

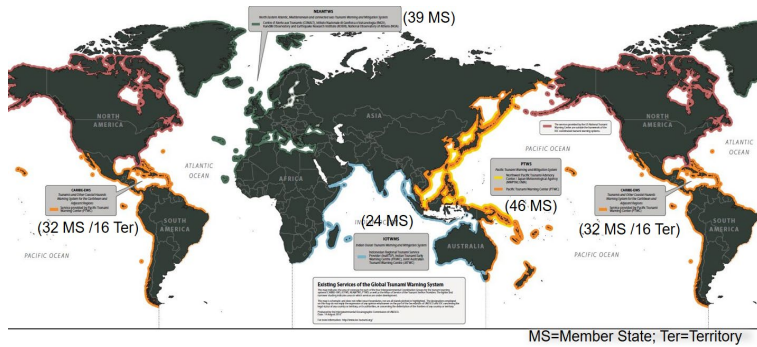


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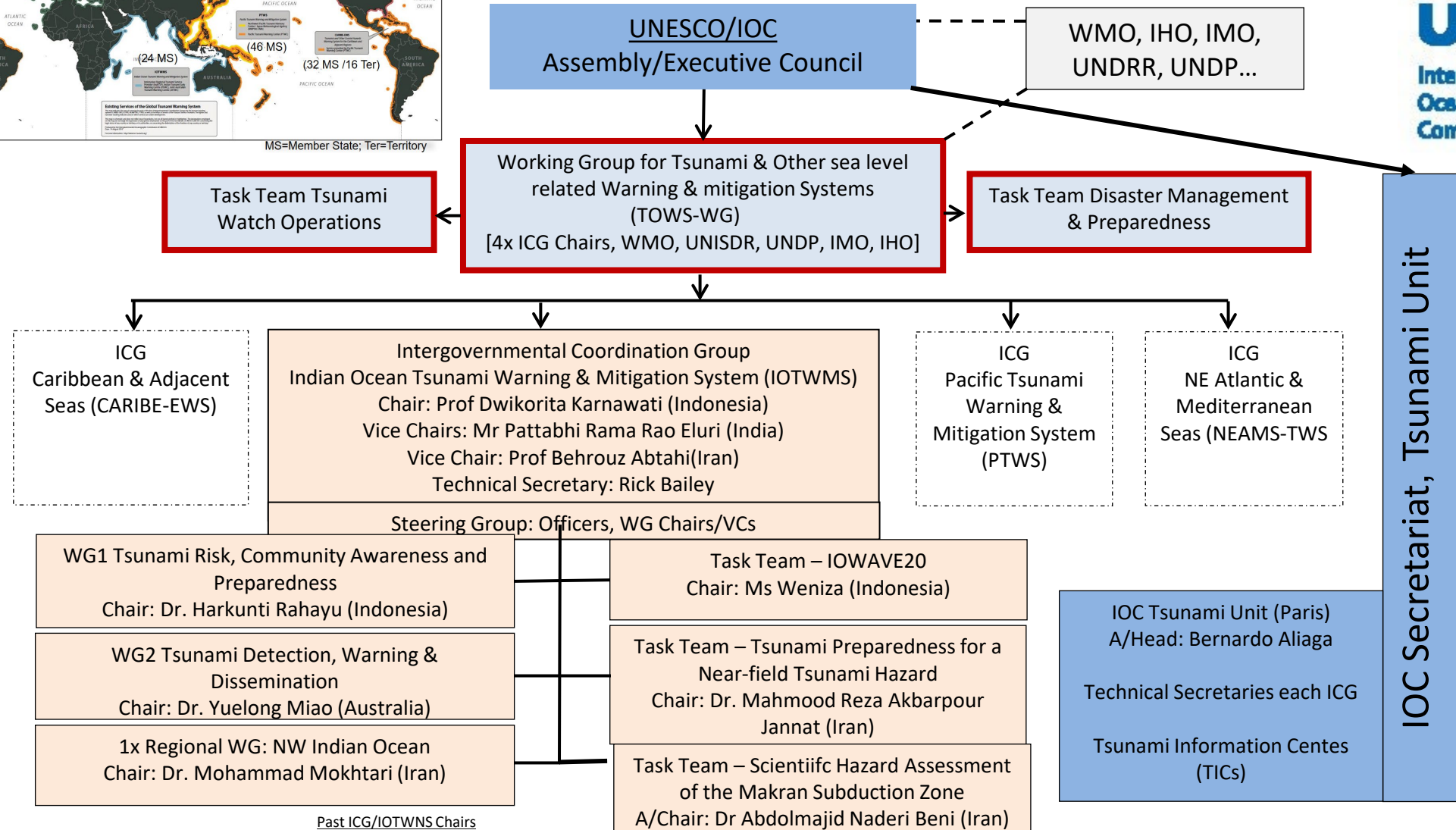
Intergovernmental
Oceanographic
Commission

