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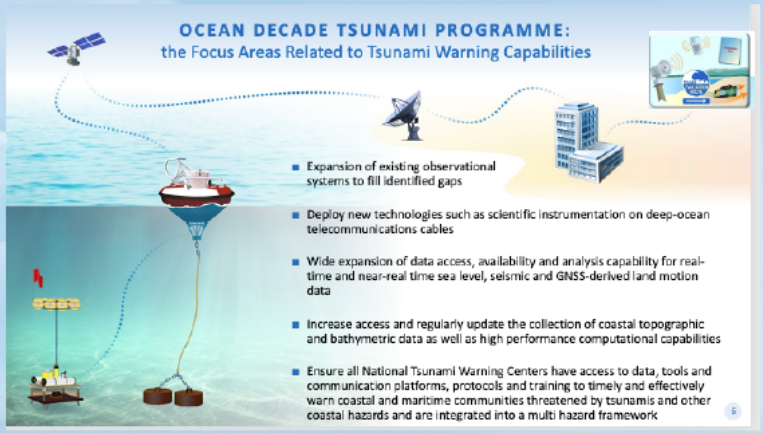
Intergovernmental
Oceanographic
Commission

UN Ocean Decade Tsunami Program Science Committee - Progress

Harkunti P. Rahayu
Chair WG1 ICG/IOC IOTWMS

Agenda Item 3
IOC Tsunami Programme and UN Ocean Decade



UN Ocean Decade (2021-30)

- Once-in-a-generation opportunity to address gaps in tsunami warning , enhance community preparedness and contribute to "A Safe Ocean"
- IOC Assembly 31 (Dec. A-31/3.4.1) established the Ocean Decade Tsunami Programme + Scientific Committee to Develop Research, Development & Implementation Plan
  - Technological & Observational Advances to reduce uncertainties
  - 100 % at risk communities prepared & resilient to tsunamis by 2030 (Tsunami Ready, etc.)

IOC Assembly

IOC Executive Council

IOC Secretariat Tsunami Unit

ICG/PTWS Pacific
ICG/IOTWMS Indian
ICG/CARIBE EWS Caribbean and Adjacent Regions
ICG/NEAMTWS NE Atlantic and Mediterranean
Coordination of Regional TWS

Capacity Development

TOWS-WG
WG on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation System

Standards, Best Practice, Advisory to IOC Governing bodies

ODTP Science Committee

TT on TWO
Task Team on Tsunami Watch Operation

TT on DMP
Task Team on Disaster Management and Preparedness

Governance

- TOWS-WG & ICGs: Global & Regional Steering Committee
- Scientific Committee: Advisory Role
- Special coalition for Tsunami Ready

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UN Ocean Decade Tsunami Programme Scientific Committee

Annex to Dec. A-31/3.4.1

Membership:

- Four (4) members nominated by the each of the TOWS-WG Task Teams;
- Three (3) members nominated by the TOWS-WG on the basis of their scientific expertise;

2022-2023

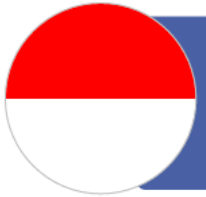
Annex to Dec. A-31/3.4.1 (cont.)

- All members will serve for a period of two years and would be eligible for renewal once.
- In selecting Expert Members, due consideration will be given to geographic, generational and gender balance.

Srinivasa Kumar Tummala
Chairperson

Christa von Hillebrandt

Amir Yahav

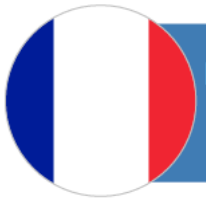


Harkunti Pertiwi Rahayu

David Coetzee

Silvia Chacon

Srinivasa Kumar Tummala



François Schindele

Yutaka Hayashi

Michael Angove

Sergio Barrientos

Alexander Rabinovich

Call for Action

- Under the UN Decade of Ocean Science for Sustainable Development, a **framework** from which actions can be developed to address critical gaps in the tsunami warning and mitigation system as a whole.
- We envision realizing transformational gains related to **rapid tsunami detection, measurement and forecasting capability** and communities that are **Tsunami Ready** along with **dedicated capacity development efforts**, specifically targeted at **SIDS and LDCs**
- We seek to identify and advance specific actions that align with the components of UNDRR **People-Centered Early Warning Systems** including:
  - Risk Knowledge
  - Monitoring and Warning
  - Warning Dissemination and Communication
  - Response Capability
  - Capacity Development and attention to SIDS and LDCs

