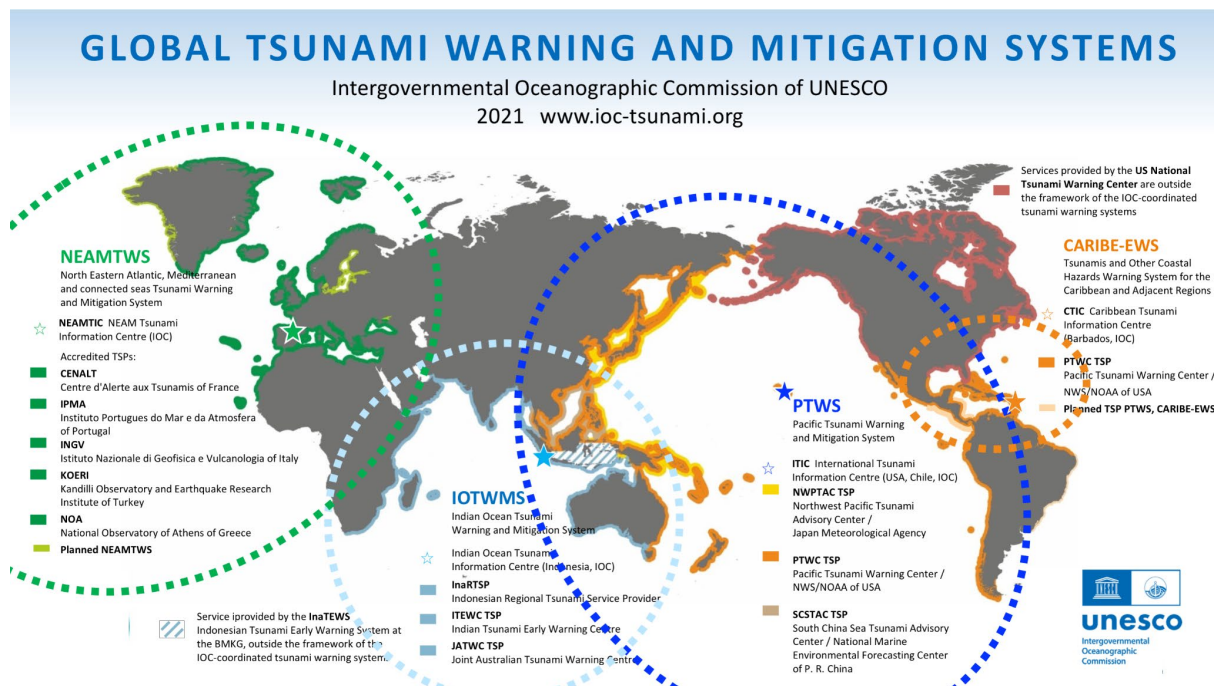
Noted the absence of the Tsunami Information Centers in the governance sections, especially for its important role in facilitating the implementation of the UNESCO IOC TRRP as a key contributor to the UNOD,

Recommends to expand and explicitly state the role of the ICGs, their Working Groups, Tsunami National Contacts, National Tsunami Warning Centers, Tsunami Warning Focal Points, Tsunami Service Providers, and Tsunami Information Centres in the Governance and Implementation chapters of the ODTP RDI.

Recommends work with relevant ICG Working Groups and Task Teams, in coordination with the Tsunami Information Centres, to propose mechanisms by which National tsunami preparedness and readiness programmes and initiatives will be able to fully participate and contribute to the UN Ocean Decade Tsunami Programme’s “100 percent of at-risk communities to be prepared and resilient to Tsunamis” goal.

Requests add the role of ICGs in their Terms of Reference as regional Steering Committees for the Ocean Decade Tsunami Programme;

Requests to include the map of the Global Tsunami Warning and Mitigation System map in the Governance chapter to clearly illustrate the components.



7. DISCUSS OUTCOMES OF THE JOINT MEETING

TT DMP discussed the meeting arrangement and the TT DMP and TT TWO Joint Agenda (see next pages) timetable, expressing that there was not enough time to fully and meaningfully discuss all the Agenda topics within the timetable provided.

Recommendations to TOWS-WG

Recommends organizing TOWS Task Team meetings over a full 3-days, with one full day on Joint agenda discussions.

8. OTHER BUSINESS

Dr Harkunti Pertiwi Rahayu provided a presentation on mainstreaming Disaster Risk Reduction in Urban Planning to respond to the global commitment, i.e., Sendai Framework for Disaster Risk Reduction, SDGs Goal no 11 building resilient cities, and Paris Agreement and strengthening one of the UN ODTP targets on mitigation. Mainstreaming disaster risk reduction into development plans is the key to preventing systemic disaster impacts on development. Mainstreaming DRR is a cross-sectoral development effort that is currently being pursued globally since 2007, through addressing disaster risk reduction in medium-term strategic development frameworks, legislation and institutional structures, sector strategies and policies, budgetary processes, as well as design and implementation of individual development programs/projects.

Recommendations to TOWS-WG

Notes the importance of mainstreaming disaster risk reduction in urban planning and development is a key to preventing systemic disaster impacts, and that this is a cross-sectoral effort,

Recommends TT-DMP to share the information to its ICGs to obtain feedback and guidance on whether to prepare a global guideline for mainstreaming tsunami disaster risk reduction for coastal urban development planning.

9. DEVELOP TT DMP WORK PLAN

The TT DMP discussed the drafting of the TT DMP summary report and the contributions of members to the online Google document to facilitate reporting on Thursday 2 March to the TOWS WG.

10. MEETING CLOSE

The chair invited any final comments. She closed the TT DMP meeting at 6:15pm (CET).