**IOC-UNESCO Working Group
Tsunami and Other hazards
related to sea level Warning
and mitigation Systems
(TOWS-WG) Report
ICG/IOTWS XIII, November 2022**

By Rick Bailey, Head UNESCO-IOC Secretariat
Intergovernmental Coordination Group
Indian Ocean Tsunami Warning & Mitigation System



Global Tsunami Warning & Mitigation System Governance eg IOTWMS



- Past ICG/IOTWMS Chairs**
- 2017 - 2019: Dr Andi Eka Sayka (Indonesia)
 - 2015 - 2017: Srinivasa Kumar Tummala (India)
 - 2010 - 2015: Rick Bailey (Australia)
 - 2007 - 2010: Jan Sopaheluwakan (Indonesia)
 - 2005 - 2007: P. S. Goel (India)



IOC-UNESCO Working Group on Tsunami and Other hazards related to sea level Warning and mitigation Systems (TOWS-WG)



Objective:

Review and provide guidance on establishing the framework mechanism for a comprehensive, sustained and integrated end-to-end global system covering tsunami and other hazards related to sea level, exploiting existing IOC mechanisms, capacities and capabilities, and facilitating priority projects and programmes, in alignment with the IOC Strategic Plan and IOC Executive Council decisions and in coordination with relevant stakeholders.

IOC-UNESCO Working Group on Tsunami and Other hazards related to sea level Warning and mitigation Systems (TOWS-WG)



Terms of Reference

The TOWS-WG will:

- (a) Advise on co-ordinated development and implementation activities on warning and mitigation systems for tsunamis and other hazards related to sea level of common priority to all ICG/TWSs, with special emphasis on:
 - (i) Harmonization and standardization of relevant observation, data management and communication, forecast and warning practices
 - (ii) Development of synergies in capacity-building and outreach activities
 - (iii) Reinforcement of intergovernmental, international and national capabilities on hazard knowledge, vulnerability, and impact assessment
 - (iv) Effective coordination with all related subsidiary bodies, experts groups and partner organizations with relevant mandates.
- (b) Report to the IOC Executive Council and Assembly on these common activities and propose new actions, as required.
- (c) Advise the IOC Executive Council and Assembly regarding:
 - i) Instructions to the relevant subsidiary bodies responsible for coordinating the implementation of TOWS-WG actions
 - (ii) Any liaison or consultation required with relevant international and intergovernmental stakeholders in implementing TOWS-WG actions not under the unique mandate of IOC.

IOC-UNESCO Working Group on Tsunami and Other hazards related to sea level Warning and mitigation Systems (TOWS-WG)



Membership

The membership of the TOWS-WG will be constituted by:

- (a) The Chairpersons of the four ICG-TWSs, and of I-GOOS, JCOMM, IODE
- (b) Three Members of the IOC Executive Council, nominated by the Chairperson, taking into account geographical distribution
- (c) High-level representatives invited from the key TOWS-WG stakeholders in disaster risk reduction outside IOC, including WMO and other ISDR System members, FDSN/GSN, and other relevant intergovernmental and international agencies

Appointed members of the Executive Council may be re-appointed for a second two-year term.

TOWS-WG shall be chaired by one of the Vice-Chairpersons of IOC and co-chaired by one of the Chairpersons of an IOC Subsidiary Body, on the recommendation of the Chairperson of the Commission after consultations with the IOC Officers

TOWS-WG shall meet once a year, prior to the IOC Executive Council or the Assembly.

IOC Executive Secretary shall provide the secretariat for the TOWS-WG.