1. Risk Knowledge.
   - Improve our **understanding of the tsunami hazard** by expanding our knowledge of past or potential tsunami sources,
   - Fully understand the impacts to **critical infrastructure and marine assets** and how to minimize them.

2. Monitoring and Warning.
   - More quickly **detect and measure tsunamis directly**, through ocean observations to include **instrumentation of undersea cables**
   - Ensure critical tsunami generation parameters are identified through the optimal use and **real-time sharing** of **new and existing** sensors and data
   - Leverage the **Seabed 2030 hydrographic survey initiative** to ensure nearshore coastal zones have complete bathymetric/topographic data coverage at the required resolution

3. Warning Dissemination and Communication.
   - Ensure full integration of tsunami services within a **Multi-Hazard Early Warning Framework**
   - Facilitate development of **warning dissemination and communication options** that are appropriate to **geographic, demographic, and infrastructure** conditions for the timely dissemination of warnings

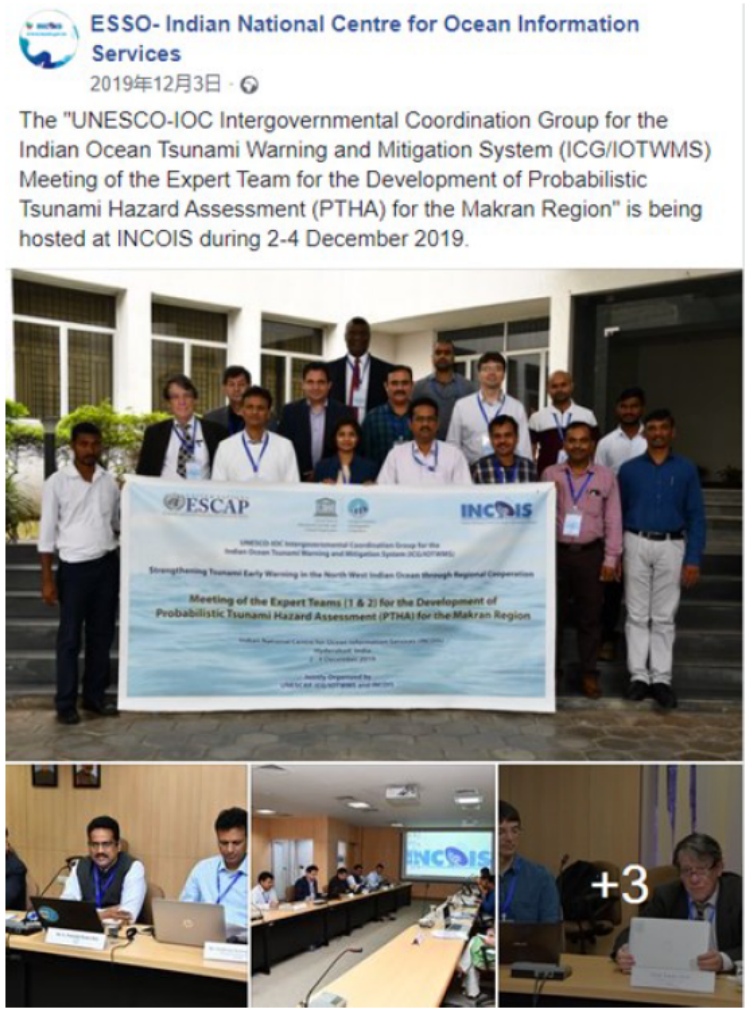
4. Response Capability
   - **Tsunami evacuation maps** must be available for all coastal communities
   - Ensure **100% of tsunami-vulnerable communities** around the world meet the indicators outlined in the **UNESCO/IOC *Tsunami Ready* program**
   - Ensure plans to minimize impacts to **critical infrastructure and marine assets** are in place to enable quicker post-tsunami restoration of services

