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|  | **MEETING OF THE INTER-ICG TASK TEAM ON DISASTER MANAGEMENT AND PREPAREDNESS**  **INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION UNESCO** |
|  | 21 - 22 February 2022 - On-line |

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

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| --- | --- | --- | --- |
| David Coetzee (Chair) | ICG/PTWS | Denis Chang Seng | IOC Secretariat / TT- DMP Secretariat / ICG/NEAMTWS/ |
| Harkunti Pertiwi Rahayu | ICG/IOTWMS | Alejandro Aldana | IOC Secretariat/ICGNEAMTWS |
| Laura Kong | ICG/IOTWMS | Esmeralda Borja | IOC Secretariat/ICGNEAMTWS |
| Ardito Kodijat | IOTIC, ICG/IOTWMS | Rosalind Joanna Cook (Observer) | UNDRR/ Invited Guest |
| Cecilia Valbonesi | ICG/NEAMTWS | Silvia Chacón-Barrantes (Observer) | ICG/ CARIB-EWS |
| Amir Yahav | ICG/NEAMTWS | Emilie Crochet (Observer) | ICG/NEAMTWS |
| Christa von Hillebrandt- Andrade | ICG/CARIBE-EWS | Ignacio Aguirre Ayerbe (Observer) | ICG/NEAMTWS |
| Alison Brome | CTIC; ICG/CARIBE-EWS |  |  |
| Marinos Charalampakis (Observer) | ICG/NEAMTWS |  |  |

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**1ST JOINT TT TWO AND TT DMP SESSION AND OPENING (CHAIRED BY DR. CHIP MCCREERY)**

**J1 WELCOME & INTRODUCTION**

Mr Bernardo Aliaga, Head of Tsunami Unit (a.i.) welcomed all participants to the joint opening session of TOWS-WG 15 Task Team meetings. He highlighted the generosity and significant contributions among peers in the work on tsunami. There are also new experts joining with new ideas and inputs.

The Task Team Chairs, Mr David Coetzee (Task Team Disaster Management and Preparedness TT-DMP) and Mr Charles McCreery (Task Team Tsunami Watch Operations TT-TWO) outlined the overall objectives of the two TT meetings.

Mr Charles McCreery noted the importance of TT-DMP and TT-TWO in supporting the work of TOWS WG to further develop a tsunami system for the world and exchange of information between the four ICGs. A critical goal is to expand the comprehensiveness of the TEWS and IOC Tsunami programme to also cover atypical tsunamis, address gaps, and create products for the maritime community.

David Coetzee, Chair of TT- DMP highlighted that Tsunami Ready will be one of the main focus areas, including Tsunami Ready Guidelines through MG74 and progressing Tsunami Ready to an official IOC Programme. The TT DMP will also look at programmes under the Ocean Decade, training, capacity development, and WTAD.

**J2 ATYPICAL TSUNAMIS**

Dr Francois Schindele (TT-TWO) introduced this agenda item and reported on the work of the ad hoc team established under the TT-TWO reviewing the best practices for hazard assessment, monitoring, and responding to atypical tsunamis.

A preliminary report was provided last year to the TT-TWO in February 2021. This year a final draft has been submitted for approval and publication (see meeting web site<https://oceanexpert.org/event/3393>).

Dr Schindele noted the ad hoc team did not have all the necessary expertise to fully examine all the different types of non-seismic sources generating tsunamis. It would have been better to have separate ad hoc teams of required experts addressing each type of non-seismic generated tsunamis. Nonetheless, the report manages to provide a very good general assessment of the non-seismic generated tsunami hazard. He noted as a next step, more work has to be undertaken to provide guidelines utilizing current best practices to help national monitoring agencies and NTWCs develop Standard Operating Procedures (SOPs) to monitor and warn for non-seismic tsunamis. He reported that there are at least 100 volcanoes with the potential to generate tsunamis. The recent Hunga-Tonga Hunga Ha‘apai (HTHH) volcanic eruption and tsunami event (discussed in the next agenda item) has highlighted the urgency to undertake the identified further work.

Mr Rick Bailey advised the meeting that a proposal to hold a Satellite Activity at the upcoming United Nations Ocean Decade Safe Ocean Laboratory (5-7 April 2022) on atypical (non-seismic) tsunamis has been successful. The symposium will draw on the outcomes from the work of the TT-TWO ad hoc team on Atypical Tsunami Sources and other active work being undertaken around the world on the topic, such as the Germany-Indonesia Tsunami Risk Project and the Kyoto Landslide Commitment (KLC2020). It is hoped this Satellite Activity will also bring together the greater expertise required.

Dr Mohammad Mokhtari recommended from experiences in the Northwest Indian Ocean that work needs to be undertaken to better understand the generation of tsunamis from splay faulting and submarine landslides, which can also add to and worsen the magnitude of any more atypical subduction zone generated tsunamis. Meteo-tsunamis have also been observed in the Persian Gulf.

**Recommendations to TOWS-WG**

**Recommendations on non-seismic generated tsunamis**

**Noting** the potentially high costs for monitoring and forecasting of relatively rare non-seismic generated tsunamis that many Member States may not be able to afford,

**Recommends** a cost-benefit analysis be first undertaken for monitoring non-seismic tsunami sources based on a hazard and risk assessment.

**Recommendations from Ad hoc Team Atypical Tsunami Sources:**

**Noting** the issues associated with the sometimes unknown and conflicting accuracies of sea level data used in tsunami warnings,

**Recommends** each ICG encourage sea-level network operators to undertake regular and routine calibration of their sea-level monitoring instrumentation and data formats, following recommendations of IOC Manuals & Guides No #3 and No. 14 (Volumes I–V),

**Noting with appreciation** the work of the current Ad hoc Team on Atypical Tsunami Sources chaired by Dr Francois Schindele,

**Considering** that the current report is of great interest for all ICGs and Member States,

**Recommends** the report be published as an IOC Technical Manual,

**Acknowledging** confusion sometimes amongst scientific experts about the term “atypical tsunami,

**Recommends** that the term “atypical tsunamis” not be used and that tsunamis be classified as either: a) Seismic generated tsunamis; or b) Non-seismic generated tsunamis; or c) Complex source generated tsunamis,

**Further recommends** TT TDMP consider outreach activities for educating the public and the media about the differences,

**Recognising** that non-subduction zone earthquakes and landslides (aerial and submarine) can also generate tsunamis and should be monitored and warned for with typical TSP and NTWC tools,

**Recommends** TSPs and NTWCs of each ICG identify all coastal areas or near-shore faults that could generate large earthquakes and submarine landslides and be prepared to issue warnings as appropriate,

**Noting** the potential for tsunamis to be generated specific atmospheric conditions,

**Recommends** TOWS-WG establish a specific Ad Hoc Team on Meteo-tsunamis under the TT-TWO chaired by Mr Mike Angove with ToRs:

1. Review and advise on gaps related to meteo-tsunami monitoring and warning systems,
2. Develop guidelines on SOPs to monitor and warn for meteo-tsunamis,
3. Review relationship required between TSPs/NTWCs and Regional/National Met Services to monitor and warn for meteo-tsunamis,
4. Write a report to submit to the TT TWO for its next session in February 2023

**Noting** the current report identifies seven types of tsunami sources related to volcanoes and in the aftermath of the HTHH tsunami in Tonga and efforts by some ICGs in the area of volcano generated tsunamis;

**Recommends** the establishment of an Ad Hoc Team on Tsunamis Generated by Volcanoes chaired by Dr Francois Schindele with ToR:

1. Confirm the list of tsunami sources related to volcanoes and volcanic eruptions,
2. Complete the list of potential threat volcanoes (referred to in annex to ATS Report),
3. Identify methodologies to monitor and detect volcanic sources of tsunami,
4. Review relationship required between TSPs/NTWCs and Volcanic Ash Advisory Centres (VAACs) and other relevant agencies to monitor and warn for volcano generated tsunamis,
5. Develop guidelines on SOPs to monitor, detect and warn for any the induced tsunami waves.

**J3 WAVE EXERCISES AND SIGNIFICANT TSUNAMI EVENTS IN EACH ICG (share outcomes, lessons learned)**

Dr Chip McCreery, Chair TT-TWO invited chairs and/or representatives of Tsunami Wave Exercises from each ICG to provide a short summary of recent exercises, share outcomes and lessons learnt.

* ***CARIBE EWS***

Alison Brome presented a report on CARIBE WAVE 21. The exercise was held under the circumstances of a pandemic on 11 March 2021. It was left up to the Member States and Territories to determine if any additional activities would be carried out and whether to use the simulated messages for one of the two scenarios.

CARIBE EWS conducted two earthquake and tsunami scenarios. The Northern Lesser Antilles and the Jamaica scenarios with earthquakes of 8.5 and 8.0 Magnitude, respectively. In the Caribbean and Adjacent Regions, 47 Member States and Territories participated in this exercise with a total of over 330,000 people engaged.

Among the key CARIBE WAVE 21 best practices include consulting with local scientists, experts, and technical agencies on tsunami sources and development of Exercise Handbook; online registration system which facilitates registration by the authorities, public involved in creating greater awareness beyond NTWCs/TWFPs; online evaluation surveys which help create graphs and gather critical information on strengths and weaknesses at regional and national levels (1 per country), an annual frequency of exercise which supports TR nomination and renewal requirements and timing allows for reporting to ICG/CARIBE EWS and takes cognizance of the Atlantic Hurricane Season which would negatively impact Member States participation.

CARIBE WAVE 22 will take place on Mar 10, 2022, with two scenarios: Western Muertos Trough (south of Hispaniola) and Northern Panama Deformed Belt. The La Palma Scenario was removed due to the ongoing volcanic activity.

* ***IOTWMS***

Dr Harkunti Rahayu (Chair WG1 ICG/IOTWMS) reported that in the Indian Ocean six IOWave Exercises have been conducted since 2009. Exercises are conducted every two years. There is an increase in the number of scenarios performed in the Indian Ocean from 1 in 2011 to 3 in 2020. In 2011, 22 countries participated, with 4 counties involved in the exercise at the community level while in 2020, 20 countries participated with 6 counties involved at the community level. IOWave20 was also conducted during the Covid-19 pandemic for over two weeks, between 6-20 October 2020. The IOWave20 contained three earthquake scenarios, the Java trench, the Andaman trench and the Makran trench scenario. Twenty Indian Ocean Member States participated in the IOWave20 evaluation survey.

Key exercise success criteria included testing and understanding communication protocols between the TSPs, NTWCs, TWFPs and information dissemination, identification of areas of improvement in the tsunami warning and response chain and the participation of local communities in the exercise to the extent possible and increase their knowledge of tsunami preparedness and response.

Dr Harkunti focused on the key lessons learnt, which included identifying the need for developing a guide/manual for exercise during a pandemic situation, conducting virtual exercisse is effective in maintaining the goal of IOWave20. A comprehensive list of recommendations was provided spanning from using exercise scenarios that are suitable for all Member States to participate, holding scenarios with a week interval apart, the need to factor the cyclone and monsoon season, coordinating with PTWS to ensure Exercises occur in opposite years and involving international observers in future exercises, updating SOPs, test/verify the UNESCO-IOC Tsunami Ready Indicators during the Exercise and agreeing on common exercise objectives and Exercise success criteria.