TASK TEAM ON TSUNAMI WATCH OPERATIONS



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Yu ich i Nish im a e
Chair



**Eliza beth
Van a core**
ICG/CARIBE EWS



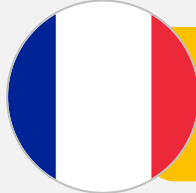
**Charles
McCreery**
ICG/CARIBE EWS



**Patt a bhi Ra ma
Ra o**
ICG/IOTWMS



**Moha m m a d
Mokht a ri**
ICG/IOTWMS



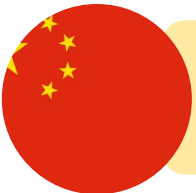
**Hele ne
He b ert**
ICG/NEAMTWS



**Alessio
Pia t a nesi**
ICG/NEAMTWS



**Yu ich i
Nish im a e**
ICG/PTWS



**Da ku i
Wa ng**
ICG/PTWS

Secretariat: Rick Bailey

IOC/TOWS-WG-X/3, Annex II (Appendix 1): **Terms of**

Reference of the Inter-ICG Task Team on Tsunami Watch

Operations

- Provide a mechanism to the ICGs for coordination of tsunami watch operations among the Tsunami Warning Systems;
- Maintain an inventory of current and proposed products and their dissemination methods;
- Recommend and promote harmonized terminology;
- Maintain an inventory of areas of responsibilities, geographical coverage, system architectures, and other relevant characteristics;
- Recommend operational standards, procedures and guidelines for regional and national providers of tsunami forecast information;
- Share and harmonise methods of detection and characterization, forecasting techniques and dissemination to enhance the accuracy and effectiveness of tsunami forecast information for users;
- Monitor status of the regional provision of tsunami forecast information; Report to TOWS-WG.

Intergovernmental
Coordination
Groups (ICGs)
representatives

The representatives to the Inter-ICG Task Team on Tsunami Watch Operations shall be nominated by their respective ICG Chairpersons. The membership shall consist of two representatives from each ICG and include representatives from the regional providers of tsunami threat information. The IOC Chair will appoint the Chair of the Task Team.

TASK TEAM ON DISASTER MANAGEMENT AND PREPAREDNESS



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**Intergovernmental
Oceanographic
Commission**

Intergovernmental
Coordination
Groups (ICGs)
representatives

Harkunti Pertiwi
Rahayu
Chair

Tsunami
Information
Center (TICs)
representatives

IOC/TOWS-WG-VI/3, Annex II: **Terms of Reference of the Inter-ICG Task Team on Disaster Management and Preparedness**

- Facilitate in collaboration with organization such as UNISDR, the exchange of experiences and information on preparedness actions, education/awareness raising campaigns and other matters related to disaster management and preparedness;
- Promote preparedness in coastal communities through education and awareness products and campaigns;
- Facilitate SOP training across ICGs to strengthen emergency response capabilities of Member States and their Disaster Management Offices;
- Promote preparedness programs and assessment tools that have been successful in one regional Tsunami Warning and Mitigation System in the others as appropriate;
- Facilitate the coordination of the TICs of the ICGs;
- Report to the TOWS-WG



Christa
von
Hillebrandt
ICG/CARIBE EWS



Harkunti Pertiwi
Rahayu
ICG/IOTWMS



Cecilia
Valbonesi
ICG/NEAMTWS



David
Coetsee
ICG/PTWS



Alison
Brome
Caribbean Tsunami
Information center



Ardito M.
Kodijat
Indian Ocean Tsunami
Information center



Marino
Champalakis
ICG/NEAMTWS



Laura
Kong
International Tsunami
Information Center

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

Secretariat: Denis Change Seng

Outcomes from TOWS-WG XV Feb 2022

IOC Executive Council #55 13-17 June 2022: TOWS-WG

Instructs the regional Intergovernmental Coordination Groups (ICGs):

- to encourage sea-level network operators to **undertake regular and routine calibration of their sea-level monitoring instrumentation**, following recommendations of IOC Manuals & Guides No #3 and No. 14 (Volumes I-V),
- to **routinely monitor the status of seismic and sea level related observing networks** to identify and better help rectify gaps in coverage and free and open data exchange,
- that **Tsunami Service Providers (TSPs) and National Tsunami Warning Centres (NTWCs) identify all coastal areas or near-shore faults that could generate large earthquakes and submarine landslides and be prepared to issue warnings as appropriate,**