5. Capacity Development and attention to SIDS and LDCs
   - **Enhanced capacity development** is necessary for the understanding of the tsunami hazard, timely warning and response and resilience.
   - Ensure that **SIDS and LDCs are fully integrated** into all phases of the global Tsunami Warning and Mitigation System.

1. Risk Knowledge

Understanding the risk and developing a plan to mitigate the risk is what saves lives. While tsunamis are infrequent, and the catastrophic ones rare, historical record shows that tsunamis have the potential to hit every coast around the world – we don't know when, where, or how big.

Member States identified in their responses several elements of ongoing programmes (**PTHA in the Indian Ocean - Makran and South West Pacific**) and/or specific requests to improve national capabilities to perform hazard and risk assessment.



2.- Monitoring and Warning

To improve through faster tsunami detection and more accurate tsunami threat assessment and impact forecast, Member States identified the requirement for denser real-time, multi-faceted sensor networks, and faster, integrated algorithms to quickly characterize the tsunami source (seismic and atypical sources) and compute tsunami inundation forecasts for their coasts. Sensors include singly or array-deployed high-quality seismometers and accelerometers, coastal sea level gauges and deep-ocean pressure systems (DART), dedicated seafloor observatories and **trans-basin undersea cables** (such as SMART), and **GNSS land and sea elevation buoys**. High-resolution coastal bathymetry and topography (DEM) contributions were identified (SEABED 2030, LIDAR).

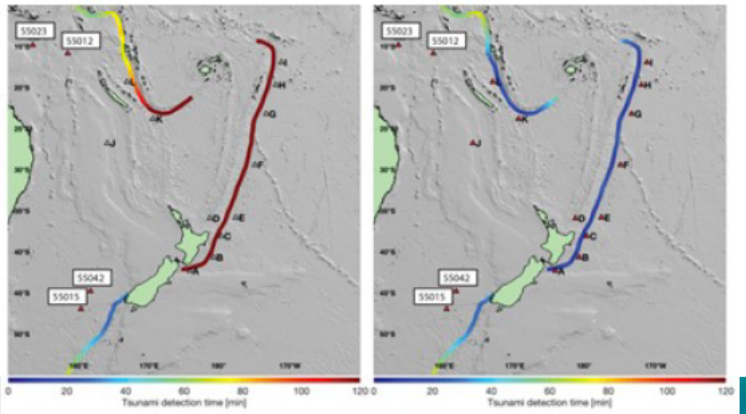
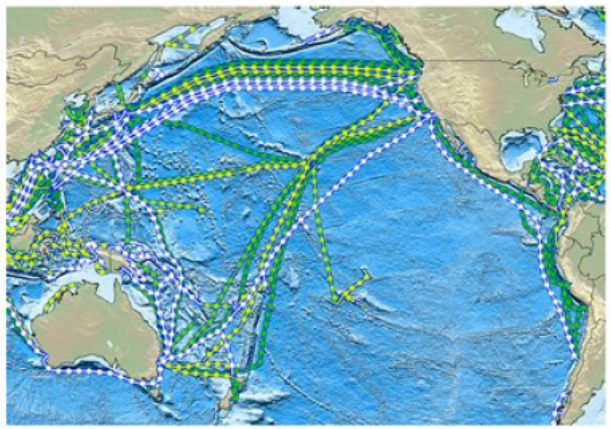