* ***NEAMTWS***

Marinos Charalampakis provided a brief history of NEAMWave exercises showing the progressive strategy to conduct joint scenarios. NEAMWave21 was conducted between 8-10 March 2021. Joint scenarios were conducted by four TSPs to reduce wave scenario exercises. The joint scenarios were conducted by IPMA (Portugal) & CENALT (France) (North Eastern Atlantic), NOA (Greece) & KOERI (Turkey) conducted the Eastern Mediterranean scenario while INGV (Italy) conducted a single scenario for the Central Mediterranean. Other major accomplishments included the development of online forms for Subscription and Evaluation, preparation of the NEAMWave Tsunami Exercise Manual comprising of two parts. Part 1 is the Exercise Instructions containing generic information part of the NEAMWave Exercise Manual, and part 2 is the Exercise Supplements. He provided the objectives of the exercise. Key success criteria of NEAMWave included aiming to achieve a high level of engagement from national emergency managers and civil protection agencies, applying recommendations and lessons learnt from previous tsunami exercises to identifying issues both in communication and emergency planning that should be improved. NEAM best practices included using joint scenarios to strengthen the cooperation among the TSPs, organization of targeted workshops for different types of participants (e.g. TSPs, CPAs etc.), tailor-made national messages (language) and enhanced products (maps) to users and carrying out the exercise in a multi-hazard crisis context and within World Tsunami Awareness Day framework. Some of the key lessons learnt included having simple and clear ways for the participation and evaluation of the exercise, timely preparation and distribution of exercise material to the participants and engaging with Civil Protection Agencies / Organizations participation. In future, NEAMWave exercises will create synergies within Tsunami Ready recognized communities, strengthening networks and partnerships with Civil Protection Agencies/Organizations, as well as making greater use and application of enhanced products, including proper effective use of Probability Tsunami Hazard Information.

* ***PTWS***

Dr Laura Kong reported on the PacWAVE20 exercise. In total, 24 countries (including 2 sub-national entities) submitted evaluations. Many more probably received the communications test but did not submit evaluations. The PacWAVE20 Summary Report will be published in early 2022.

A SEP Regional Exercise aimed to improve regional coordination procedures was conducted on 22 October 2020, with the participation of Peru (role-playing as PTWC), Chile, Colombia, and Ecuador. Activities included notification, data sharing, assessment, and country bulletin sharing. The Tsunami Coastal Assessment Tool (TsuCAT) was used to choose the scenario and generate the PTWC public text and enhanced graphical products.

A CATAC Regional Exercise was conducted on 11 Nov 2020 to continue the development of CATAC products as PTWS TSP for Central America – Pacific Coast. PTWS National Exercises in Colombia, Fiji, Tuvalu, Vanuatu, and Russia allowed local stakeholders to better understand their goals, responsibilities and roles in case of tsunami emergencies; and coastal communities be aware of their tsunami risk and are better prepared for tsunamis.

Due to the Pandemic, few countries outside of the SEP tested regional communication and cooperation between countries.

**Recommendations to TOWS-WG**

**Appreciates** thewave exercises conducted in the Caribbean (CARIB WAVE21) and NEAM (NEAMWave21) region during the ongoing pandemic.

**Request** that the TT-DMP continue to work on coordination of the conduct and reporting of exercises with the aim of having standard practices among the ICGs.

Dr Chip McCreery, Chair TT-TWO invited TSP/NTWC representatives from each ICG to provide a short summary on significant operational events with USGS Mw>/= 6.5 and/or events that caused significant tsunamis in the inter-sessional period.

Dr McCreery advised the meeting there were three significant tsunami events in the Pacific Ocean during the intersessional period: a) 4 March 2021 Kermadec, magnitude 8.1; b) 12 August 2021 South Sandwich Island, magnitude 8.2; c) Tonga HTHH volcanic eruption. He noted PTWC has begun using auto-alerting software to help detect and alarm for noon-seismic generated tsunamis, but further noted due to the sensitivity and similar background noise falsely triggering alarms, such alerting software is best only used when there is a known potential threat, such as volcano with potential to destructively erupt. It was also noted that the South Sandwich Island earthquake, while in the South Atlantic, did generate small tsunamis waves that also traveled into the Pacific and Indian Oceans, requiring the PTWS and IOTWMS to react. Commander Carlos Zuniga also noted these waves reach the shores of Antarctica and other countries in the South Atlantic not covered by a regional tsunami warning system. This issue was further discussed in agenda item #5 of the separate TT-TWO meeting.

In the aftermath of the 4 March 2021 Kermadec event, the ITIC and IOC convened a Post-Event Brief on 1[7 March 2021](https://oceanexpert.org/event/2995).  The hotwash covered international and national tsunami warning and emergency responses and was followed by an open discussion aimed at answering country questions and identifying priority recommendations needed to improve the PTWS and national responses.  Actions forward compiled in a post-meeting survey highlighted the importance that the PTWS should organize hotwashes for all major events.  Mindful of the COVID pandemic travel restrictions, webinars, and training on the topics of tsunami sea level monitoring and forecasting, as well as on the PTWC Enhanced Products, Competencies, Tsunami Emergency Response and TEMPP, and Tsunami Ready.

In the aftermath of the 15 January 2022 event, the ITIC and IOC convened three Post-Event Briefs ([20 January](https://oceanexpert.org/event/3380), [3 February](https://oceanexpert.org/event/3387), [10 February](https://oceanexpert.org/event/3401) 2022) for Member States ICG/PTWS and other stakeholders.  The Briefs shared country experiences in warning and responses to this atypical event, and discussed lessons learned and actions forward to strengthen their response to especially volcano-generated tsunamis.  A Poster on the HTHH eruption and tsunami and the importance of real-time sea-level data for tsunami warning was presented at the IOC IODE International Ocean Data Conference 2022 - The Data We Need for the Ocean We Want, 14-16 February 2022.  An ad hoc Hunga-Tonga Hunga Ha‘apai Volcano Task Team is working with the PTWC to stand up interim HTHH volcano tsunami guidance and alerts for the PTWS, with special attention to Tonga and the nearby region. The widespread impact triggered the need to conduct an IOC Post-Event Assessment (IOC CL 2877).

Mr Pattabhli Rama Rao Eluri advised the meeting there were four significant tsunami events in the Indian Ocean: a) 12 May 2021 Mauritius/La Reunion, magnitude 6.6; b) 12 August 2021 South Sandwich Island, magnitude 8.1; c) 14 May 2021 West Coast of Northern Sumatra, magnitude 6.7; d) 14 January 2022 Sunda Strait, magnitude 6.6. The three ICG/IOTWMS Tsunami Service Providers (TSPs) operated by Australia, India and Indonesia all met their targets for the ICG/IOTWMS Key Performance Indicators (KPIs).

Mr Fernando Carrilho advised there was a small tsunami generated near Northern Algeria on 18 March 2021 (approximately 4-9cm).

Dr Elizabeth Vanacore, highlighted the M7.2 August 14, 2021, Haiti Earthquake and Tsunami as well as the Hunga-Tonga-Hunga-Ha'apai Tsunami Observations in the Caribbean and Adjacent Regions.  The Haiti event qualified for an after-action review based on earthquake intensity and the issuance of a tsunami threat message by the Regional Tsunami Service Provider (PTWC).  Preliminary assessment of responding Member States revealed that the PTWC messages were well received by all, however there was a predominant reliance on email.  Regarding the 15 January 2022 Hunga-Tonga-Hunga-Ha'apai volcanic eruption in Tonga, South Pacific, DR. Vanacore reported that sea level disturbances associated with the eruption were observed in the Caribbean, and a small Adhoc Working Group had been established with national and regional experts examining a range of data including sea level, tsunami travel time and atmospheric pressure.  The findings are to be published.

**1. TT-DMP SESSION ORGANIZATION**

**Logistics, participants, agenda**

Mr David Coetzee, Chairperson of TT-DMP started the TT-DMP meeting and again warmly welcomed all members, observers and participants to the TOWS-15 Task Team on Disaster Management and Preparedness (TT- DMP).

The Chairperson introduced the new members of TT-DMP currently participating as observers.

Mr Denis Chang Seng, IOC Programme Specialist and Technical Secretary of TT-DMP briefed the group regarding meeting support and logistics. Ms Esmeralda Borja and Mr Alejandro Aldana are responsible for running presentations, organizing documents, and taking notes to help draft the TT DMP summary report.

The Chairperson then introduced the provisional Agenda. The Group examined and adopted the TT - DMP Agenda with no change.

**2. REFLECTION ON TT- DMP RECOMMENDATIONS TO TOWS-WG XIV (2021)**

The Chairperson and meeting participants reflected on the recommendations of the Task Team to the TOWS WG 14 session.

**Recommendations to TOWS-WG**

**Requests** the Secretariat toshare reports and presentations regarding recent Wave exercises, outcomes, best practices and lessons learnt when received from ICGs,  
  
**Appreciates** the finalization and publication 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 in English,  
  
**Requests** the Secretariat to support the translation of MG 86 into French and Spanish.

**3. TSUNAMI READY TOOLS**

**3.1 IOC Tsunami Ready Guidelines and Tsunami Ready Logo**

Mr Ardito Kodijat provided an update concerning the MG 74 on Standard Guidelines for the Tsunami Ready Recognition Programme and Tsunami Ready Logo.The MG74 has gone through a series of revisions and updates. The document is being processed by a UNESCO IOC Assistant Publication Officer for finalization before publication.

The meeting further discussed the use of the Tsunami Ready logo in the context of the Tsunami Ready implementation. The discussion also highlighted that municipalities that started the accreditation procedure using the previous scheme of indicators should update it to the new one if they apply for accreditation after the approval of the new guidelines.

The meeting also emphasized the importance of standardizing Tsunami Ready signs in order not to confuse for example visitors and the importance of considering a fund-raising strategy to support the most disadvantaged communities, as proposed in the context of the Tsunami Ready Coalition.

**Recommendations to TOWS-WG**

**Requests** that it be noted in the guidelines on the usage of the TR logo that only communities that have received recognition of Tsunami Ready receive automatic approval for the usage of the Tsunami Ready logo for the duration of their Tsunami Ready status in its official products and documents, and that any other entities (including National Tsunami Ready Boards) must request approval from UNESCO/IOC Secretariat to use the Tsunami Ready logo.

**Further requests** that the automatic approval for the usage of the logo by Tsunami Ready communities be informed by the IOC Secretariat in the Tsunami Ready designation letter with regards to MG 74.

**3.2. Tsunami Ready Interactive Map Viewer**

Mr Bernardo Aliaga and Dr Laura Kong provided an update of the Tsunami Ready Map Viewer and Tsunami Ready website. Currently, there are thirty Tsunami Ready recognized communities. The interactive map is driven by an Excel data spreadsheet which will be populated. The Tsunami Ready Map Viewer is completed and it is currently being reviewed by UNESCO Public Relations. This includes verifying maps in accordance with the UN political border requirements, disclaimer and use rights.

The Tsunami Ready website ([www.tsunamiready.org](http://www.tsunamiready.org)), hosted by ITIC, contains information about the Programme, easy links to the Tsunami Ready Map Viewer and an information page on each community that has been recognized as UNESCO IOC Tsunami Ready.

The meeting was informed that the Secretariat is also developing internal procedures and workflows between the Tsunami Ready Boards, TICs and the Secretariat to manage the Tsunami Ready recognition process.

**Recommendations to TOWS-WG**

**Notes** with appreciation the hosting of the TR web site by ITIC,

**Further notes** the importance to have Tsunami Ready resource documents available in local languages,  
  
**Requests** ICGs and the IOC Tsunami Programme Secretariat to advisecountries that are currently in the process of implementing Tsunami Ready, to now follow the MG74 when submitting/applying for Tsunami Recognition, and that MG74 will apply for all future applications.