Outcomes from TOWS-WG XV Feb 2022

IOC Executive Council #55 13-17 June 2022: TOWS-WG

Instructs the regional Intergovernmental Coordination Groups (ICGs)(cont):

- the addition of the task to facilitate the UNESCO/IOC Tsunami Ready Recognition Programme to the Terms of Reference of each ICG TIC,
- requests the PTWS to share their local source SOPs efforts with other ICGs, with a view toward developing consistent approaches,
- requests the PTWS to share its document on NTWC Competency Framework (2017), with other regions, and invite comments and feedback with a view toward developing a global framework, and
- continue the strong collaboration between the IOC and UNDRR for World Tsunami Awareness Day (5 November), noting that the WTAD 2022 will highlight Target F of the Sendai Framework for Disaster Risk Reduction;

Outcomes from TOWS-WG XV Feb 2022

IOC Executive Council #55 13-17 June 2022: TOWS-WG

- Approves the establishment of the **UNESCO/IOC Tsunami Ready Recognition Programme** as described in the working document “Tsunami Ready Programme – Proposal for endorsement by IOC” dated 21 February 2022;
- Approves the Terms of Reference for the **Tsunami Ready Coalition**
- Recommends that GOOS consider **ocean bottom pressure as an Essential Ocean Variable (EOV)**, given its importance for the detection and characterisation of tsunamis and computation of general ocean circulation.

Outcomes from TOWS-WG XV Feb 2022

IOC Executive Council #55 13-17 June 2022: IOTWMS

1. Notes with appreciation the development of work plans to address issues raised in the 2020 report on the Capacity Development of Tsunami Preparedness in the IOTWMS;
2. Also notes with appreciation the planning to utilise the Tsunami Programme of the UN Decade for Ocean Science to deliver more timely and accurate tsunami warnings to 100% Tsunami Ready at-risk coastal communities;
3. Further notes with appreciation the efforts to expand capacity development for SIDS and LDCs;
4. Notes the efforts continuing to address the challenges of warning for non-seismic and complex source tsunami events;
5. Notes with concern the continuing challenges with regards to timely and open exchange of seismic and sea level data for tsunami warning;

Tsunamis generated by non-seismic sources - recent event motivation

- **Palu non-subduction zone earthquake, submarine landslides, and tsunami, Indonesia 2018**
- **Sunda Strait Ana Krakatoa flank collapse and tsunami, Indonesia 2018**
- **Tonga volcano eruption and tsunami, Tonga 2022**