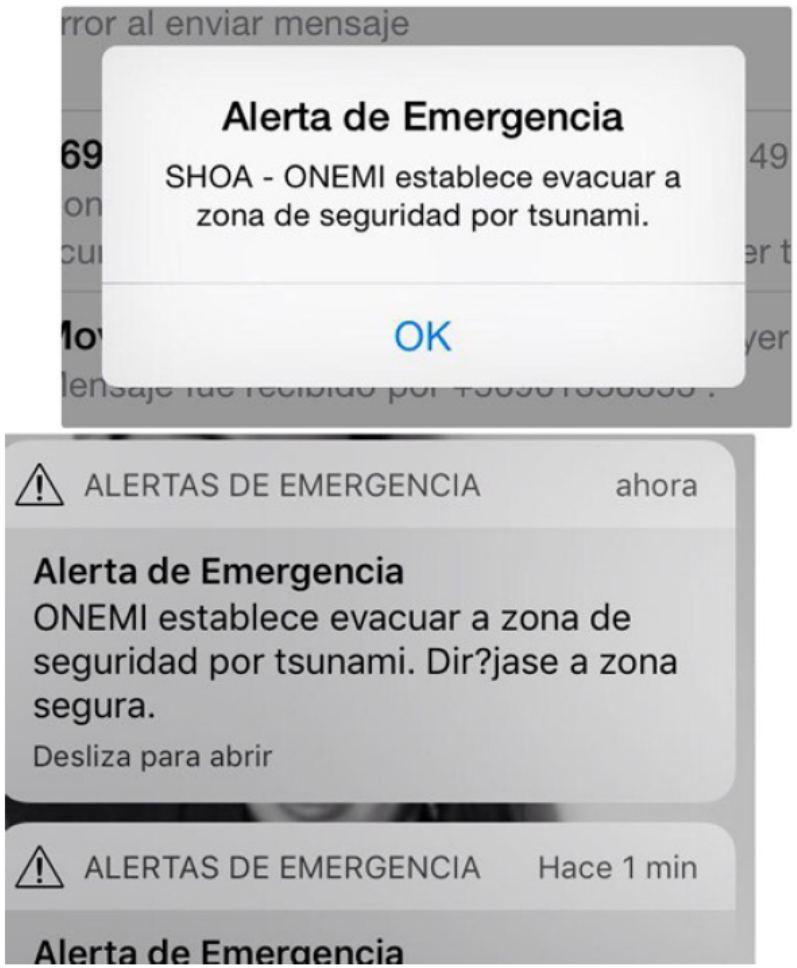
Fig. 1. Approximate locations of new (lettered) and existing (numbered) DART sites. Colored lines indicate faults associated with seismic activity; a tsunami generated along one of these faults will be detected by the DART buoy array in the time indicated by color. Detection times for the existing array (left) can be compared to detection times with the full array (right).



A World of Opportunity: Telecommunications cables criss-cross the oceans, passing through zones of oceanographic and seismic interest. SMART cables will allow scientific sensors to hitch a ride, reporting back data that can help us better understand and mitigate ocean risks like tsunamis and ocean warming.

3.-Warning Dissemination and Communication

A tsunami warning and evacuation advice is only effective when it reaches a person on the coast in time before a destructive wave hits. Both the dissemination (its timeliness and reliability) and the communication of the advice (what the message says) must be successful or lives may be unnecessarily lost. Member States identified the strengthening and enhancing of their **end-to-end warning chains**. Additionally, incorporating tsunami warning dissemination (which may be infrequent) into **Multi-Hazard** communication systems will help to ensure sustainability and readiness.



4. Response Capability

As disasters are foremost local, it will be coastal communities that suffer the brunt of impact from the next tsunamis. The UNESCO IOC Tsunami Ready programme motivates communities to take common-sense preparedness actions, that include hazard assessment, inundation and evacuation mapping, awareness and education and exercises. **Tsunami Ready was identified by most of Member States as a priority activity**. Novel initiatives like the **Blue-Line project** around New Zealand coastlines may also be disseminated in the context of Tsunami Ready. Last but not the least the **World Tsunami Awareness Day (WTAD)** was also mentioned by Member States as a mean of increasing awareness and preparedness.