**Notes** that there are Member States that have their own tsunami preparedness programmes that align closely with the UNESCO/IOC Programme, and

**Requests** the TT-DMP to consider a mechanism to equate those programmes to Tsunami Ready.

**3.3 Tsunami Ready Communication Tools**

Mr Ardito Kodijat introduced the new Tsunami Ready Board Game and Animation Video Series as part of the Tsunami Ready Communication Tools. Printing the board game costs 60 USD. IOTIC has delivered 200 board games in Indonesian and English. In future, the board game can be translated into different languages, however, the shipping cost is high compared to the actual cost of production. IOTIC is happy to share all files with respective ICGs for their own production. Additional funding is needed to continue the development of communication tools. The meeting was interested in possible marketing strategies to make the game more available to the public.

**Recommendations to TOWS-WG**

**Notes** with appreciation the development and production of a new TR Board Game and supporting animation video series prepared by IOTIC, and that additional resources will be required for the production and translation of TR Board Game into several languages.

**4. TSUNAMI READY PILOT PROGRAMMES (see item 6)**

Ms Cecilia Valbonesi, Mr Ardito Kodijat, Dr Laura Kong and Ms Alison Brome reported on the recent developments concerning piloting Tsunami Ready in NEAM, Indian Ocean, Pacific and Caribbean region respectively.

* ***NEAM***

A Task Team on Tsunami Ready under Working Group 4 on Public Awareness, Preparedness and Mitigation was formally established with Terms of Reference (TORs) in the ICG/NEAMTWS XVII Session that took place from 24 - 26 November 2021. The TT on Tsunami Ready will promote, coordinate, and provide advice regarding the implementation of Tsunami Ready in the NEAM region.

Several activities have been carried out in the NEAM region with the purpose of obtaining the Tsunami Ready recognition in countries such as Spain (Chipiona), France (Cannes), Italy (Palmi, Minturno, and Marzamemi), Turkey (Bodrum and Istanbul), Greece (Kos and Samos), Malta (Marsaxlokk) and Portugal (Region of Madeira and Azores).

Several of the twelve Tsunami Ready Indicators have been completed in Cannes, Palmi, and Minturno. Samos, Chipiona, Istanbul, and Marsaxlokk are currently preparing to move forward with the Tsunami Ready Programme through the support of the newly approved EU DG-ECHO and UNESCO-IOC CoastWave Project.

* ***Indian Ocean***

Mr Ardito Kodijat reported that 2 communities in India have received the TR Recognition. In addition, 29 communities are in the process to become TR recognized in Indonesia (7) and India (22) respectively.

* ***Pacific***

The PTWS Working Group 3 on Disaster Risk Management and Preparedness facilitates and monitors Tsunami Ready campaigns and outcomes, and reports results to the ICG/PTWS and the TOWS-WG. In addition, the PTWS Task Team on Future Goals and Performance Monitoring ensures a Global Framework for Goals and Performance Monitoring is aligned with the Tsunami Ready Programme.

Tsunami Ready recognition has been achieved by 10 communities in 5 countries: Guatemala (2), El Salvador (2), Honduras (1), Costa Rica (4), and Samoa (1), with 30 communities in 10 countries in the process or planned: Tonga, Fiji, Cook Islands, Solomon Islands, Vanuatu, Republic of the Marshall Islands, [Federated States of Micronesia](https://en.wikipedia.org/wiki/Federated_States_of_Micronesia), Palau, Costa Rica, Panama, and Ecuador), through the UNESCO Tsunami Ready Pilot.

* ***Caribbean***

There are 14 recognized Tsunami Ready communities in the Caribbean region. The British Virgin Islands and St. Kitts and Nevis met requirements for Tsunami Ready renewal. Old Harbour Bay, St. Catherine, Jamaica met requirements for recognition. There has been progress in the implementation of Tsunami Ready Indicators in St. George, St. Vincent and the Grenadines. The implementation of Tsunami Ready Indicators has been postponed in Holetown, Barbados and Belize City with Holetown scheduled to be completed in 2022 with financial support mobilized by IOC.

**Recommendations to TOWS-WG**

**Notes** the continued progress in the implementation of Tsunami Ready in the NEAM, Indian Ocean, Pacific and Caribbean regions, which indicates that Tsunami Ready has now established itself as a globally popular and recognized tsunami preparedness tool.

**5. TSUNAMI READY PROGRAMME – PROPOSAL FOR ENDORSEMENT BY IOC**

Dr Laura Kong, Director of International Tsunami Information Centre (ITIC) introduced a [document on Tsunami Ready Programme](https://oceanexpert.org/document/30036) for TT-DMP discussion and approval for recommendation to the TOWS-WG-XV, and eventual endorsement by IOC at its next Governing meeting in June 2022. The intent is to transition from a Pilot to a Programme. This document presents the main features of a Programme (i.e., aim, planning, promotion, scientific and technical guidance, standard-setting, among others).

The document highlights that the Tsunami Ready Recognition Programme is an international community-based recognition programme developed by UNESCO/IOC. It aims to build resilient communities through awareness and preparedness strategies that will protect life, livelihoods, and property from tsunamis in different regions. In June 2021, the IOC Assembly through [IOC Decision A-31/3.4.1 - Warning Mitigation Systems for Ocean Hazards.](https://oceanexpert.org/downloadFile/49209) approved the establishment of the IOC Ocean Decade Tsunami Programme, with the aim of making 100% of communities at risk of tsunami prepared for and resilient to tsunamis by 2030 through the implementation of the UNESCO/IOC Tsunami Ready Recognition Programme and other initiatives. The implementation of the Tsunami Ready Recognition Programme will be a key contribution to achieving the societal outcome ‘*A Safe Ocean*’ of the Ocean Decade.

The proposal is attached to this Report as Annex A.

**Recommendations to TOWS-WG**

**Recommends** to include both “UNESCO” and “IOC” in the name of the Programme, i.e. *“UNESCO/IOC Tsunami Ready Recognition Programme”,*

**Recommends** the establishment of an UNESCO/IOC Tsunami Ready Recognition Programme, as described by the TT-DMP Working document on the UNESCO/IOC Tsunami Ready Recognition Programme (Annex A of this Report),  
  
**Recommends further** the addition of the task to facilitate the UNESCO/IOC Tsunami Ready Recognition Programme to the Terms of Reference of each ICG Tsunami Information Centre (TIC).

**6. NEW PROJECTS, INCLUDING OCEAN DECADE ACTIONS**

The Chairperson invited the Technical Secretaries of ICGs and TIC representatives to provide an update concerning ongoing, recent, and potential new projects on the horizon.

* ***NEAM***

Mr Denis Chang Seng, ICG/NEAMTWS Technical Secretary reported on the new UNESCO/IOC and European Union (EU) Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG-ECHO) CoastWAVE project “Strengthening the Resilience of Coastal Communities in the North-East Atlantic and Mediterranean Region to the Impact of Tsunamis and Other Sea Level Related Coastal Hazard”. The CoastWAVE project is currently being implemented in seven countries: Cyprus, Egypt, Morocco, Greece, Malta, Turkey, and Spain; and it will also involve the technical expertise and advice of Member States such as Italy and France who are already implementing Tsunami Ready communities. The project aims to improve understanding of tsunami and sea-level related risks perceptions (tsunami, storm surge and sea-level rise), develop better communication strategies, enhance real-time detection and monitoring capacities, improve alert and warning capacity and eventually implement at least seven Tsunami Ready recognized communities by 2023 in the seven selected countries. The project will build upon the JRC Last Mile Projects implemented in Greece, Malta, and Turkey. A Project Assistance (Finance and Administration) and Associate Project Officer have recently been recruited. They will report to the TT-DMP in 2023. Project implementation is based on a flexible and adaptable time frame within the project lifetime of 2.5 years due to COVID-19.

* ***Indian Ocean***

Mr Ardito Kodijat presented a report on new projects in the IOTWMS. The UNESCAP TTF-29 - Phase 2 project, “*Strengthening tsunami early warning in the North West Indian Ocean region through regional cooperation”*, was launched in December 2021. The participating Member States of the project include India, Iran, Pakistan, Oman and the United Arab Emirates. The two objectives of the second phase of the project are to complete the finalization of Phase-1 remaining activities in tsunami risk knowledge and strengthening of national tsunami warning chains and to gap analysis and development of guidance on tsunami inundation mapping and evacuation planning in the NWIO region.

The IOTIC BMKG Programme has requested funding to support the following activities: 1. Indian Ocean Regional Workshop (proposed); 2. Development of Tsunami Ready Tools (proposed); 3. OTIC and IOWave Website (proposed).

In addition, the IOTIC BMKG Programme plans to develop a UNESCO-IOC Tsunami Ready Recognition online application. The online application will allow the National Tsunami Ready Board to select the region of the nominated village, complete indicators checklist and document attachments, as well as workflow to the IOC Secretariat, TIC, and ICG of the region to access the files. Presently, the Tsunami Ready Recognition online application platform is in an early discussion phase.

* ***Pacific***

The ITIC has received funding from US to implement Tsunami Ready in the Republic of Marshall Islands, Federated States of Micronesia, and Palau, as well to assist in Fiji.

* ***Caribbean***

Ms Alison Brome provided a report on new projects of the CARIBE EWS.

Nine (9) new Tsunami Ready Communities are scheduled to be recognized (1 each in Dominica, Dominican Republic, Grenada, Jamaica, Saint Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago, and 2 communities in Barbados) in 2022.  Additionally, Anguilla (territory-wide) and the communities of St. Patrick, Grenada and Fort Liberte, Haiti are up for renewal.

The IOCARIBE-led UN Decade Actions for CARIBE EWS include two new projects:

1. Integrating Coastal Hazard Early Warning Systems and Services for the Tropical Americas and Caribbean (iCHEWS TAC)

2. TAC Ocean Observing and Forecasting System (TAC-OOS)

A total of 34 Member States and Territories in the region will benefit from the iCHEWS TAC Project. Key objectives of the project include prioritizing the integration of existing and new coastal hazards early warning systems and services considering four components: Monitoring and Warning, Risk Knowledge, Warning Dissemination and Communication, and Response Capabilities, supported by capacity development. In addition, other ocean-related hazards and their impacts will be considered including tropical cyclones, climate change, tsunami, sargassum, wastewater, oil spills, and coral bleaching.

The TAC-OOS project will also benefit 34 Member States and Territories in the region. The project aims to support the co-design and operation of a sustained, regional integrated ocean observation and forecasting system to provide essential information for the sustainable development, well-being, and safety of the region’s oceans. The project will promote the development of regional National Observing Systems and collaborate with Ocean Decade Programs both in regard to capacity building and education.

CARIBE EWS also reported that it will participate in the Ocean Decade: Safe Ocean Laboratory which will take place from 5-7 April 2022. Themes to be addressed include blue line modeling and GIS to identify tsunami and other coastal inundation limits, warning and responding to atypical tsunamis and SMART Subsea Cables.

**Recommendations to TOWS-WG**

**Notes with appreciation** the new projects underway in the respective regions.

**7. TRAINING**

Mr Ardito Kodijat provided a report on the Tsunami Ready training provided by the Ocean Teacher Global Academy (OTGA) in collaboration with Indonesia BMKG. The training consists of a four-course breakdown and 3 types of Modules. The four-course breakdown comprises an introduction to Tsunami Ready, Tsunami Ready indicators, implementing Tsunami Ready, and facilitating Tsunami Ready. The modules cover themes such as Tsunami Ready for decision-makers, Tsunami Ready for the community, and Tsunami Ready for facilitators. In addition, links to references such as videos, articles and news will be provided. Quizzes for the courses still have to be prepared.