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

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION UNESCO

27 - 28 February 2022 – Hybrid

JOINT TT TWO AND TT DMP SESSION

1ST JOINT TT TWO AND TT DMP SESSION AND OPENING (CHAIRIED BY PROF HARKUNTI PERTIWI RAHAYU AND MR YUJI NISHIMAE)

J1 WELCOME & INTRODUCTION

Mr Bernardo Aliaga, Head of Tsunami Unit welcomed all participants to the joint opening session of the UNESCO-IOC Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG) task teams. This is the first face-to-face meeting of the Task Teams following two-years of meeting online due to COVID. Today marks the commemoration of the 27 February 1960 Chile earthquake and tsunami. Mr Aliaga highlighted the progress since the ITSU (International Tsunami Warning System in the Pacific) was established by IOC in 1965 and the subsequent establishment of the four Intergovernmental Coordination Groups (ICGs) in 2005 following the 2004 Indian Ocean Tsunami for the Indian Ocean, Pacific, Caribbean and Adjacent Seas, NE Atlantic & Mediterranean Seas. The global tsunami warning and mitigation system and its four ICGs have advanced implementation through the work of their task teams and working groups, allowing the expansion and efficiency of the system. Through this time, the development of global standards has been overseen by the TOWS-WG. Looking forward to 2030, the Ocean Decade Tsunami Programme (ODTP) has two goals: 1) Improved timeliness and accuracy of tsunami warnings; and 2) 100% of at-risk communities are prepared for and resilient to tsunamis. Integration of tsunami warning and mitigation into the international development of the global Multi-Hazard Early Warning System (MHEWS) led by the World Meteorological Organization (WMO) is an ongoing focus.

The task team chairs, Dr Harkunti Rahayu (TT-DMP) and Mr Yuji Nishimae (TT-TWO) outlined the overall objectives of the overall two task team meetings, including this joint session.

Mr Yuji Nishimae, Chair of TT-TWO, recalled the experience of the Japan Meteorological Agency (JMA) in implementing its tsunami warning system. He congratulated Mr Aliaga on his promotion to Head of the Tsunami Unit at UNESCO-IOC. He recalled the Turkish earthquake on 20 February 2023 and expressed his sympathies to those affected by this devastating event. He called on the support of all participants for productive discussions.

Dr Harkunti Pertiwi Rahayu, Chair of TT-DMP, also congratulated Mr Aliaga on his promotion. She noted her attendance at her first meeting of the TOWS-WG and ongoing contributions as chair of the ICG/IOTWMS Working Group 1, Tsunami Risk, Community Awareness and Preparedness. She recalled the ODTP goal for tsunami resilient coastal communities. In conclusion, Dr Harkunti welcomed all participants and encouraged active discussion during the two task team meetings and joint session.

J2 WAVE EXERCISES AND SIGNIFICANT TSUNAMI EVENTS IN EACH ICG (share outcomes, lessons learned)

Dr Harkunti Pertiwi Rahayu and Mr Yuji Nishimae invited co-chairs and/or representatives of Tsunami Wave Exercises from each ICG to provide a short summary of recent exercises, share outcomes and lessons learnt, as well as significant events in each region.

WAVE EXERCISES

- ***ICG/CARIBE-EWS***

Dr Elizabeth Vanacore presented a report on the CaribeWave22 exercise. The CaribeWave22 exercise was conducted on 10 March 2022. It was composed of two earthquake and tsunami scenarios: Western Muertos Trough (south of Hispaniola) and Northern Panama Deformed Belt. The exercise results indicated that the Dummy (Start of Exercise) message was received by 34 Member States, representing 91% of the CARIBE-EWS Member States and Territories. There was a strong dependency on email for the reception of products from the PTWC. The exercise planning went well under extenuating circumstances, resulting in an 88% of satisfaction of Member States and territories, and a total participation of 413,285 people from the Caribbean.

The Caribe Wave23 exercise will take place on 23 March 2023. There will be two scenarios, one based on an earthquake in the Gulf of Honduras and second, for testing of volcano EWS, an eruption and flank collapse of Mount Pelée, Martinique.

- ***ICG/IOTWMS***

There was no update provided about the upcoming IOWave23 exercise.

- ***ICG/NEAMTWS***

Dr Marinos Charalampakis reported on the development concerning organizing NEAMWave23. The NEAMWave23 exercise is planned either between 30-31 October or 6-7 November 2023. There is a need to have a stronger engagement with the Civil Protection Agencies (CPAs). There is an interest to organize an online meeting between the CPAs and the European Civil Protection Mechanism ahead of the exercise. The TT-TE is preparing informative material (NEAMWave exercise concept papers, best practices, etc.) to share with the national CPAs.

There is an agreement among TSPs to implement two exercise scenarios:

1. North-eastern Atlantic: Conducted by IPMA (Portugal) and CENALT (France)
2. Mediterranean Sea: INGV (Italy), NOA (Greece), KOER (Turkiye).

A key aim of NEAMWave23 exercise is to engage with CoastWAVE Tsunami Ready communities. CoastWAVE project countries will need to decide if they will make the NEAMWave23 exercise an action or not.

- **ICG/PTWS**

Dr Laura Kong and Cdr Carlos Zuniga reported on the PacWave22 exercise. The exercise was organized between September - November 2022 with emphasis on regional cooperation in South America, South China Sea and Pacific Islands. The TSP live communication test took place on 13 October 2022 with the participation of 27 countries. All the TSPs that participated in the exercise sent messages according to procedures, 24 respondents reported to have received the message from PTWC correctly, 11 from NWPTAC, 7 from SCSTAC and 3 from CATAC.

The PICT regional exercise took place on 9 November 2022 with the participation of 18 Pacific Islands, countries and territories. The scenario was the Hunga Tonga Hunga Ha'apai (HTHH) volcanic eruption and tsunami of 15 January 2022. It consisted of a 2-hour live tabletop exercise to test the HTHH PTWC Interim Procedures and PTWS products, and whether the HTHH PTWS products are interpreted by PICT Member States accurately and in a timely manner, and the testing of live information sharing between countries of the region to test its efficacy and value. Controllers simulated four PTWC bulletins sent by e-mail using a Listserv (hosted by ITIC, same as that used for the Tsunami Bulletin Board) and through a WhatsApp group. The use of HF radio was also tested since post-HTHH. HF radio proved to be one of the few (the other being satellite phones) communication methods after the blackout. All information was immediately shared (no delay or review). Only 5 mails were not distributed because they were sent from an unregistered email into Listserv.

A PACWave22 PICT Cold wash debrief took place on 16 November 2022. Participants noted the email communication method as the most important for the Live TSP test. For the HTHH scenario, the PTWC products were understood and useful, and the live information sharing overwhelmingly endorsed as highly useful, with the greatest interest in sharing via Whatsapp communications in future exercises. It was noted that if Tonga had been able to share what was observed (seen) '*natural massive eruption warning signs*' and issued a national tsunami warning minutes later, this would have significantly helped neighboring countries in their tsunami warning decision-making.