5. Capacity Dev. and Attention to SIDS and LDCs

Capacity Development to mitigate against tsunamis continues to be a critical need for SIDS and LDCs. Training has been organized and conducted by the IOC and regional organizations, but it has not been frequent-enough to meet their requests. The development of online, on-demand, and hybrid training, such as through the IOC Ocean Teacher Global Academy (**OTGA**), will help to significantly broaden the audience reach and availability of trainings globally.

Multi-sectoral tsunami exercises, complemented by education and awareness campaigns, have been embraced by Member States contributions as key preparedness activities that test warning and response procedures, alerting, and community evacuation responses. SIDS Member States identified the need for **Regular technical training** (i.e. SeisComP for seismic monitoring) and promotion of **Wave exercises**, National Drills and **WTAD**

OTGA for Tsunami Ready

1. **Tsunami Awareness (ITIC)** – general
2. **Tsunami Ready (BMKG/IOTIC)** – plan for 3 modules: TR for Decision Makers, TR for Community, TR for Facilitators
3. **Tsunami Early Warning Systems (TEWS, ITIC)** – more detail on different components of end-to-end tsunami warning and requirements
4. **TEMPP (ITIC, BMKG/IOTIC)**
   - DEM – background (training on how to make needed?), ITIC with NCEI
   - Tsunami Inundation Modeling – hybrid training ITIC with PMEL
   - Tsunami Evacuation Mapping – ITIC / BMKG
   - SOPs and Response Plans – ITIC / BMKG, incl TsuCAT tool for planning PTWS/CARIBE-EWS exercise injects
   - Exercises – ITIC / BMKG

The Oceania Regional Seismic Network (ORSNET) member states completed an 8-days online Basic SeisComP Training from 26th October to 4th November 2020 delivered by gempa GmbH. ORSNET member states were last trained on SeisComP3 by gempa GmbH in 2013. This gap in capacity development was recognized at the 28th Meeting of ICG/PTWS held in Nicaragua in April 2019 under the Working Group 2- Tsunami Detection, Warning and Dissemination through the Fifth Meeting of the Task Team Seismic Data Sharing in the Southwest Pacific and the Seventh Meeting of the Pacific Islands Countries and Territories Working Group on Tsunami Warning and Mitigation held on March 2019 in Noumea, New Caledonia.

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UN Ocean Decade Tsunami Programme
Scientific Committee - ToR

1. Develop a Draft 10-Year Research, Development and Implementation Plan for the Ocean Decade Tsunami Programme based on the concept paper ***"Protecting Communities from the World's Most Dangerous Waves: A Framework for Action under the UN Decade of Ocean Science for Sustainable Development"***;

2. Identify and address gaps in global tsunami hazard assessment as follows:

    a. comprehensive assessment to include all potential tsunamis, anywhere in the world, regardless of their source,

    b. strategies to validate historical tsunami sources, through the application of paleotsunami techniques and historical seismology

3. Identify gaps in tsunami detection, measurement, forecasting, with a special emphasis on tsunamis generated close to populated coastlines;

4. Propose to enhance sensing and analysis strategies to enable the rapid characterization of tsunami sources through the combined use of land-based seismic and geodetic sensors, GNSS terminals, coastal sea level gauges, deep-ocean tsunameters, SMART repeaters on deep-ocean fiber-optic cables and satellite-based observations;

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Scientific Committee – ToR

5. Propose a roadmap for collaboration with the ITU/WMO/IOC SMART Joint Task Force cable initiative to fully explore the feasibility of widespread deployment of scientific instrumentation on deep-ocean fiber-optic cables to improve capability to rapidly detect and characterize tsunami sources as well as propagating tsunami wave fields;
6. Consider and propose strategies, programmes and content to enhance societal resilience for tsunami and other ocean hazards;
    a. build the framework needed to ensure the training and development of the next generation of technical-scientific expertise,
    b. identify strategies that allow to characterize structural and social vulnerability in tsunami hazard zones
7. Overview the consolidation of inputs received to IOC Circular Letter 2825 on Inventory of actions 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;
8. Submit a Draft 10-Year Research, Development and Implementation Plan for endorsement by the TOWS-WG at its 15th meeting.