Dr Laura Kong provided a report on training course proposals of the International Tsunami Information Center (ITIC) with the support of the OTGA Platform. ITIC has proposed 5 training courses to support Tsunami Ready. The initial target timeline to construct the courses is 2023. The courses proposed are the following:

1. Tsunami Awareness (4-8 hr content) – introduction available to everyone.
2. Tsunami Early Warning Systems overview (40-80 hrs content) taught in-person to country government officials and scientists since the 1970s.
3. Tsunami Evacuation Maps, Plans, & Procedures (200 hrs content) –IOC MG 82 course manual, taught since 2015, training on Tsunami Ready Indicators.
4. Tsunami Warning Center and Emergency Management Response SOPs (40 hrs content) – IOC MG 76 course manual, taught since 2006, training on operations.
5. Tsunami Warning Center Competencies (80 hrs content)–content under development, taught 1 pilot in 2019 in Pacific SIDS

The Tsunami Evacuation Maps, Plans, and Procedures (TEMPP) course will teach participants lessons on modeling to inundation mapping, response planning and exercise. The TEMPP course is designed to strengthen capacity building and help communities be Tsunami Ready Recognized much sooner.

In addition, ITIC and IOC Tsunami Unit DRR Officer based in Fiji conducted hybrid training workshops, “Review and Update of Regional and Local Tsunami SOPs (TWC & TER SOPs)”, in the Solomon Islands, Fiji, and Vanuatu in November 2021.

For 2021-2022, ITIC is producing training videos on the PTWC products, tsunami warning operations, and tsunami forecasting. Videos explaining the PTWC Enhanced Products for the Caribbean, and for the Pacific, in English with SPanish and French captions, have been completed, and are available on the ITIC Vimeo page.

**Recommendations to TOWS-WG**

**Notes with appreciation** the efforts of the IOTIC, BMKG (Indonesia) and ITIC in preparing Tsunami Ready and TEMPP training through the Ocean Teacher Global Academy (OTGA) platform as well as offering hybrid training workshops and training videos.

**8. WTAD 2021/2022**

Ms Cecilia Valbonesi (NEAM), Mr Ardito Kodijat (Indian Ocean), Dr Laura Kong (Pacific) and Ms Alison Brome (Caribbean) provided a summary of the activities carried out in each region in 2021 to commemorate the WTAD.

* ***NEAM***

In the NEAM region, two separate exercises/drills were conducted in France: Prefect of Bouches du Rhône Department Tsunami Exercise (Marseille, Martigues, Fos-sur-Mer and Cassis) on 4 November 2021 and a Tsunami drill and seminar was held in the city of Cannes on 5 November 2021. In Malta, an end-to-end tsunami exercise (JRC TLM-MALTA21) was organized by the Civil Protection Department and the University of Malta with the support of the JRC in the village of Marsaxlokk on 5 November 2021. CAT-INGV TSP, Italy provided regional tsunami alert messages to Malta to execute the exercise.

The CAT-INGV, Italy and NOA, Greece also participated in a table-top exercise promoted by the ChEESE project on 5 November 2021, to show the potentiality of Urgent Computing for Rapid Post Event Assessment.

CAT-INGV also created [The Story Map](https://storymaps.arcgis.com/stories/32091c82e42a4d30a2f24b1e7b5955b6): "*A journey through the tsunamis of the Mediterranean Sea. From 365 A.D. to today: an interactive path to tell the tsunamis occurred in the Mediterranean Sea*"

A Tsunami Ready office was inaugurated in Chipiona, Spain on 3 November 2021 with a permanent exposition display to the local public and visitors.

A tsunami awareness event was co-organized by the Istanbul Metropolitan Municipality and KOERI, Turkey with the participation of METU and various national stakeholders. The National Institute of Oceanography and Fisheries (NIOF), Egypt organized social events for public awareness, including an online workshop on 8 Nov. 2021.

* ***Indian Ocean***

In the Indian Ocean, IOTIC and IOTWMS secretariat organized a webinar, “International Cooperation: A Strategic Pathway for the Indian Ocean Tsunami Warning and Mitigation System within the context of the UN Decade or Ocean Science”. The webinar was attended by 78 participants and was composed of a closed strategic pathway discussion session with breakout groups about risk assessment and reduction: hazard and risk identification and risk reduction; and tsunami risk, community awareness and preparedness.

The webinar resolved to continue to encourage Member States to put priority into the effort of improving the timeliness, reducing uncertainty levels in tsunami detection and warning, and implementation of Tsunami Ready, and to continue to facilitate local, regional, and national communities of Member States to pro-actively learn about Tsunami Ready indicators and implement Tsunami Ready to enhance readiness levels. An open session was streamed through IOTIC Facebook with the announcement of the Indian Ocean Youth Video Competition winners.

* ***Pacific***

The November 5, 2021, high-level, online World Tsunami Awareness Day event was co-organized by the governments of Japan, Chile, Fiji, Maldives, as well as Australia, Indonesia, Norway, and Peru, UNDRR, UNDP, and UNESCO.  Regional activities included seminars on International Cooperation on Tsunamis in Asia-Pacific, introduced by Sweden, with contribution from the Philippines, UNDRR, ESCAP, UNESCO, and UNDP, and International Cooperation for Tsunami Warning and Mitigation in Pacific Island Countries (PIC), introduced by Fiji, with contributions from Cook Islands, UNDRR, SPC, ICG/PTWS Vice Chair (Tonga), and ITIC.  PIC activities included active Facebook posts from Fiji, Samoa, Solomon Islands, Cook Islands, Vanuatu, and Tonga, as well as awareness events, in Tonga (media, youth awareness competitions), Samoa (exercise), Solomon Islands (youth events), and Vanuatu (Aneitjom, Epi island exercises).  The UNDRR and IOC collaborated to produce several short awareness videos highlighting activities in several PTWS countries, including New Zealand (DARTs) and the Solomon Islands (Tsunami Early Warning System).  For the global level video, the ITIC Director joined the IOC Executive Secretary to highlight the UN Ocean Decade and Tsunami Ready.

* ***Caribbean***

The Caribbean Tsunami Information Centre (CTIC) activities supported concept development of global UNDRR-led WTAD activities. CTIC took part in the UNDRR-led VII Regional Platform Disaster Risk Reduction in the Americas and the Caribbean (Virtual), Ideas Incubator Session (Side Event) – [“Tsunami Ready: Towards A Safer Ocean”, and](https://www.youtube.com/watch?v=D7hIAGSGZE0&list=PLBDwPnveHho-auwFi36iav0Otyt_RokVE&index=3) Innovator Platform Session (Virtual Exhibition).

There were two CARIBE-EWS videos showcasing international collaboration for Tsunami Ready. Key partners included the Caribbean Disaster Emergency Management Agency (CDEMA), the Coordination Center for the Prevention of Disasters in Central America and the Dominican Republic (CEPREDENAC) and the Delegation of the European Union.

* **UNDRR**

Ms Rosalind Cook, UNDRR provided a summary or overview concerning key achievements and challenges in regard to WTAD 2021 and suggested a way forward (strategy and activities) to celebrate WTAD 2022. There were major events in New York, Asia Pacific, Africa and the Caribbean. The 2021 campaign had 194 million impressions. It generated 1.1 million views, and over 54,000 reactions and shares. It was used by nearly 3,400 accounts including the UN and UNESCO.

The WTAD 2022 theme is on the Sendai Framework Global Target G: Substantially increase the availability of and access to multi‑hazard early warning systems and disaster risk information and assessments to the people by 2030.

The meeting discussed how to make optimal use of resources and staff to continue to achieve high impact.

**Recommendations to TOWS-WG**

**Notes** the activities undertaken by the respective regions for WTAD 2021, and the success achieved by UNDRR,

**Notes** that the 2022 WTAD theme will highlight Sendai Framework Global Target G: Substantially increase the availability of and access to multi‑hazard early warning systems and disaster risk information and assessments to the people by 2030, and that this theme aligns closely with the current focus of the TOWS-WG in the context of the UN Ocean Decade.

**Recommends** the continued strong collaboration between the UNESCO/IOC and UNDRR for the 2022 WTAD highlighting among other initiatives the UN Ocean Decade Tsunami Program goal for 100% Global Tsunami Ready for highly vulnerable communities,

**Recommends** highlighting the multi-hazard framework in WTAD activities.

**2ND JOINT SESSION TT TWO AND TT DMP (CHAIRED BY MR. DAVID COETZEE)**

**J4. GLOBAL KPIs**

Ms Sarah-Jayne McCurrach (Chair, WG1 of the PTWS and lead of the task team on global KPIs) reported on the work of the team established in 2019 to develop a KPI framework in relation to the Sendai Framework for Disaster Risk Reduction (SFDRR) indicators.

In February 2019 ‘Action Item 6’ from the 'Report of the Inter-ICG Task Team on Disaster Management and Preparedness' stated:

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

To achieve the above, a Task Team was formed from members of the CARIBE-EWS, PTWS, IOTWMS and NEAMTWS. All meetings of this Task Team have occurred online due to the global pandemic.

The Task Team have developed a global framework with goals, targets and corresponding measures. These are currently having a final review before being published as final draft to TTDMP. The mission of this work is to promote a *“…modern and effective global tsunami warning and mitigation system based on global ICG and Member State participation. A key focus is to substantially improve community access to tsunami hazard and risk information, resulting in prepared, aware and resilient countries at risk of tsunami. Subsequently, we agree to work together, to reduce risk and build resilience to tsunami hazards.”*

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

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

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

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

The secretariat confirmed that IOC can host the site and will provide a consultant to support the development of the online survey which will include the technical/technological aspects of survey design. The secretariat also proposed the ICG focal points form a steering group to over the decisions and outputs of the Task Teams work from now, until completion.

**Recommendations to TOWs-WG:**

**Agrees** to the approach taken by the Task Team to create the global framework,

**Requests** the Task Team to finalize the data and information contained in the measures, and to develop on-going documents and user guidance for survey completion/reporting aligned with the framework,

**Notes** aspects of this work requires additional resource and expertise that sits outside of the current Task Team,

**Notes** the Secretariat will resource working with industry experts to develop the on-line survey.

**Notes** that the survey will be hosted on the IOC website.

**J5. LOCAL SOURCE SOPS**

Representatives of the respective ICGs reported on the status of implementation of local source SOPs across MS in their regions, especially with a view on atypical tsunamis:

Dr Laura Kong shared information for the Pacific, which released Version 1 of its Local-Source Tsunami Response Best Practice (ICG/PTWS-XXVIII, 2019), for use by PTWS Member States.  The document focused on response to earthquake-generated tsunamis and their natural tsunami warnings and emphasized self-evacuation and public awareness and education.  Items left for subsequent consideration included work to cover non-typical or non-earthquake-generated tsunamis.

In the aftermath of the January Tonga volcanic eruption and tsunami, the PTWS, with the TSP PTWC and advised by an ad Hoc Hunga-Tonga Hunga Ha’apai Task Team, is urgently implementing as a best-endeavors effort Interim volcano tsunami procedures, with training, for the HTHH volcano should it erupt again.  The Tonga Meteorological Services, as the NTWC for Tonga, acknowledging the challenges to effectively warn in time for local events, is working with expert partners to produce worst case volcano scenario expected inundation maps as public education and outreach tools to inform their people on what to expect and where to evacuate to.  Previously, as mentioned later under Agenda J 6 Training Competencies, its NTWC had implemented a ‘Did You Feel It’ mobile phone tool for quick, non-instrumental characterization of the earthquake source as a local SOP for tsunami warning. These interim SOPs could be shared with the other ICGs.

Mr Rick Bailey advised the meeting that the ICG/IOTWMS has a Task Team on Tsunami Preparedness for a Near-Field Tsunami Hazard. Also due to the near-field threat of tsunamis in the Northwest Indian Ocean due to the Makran Source Zone (MSZ), the UNESCAP funded project “Strengthening Tsunami Warning in the North West Indian Ocean” is helping Member States in the region to develop national tsunami warning chains with well-developed SOPs. In response to Anak Krakatoa flank collapse and corresponding tsunami in 2018, Indonesia has implemented volcano and tsunami wave monitoring procedures to inform future tsunami warnings.