As a further indication of its usefulness, the WhatsApp tool was used in 3 real events soon after, including one on which Tonga was only able to receive the PTWC messages through WhatsApp because their email server was down at that moment.

Cdr Zuniga shared information of the Southeast Pacific (South America) regional exercise, which consisted of two exercises.

Recommendations to TOWS-WG

Commends the PTWS Pacific Islands and Southeast Pacific for testing and enabling communication methods by which to share key tsunami information regionally to assist neighboring countries in their national tsunami warning decision-making.

Recommends ICGs to align Wave exercises with World Tsunami Awareness Day and UNESCO IOC Tsunami Ready implementation.

SIGNIFICANT TSUNAMI EVENTS

- **ICG/CARIBE EWS**

Dr Chip McCreery reported that four or five events have been reported in the Caribbean region, but with no threat messages being required to be issued.

- **ICG/IOTWMS**

Mr Pattabhi Rama Rao reported that in the Indian Ocean region two (2) events over the required earthquake thresholds were responded to. For both events, the three Indian Ocean Tsunami Service providers (TSPs) issued no threat bulletins to the Indian Ocean region.

- **ICG/NEAMTWS**

Dr H el ene H ebert reported seventeen earthquakes were monitored in 2022 and five in 2023.

Ms Christa von Hillebrandt-Andrade noted that the ICG/NEAMTWS threshold magnitude for reporting events could result in public enquiry if they are different and below the threshold of the ICG/PTWS.

Mr Francois Schindele commented that the Earthquake Source Zone (ESZ) southern latitude for the South Atlantic may not include all events south of that, which could generate tsunamis that could impact coastlines of the South Atlantic, Pacific and Indian oceans.

Prof. Ahmet Cevdet Yalciner was invited to report on the T urkiye earthquakes and sea level anomalies, starting on 6 February 2023. His presentation focused on the coastal structure of the Gulf of Iskenderun and tsunamis in the Eastern Mediterranean, where the death toll has exceeded 50,000 persons due to the earthquakes. The magnitude 7.7 earthquake, which occurred on 20 February 2023, resulted in a small tsunami in the Gulf of Iskenderun. The earthquake was associated with a significant magnitude 6.6 foreshock (6 February 2023) and many aftershocks. Initial assessments of coastal structures in the Gulf of Iskenderun indicate local subsidence and damage, which includes four tide gauge stations and other structures. Further investigations are being conducted to better understand the resulting tsunami.

Mr Rick Bailey, IOC-UNESCO Secretariat, enquired about the lessons learnt in tsunami and community education. Dr Yalciner responded that the NEAMTWS is working well. Regional awareness has been increased through the warning messages.

Dr Silvia Chacon Barrantes asked about the community response. Dr Yalciner replied that there was much interest from the community and a desire to learn how to respond to tsunami threats. Dr Musavver Didem Cambaz expanded that the local people left their homes as a response to the earthquake and wanted to learn the appropriate tsunami response.

Dr Harkunti Rahayu asked if the coastal infrastructure damage was due to subsidence or the earthquake. Dr Yalciner responded damages to structures resulted from subsidence as well as fire.

Dr Denis Chang-Seng raised the importance of evacuating buildings in response to earthquakes and noted renewed interest in countries joining the ICG/NEAMTWS and its activities.

Mr Alejandro Rojas Aldana asked about the communication surrounding the earthquake. Dr Yalciner noted an important lesson that the people in the damage zone could not send messages, and communication failures resulted in confusion.

Dr Mohammad Mokhtari enquired about prior tsunami events. Mr Yalciner responded that a tsunami in 2020 resulted in wave damage and one fatality. A DART (*Deep-ocean Assessment and Reporting of Tsunamis*) system could be implemented to improve the warning system.

- **ICG/PTWS**

Dr Chip McCreery noted since the last TOWS-WG meeting, twenty-seven (27) tsunami information statements and twelve (12) tsunami threat sequences have been issued in the Pacific region. The Hunga Tonga Hunga Ha'apai (HTHH) volcanic event (prior to last meeting) was included in the count due to its significance and follow-up work, which has raised awareness on non-seismic tsunami generation.

Dr McCreery reviewed the response to the HTHH event. The resulting tsunami was detected in all ocean basins and the precise mechanism is under investigation. The PTWS has developed and implemented new interim products (subject to ICG/PTWS approval at its next session) in case of similar future events. In response to the HTHH event in the Pacific Ocean and two non-seismic and complex source events in Indonesia in the Indian Ocean and connecting seas, TOWS-WG has formed two *ad hoc* teams, one on tsunamis generated by volcanoes and another on meteotsunamis.

Dr Mohammad Mokhtari asked about detection of non-seismic events in other ocean basins, with reference to the Makran region. Mr McCreery noted that the coastal sea-level gauges are not well set-up to alert for significant wave heights due to possibility for sea-level noise also triggering. However, during the precursory activity in Hunga Tonga a trigger was programmed on the nearby sea-level gauge. This gauge and a nearby DART signal were used to action the response. Something similar may be able to be implemented in the Makran region.

Recommendations to TOWS-WG:

- TOWS-WG, given the critical need to resolve and understand the near-field threat to high at-risk communities where a tsunami may arrive in 5-30 minutes, reiterate the urgent need for all Member States to sample sea level data at one second intervals and transmit this in real-time.
- TOWS-WG request IOC Assembly at its next session to reconsider the request to extend the Pacific Earthquake Observing Zone to include the South Atlantic, given the ongoing threat in this region to generate tsunamis that also impact the Pacific and Indian Oceans (e.g., South Sandwich Islands event, 12 August 2021)

J3 REPORT FROM AD HOC TEAM ON TSUNAMIS GENERATED BY VOLCANOES

Dr Francois Schindele (France), Dr Raphael Paris (France) and Dr Laura Kong (United States of America) reported on the *Ad Hoc* Team on Tsunamis Generated by Volcanoes (TGV) under the TT TWO. The scientists on the team also included Emily Lane (New Zealand), Maurizio Ripepe (Italy) and Vasily Titov (United States of America). A survey on volcano observatory activities with regards volcanic activity hazard assessment and related tsunami monitoring and warning systems was circulated to volcanic observatories and relevant institutes. The *Ad Hoc* Team TGV report is being finalised and includes chapters on tsunamis generated by volcanic activity, numerical modeling of volcanic tsunamis, volcanic tsunami hazard assessment, volcano monitoring requirements for tsunami warning, volcanic tsunami warning systems and standard operating procedures, and recommendations. A draft of the report was tabled at the meeting.