Agenda Item 4

Scientific Committee for the UN Ocean Decade Tsunami Programme (SC-ODTP)

Goal=Draft a 10-Year Research, Development and Implementation Plan for the Ocean Decade Tsunami Programme

Proposed Timeline

Consultants to draft chapters

Consultations with TSU community (TTs/ICGS)

Consult/contributions Member States (CL)

17 Feb 2022

SC 1st meeting (online)

The purpose of this meeting is to first and foremost meet (virtually) and present each other, but also to broadly discuss the terms of reference and agree on a timeline for delivering the 10-year plan

24-25 Feb 2022

TOWS-WG-XV

TOWS-WG is a standard setting and advisory body to the IOC on tsunami and other coastal hazards. This session will discuss among other matters, SMART Cable, Tsunami Ready & UN Decade

5-7 April 2022

Safe Oceans Lab

Laboratories are innovative formats that function as self-sustaining events. They act as a creative platform to link diverse stakeholders and topics to trigger collaborative efforts regarding the UN Ocean Decade.

13-17 June 2022

IOC -EC 55

IOC Governing body .

2nd SC meeting (in person)

Opportunity for an in-person SC meeting – 1st Draft of the 10-Year Plan

Nov-Dec 2022

2nd IOC Tsunami Symposium

to examine lessons learnt from past events & recent efforts in further developing TWMS

3rd SC meeting (in person)

Final version of the Draft 10-Year Research, Development and Implementation Plan for the Ocean Decade Tsunami Programme.

23-24 Feb 2023

TOWS WG XVI

Endorsement of the 10-Year Research, Development and Implementation Plan for the Ocean Decade Tsunami Programme