**Recommendations to TOWS-WG**

**Noting** the interest of other ICGs**, requests** the PTWSto sharetheir local source SOPs efforts with other ICGs, with a view toward developing consistent approaches.

**J6. TRAINING COMPETENCIES**

Dr Laura Kong reported on training competencies and related training programmes. She provided a summary of the PTWS’s work to develop a National Tsunami Warning Centre (NTWC) Competency Framework, which was a request from the Pacific Islands and Territories (PICT) Regional Working Group. A draft was completed and endorsed in 2017 by ICG/PTWS-XXVIII. It proposes a tiered framework, with competencies dependent on whether staff are to attain comprehensive expert or basic levels, or whether the warning centre is a minimally viable, or fully independent centre. The ITIC has been taking the lead as part of the PICT WG Task Team on Minimum Competency Levels for NTWC Operations Staff and conducted one pilot in October 2019 in Tonga at their request. Topics covered the tsunami warning chain, lessons learned, and hands-on activities, with significant time spent on Tonga SOPs, especially for a local event.

Dr. Kong highlighted that after the training, Tonga’s NTWC staff used tools (TsuCAT) and knowledge gained to investigate threat scenarios and conduct daily exercises to practice their SOPs. Lacking a seismic network, they also developed a simple “did you feel it” (based on Modified Mercalli scale) app that provided a rough estimate of the felt earthquake’s location and size, and this has been used successfully to justify warnings. It is always hard to measure the effectiveness of trainings, but what we do know is that for the 15 January 2022 volcano tsunami, the Staff was well-versed in local response, and once the ‘natural warning’ threshold was reached, they immediately knew to issue warning, then monitor, and finally cancel following the SOPs they developed.

One of the keys for training continues to be the person-to-person interaction, which is why it is challenging to develop fully online or remote learning training. Currently, the ITIC intends to develop online or hybrid courses for its SOP topics (NTWC competencies) through the Ocean Teach Global Academy, working with partners. ITIC is currently working on Tsunami Awareness. Based on the Tonga experience, a combination of online, self-paced courses that cover the basic knowledge (such as the USA COMET® course that were done by Tonga MetService staff), followed by in-person or hybrid training on more advanced topics, may be the most cost-efficient and cost-effective modality.

**Recommendations to TOWS-WG**

**Notes** with appreciationthe work of the PTWS to develop aNTWC Competency Framework (2017), and the ITIC’s leadership to pilot training courses based on the Framework,

**Notes the interest of other ICGs, requests** the PTWS to share its document with other regions, and invite comments and feedback, and

**Also noting** the challenges in developing and implementing a global competency framework,

**Requests** the TT-TWO and TT-DMP work together to draft guidelines for a global NTWC competency framework based on the available set of documents and Pacific input, noting that implementation can be at a regional level.

**J7. TSUNAMI GLOSSARY UPDATE**

Dr Laura Kong provided an update on the status of the Tsunami Glossary. She provided a short history of work since the first edition in 1991. The Glossary was translated into other languages after the 2004 Indian Ocean tsunami and updated in 2016 and 2019. The next update is scheduled for 2022 but Dr Kong recommended delaying the next update until 2023 due to delays caused by unforeseen events and to enable accommodation of new Tsunami Ready terminology when it becomes an IOC Programme, as well as terminology related to atypical sources, under development. Continuing their long cooperation with the IOC, scientists of the IUGG Joint Tsunami Commission Working Group on Terminology have compiled preliminary recommended edits and these are posted to the meeting web site. Recommendations were also received from Member States, including for volcano tsunami.

**Recommendations to TOWS-WG**

**Notes** with appreciationthe contributions of the IUGG Joint Tsunami Commission Working Group on Terminology and Member States to update the 2019 Tsunami Glossary,

**Agrees** to postpone the next update of the Tsunami Glossary to 2023 to facilitate the incorporation of important changes,

**Notes** the importance of translating the Tsunami Glossary in local languages so local people and authorities can understand and use the consistent terminology.

**Also** **notes** the importance of having abbreviated definitions for key terms for use in social media and other abbreviated language communication tools.

**J8. IUGG UPDATE**

Dr Laura Kong provided an update on the IUGG (*International Union of Geodesy and Geophysics) Joint Tsunami Commission (JTC).* IUGG is an international organization dedicated to advancing, promoting, and communicating knowledge of the Earth system, its space environment, and the dynamic processes causing change. Established in 1960, the JTC promotes the exchange of scientific and technical information about tsunamis among nations concerned with the tsunami hazard. In the past, the IUGG JTC and PTWS have co-hosted tsunami workshops prior to the ICG/PTWS sessions. There are currently six Working Groups (Tsunami Terminology, Science-based Tsunami Warning, Tsunami Magnitude, GNSS Data for Tsunami Warning, Meteotsunami, Tsunami Data), and these are available to support IOC and ICG tsunami science activities. Since 1960, 28 Tsunami Symposia have been held, including 1 in 2019 and 1 in 2021. Tsunami papers have been published as special volumes or topical papers on tsunamis in 1992 Nicaragua, 2015, Chile, 2016 Kaikoura, New Zealand, 2016 Italy earthquake, and 2017 Chiapas Central Mexico earthquake and tsunami.

**Recommendations to TOWS-WG**

**Welcomes** the offer of the IUGG Joint Tsunami Commission to further collaborate with the IOC and its ICGs, such as through the JTC Working Groups, international science symposia, and tsunami publications.

**J9. PLANNING FOR OCEAN DECADE**

**Science Committee progress and plans**

Dr Srinivas Kumar, Chair of the Ocean Decade Tsunami Programme (ODTP) Scientific Committee (SC), reported on the progress and plans following their initial meeting on 17th February 2022.

He underlined that the UN Ocean Decade (2021-30) is a once-in-a-generation opportunity to address gaps in tsunami warning, enhance community preparedness and contribute to “A Safe Ocean”. The IOC Assembly 31 (Dec. A-31/3.4.1) established the Ocean Decade Tsunami Programme Scientific Committee to Develop Research, Development & Implementation Plan to focus on Technological and Observational Advances to reduce uncertainties with the aim to have 100 % at-risk communities prepared and resilient to tsunamis by 2030 (Tsunami Ready, etc.). The figure below shows the structure of the ODTP -SC in relation to other IOC governing structures, including TOWS-WG, TT-DMP, TT-TWO etc.

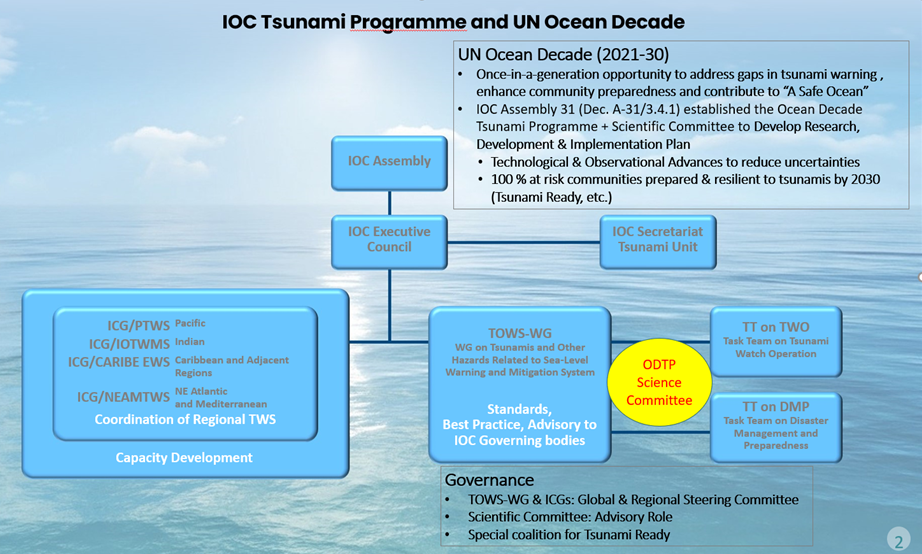


Figure 1: UN Ocean Decade Tsunami Programme Scientific Committee

He introduced the appointed members of the UN Ocean Decade Tsunami Programme Scientific Committee (Annex to Dec. A-31/3.4.1). Members will serve for a period of two years and would be eligible for renewal once.

Dr Kumar also introduced the ToR of the UN Ocean Decade Tsunami Programme Scientific Committee and outlined a proposed timeline for the work of the Scientific Committee to prepare the 10-Year Research, Development and Implementation Plan for the Ocean Decade Tsunami Programme. The timeline accounts for key events, including the Safe Ocean Labs (April 2022), the IOC -EC 55 (June 2022) leading to the next TOWS WG meeting in February 2022 for the UN Ocean Decade Tsunami Programme.

Mr Mike Angove provided a brief on the development of a conceptual framework on “*Protecting Communities from the World's Most Dangerous Waves: A Framework for Action under the UN Decade of Ocean Science for Sustainable Development*”. The Tsunami Decade value proposition and opportunities encompass improving direct tsunami detection and measurement, rethinking ocean observations, reducing uncertainty in global tsunami forecasts and addressing new potential sources of seismic observations for tsunami warning systems. The proposition entailed exploring new challenging areas across the EWS elements: risk knowledge, monitoring and warning, dissemination and communication, response capability and capacity development with specific attention to SIDS and LDCs. An inventory of actions is being considered under the United Nations Decade of Ocean Science for Sustainable Development (2021–2030) in the field of tsunamis and other sea-level related hazards warning and mitigation. Member States and Observers have contributed information through a dedicated questionnaire on UN Decade tsunami-related specific actions that aligns with the components of UNDRR People-Centered Early Warning Systems including.

**Recommendations to TOWS-WG**

**Notes** the report of Dr Kumar on the progress and plans following their initial meeting of the UN Ocean Decade Tsunami Programme Scientific Committee on 17th February 2022.

**Tsunami Ready Coalition**

Mr David Coetzee, Chair of TT-DMP summarized the report of a meeting of the TT-DMP in October 2021, at the request of the Chair of the TOWS-WG, to advise on the composition and mandate of the special Tsunami Ready Coalition at the request of. The [report](https://oceanexpert.org/document/30040) is available on the meeting website; it covered the proposed Coalition mandate, goals and objectives; 2) Composition, and 3) Challenges in the functioning of the Coalition.

**Recommendations to TOWS-WG**

**Notes** the report and proposals of the TT-DMP with regards to the special Tsunami Ready Coalition

**Agrees** to incorporate the proposed goal, objectives, scope and composition in the terms of reference for the tsunami Ready Coalition.

**Tsunamis nexus with other coastal hazards (Multi-Hazard Early Warning Systems)**

Mrs Christa von Hillebrand-Andrade shared efforts and a proposal from the Caribbean on Multi-Hazard Early Warning Systems (MHEWS). One of the 10 challenges of the Ocean Science Decade is to Enhance multi-hazard early warning services for all geophysical, ecological, biological, weather, climate and anthropogenic related ocean and coastal hazards, and mainstream community preparedness and resilience. She also indicated that to date there have been several endorsed actions for the decade which are focused directly on tsunamis or for which tsunamis are included ocean observing and forecasting systems. She highlighted that in many countries, tsunamis are embedded in other agencies responsible for monitoring and advising on threats. It was noted that there are efficiencies at the technical and preparedness levels to be gained at the upstream and downstream for more effective coastal hazard warning systems and services. Through IOCARIBE in January 2022 two projects covering the Tropical Americas and Caribbean have been submitted for endorsement by the UN Ocean Decade: Integrating Coastal Hazard Early Warning Systems and Services for the Tropical Americas and Caribbean (iCHEWS TAC and TAC Ocean Observing and Forecasting System (TAC-OOS). Both of these, if endorsed, would contribute to the Tsunami Decade Programme. The Caribbean Tsunami Information Center was included as a strategic partner. She suggested that TOWS encourages Member States, ICGs, IOC Tsunami Unit, Tsunami Information Centers and UN Decade Tsunami Programme to purposely support, contribute to, and manage the integration of tsunami warning system capabilities with other coastal hazard early warning systems and services. She noted that a multi hazard system includes risk knowledge, observations and warning, warning communications and response capabilities all supported through capacity development. Given these considerations, she suggested that TOWS encourages Member States, ICGs, IOC Tsunami Unit, Tsunami Information Centers and UN Decade Tsunami Programme to purposely support, contribute to, and manage the integration of tsunami warning system capabilities with other coastal hazard early warning systems and services.