Dr Raphael Paris reported on the first two chapters of the report: 'Tsunamis generated by volcano activity and instability' and 'Numerical modeling of volcanic tsunamis'.

Dr Francois Schindele reported on the three different volcanic tsunami hazard assessments with an example of the worst-case scenario for Stromboli. The Stromboli volcanic tsunami warning system has been long standing with tsunami beacons in the seas on the southern and northern volcanic flanks. The system was successful in detecting the Stromboli event on 4 December 2022. The signage at Stromboli shows the hazard zone and evacuation routes for tsunami events.

Dr Laura Kong noted that of the twenty-five (25) volcano observatories surveyed, fifteen (15) countries have responded to the volcano observatory questionnaire. The current practice is to detect and then warn. There are two possible triggers for tsunami warnings: Volcanic Ash Advisory Centre (VAAC) notices of activity and actual tsunami wave detection. Most volcano observatories do not have sea level stations. Since most volcanic observatories do not have 24x7 operations, they cannot be tsunami warning centres.

Dr Laura Kong then presented the preliminary recommendations and gaps for warning of tsunamis generated by volcanoes. These recommendations were further discussed later in the day and the final recommendations presented to the joint session of the task teams on Day 2 of the meetings.

Cmdr Carlos Zuniga asked about Deception Island in Antarctica, which is outside of the monitored networks. Dr Raphael Paris responded that this can be included in the report.

Dr Chip McCreery noted that low-cost flood sensors have been installed in key localities on land to monitor for inundation. These 'wet sensors' are easy to deploy and have been reliably detecting flooding at a given elevations for the past 10+ years.

Recommendations to Member States

Monitoring and Warning:

1. As a first step, organization(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.
2. The TGV monitoring and warning system should be implemented by, or in cooperation with the National Tsunami Warning Centre (NTWC) and regional Tsunami Service Provider and national and regional Volcano Service Providers, where such exist.
3. 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.
4. 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)
5. 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 1 cm 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.
6. Methods to also specifically alert persons in remote areas (such as scientific teams in the field, or recreational hikers) should be considered.
7. TGV SOPs for tsunami warning should be linked with existing Volcano Alert Activity scales.

Risk Assessment and Preparedness:

8. TGV hazard and risk assessment should be undertaken to determine vulnerable areas.
9. 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.
10. During a period of heightened TGV hazard, consider closing access to vulnerable areas. When an eruption is imminent and the tsunami hazard is high, consider evacuating populations from vulnerable locations.
11. Specific TGV signage and evacuation routes should be implemented in all areas that may be impacted by tsunamis generated by volcanoes.
12. 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.

Recommendations to TOWS-WG

1. TGV warning notification systems should be considered and coordinated as part of the IOC-UNESCO Global Tsunami Warning and Mitigation System, and also when possible be part of a Multi-Hazard Early Warning System (MHEWS).
2. TOWS-WGs recommend ICGs examine TGVs in the region of responsibility and review TGV hazard monitoring and warning requirements, including costs of deploying and maintaining such systems.
3. TOWS-WG recommend, where identified TGVs may impact multiple Member States, Tsunami Service Providers (TSPs) for the relevant ocean basin tsunami warning and mitigation systems consider if they need to be involved in monitoring and provision of threat advice.
4. IOC-UNESCO Ad hoc Team on TGV should continue and finalize the TGV Report by mid-2023.

Recommendations to IOC-UNESCO Secretariat

IOC Secretariat to help inform Member States widely on the potential tsunami hazard from volcanoes:

1. Publish the TGV report as an IOC-UNESCO publication in 2023
2. Provide the TGV Report, including the List of Tsunamigenic Volcanoes to Volcano Observatories
3. Provide the TGV Report, including the List of Tsunamigenic Volcanoes to IOC-UNESCO Member States

J4 REPORT FROM AD-HOC TEAM ON METEO-TSUNAMIS

Mr Mike Angove reported on the work of the *Ad-Hoc* Team on Meteotsunamis under TOWS-WG TT TWO. The report assessed the current global status and advised on gaps related to meteotsunami monitoring and warning systems. It also identified guidelines for Standard Operating Procedures (SOP) development to monitor and warn for meteotsunamis, and reviewed relationships and coordination requirements between TSPs/NTWCs and

regional/national meteorological services to monitor and warn for meteotsunamis.

Where they exist, meteotsunami alert products are currently addressed within the SOPs of national or regional meteorological services. Meteotsunami are common in some parts of the world where the required conditions occur, happen infrequently, but can cause a significant risk to life and property (i.e., Balearic Island region in Mediterranean Sea). The global tsunami warning system can play a supporting role in direct tsunami detection. A future unified system with a combination of direct tsunami detection and NWP-based meteotsunami forecasts is considered worthwhile. Local understanding of the meteotsunami threat is critical.

Observed significant meteotsunami occurrences are typically mid-latitude features related to fast moving (i.e., over 30 nautical miles) mesoscale complexes. They have been observed in the Adriatic Sea, Mediterranean Sea, Nagasaki Bay, Lake Michigan, and the Persian Gulf. Mr Rick Bailey also noted they have been observed off the west coast of Australia, causing a ship to break its moorings and nearly collide with a major road bridge.

Dedicated meteotsunami alerting systems are in place in the Balearic Islands, Adriatic Sea, and South Korean Peninsula. Other areas have more generalized systems based on detection of flooding.

Using the global tsunami warning system for meteotsunami may be considered. However, rethinking of global tsunami observation may allow for instrumentation specifically tuned for meteotsunami.

Generalized SOPs for meteotsunami have been developed by the *ad hoc* team.

Further discussion is needed on preferred forecasting and warning organisations (i.e., organisations responsible for meteorology and/or tsunami warnings). It is recommended that meteotsunami alerting is jointly coordinated by WMO and IOC-UNESCO. A new instrumentation strategy should be considered and a framework for a unified meteotsunami system should be established.