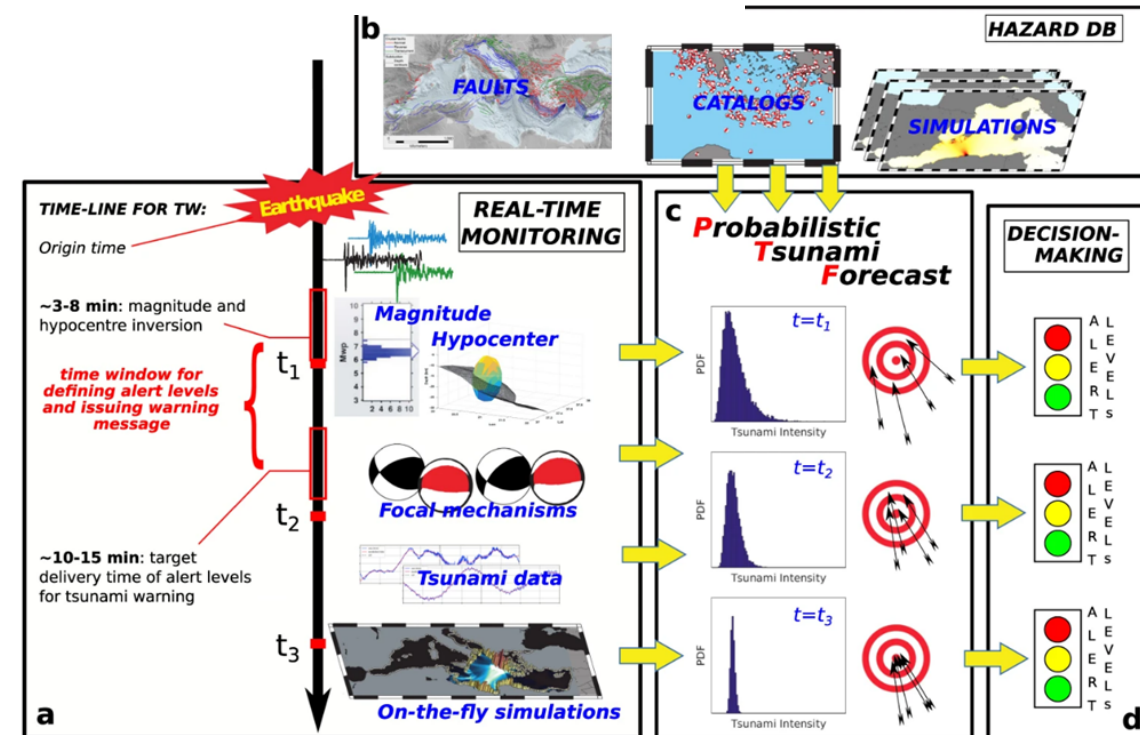
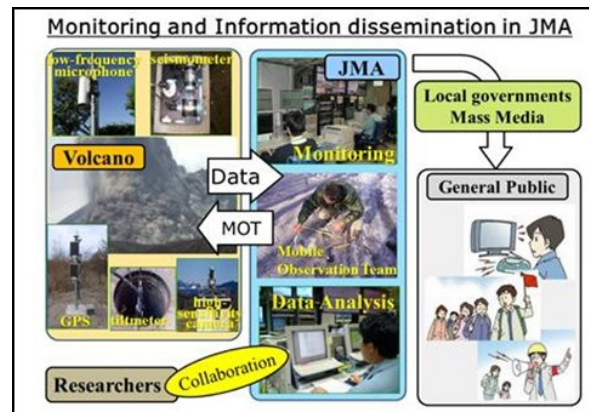
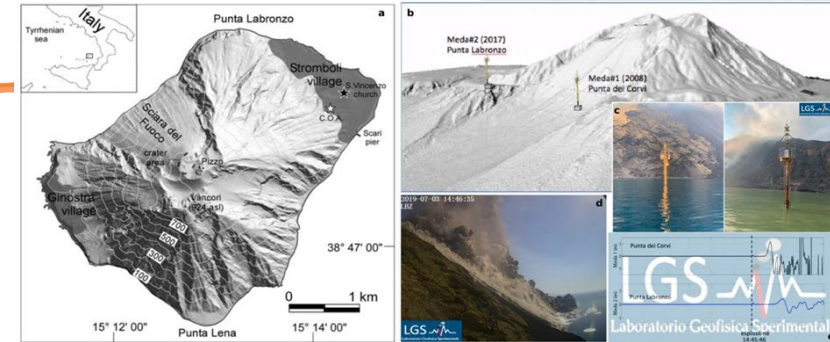


IOC-UNESCO Working Group on Tsunami and Other hazards related to sea level Warning and mitigation Systems (TOWS-WG)



• Task Team on Tsunami Watch Operations

- Ad Hoc Team “Atypical” Tsunamis
- Chair Francois Schindele (France)
- Draft report completed and to be published
- Examined tsunamis generated by non-subduction zones earthquakes, volcano flank collapses, and meteo-tsunamis
- Considered processes involved, monitoring and warning requirements



Tsunami Generated by Non-Sesimic Sources



- **IOC-UNESCO Working Group on Tsunami and Other hazards related to sea level Warning and mitigation Systems (TOWS-WG)**
 - **Task Team on Tsunami Watch Operations (TT TWO)**
 - Ad Hoc Team “Atypical” Tsunamis (completed)
 - Ad Hoc Team on Tsunamis Generated by Volcanoes (new)
 - Ad Hoc Team on Meteo-tsunamis (new)
- **Work underway by the four ICGs of the IOC tsunami Programme**
- **Germany-Indonesia Tsunami Risk Project**
- **Kyoto Landslide Commitment 2020**
- **IOC-UNESCO United Nations Ocean Decade Safe Ocean laboratory**
 - **Satellite Activities:**
 - Further Challenges for Tsunami Warnings