Dr Denis Chang-Seng reported on the engagement and contributions of UNESCO IOC towards the organization of GP2022, the Third MHEWS Conference (MHEWS-III) and the preparation of the WiA Guide on Multi-Hazard Early Warning System. The Seventh Session of the Global Platform for Disaster Risk Reduction (GP2022) will be organized in Bali Indonesia 23-28 May 2022. The High-Level Message is from Risk to Resilience: Towards Sustainable Development for All in a COVID-19 Transformed World. The three main themes of GPDRR are: Disaster Risk Governance, COVID-19 Recovery, DRR financing and three cross cutting themes are: Sendai Framework stock taking, Leave no one behind, SDGs and Climate Change. IOC/UNESCO coordinated the nomination of candidates from the tsunami community to the DPDRR High Level Dialogue, fifteen Thematic Session Organizing Teams as well as panelist. There were 35 nominations to participate in the respective organizing teams. Twenty nominations were received focused on Thematic Session 15: Early Warning and Early Actions. A few members including Secretariat are serving on four of the Thematic Sessions organizing teams, including TS 15, however there were no successful nominations for panelist.

IOC/UNESCO and partners have submitted two proposals for side events on **My Coastal City is Getting Ready (**UNESCO, IOC/ CLT & UNDRR), and **Recognizing Tsunami Ready: A New Meaning to Community Awareness and Preparedness (**UNESCO-IOC/ BMKG). In addition, IOC UNESCO is involved in twoInnovation Platforms on **The Girl and the Tsunami** (Pacifico Creative Risk Communications, IOC/UNESCO & UNDRR) and **Recognizing Tsunami Ready Communities** (UNESCO-IOC).

IOC/UNESCO is also participating in the International Network on MHEWS (IN-MHEWS) to organize the Third MHEWS III, 21-22 May 2022, Bali, Indonesia and contributing as co-lead with a WMO on a chapter on the Words into Action Guide on MHEWS. The objective of the WiA Guide is to Provide advice for governments, stakeholders & partners on how to institutionalize, operate, monitor and strengthen people-centred inclusive approaches for multi-hazard and comprehensive end-to-end EWS that enables early action to protect livelihoods, people and assets. The WiA Guide will  be launched on the International Day for Disaster Risk Reduction, 13 October 2022.

**Recommendations to TOWS-WG**

**Notes with appreciation** the efforts of the CARIBE-EWS and the Secretariat to coordinate and contribute to global initiatives related to MHEWS.

**Encourages** Member States, ICGs, IOC Tsunami Unit, Tsunami Information Centers and the UN Decade Tsunami Programme to purposely support, contribute to, and manage the integration of tsunami warning system capabilities with other coastal hazard early warning systems and services

**Reducing the uncertainty in tsunami forecasts against elapsed time.**

Mr Mike Angove presented on the challenge to offer more certainty faster in tsunami warnings. Present seismic and sea level monitoring networks are limited in their coverage. Through the UN Ocean Decade Tsunami Programme its proposed to enable more timely and accurate tsunami warnings by: 1) Expansion of existing and deployment of new technologies addressing observational gaps; 2) Wide expansion of real and near-real time data access and availability; 3) Access to data, tools and communication platforms, protocols and training to timely and effectively warn coastal and maritime communities.

**Tsunami Risk Reduction in urban planning**

Dr Harkunti P. Rahayu, member of TT-DMP, proposed that the UN Ocean Decade Tsunami Programme Framework for Action include: 1) mainstreaming Tsunami Disaster Risk Reduction in urban planning for city/municipality level by linking Ocean Decade actions with SDG’s Goal 11 to make cities inclusive, safe, resilient and sustainable; as well as with Target 5 of the Sendai Framework by increasing the number of local DRR strategies; 2) built back better pre-disaster recovery planning for tsunami by linking to priority 4 of Sendai Framework.

**J10 PLANNING FOR WTAD 2022 (ACCESS TO MULTI-HAZARD WARNING SYSTEMS AND DISASTER RISK INFORMATION AND ASSESSMENTS)**

Ms Rosalind Cook, UNDRR provided an update in the joint session (based on the discussion of Day 1) on WTAD 2021 and the way forward to commemorate WTAD 2022.

The chair of the TT-DMP advised that the task team had an extensive discussion on Day 1 about WTAD activities in 2021 and it was encouraging to get this global view. He noted the theme for 2022 is Sendai Framework Global Target G: “Substantially increase the availability of and access to multi‑hazard early warning systems and disaster risk information and assessments to the people by 2030”, and that this theme aligns closely with the current focus of the TOWS-WG in the context of the UN Ocean Decade.

**Recommendations to TOWS-WG (See earlier – item 8)**

**J11. PLANNING FOR NEXT SYMPOSIUM**

Mr François Schindele reported on the planning for the next proposed Tsunami Symposium. The first IOC UNESCO Tsunami Symposium was held in February 2018. One of its recommendations was to repeat this kind of symposium. The goal would be to examine lessons learnt from past events and recent efforts in further developing tsunami warning and mitigation systems to enable enhanced community responses. Future needs and suggested developments will contribute to the following areas: (i) Detection and Warning; (ii) Emergency Management; (iii) Community Awareness and Preparedness; (iv) National Initiatives; and (v) International Initiatives.

The meeting discussed ways to incorporate more diversity in the organizing committee by the inclusion of all regions, consideration of a venue that can accommodate a hybrid meeting that would enable the most people to successfully participate and engage, and exploration of funding opportunities to support diverse participation.

Mr François Schindele advised the meeting that due to other work commitments he was no longer able to lead the organisation of the next Tsunami Symposium. He invited the session to decideon the Tsunami Symposium organizing committee. He suggested that Co-chairs may be drawn from TT TWO, TT DMP, the Chair of the new Scientific Committee and IUGG-JTC. The committee could include UNESCO/IOC Secretariat and other UN Organizations; In addition, TTs need to decide on dates, place of Symposium, as well as funding.

The Chair requested the TT-TWO and TT-DMP to nominate co-chairs for the next symposium, and that they then invite other relevant organizations to join the organizing committee. The organizing committee should then explore and advise the place, time/date, and scope of the next symposium.

**Recommendations to TOWS-WG**

**Notes with appreciation** the contributions of Dr Francois Schindele towards the organization of the next Tsunami Symposium,

**Recommends** the Co-chairs of the Tsunami Symposium Organizing Committee be drawn from TT TWO, TT DMP, the Chair of the new Scientific Committee and IUGG-JTC,

**9. TT-DMP DISCUSS OUTCOMES OF THE JOINT MEETING**

The Chairperson of TT-DMP invited a discussion and reflection regarding the outcomes of the TTs joint meetings.

**Tsunami Symposium**

The TT-DMP nominatedDr Harkunti Rahayu as a co-chair of the Tsunami Symposium Organizing Committee. The ITIC suggested that the TICs be included as part of the Organizing Committee on behalf of ICG Member States, and this was endorsed by the TT-DMP Chair and TT-DMP nominated Co-Chair to the Symposium. The task team also recommended that the Symposium Organizing Committee include representatives of the International Scientific Organizations, e.g. The Joint Research Centre of the European Commission, and other relevant bodies such as WMO and UNDRR.

**Recommendations to TOWS-WG**

**Recommends** Dr Harkunti Rahayu be nominated as one of the co-chairs of the Tsunami Symposium Organizing Committee

**Recommends** the Tsunami Symposium Organizing Committee include representatives of the International Scientific Organizations, e.g. The Joint Research Centre of the European Commission and IUGG Joint Tsunami Commission, and other relevant bodies such as the WMO and UNDRR.

**10. OTHER BUSINESS**

There was no other business.

**11. DEVELOP TT DMP WORK PLAN**

The meeting concluded with a reflection on recommendations. The Secretariat undertook to send a draft report and recommendations to the task team members before the TOWS-WG meeting; the chair asked all members to provide timely feedback to the draft

**11. MEETING CLOSE**

The chair invited any final comments; several task team members expressed appreciation for the chair’s leadership and input over the last four years. The chair acknowledged this with appreciation and remarked that success is a result of the team, and that it was a pleasure to chair this talented team. He closed by wishing the incoming chair well and noted that she has a strong team that is making a real difference.

1. **SUMMARY OF RECOMMENDATIONS TO THE TOWS-WG XIV (INCLUDING JOINT AGENDA ITEMS WITH TT TWO)**

**Noting** the potentially high costs for monitoring and forecasting of relatively rare non-seismic generated tsunamis that many Member States may not be able to afford,

**Recommends** a cost-benefit analysis be first undertaken for monitoring non-seismic tsunami sources based on a hazard and risk assessment.

**Recommendations from Ad hoc Team Atypical Tsunami Sources:**

**Noting** the issues associated with the sometimes unknown and conflicting accuracies of sea level data used in tsunami warnings,

**Recommends** each ICG encourage sea-level network operators to undertake regular and routine calibration of their sea-level monitoring instrumentation and data formats, following recommendations of IOC Manuals & Guides No #3 and No. 14 (Volumes I–V),

**Noting with appreciation** the work of the current Ad hoc Team on Atypical Tsunami Sources chaired by Dr Francois Schindele,

**Considering** that the current report is of great interest for all ICGs and Member States,

**Recommends** the report be published as an IOC Technical Manual,

**Acknowledging** confusion sometimes amongst scientific experts about the term “atypical tsunami,

**Recommends** that the term “atypical tsunamis” not be used and that tsunamis be classified as either: a) Seismic generated tsunamis; or b) Non-seismic generated tsunamis; or c) Complex source generated tsunamis,

**Further recommends** TT TDMP consider outreach activities for educating the public and the media about the differences,

**Recognising** that non-subduction zone earthquakes and landslides (aerial and submarine) can also generate tsunamis and should be monitored and warned for with typical TSP and NTWC tools,

**Recommends** TSPs and NTWCs of each ICG identify all coastal areas or near-shore faults that could generate large earthquakes and submarine landslides and be prepared to issue warnings as appropriate,

**Noting** the potential for tsunamis to be generated specific atmospheric conditions,

**Recommends** TOWS-WG establish a specific Ad Hoc Team on Meteo-tsunamis under the TT-TWO chaired by Mr Mike Angove with ToRs:

1. Review and advise on gaps related to meteo-tsunami monitoring and warning systems,
2. Develop guidelines on SOPs to monitor and warn for meteo-tsunamis,
3. Review relationship required between TSPs/NTWCs and Regional/National Met Services to monitor and warn for meteo-tsunamis,
4. Write a report to submit to the TT TWO for its next session in February 2023

**Noting** the current report identifies seven types of tsunami sources related to volcanoes and in the aftermath of the HTHH tsunami in Tonga and efforts by some ICGs in the area of volcano generated tsunamis;

**Recommends** the establishment of an Ad Hoc Team on Tsunamis Generated by Volcanoes chaired by Dr Francois Schindele with ToR:

1. Confirm the list of tsunami sources related to volcanoes and volcanic eruptions,
2. Complete the list of potential threat volcanoes (referred to in annex to ATS Report),
3. Identify methodologies to monitor and detect volcanic sources of tsunami,
4. Review relationship required between TSPs/NTWCs and Volcanic Ash Advisory Centres (VAACs) and other relevant agencies to monitor and warn for volcano generated tsunamis,
5. Develop guidelines on SOPs to monitor, detect and warn for any the induced tsunami waves.