Recommendations to TOWS-WG

Noting the report from the *Ad Hoc* Team on Meteotsunamis initially sought to look at meteotsunami the perspective of global tsunami services;

Further noting the report from the *Ad Hoc* Team on Meteotsunamis discovered responsibility for issuing public alerts related to meteotsunami currently is typically addressed by national or regional Met services offices, but usually in the context of storm surge or anomalous coastal flooding event;

Further noting as 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 volcanoes and meteotsunami, among others;

Further noting combining the direct tsunami detection capability of the GTWS with the NWP-based algorithms tuned to meteotsunami prediction could deliver significant advances in global capability at minimal cost;

1. TOWS-WG initiates a comprehensive dialogue between the IOC and WMO to ensure full exchange of information in support of a robust international alerting system for meteotsunamis is achieved. It is the *Ad Hoc* Team for meteotsunami's recommendation that this report be used as a starting point of those discussions.
2. TOWS-WG to establish a mechanism for input from national and regional meteorological services offices on data needs for meteotsunami monitoring and alerting as the Global Tsunami Early Warning System (GTEWS) considers a new generation of tsunami detection and measurement networks.
3. TOWS-WG to establish a task team made up of experts from both GETWS and NWP systems be formed with the expressed intent of outlining the potential construction of an integrated meteotsunami prediction system.
4. TOWS-WG establish an *ad-hoc* team to conduct a global meteotsunami hazard assessment to provide all MS advice on the meteotsunami hazard and risks on their coasts.

Commends the work of the *Ad Hoc* Team on Meteotsunamis.

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

Recommends that WMO experts be engaged to assist in this task and **acknowledges** that WMO requests the WMO-IOC Joint Collaborative Board to discuss tsunami related issues with respect to meteotsunami, to clarify the roles and responsibilities for the WMO and UNESCO-IOC, and how best to strengthen collaboration for supporting Member States.

Recommends the *ad-hoc* team on Meteotsunami continue through 2023, including WMO representatives for the purpose of recommending a global altering strategy to include specific roles of met services and TSPs/NTWCs.

Recommends the establishment of an *ad-hoc* team to conduct a global meteotsunami hazard assessment to provide all MS advice on the meteotsunami hazard and risks on their coasts.

J5 PLANNING FOR OCEAN DECADE

The Chair asked the Secretariat to report on the work on the status, activities, and plans for the Ocean Decade.

- **Ocean Decade Tsunami Programme Endorsement**

Mr Mike Angove reported on the instrumentation and warning vision to build off the legacy seismic analysis capability, with a view to combine this with more direct in-situ tsunami measurement, in order to enable positive confirmation of tsunami generation from a source event to provide more accurate forecast information. The identification of a global sensor strategy to achieve these goals would include many sources of measurement and detection. This will require Member State to enhance current monitoring coverage. The recommended enhanced global monitoring systems would go to the ICGs and/or TOWS-WG to coordinate implementation.

Dr Harkunti Rahayu noted that the goal of 100% of communities at risk to be prepared and resilient to tsunami will be first discussed by the TT-DMO.

- **Draft of the 10—year research and development implementation plan for the ODTP**

The Scientific Committee has met three times over the last year. The first draft of the Ocean Decade Tsunami Programme Research and Development Implementation Plan was released in November 2022 for Member State comments. The second draft was released on 13 February 2023 for review by the TOWS-WG and its task teams. Following this review and feedback, the Scientific Committee will finalize the report for the UNESCO-IOC Assembly in June 2023 and seek endorsement from Member States.

- **Progress report of the Tsunami Ready Coalition**

Mr Bernardo Aliaga, new Head of the IOC Tsunami Unit announced the appointment of Dr Laura Kong as the Chair of the Tsunami Ready Coalition. She was nominated by the TOWS Task Team Chairs and endorsed by TOWS WG Chair. Dr Kong has a strong background and experience in tsunami warning and mitigation, and preparedness. The goal of the Coalition is to “Contribute to increasing the number of Tsunami Ready communities as part of the Ocean Decade” through the following objectives:

- a. Raising the profile of UNESCO Tsunami Ready in collaboration with critical stakeholders across the UN system, interested regional organizations, national disaster management agencies and the public,
- b. Increasing funding resources for the implementation of Tsunami Ready,
- c. Advising the IOC TOWS-WG, TT-DMP, and TT-TWO on the implementation of UNESCO Tsunami Ready, including on: i) Flexibility with regards to accomplishing the indicators to allow for circumstances where formal bureaucratic frameworks/requirements may pose barriers; and ii) Consideration of unique regional and/or local circumstances.

- **Plans for the 2nd UNESCO-IOC Science Symposium on advances in tsunami warning to enhance community responses:**

Dr Harkunti Rahayu, chair of the 2nd UNESCO-IOC Science Symposium Organizing Committee, reported that Indonesia and the ICG/IOTWMS plans to host an Indian Ocean Tsunami Symposium in the first week of December 2024 in Aceh, Indonesia, back-to-back with the 14th Session of the ICG/IOTWMS in Jakarta. The year 2024 will mark the 20th commemoration since the Indian Ocean Tsunami of 2004 killed nearly 200,000 people in Indonesia and in total more than 230,000 across the Indian Ocean. The Government of the Republic of Indonesia, through the Head of the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG and Chair of the ICG/IOTWMS, Dr Dwikorita Karnawati, has offered to make the symposium global and accordingly host the 2nd

UNESCO-IOC Science Symposium on advances in tsunami warning to enhance community responses.

The TT-DMP recommended having discussions about the nomination of a Tsunami Symposium vice-chair and members of the committee.

Recommendations to TOWS-WG

Noted with appreciation the nomination of Dr Laura Kong as the chair of the UNESCO IOC Tsunami Ready Coalition;

Accepts with appreciation the offer of the Government of the Republic of Indonesia to host the Global Symposium in December 2024 as part of the plans by the ICG/IOTWMS to commemorate the 20th Anniversary of the Indian Ocean Tsunami of 2004.

Recommends the nomination of a Tsunami Symposium co-chair and members of the committee.

J6 LOCAL SOURCE SOPs

- ***Visual Communication of Tsunami Warnings***

Mr Yuji Nishimae reported on visual communication of tsunami warnings and advisories in Japan. A study group found that flags were an effective method to communicate tsunami warnings/advisories, and that red and 'U' flags are most visible at a distance. A questionnaire of people with hearing and color impairments confirmed the aforementioned flags were most identifiable. The study group then proposed specifications for the flags. In response to the report, JMA amended the regulation on 24 June 2020 and published a brochure showcasing the adopted flag.