Draft TORs consultancies

1st Draft by email

Proposed Intervention

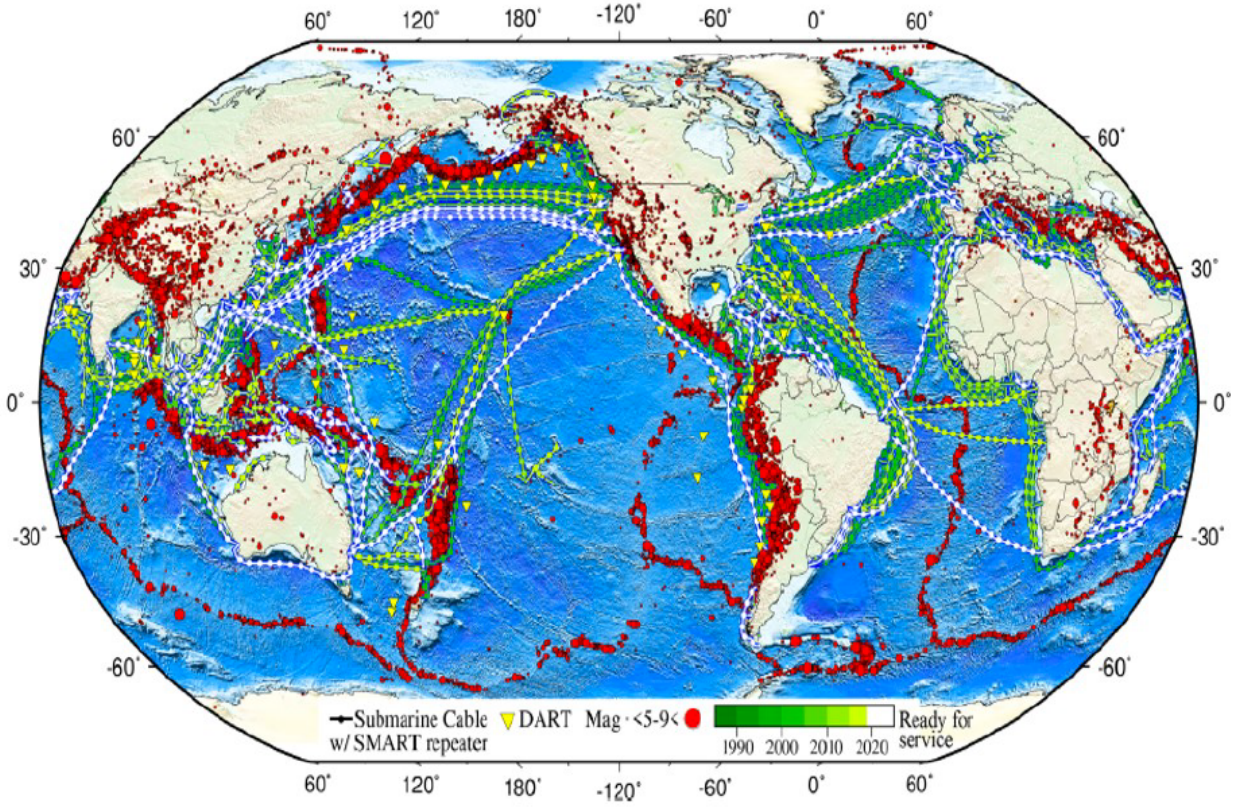
Tsunami Decade Value Proposition

- Tsunamigenic processes are complex and difficult to accurately simulate in real-time. Reliance on seismic proxy
- In contrast the tsunami **wavefield** is detectable, measureable and propagates deterministically in open water.
- Opportunity: Focus effort on <u>improving direct tsunami detection and measurement</u>
  - ***Science?***
  - ***Observations?***
  - ***Techniques?***
- <u>RESULT</u>: ***EM Decisions informed by accuracy and precision, rather than broad uncertainties.***