**Appreciates** thewave exercises conducted in the Caribbean (CARIB WAVE21) and NEAM (NEAMWave21) region during the ongoing pandemic.

**Request** that the TT-DMP continue to work on coordination of the conduct and reporting of exercises with the aim of having standard practices among the ICGs.

**Requests** the Secretariat toshare reports and presentations regarding recent Wave exercises, outcomes, best practices and lessons learnt when received from ICGs,  
  
**Appreciates** the finalization and publication 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 in English,  
  
**Requests** the Secretariat to support the translation of MG 86 into French and Spanish.

**Requests** that it be noted in the guidelines on the usage of the TR logo that only communities that have received recognition of Tsunami Ready receive automatic approval for the usage of the Tsunami Ready logo for the duration of their Tsunami Ready status in its official products and documents, and that any other entities (including National Tsunami Ready Boards) must request approval from UNESCO/IOC Secretariat to use the Tsunami Ready logo.

**Further requests** that the automatic approval for the usage of the logo by Tsunami Ready communities be informed by the IOC Secretariat in the Tsunami Ready designation letter with regards to MG 74.

**Notes** with appreciation the hosting of the TR web site by ITIC,

**Further notes** the importance to have Tsunami Ready resource documents available in local languages,  
  
**Requests** ICGs and the IOC Tsunami Programme Secretariat to advisecountries that are currently in the process of implementing Tsunami Ready, to now follow the MG74 when submitting/applying for Tsunami Recognition, and that MG74 will apply for all future applications.

**Notes** that there are Member States that have their own tsunami preparedness programmes that align closely with the UNESCO/IOC Programme, and

**Requests** the TT-DMP to consider a mechanism to equate those programmes to Tsunami Ready.

**Notes** with appreciation the development and production of a new TR Board Game and supporting animation video series prepared by IOTIC, and that additional resources will be required for the production and translation of TR Board Game into several languages.

**Notes** the continued progress in the implementation of Tsunami Ready in the NEAM, Indian Ocean, Pacific and Caribbean regions, which indicates that Tsunami Ready has now established itself as a globally popular and recognized tsunami preparedness tool.

**Recommends** to include both “UNESCO” and “IOC” in the name of the Programme, i.e. *“UNESCO/IOC Tsunami Ready Recognition Programme”,*  
**Recommends** the establishment of an UNESCO/IOC Tsunami Ready Recognition Programme, as described by the TT-DMP Working document on the UNESCO/IOC Tsunami Ready Recognition Programme (Annex A of this Report),  
  
**Recommends further** the addition of the task to facilitate the UNESCO/IOC Tsunami Ready Recognition Programme to the Terms of Reference of each ICG Tsunami Information Centre (TIC).

**Notes with appreciation** the new projects underway in the respective regions.

**Notes with appreciation** the efforts of the IOTIC, BMKG (Indonesia) and ITIC in preparing Tsunami Ready and TEMPP training through the Ocean Teacher Global Academy (OTGA) platform as well as offering hybrid training workshops and training videos.

**Notes** the activities undertaken by the respective regions for WTAD 2021, and the success achieved by UNDRR,

**Notes** that the 2022 WTAD theme will highlight Sendai Framework Global Target G: Substantially increase the availability of and access to multi‑hazard early warning systems and disaster risk information and assessments to the people by 2030, and that this theme aligns closely with the current focus of the TOWS-WG in the context of the UN Ocean Decade.

**Recommends** the continued strong collaboration between the UNESCO/IOC and UNDRR for the 2022 WTAD highlighting among other initiatives the UN Ocean Decade Tsunami Program goal for 100% Global Tsunami Ready for highly vulnerable communities,

**Recommends** highlighting the multi-hazard framework in WTAD activities.

**Agrees** to the approach taken by the Task Team to create the global framework,

**Requests** the Task Team to finalize the data and information contained in the measures, and to develop on-going documents and user guidance for survey completion/reporting aligned with the framework,

**Notes** aspects of this work requires additional resource and expertise that sits outside of the current Task Team,

**Notes** the Secretariat will resource working with industry experts to develop the on-line survey.

**Notes** that the survey will be hosted on the IOC website.

**Noting** the interest of other ICGs**, requests** the PTWSto sharetheir local source SOPs efforts with other ICGs, with a view toward developing consistent approaches.

**Notes** with appreciationthe work of the PTWS to develop aNTWC Competency Framework (2017), and the ITIC’s leadership to pilot training courses based on the Framework,

**Notes the interest of other ICGs, requests** the PTWS to share its document with other regions, and invite comments and feedback, and

**Also noting** the challenges in developing and implementing a global competency framework,

**Requests** the TT-TWO and TT-DMP work together to draft guidelines for a global NTWC competency framework based on the available set of documents and Pacific input, noting that implementation can be at a regional level.

**Notes** with appreciationthe contributions of the IUGG Joint Tsunami Commission Working Group on Terminology and Member States to update the 2019 Tsunami Glossary,

**Agrees** to postpone the next update of the Tsunami Glossary to 2023 to facilitate the incorporation of important changes,

**Notes** the importance of translating the Tsunami Glossary in local languages so local people and authorities can understand and use the consistent terminology.

**Also** **notes** the importance of having abbreviated definitions for key terms for use in social media and other abbreviated language communication tools.

**Welcomes** the offer of the IUGG Joint Tsunami Commission to further collaborate with the IOC and its ICGs, such as through the JTC Working Groups, international science symposia, and tsunami publications.

**Notes** the report of Dr Kumar on the progress and plans following their initial meeting of the UN Ocean Decade Tsunami Programme Scientific Committee on 17th February 2022.

**Notes** the report and proposals of the TT-DMP with regards to the special Tsunami Ready Coalition

**Agrees** to incorporate the proposed goal, objectives, scope and composition in the terms of reference for the tsunami Ready Coalition.

**Notes with appreciation** the efforts of the CARIBE-EWS and the Secretariat to coordinate and contribute to global initiatives related to MHEWS.

**Encourages** Member States, ICGs, IOC Tsunami Unit, Tsunami Information Centers and the UN Decade Tsunami Programme to purposely support, contribute to, and manage the integration of tsunami warning system capabilities with other coastal hazard early warning systems and services

**Notes with appreciation** the contributions of Dr Francois Schindele towards the organization of the next Tsunami Symposium,

**Recommends** the Co-chairs of the Tsunami Symposium Organizing Committee be drawn from TT TWO, TT DMP, the Chair of the new Scientific Committee and IUGG-JTC,

**Recommends** Dr Harkunti Rahayu be nominated as one of the co-chairs of the Tsunami Symposium Organizing Committee

**Recommends** the Tsunami Symposium Organizing Committee include representatives of the International Scientific Organizations, e.g. The Joint Research Centre of the European Commission and IUGG Joint Tsunami Commission, and other relevant bodies such as the WMO and UNDRR.

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**Annex A**

**UNESCO/IOC Tsunami Ready Recognition Programme  
(UNESCO Tsunami Ready)**

# Aim

The Tsunami Ready Recognition Programme is a voluntary international community-based recognition programme developed by UNESCO/IOC. It aims to build resilient communities through awareness and preparedness strategies that will protect life, livelihoods and property from tsunamis in different regions.

In June 2021, the IOC Assembly approved the establishment of the IOC Ocean Decade Tsunami Programme, with the aim of making 100% of communities at risk of tsunami prepared for and resilient to tsunamis by 2030 through the implementation of the UNESCO/IOC Tsunami Ready Recognition Programme and other initiatives. The implementation of the Tsunami Ready Recognition Programme will be a key contribution to achieving the societal outcome ‘A Safe Ocean’ of the Ocean Decade.

# Planning and resources

The Tsunami Ready Recognition Programme is implemented as a voluntary, performance- based community recognition programme. It promotes the concept of readiness through actions to meet 12 key indicators that serve as the standard for reducing tsunami risk at the community level. For a community to be recognized by UNESCO IOC as Tsunami Ready, all 12 indicators must be met.

The UNESCO IOC Tsunami Programme, which coordinates the global tsunami warning and mitigation system, oversees the administration of the Tsunami Ready Recognition Programme, through the IOC’s four Intergovernmental Coordination Groups (ICGs), corresponding to the regions Pacific, Caribbean and Adjacent Regions, Indian Ocean, and North-eastern Atlantic the Mediterranean and connected seas, with its Tsunami Information Centres (TICs) serving as the focal point for each ICG region.

The ICGs provide mechanisms for the sharing of experience and expertise, and for ensuring the Tsunami Ready implementation consistency across the ICG region. The ICGs, comprised of Member States with coastlines vulnerable to tsunamis to varying degrees, meet regularly to coordinate activities, and among other objectives, to promote implementation of relevant capacity-building, resilience building and emergency management, including high levels of public awareness.

The IOC Tsunami Unit will be the official holder of the documentation supporting the Tsunami Ready recognition.

The Tsunami Ready Recognition Programme web site ([www.tsunamiready.org](http://www.tsunamiready.org/)) serves as the public information site providing information on the Programme and recognized Tsunami Ready communities.

The Tsunami Ready Recognition Programme web viewer (<https://tsunamireadyviewer.ioc-tsunami.org/>) provides up-to-date metadata information on recognized communities, and those seeking recognition.

The Tsunami Ready Recognition Programme is implemented by Member States. Each Member State is responsible for administering its national programme. Its National Tsunami Ready Board (NTRB) and Tsunami Ready Local Committee (TRLC) provide guidance to the community during the recognition process. The NTRB is responsible for reviewing and approving the Tsunami Ready Application. In the case of small countries and territories, the recognition may be made at the National/Territorial level, in this case, a Regional Tsunami Ready Board (RTRB) would be responsible for reviewing and approving recognition

**IOC Manual and Guides 74 (2022) *Standard Guidelines for the Tsunami Ready Recognition Programme (in press)***serves as the primary implementing reference. The publication also includes information on the resources needed, tools, references, and videos, as well as training materials. The users of the Tsunami Ready Guidelines are local authorities of coastal communities at risk of tsunami impact, as well as representatives of Emergency Management Agencies or Disaster Management Offices and Disaster Risk Management experts working with coastal communities facing risk of tsunami impact.

The Guidelines list strategies that must be implemented for a community to be recognized as Tsunami Ready. The strategies are defined by 12 key indicators that serve as the standard for reducing tsunami risk at the community level. For a community to be recognized by UNESCO IOC as Tsunami Ready, all 12 indicators must be met.