Ms Christa von Hillebrandt-Andrade reported that she observed flags being used in Odisha, India for tsunami alerting while observing IOWave18 exercise. She further asked if other flags are used for beach warnings in Japan. Mr Yuji Nishimae responded that JMA modified the regulation for dissemination flags for tsunami warnings and no other flags are currently used along beaches.

Dr Chip McCreery asked about the practicality of implementation. Mr Yuji Nishimae replied that the local government is responsible for tsunami evacuations and should prepare enough flags to cover the beaches.

Mr Ardito Kodijat asked about the timing of using the flag. Mr Yuji Nishimae explained that the U-flag is used for the first warning to evacuate and is not used even when the tsunami warning is updated after the tsunami strikes.

Dr Harkunti Rahayu noted the merit in flag use for people who have a hearing impairment. She further recalled that this practice is being employed in Oman. Mr Yuji Nishimae also recalled that Oman uses something like fireworks.

Mr Rick Bailey agreed that communities should agree and consult with other groups, such as surf life-saving who also used flags for communicating hazards at the beach.

Ms Christa von Hillebrandt-Andrade suggested a recommendation on disability inclusiveness with regards to tsunami warnings, noting the example from Japan.

Dr Mohammad Mokhtari suggested including a tsunami symbol on the flag. Mr Yuji Nishimae responded that this has been tested and is not as visible as a U-flag.

Dr Elizabeth Vanacore noted the benefit of global harmonization of tsunami warning flags.

Recommendations to TOWS-WG

Noted that Japan has defined a flag called “Tsunami Flag” as a visual communication method of tsunami warning in order to disseminate tsunami warning to people with hearing difficulties and people at the beach. The flag has been used since June 2020.

Recommends global harmonisation of the tsunami beach flag in consultation with other groups using flags to warn for other coastal hazards, and the broader consideration of people with disabilities in tsunami warnings.

Recommendations to TOWS-WG TT DMP:

1. TT DMP to further investigate requirements and methods to warn people with disabilities and underserved communities, especially given WTAD objective 2023 “fighting inequality for a resilient future”.
2. TT DMP take action now to upgrade NTWC competency training framework from a Pacific to global approach and include competency training for Tsunami Warning Focal Points (TWFPs) in the framework given their key role in tsunami warnings.

J7 GLOBAL NTWC COMPETENCY FRAMEWORK

Dr Laura Kong reported on the Global Competency Framework for National Tsunami Warning Centres. The ICG/PTWS Task Team on Minimum Competency Levels for NTWC Operational Staff was formed based on the request from the Pacific Small Island Developing States (SIDS) for a competency framework for NTWC personnel. The task team has proposed a first draft of the framework, which was approved in 2019 (ICG/PTWS-XXIX). The document outlines two tiers of competencies (i.e., expert and basic).

As an example of the value for capacity building, Dr Laura Kong gave the example of Tonga. Since 2009, capacity building initiatives have been conducted through five in-Tonga trainings and abroad, where Tonga participated in international training on tsunami warning operations. They built their warning response capacity over time, and their built capacity to respond well was demonstrated for the 2022 HTHH event. Further, the Solomon Islands Meteorological Service underwent impact based forecast training and identified that DRR aspects should be included within the competency framework. A capacity training workshop in the South-West Pacific (SWP) in 2022 highlighted the need for training of the trainers and for support to map and develop a framework among the Pacific Island Countries (PICTs). The PICT Task Team on Capacity Development met on 2 February 2023.

Dr Laura Kong further outlined the task team's plans to finish the PTWS Competency Framework for approval in September 2023 at the next ICG/PTWS-XXX. The ITIC plans to work with expert and advanced NTWC partners to develop a Concept Note for Implementation, which is planned as a funded pilot in 2024 and beyond. In August 2023, the ITIC plans to partner with New Zealand to conduct its 2-week ITP-Hawaii in New Zealand, where warning centre operations will be a focus. Additionally, the 2024 ITIC Training Programme (ITP-Hawaii) is planned to be in Chile (2018 was first time), which operates advanced seismic monitoring and tsunami warning centres.

Dr Chang-Seng asked how this can be utilized in other regions. Dr Laura Kong noted the documents outline the requirements for staff at warning centres everywhere. The PTWC NTWC competency framework contains global content, which could be implemented in other areas.

Dr Elizabeth Vanacore noted that warning centres may need competency in understanding the products they are receiving from TSPs. Dr Laura Kong responded that the task team Framework document provides a basis for developing a global competency framework.

Recommendations to TOWS-WG

Noted the work of the PTWS to develop a National Tsunami Warning Centre (NTWC) Competency Framework (2017), and the ITIC's leadership to pilot training courses based on the Framework;

Recommends ITIC to pilot the PTWS NTWC Competency Framework with the goal to develop a global framework for all ICGs to use.

J8 IUGG UPDATE

Dr Laura Kong provided an update on the International Union of Geodesy and Geophysics (IUGG) Joint Tsunami Commission (JTC). IUGG/JTC promotes the exchange of scientific and technical information about tsunamis among nations concerned with the tsunami hazard. There are six Working Groups: Tsunami Terminology, Science-based Tsunami Warning, Tsunami Magnitude, GNSS Data for Tsunami Warning, Meteotsunami, and Tsunami Data. Future meetings being organized include the EGU 2023 on tsunamis from source processes to coastal hazard and warning. Proposed meetings include the IUGG JTC - PTWS Tsunami Symposium (ICG/PTWS-XXX) in September 2023 in Tonga and the proposed IOC – IUGG/JTC 2nd International Tsunami Symposium in December 2024. Recent publication series edited by the IUGG/JTC include special journal issues on the Sulawesi/Palu (2018) and Anak/Krakatau (2018) Tsunami as a Topical collection in Pure and Applied Geophysics (19 papers), and the Tonga Volcanic Explosion 2022 as a topical collection in Pure and Applied Geophysics (6 papers and ongoing). Support provided to the IOC includes the Tsunami Glossary 2019 update, and Tsunami Generated by Volcanoes and Meteotsunami *ad hoc* team reports.

Ms Christa von Hillebrandt informed the meeting that the 28th IUGG General Assembly will be held 11-20 July 2023 at the Messe Berlin – City Cube, Berlin, Germany. It is a special opportunity for participants from around the world to come together and share their science and culture. She noted that there will be a tsunami symposium consisting of 70 abstracts and it would be interesting to see the outcome.