Outcomes following TOWS-WG 2022

- Definition of “Atypical” tsunamis can be very confusing. Decided better terminology to be adopted and used is:
 - “Tsunamis generated by non-seismic and complex sources”
- Established two further ad hoc Teams:
 - *Ad Hoc Team on Tsunamis Generated by Volcanoes* chaired by Dr Francois Schindele
 - *Ad Hoc Team on Meteo-tsunamis* under the TT-TWO chaired by Mr Mike Angove

ToRs Ad Hoc Team on Tsunamis Generated by Volcanoes



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
6. Write a report to submit to the TT TWO for its next session in February 2023

ToRs Ad Hoc Team on Ad Hoc Team on Meteo-tsunamis



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

ICG Pacific

Tsunami Warning & Mitigation System



1. Debriefings following Hunga Tonga – Hunga Ha’apai volcano eruption and tsunami 15 January 2022:

http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=2186:15-january-2022-hunga-tonga-hunga-ha-apai-volcanic-eruption-and-tsunami&catid=2664&Itemid=3265

2. Initial issues for Pacific Tsunami Warning Centre (PTWC), where systems and procedures are based on earthquake generated tsunamis. Created difficulties initiating systems and transmitting advisories to National Tsunami Warning Centres (NTWCs) of ICG/PTWS Member States, which eventually were fortunately overcome to issue basic advisories on the event
3. Some countries successfully implemented their own SOPs for tsunamis generated by non-seismic sources (Japan, Australia)

Interim Volcano-generated Tsunami Alert Products and Procedures of the Pacific Tsunami Warning and Mitigation System released 16 March 2022:



The PTWC will use first available information that a tsunami has been generated to underpin PTWC Threat Messages for future HTHH events.

Specifically, PTWC:

- Will use observed tsunami amplitudes as the basis of a forecast. These include amplitudes from the sea level gauge at the Nuku`alofo and the deep ocean NZG DART gauge, which is the nearest DART to the HTHH volcano.

Tsunamis generated at the HTHH volcano will arrive at those stations within approximately 20 to 30 minutes.

Observations on these stations will likely constitute the first evidence of a tsunami threat.

- Create the forecast for the future HTHH event by scaling observed maximum amplitudes across the Pacific from the 15 January 2022 event with observed amplitudes of the future HTHH event, starting with the observed amplitudes at Nuku`alofo and the NZG DART.

Forecast values are only for specific sea level locations and do not represent a wider forecast for that coast.

- Calculate estimated tsunami arrival (ETA) times according to tsunami propagation generated by an earthquake.

NTWCs will then need to apply their knowledge of what happened along all their coasts during the 15 January event and also scale it accordingly. A useful reference can be the comparison of the barometric pressure change of the 15 January eruption with record(s) during the future HTHH event from any country weather station or nearby stations.

Interim Volcano-generated Tsunami Alert Products and Procedures of the Pacific Tsunami Warning and Mitigation System released 16 March 2022:



- To facilitate implementation of PTWS Interim Volcano Tsunami Alert Products and Procedures, the ICG/PTWS established a **Task Team on the HTHH Volcanic Tsunami Hazard Response** under ICG/PTWS Working Group 2 on Detection, Warning, and Dissemination.
- The **TT-HTHH Terms of Reference** were to review and finalize the Implementation Plan, and review and provide feedback to the PTWC during the implementation and development of a User's Guide.
- The **TT-HTHH finalized the Implementation Plan on 1 March 2022 (v1.1)**, which was provisionally adopted by the ICG/PTWS Steering Committee, and announced officially to Member States through **IOC Circular Letter 2822** 'Interim Volcano-generated Tsunami Alert Products and Procedures of the Pacific Tsunami Warning and Mitigation System' dated 18 March 2022.
- The **ICG/PTWS PTWC Interim Procedures and PTWS Products User's Guide** developed by the TT-HTHH, reviewed in consensus by the ICG/PTWS Steering Committee and subsequently approved by the Chair of ICG/PTWS on 25 July 2022 was shared with ICG/PTWS Member States via **IOC Circular Letter 2902 18 August 2022**



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THANK YOU