Rethinking Ocean Observation – Reducing Uncertainty in Global Tsunami Forecast

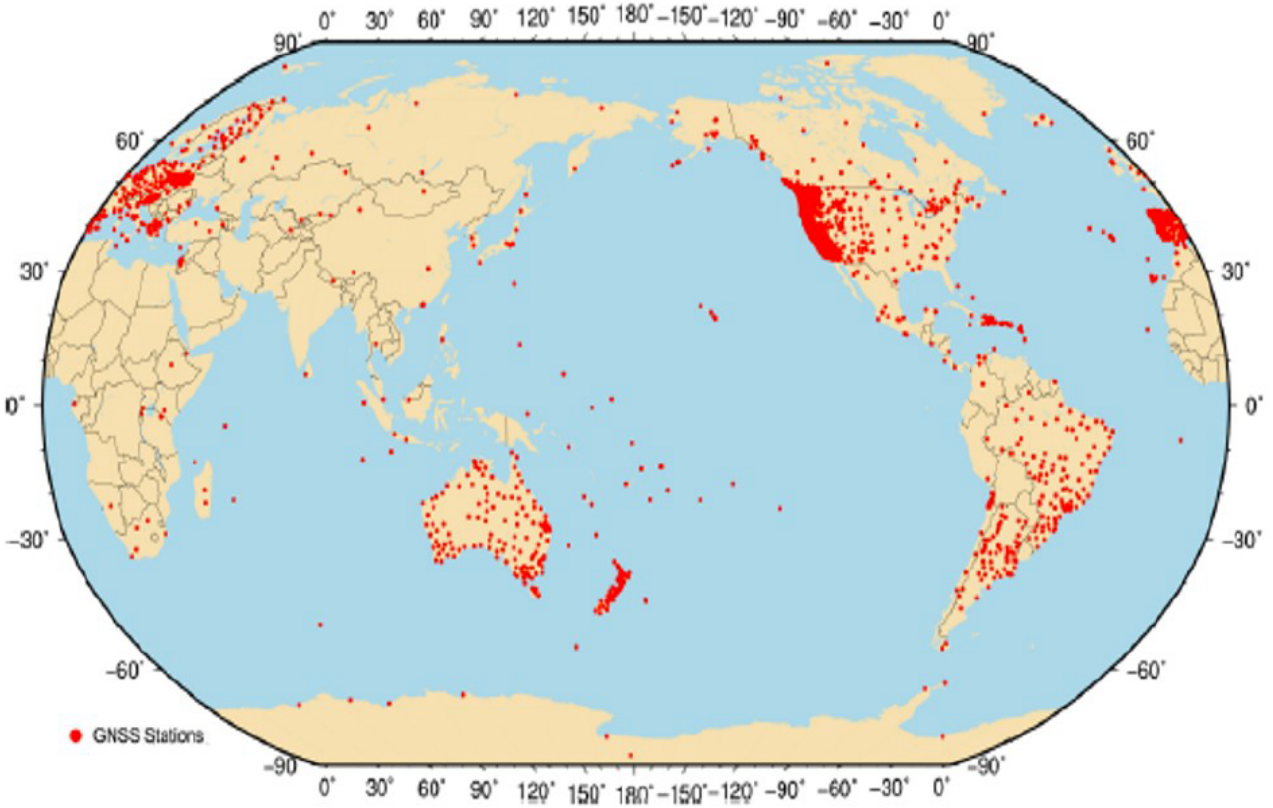
NEW POTENTIAL SOURCES OF SEISMIC OBSERVATIONS FOR TSUNAMI WARNING SYSTEMS

Locations and magnitudes of historical seismic events (red), DART tsunami buoys (yellow triangles) and current (green) and planned (white) submarine cables,. SMART repeaters shown every 300 km



Angove, M . et. al, 2019

The location of 2,260 real-time GNSS stations from public networks around the world



Pacific Northwest Geodetic Array/Central Washington University

Propose additional actions for concept paper

(*IOC Circular letter, 2825*) Protecting Communities from the World's Most Dangerous Waves: A Framework for Action under the UN Decade of Ocean Science for Sustainable Development

specifically targeted at **SIDS and LDCs**. We seek to identify and advance specific actions that align with the components of UNDRR **People-Centered Early Warning Systems** including:

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   - Ensure that **SIDS and LDCs are fully integrated** into all phases of the global Tsunami Warning and Mitigation System.

1. Risk Knowledge:
   - Fully understand the impacts to the built environment (cities/municipalities) and know how to minimize them through tsunami DRR based urban planning.

4. Response Capability:
   - Ensure **mainstreaming Tsunami Disaster Risk Reduction in urban planning** for city/municipality level
   - Built Back Better pre-disaster recovery planning for cities/municipalities level

Outline of Frame of Action

on going process

Outline Framework of Action

1. Introduction
2. Tsunami Risk Knowledge
3. Monitoring, detection, analysis and forecasting of tsunamis and possible consequences
4. Warning, dissemination and communication
5. Preparedness and Response Capabilities
6. Capacity Development and Attention to SIDS and LDCs
7. Governance: Cooperation, Participation: Inclusiveness, Legal, Institutional policy and regulatory frameworks
8. Monitoring / Reporting on the Global Sendai Target
9. Implementation Plan

Issues to be discussed by WG1 for Section 5

- The ocean decade will from 2022 to 2030
- The ultimate goal of an early warning system is the protection of life, as well as livelihoods. One of the two main goals of the decade is that 100% of communities at risk from tsunamis be prepared and resilient through program like Tsunami Ready or other similar program owned by the Member States.
- Q1 : What is Community?
- Q2 : How many Communities are at Risk from Tsunami?
- Q3: Are public awareness and educational activities conducted?
- Q4: Are public awareness and response tested and exercised?
- Q5: Institutionalizing Tsunami Awareness and Response ?

Thank you …