Recommendations to TOWS-WG

Notes the recent EGU 2022 meetings on tsunamis from source processes to coastal hazard and warning;

Notes the publication of IUGG concerning the Sulawesi/Palu (2018) and Anak/Krakatau (2018) Tsunamis;

Further notes the support provided by IUGG to IOC on the tsunami glossary update in 2019 and reports on meteotsunamis and tsunamis generated by volcanoes;

Welcomes the engagement of the members of the TOWS-WG task teams at the 28th IUGG General Assembly, 11-20 July 2023 at the Messe Berlin – City Cube, Berlin, Germany;

Further welcomes the proposed joint IUGG and IOC Tsunami Symposium prior to ICG/PTWS meeting in September 2023 in Tonga.

J9 EMERGENCY WARNING SERVICE IN GALILEO

Mr Eric Guyader, an engineer at the European Commission - Galileo Programme delivered an online presentation on the new emergency warning service in Galileo. Galileo has been in operation for 20 years, and it is now introducing its services in a wider public context. It is a new service to help alert the population. The initiative is in line with global trends and contributes to the UN DRR targets. It offers a satellite dissemination means of alerts to the population. Messages can be broadcasted to any place on earth. Galileo can alert population through smart phones. Anyone with a smart phone can receive alerts, however it is the sovereign responsibility of nations to issue alerts and choose best means of alert dissemination. Galileo must first consult with each nation it proposed sending alerts to. Galileo programme takes care of the formatting and dissemination of the alert message. There is no need for any specific network connection. Only relevant people can receive the message, and it can target populations as large as a continent to a building block. It uses an eclipse approach to target the population. Galileo takes care of 130 hazards. The target date to start full implementation is 2024. Several bilateral contacts have been established mainly with CPAs. There are ongoing discussions with countries including Australia to use Galileo services in ocean /maritime area. Field demonstration is expected to be carried out in four locations in France, Germany, Cyprus, and Belgium. They are developing the capacity and scenarios to carry out the demonstration examples. There is a workshop planned in February 2024. Galileo Programme is happy to receive relevant materials, story lines, protocols, guidelines to help design the demonstration examples in those mentioned countries. It was clarified that instructions can be sent to people inside or outside the threat zone. There are no cost implications, it is free of charge aside the operational cost. There are only 32 authorized entities able to contact Galileo, and these are pre-agreed authorized entities. It was clarified

that the ellipse corresponds to people threatened. Cancellation of alerts works in the same way as issuing alerts. Mrs. Caroline Morisot-Pagnon attended the meeting in person and was available to provide further information on the Galileo services.

Recommendations to TOWS-WG

Noted the expanded services to be offered by Galileo European Global Navigation System in 2024 for satellite-based dissemination of targeted alerts to the population and the Galileo demonstration examples to be carried out in France, Germany, Cyprus, and Belgium, the workshop planned in February 2024, and **welcomed** the offer of the Galileo Programme to provide relevant documents, storylines, protocols, guidelines and manuals to support the design of the demonstration examples.

J10 UN SEC GENERAL “EARLY WARNING FOR ALL”

Dr Denis Chang Seng reported that the World Meteorological Organization (WMO) will provide an official report on the progress concerning implementing “Early Warning for All” during the TOWS-WG session on 2 March 2023. However, he remarked that it is important to briefly report and discuss the matter during the task teams meetings. “Early Warning for All” aims to ensure that every person on earth is covered by an early warning system by the year 2027. WMO is leading the initiative with UNDRR and partners. “Early Warnings for All” Action Plan was unveiled at COP27, Sharm el-Sheikh, Egypt, 7 November 2022. There are currently four “Early Warning for All” pillars:

Pillar 1: Risk Knowledge and Management

Pillar 2: Observations, Monitoring and Forecasting

Pillar 3: Dissemination and Communication

Pillar 4: Preparedness to Respond

“Early Warnings for All” (EW4ALL) will address the following:

- Enhancing capacity to detect hazard ,
- Close the observing gaps,
- meet the data needs for monitoring hazards (Estimated for 70 priority countries
- Enhance the existing framework and the capabilities of global data processing, forecasting, and analysis systems.
- Sustainable data and Information exchange infrastructure to support EWS
- Optimize international efforts on observation, monitoring, and forecasting
- Upscale successful regional initiatives on sharing data and forecasting products

WMO and partners are working on the action plan. Following recent discussions, it is understood that UNESCO is tasked to contribute to Pillar 2 on Observation, monitoring and forecasting together with WMO, UNEP and UNDP. UNESCO's (All Sector approach) position is to contribute to multi-hazards (flood, drought, tsunami, and earthquake). UNESCO can contribute to Innovation EWS (AI, Citizen Science) in Pilot Projects. Several steps are being

undertaken to advance the initiative. For instance, WMO is developing a shared workspace for EW4All Pillar 2 group to collect inputs and share information and initial country mapping. IOC has already provided a list of countries where we have project interventions.

Recommendations to TOWS-WG

Acknowledges the gaps in the global coverage of the tsunami early warning system and **recommends** full global coverage be pursued to ensure that all at risk coastal areas are assured of access to tsunami early warnings by 2027. This is a commitment to the UN “Early Warnings for All” initiative.

J11 PLANNING FOR WTAD 2023

Ms Regina Khanbekova (UNDRR), reported that World Tsunami Awareness Day (WTAD) 2022 advocated on reducing tsunami risk globally through increasing access to early warning systems. Through political engagement to drive change, the UN Secretary-General, Antonio Guterres launched the “Early Warnings For All” Action Plan to achieve early warning for all in five years. This will save lives and protect livelihoods. In addition, the UNDRR event in New York on “Early Warning and Early Action Before Every Tsunami” served to build partnerships and leverage data to ensure no one is left behind, and aims to minimize the risks posed by tsunamis and other hazards.

Citizen engagement to build a culture of tsunami and other coastal hazards awareness for all the people at risk took place with the conduction of the *#gettohighground* public-facing campaign, where citizens participated in fun walks of tsunami evacuation routes at local level. The campaign was supported by Member States such as Indonesia, Samoa, Ecuador, Cook Islands, Portugal, and Mauritius. Approximately 4000 people participated in the *#gettohighground* campaign.