The 12 indicators can be grouped into three categories of essential actions: Assessment, Preparedness and Response (Table 1).

|  |  |
| --- | --- |
|  | **TSUNAMI READY INDICATORS** |
| **I** | **ASSESSMENT (ASSESS)** |
| 1 | **ASSESS-1**. Tsunami hazard zones are mapped and designated. |
| 2 | **ASSESS-2**. The number of people at risk in the tsunami hazard zone is estimated. |
| 3 | **ASSESS-3**. Economic, infrastructural, political, and social resources are identified. |
| **II** | **PREPAREDNESS (PREP)** |
| 4 | **PREP-1**. Easily understood tsunami evacuation maps are approved. |
| 5 | **PREP-2**. Tsunami information including signage is publicly displayed. |
| 6 | **PREP-3**. Outreach and public awareness and education resources are available and distributed. |
| 7 | **PREP-4**. Outreach or educational activities are held at least 3 times a year. |
| 8 | **PREP-5**: A community tsunami exercise is conducted at least every two years. |
| **III** | **RESPONSE (RESP)** |
| 9 | **RESP-1**. A community tsunami emergency response plan is approved. |
| 10 | **RESP-2**. The capacity to manage emergency response operations during a tsunami is in place. |
| 11 | **RESP-3**. Redundant and reliable means to timely receive 24-hour official tsunami alerts are in place. |
| 12 | **RESP-4**. Redundant and reliable means to timely disseminate 24-hour official tsunami alerts to the public are in place. |

*Table 1. List of Tsunami Ready Indicators organized within the categories of Assessment, Preparedness and Response.*

As a community performance-based programme, the Tsunami Ready Recognition Programme promotes the active participation of local actors, in coordination with local and national authorities, in order to strengthen local capacities to cope with the tsunami risk. As a result of the work done to meet the 12 indicators, communities will see their coping mechanisms strengthened to deal with tsunami events and to enable an initial response prior to any external assistance.

Those capacities involve both institutional strengthening as well as community organization, to collectively address the tsunami risk by implementing Assessment, Preparedness and Response activities.

Tsunami Ready recognition is not a one-time achievement; it requires ongoing efforts in preparedness measures such as drills and exercises as well as public awareness. The Tsunami Ready recognition should be renewed every four years.

It is important to consider that Tsunami Ready recognition does not imply approval or confirmation that a community can or will perform at a certain level in case of a tsunami. Tsunami Ready recognition does not mean that a community is tsunami proof; it is rather an acknowledgment and recognition of the measures adopted by the community to cope with their tsunami risk.

# Promotion

The IOC Decision A-31/3.4.1 - Warning Mitigation Systems for Ocean Hazards also approved the establishment of a Coalition for Tsunami Ready in collaboration with other critical stakeholders across the UN structure as well as national civil protection agencies.

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:

1. 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
2. Increasing funding resources for the implementation of Tsunami Ready
3. Advising the IOC TOWS-WG, TT-DMP, and TT-TWO on the implementation of UNESCO Tsunami Ready, including on

* Flexibility with regards to accomplishing the indicators to allow for circumstances where formal bureaucratic frameworks/requirements may pose barriers
* Consideration of unique regional and/or local circumstances

# Recognition of similar standards already in place in some countries

# Coordination

At the international level, coordination is enabled through the IOC ICGs, each headed by a IOC ICG Technical Secretary, with active Member States, and the ICG’s TICs.

For each community, relevant local authorities, representatives of Emergency Management Agencies or Disaster Management Offices, first responders, other government agencies, as well as voluntary and/or community organizations, NGOs, universities, schools, private business and tourism sector if applicable, will be working together to meet the Tsunami Ready Recognition Programme indicators. At the national level, the primary agencies would be the National Emergency Management Agency or Disaster Management Office, National Tsunami Warning Centre (NTWC), National Tsunami Warning Focal Point (TWFP) Tsunami National Contact (TNC), and the scientific community.

The NTRB, RTRB and TRLC provide the leadership for the implementations and serve as the governance structure for recognizing communities. Activities, actions, and products that are intended to meet the Programme goals are coordinated and championed through the TRLC and NTRB..

# Scientific and technical advice and guidance

IOC Manual and Guides are available to support the implementation.

Topics include inundation modelling and mapping, evacuation mapping, response and evacuation planning, and the conduct of tsunami exercises, which are also supported by online through the OTGA and/or in-person training through the ITIC.

* **IOC Manuals and Guides 74**: **Standard Guidelines for the Tsunami Ready Recognition Programme (in press).** This guide provides: (i) the framework and the background information of the Tsunami Ready programme, (ii) key issues concerning the Tsunami Ready recognition programme and its methodological references, (iii) guidelines and their respective actions to achieve the Tsunami Ready recognition, as well as the templates for requesting recognition, and finally (iv) the glossary of terms and a list of available tools and references to facilitate its implementation.
* **IOC Manuals and Guides 49**: **Tsunami preparedness: information guide for disaster planners (UNESCO, 2008).** This guide provides a general plan of action and basic framework for dealing with the unique hazards resulting from tsunamis. This guide outlines the construction and maintenance of defensive structures and discusses how current disaster prevention and emergency response planning can be improved by using research on past tsunamis.
* **IOC Manuals and Guides 58**: **How to plan, conduct and evaluate UNESCO/IOC tsunami wave exercises (UNESCO, 2012).** The purpose of this Guideline is to provide a set of generic and consistent advice on exercise development, management and evaluation to both exercise coordinators and exercise players (tsunami service providers and warning centres), as well as disaster management agencies, that can be used by all Intergovernmental Coordination Groups (ICGs). This Guideline provides a step-by-step approach for conducting national to local tsunami exercises in the context of the UNESCO/IOC-coordinated Tsunami Wave exercises..
* **IOC Manuals and Guides 76**: **Plans and procedures for tsunami warning and emergency management (UNESCO, 2017).** This manual seeks to assist countries participating in the IOC-coordinated regional Tsunami Warning and Mitigation Systems in strengthening their existing tsunami warning and emergency responses through the development of Tsunami Warning and Emergency Response Plans and Standard Operating Procedures (SOPs). It relates to tsunami warning authorities (referred to as National Tsunami Warning Centres -NTWCs) and to tsunami emergency management authorities (referred to as Emergency Management Agencies-EMAs), promoting alignment, interoperability and consistency among all stakeholders in the end-to-end tsunami warning system.
* [**IOC Manuals and Guides 82**](http://itic.ioc-unesco.org/index.php?option=com_content&view=category&layout=blog&id=2166&Itemid=2640): **Preparing for Community Tsunami Evacuations: from inundation to evacuation maps, response plans and exercises (UNESCO, 2020),** describes the steps required to produce reliable and practical community-level tsunami evacuation maps, and covers all of the Tsunami Ready Recognition Programme indicators.
* **IOC Manuals and Guides 86**: **Multi-Annual Community Tsunami Exercise Programme Guidelines for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (UNESCO, 2022).** This guide provides guidance on how to plan, conduct, and evaluate a multiannual local tsunami exercise programme. It has been designed by Member States of the Intergovernmental Oceanographic for Commission for the use of their coastal communities who should participate in multiannual exercises. The guide is divided into four sections which provide a range of practical advice and templates for community stakeholders and in- country exercise developers. It highlights that a progressive and long-term approach is needed for tsunami exercises.

Training is available to support the implementation.

* OceanTeacher Global Academy (Online and Hybrid Training)

[OceanTeacher Global Academy](https://classroom.oceanteacher.org/) (OTGA) provides a comprehensive web-based training platform that supports classroom training (face-to-face), blended training (combining classroom and distance learning), and online (distance) learning. For the Tsunami Ready Recognition Programme, the OTGA provides a standard set of training courses to assist countries and communities in implementing Tsunami Ready.

* **ITIC Training Programme (In-person Training)**

The ITIC with the Caribbean Tsunami Information Centre (CTIC), Indian Ocean Tsunami Information Centre (IOTIC), Northeastern and Mediterranean Seas Tsunami Information Centre (NEAMTIC), assists countries in establishing tsunami warning systems and improving tsunami preparedness and, for decades, has annually conducted a training programme.

# Standard setting and nomenclature

The Tsunami Ready Recognition Programme is fully consistent with international disaster risk reduction strategies, frameworks, and initiatives, which include:

* Disaster Risk Management Approach
* Sendai Framework for Disaster Risk Reduction (SFDRR) 2015–2030, including **Priority 1: Understanding disaster risk and Priority 4: Enhancing disaster preparedness for effective response** and to “Build Back Better” in recovery, rehabilitation and reconstruction, as well as to the seven assessment targets of the SFDRR
* Sustainable Development Goals, **Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable**. In particular Target 11.b: By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015– 2030, holistic disaster risk management at all levels
* UN Decade of Ocean Science for Sustainable Development (2021-2030)
* World Tsunami Awareness Day (November 5)

**IOC Manual and Guides 74 (2022) *Standard Guidelines for the Tsunami Ready Recognition Programme (in press)***provides the standards consisting of 12 indicators in Assessment, Preparedness, and Response, that serves as a global strategy and measure of community readiness for the next tsunami.

The UNDRR provides the global platform for disaster risk reduction. Other UN agencies that directly work with the IOC Tsunami Programme for services and projects include the WMO, CTBTO, ITU, IHO, UNDP, UNESCAP and the UNESCO International Geoscience Programme (IGCP). The ICSU World Data Service Marine Geophysics provides marine databases such as digital elevation models, tsunami marigrams, and historical hazard databases, while the IUGG Joint Tsunami Commission provides expertise on tsunami analysis methods, terminology, tsunami risk assessment, and science-based tsunami warning. Regional organizations in disaster management, ocean policy and sciences, such as ASEAN (IO, Africa), CDEMA, CEPREDENAC, CPPS, SPC, SPREP, EMIZA support Member States in building capacity in tsunami warning and tsunami disaster management.

# Cooperation

The IOC Tsunami Programme cooperates and coordinates with other IOC bodies, including through the TOWS-WG and its TT-DMP on their advisory role to IOC Governing Bodies for global guidance, the ICGs for regional tsunami coordination and advocacy, GOOS and Group of Experts for sea level monitoring, IOC Sub-Commission for the Western Pacific (WESTPAC), IOC Sub-Commission for Africa and Adjacent Island States (IOCAFRICA), IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE), Group of Experts for Capacity Development, among others.

Additional organizations are listed above under **Standard Setting and Nomenclature.**

# Evaluation

The Tsunami Ready Recognition Programme shall be evaluated for its impact and effectiveness every 4 years.

# Reporting

The Tsunami Ready Recognition Programme shall report annually on its implementation progress, as part of the remit of the IOC Tsunami Unit, through regular reporting mechanisms of the ICGs and TOWS-WG.

# RECOMMENDATION

**Recalling** the first initiative for the Caribbean and the international community through the NWS and UNESCO/IOC TsunamiReady® pilot which recognized Anguilla as ‘TsunamiReady®’ in 2011; recalling further the approval of Tsunami Ready Guidelines by the ICG/CARIBE-EWS in 2015 at its 10th Session,

**Recalling** TOWS Recommendations (TOWS-WG-IX, 2016; TOWS-WG-X, 2017) calling on the ICGs and Member States to consider piloting the Caribbean guidelines with a view toward developing a harmonized consistent global guideline,

**Having taken** into account the feedback provided from piloting Tsunami Ready communities in the Caribbean, Indian, and Pacific Oceans to publish IOC Manual and Guides 74 (2022) Standard Guidelines for the Tsunami Ready Recognition Programme (in press),

**Appreciating** the creation of TsunamiReady Viewer, Tsunami Ready web site, Tsunami Ready Board Game and Information / Communication tools, development of online training through the Ocean Teacher Global Academy, as well as IOC Manual and Guides (49, 58, 74, 76, 82, 86) and technical documents to support tsunami inundation modeling and mapping, evacuation mapping, emergency response and evacuation planning, exercising, and available of awareness-raising materials developed and distributed through the IOC Tsunami Information Centres (TICs),

**Appreciating** the collaborative efforts with the UNDRR to promote awareness through World Tsunami Awareness Day every November 5, and the creation of many short videos showing communities and countries joining the Tsunami Ready global community in 2020 and 2021,

**Recommends the establishment** of a UNESCO/IOC Tsunami Ready Recognition Programme, as described by IOC TOWS-WG Task Team DMP/5 Working document on the Tsunami Ready Recognition Programme of the UNESCO/IOC.

**Recommends further** the addition of the task to facilitate the UNESCO/IOC Tsunami Ready Recognition Programme to the Terms of Reference of each ICG Tsunami Information Centre (TIC)

**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 |