For the 2023 campaign, the theme will focus on fighting inequality for a resilient future. It will look to engage with more Member States, Making Cities Resilient (MCR) 2030, advocate decision makers on the importance of EWS coverage using strategic communications, and to continue the strong synergy between partners such as UNESCO-IOC, WMO and the UN System.

TICs, TT-DMP representatives reported on the key activities and achievements of WTAD 2022

Ms. Christa von Hillebrandt-Andrade requested that UNDRR also use the hashtag #TsunamiReady as part of its WTAD in support of the Ocean Decade goal of 100% of at-risk communities are ready for and resilient to tsunamis by 2030 through programmes like UNESCO IOC Tsunami Ready Recognition Programme.

Recommendations to TOWS-WG

Notes the activities undertaken by the respective regions for WTAD 2022, and as part of this, the strong engagement in the #GetToHighGround initiative, and the success achieved through the United Nations Office for Disaster Risk Reduction (UNDRR), and IOC collaboration;

Further notes to build connections with EW4ALL multi-hazard approach to coastal risk and Making Cities Resilient (MCR2030);

Further notes the 2023 WTAD theme will highlight the importance of fighting inequality for a resilient future;

Further notes activities will include continuing the #GetToHighGround initiative and the #TsunamiReady to engage citizens on tsunami awareness. The theme aligns closely with the current focus of the TOWS-WG in the context of the UN Ocean Decade, The Mid-Term Review of the Sendai Framework, and action to accelerate the implementation of the Early Warnings for All (EW4All) initiative to ensure everyone on earth is covered by MHEWS in the next four years, prioritizing the most at-risk communities;

Recommends continued collaboration between the UNESCO IOC and the UNDRR;

Requests the UNDRR to strengthen collaboration with respective ICGs and corresponding TICs.

J12 TSUNAMI GLOSSARY UPDATE

Dr Laura Kong provided an update on the status of the 2019 Tsunami Glossary. In the last session of the TOWS-WG-XV meeting in 2022, Dr Laura Kong recommended delaying the next update until 2023, due to delays caused by unforeseen events and to enable accommodation of the new Tsunami Ready terminology when it becomes an IOC Programme, as well as terminology related to tsunamis generated by non-seismic and complex sources under development. TOWS-WG agreed to postpone the next update of the Tsunami Glossary to 2023 to facilitate the incorporation of important changes.

In addition, the group again noted the importance of translating the Tsunami Glossary into languages additional to the UN languages, so many more people and authorities at the local level can understand and use the terminology consistently, and the importance of having abbreviated definitions for key terms for use in social media and other abbreviated language communication tools.

The 2023 version of the Tsunami Glossary will contain updates to tsunami maps and tables, information on meteotsunami, tsunami generation theory, and tsunami numerical modeling. New material will be included on lamb waves, the IOC-UNESCO Tsunami Ready Recognition Programme, and tsunamis generated by volcanoes.

There was a discussion about the definition of meteotsunami, and it was decided the *Ad Hoc* Team on Meteotsunamis will provide this for the glossary.

Dr Elizabeth Vanacore raised the issue that the definition of arrival time is currently the arrival of the maximum tsunami wave amplitude and suggested it be revised to be the time of the first maximum or minimum tsunami wave amplitude. It was decided to adopt the definition given in the Tsunami Watch Operations Global Service Definition Document (IOC TS 130, 2016).

Dr Mohhammad Mokhtari asked if tsunami sources such as splay-faulting and landslides could be defined within the glossary. He also mentioned that translation of the glossary into the local language will be important for implementation of the IOC-UNESCO TRRP.

Dr Bill Fry suggested the addition of another term to define the time that the tsunami reaches a threshold value. Mr Bernardo Aliaga replied that the update could be included in a future addition.

Recommendations to TOWS-WG

Express appreciation to the IUGG-JTC Terminology Working Group and ITIC for leading the effort to review the Tsunami Glossary 2019.

Approves the glossary updates and requested the IOC to implement the updates to create the Tsunami Glossary 2023, with support from ITIC.

Requests the IUGG JTC Terminology Working Group and ITIC to undertake a review to advise the next meeting of the TOWS Inter-agency Task Teams on whether the 2023 Tsunami Glossary is sufficient to meet the needs of the scientific community, tsunami stakeholders, and other practitioners, or if separate target audience specific versions are required.

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Annex 1:

List of acronyms

ASEAN	Association of Southeast Asian Nations
CDEMA	Caribbean Disaster Emergency Management Agency
CEPREDENAC	Coordination Center for the Prevention of Natural Disasters in Central America
CPPS	Permanent Commission of the South East Pacific
CTBTO	Comprehensive Nuclear-Test-Ban Treaty Organization
CTIC	Caribbean Tsunami Information Centre
EMIZA	État-major Interministériel de la Zone Antilles
GOOS	UNESCO/IOC Global Ocean Observing System
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
ICSU	International Council of Science
IGCP	UNESCO International Geoscience Programme
IHO	International Hydrographic Organization
IOC	Intergovernmental Oceanographic Commission
IOCAFRICA	Intergovernmental Oceanographic Sub-Commission for Africa and Adjacent Island States
IOCARIBE	IOC Sub-Commission for the Caribbean and Adjacent Regions
IOTIC	Indian Ocean Tsunami Information Centre
ITIC	International Tsunami Information Center
ITU	International Telecommunication Union
IUGG	International Union of Geodesy and Geophysics
NEAMTIC	Tsunami Information Centre for the North-eastern Atlantic, the Mediterranean and Connected Seas
NGO	non-governmental organisation
NTWC	National Tsunami Warning Centre
NTRB	National Tsunami Ready Board

OTGA	Ocean Teacher Global Academy
RTRB	Regional Tsunami Ready Board
SFDRR	Sendai Framework for Disaster Risk Reduction
SPC	Secretariat of the Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
TIC	Tsunami Information Centres
TNC	Tsunami National Contact
TOWS-WG	Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems
TRLC	Tsunami Ready Local Committee
TT DMP	Task Team on Disaster Management and Preparedness
TT TWO	Task Team on Tsunami Watch Operations
TWFP	Tsunami Warning Focal Point
UN	United Nations
UNDP	United Nations Development Programme
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
WESTPAC	IOC Sub-Commission for the Western Pacific
WMO	World Meteorological Organization