



unesco

Intergovernmental
Oceanographic
Commission

UN Ocean Decade Tsunami Programme

**Rick Bailey, Bernardo Aliaga and
Denis Chang-Seng**
Tsunami Resilience Section



unesco

**Intergovernmental
Oceanographic
Commission**



2021 United Nations Decade
2030 of Ocean Science
for Sustainable Development

UN Decade of Ocean Science for Sustainable Development: 2021 - 2030

VISION:

The Decade will harness, **stimulate and coordinate interdisciplinary research efforts** at all levels, in order to support **delivery of the information, action and solutions** needed to achieve the UN's 2030 Agenda for Sustainable Development.

Goals:

Goal 1

To generate **the scientific knowledge and underpinning infrastructure and partnerships** needed for sustainable development of the ocean.

Goal 2:

To provide **ocean science, data and information to inform policies for a well-functioning ocean** in support of all SDG-2030 Agenda.

SOCIETAL OUTCOMES:

- 1. A Clean Ocean;**
- 2. A Healthy and Resilient Ocean;**
- 3. A Predicted Ocean;**
- 4. A Safe Ocean;**
- 5. A Sustainable harvested and productive ocean;**
- 6. A “Transparent and Accessible” Ocean;**



unesco

Intergovernmental
Oceanographic
Commission

The Vision of a Safe Ocean

A Safe Ocean is:

- **not** an ocean in which tsunamis do not occur;
- **is** an ocean in which tsunamis are understood, observed, and their impact is **accurately predicted before** they reach the coast;
- **is** an ocean in which those that live, work, and recreate along it are **armed with knowledge and prepared** to act before a tsunami strikes.



EXISTING GLOBAL TSUNAMI WARNING SYSTEM

Intergovernmental Oceanographic Commission of UNESCO
2021 www.ioc-tsunami.org



unesco

Intergovernmental
Oceanographic
Commission

The services provided by the
US National Tsunami Warning Center
are outside the framework of the IOC
coordinated tsunami warning systems

CARIBE-EWS

Tsunamis and Other Coastal
Hazards Warning System for the
Caribbean and Adjacent Regions

Service provided by

PTWC
Pacific Tsunami Warning Center

Planned

PTWS

Pacific Tsunami Warning
and Mitigation System

NWPTAC/JMA
Northwest Pacific Tsunami
Advisory Center /
Japan Meteorological Agency

PTWC
Pacific Tsunami Warning Center

SCSTAC/NMEFC
South China Sea Tsunami
Advisory Center /
National Marine Environmental
Forecasting Center of P. R. China

IOTWMS

Indian Ocean Tsunami
Warning and Mitigation System

InaRTSP
Indonesian Regional Tsunami Service Provider

ITEWC
Indian Tsunami Early Warning Centre

JATWC
Joint Australian Tsunami Warning Centre

Service is provided by the
InaTEWS
Indonesian Tsunami Early Warning System at
the BMKG, outside the framework of the IOC-
coordinated tsunami warning systems

NEAMTWS

North Eastern Atlantic, Mediterranean
and connected seas Tsunami Warning
and Mitigation System

Accredited TSPs:

CENALT
Centre d'Alerte aux Tsunamis

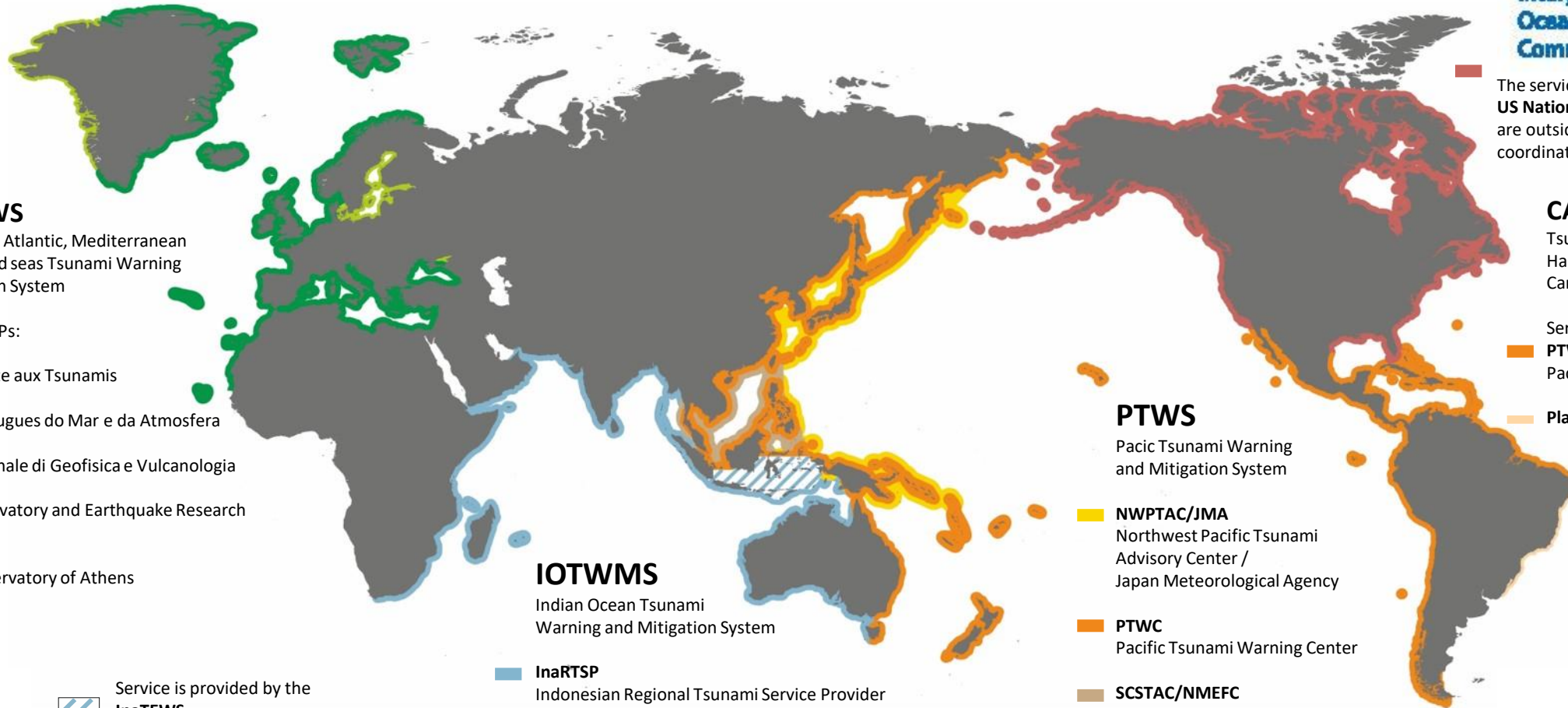
IPMA
Instituto Portugues do Mar e da Atmosfera

INGV
Istituto Nazionale di Geofisica e Vulcanologia

KOERI
Kandilli Observatory and Earthquake Research
Institute

NOA
National Observatory of Athens

Planned

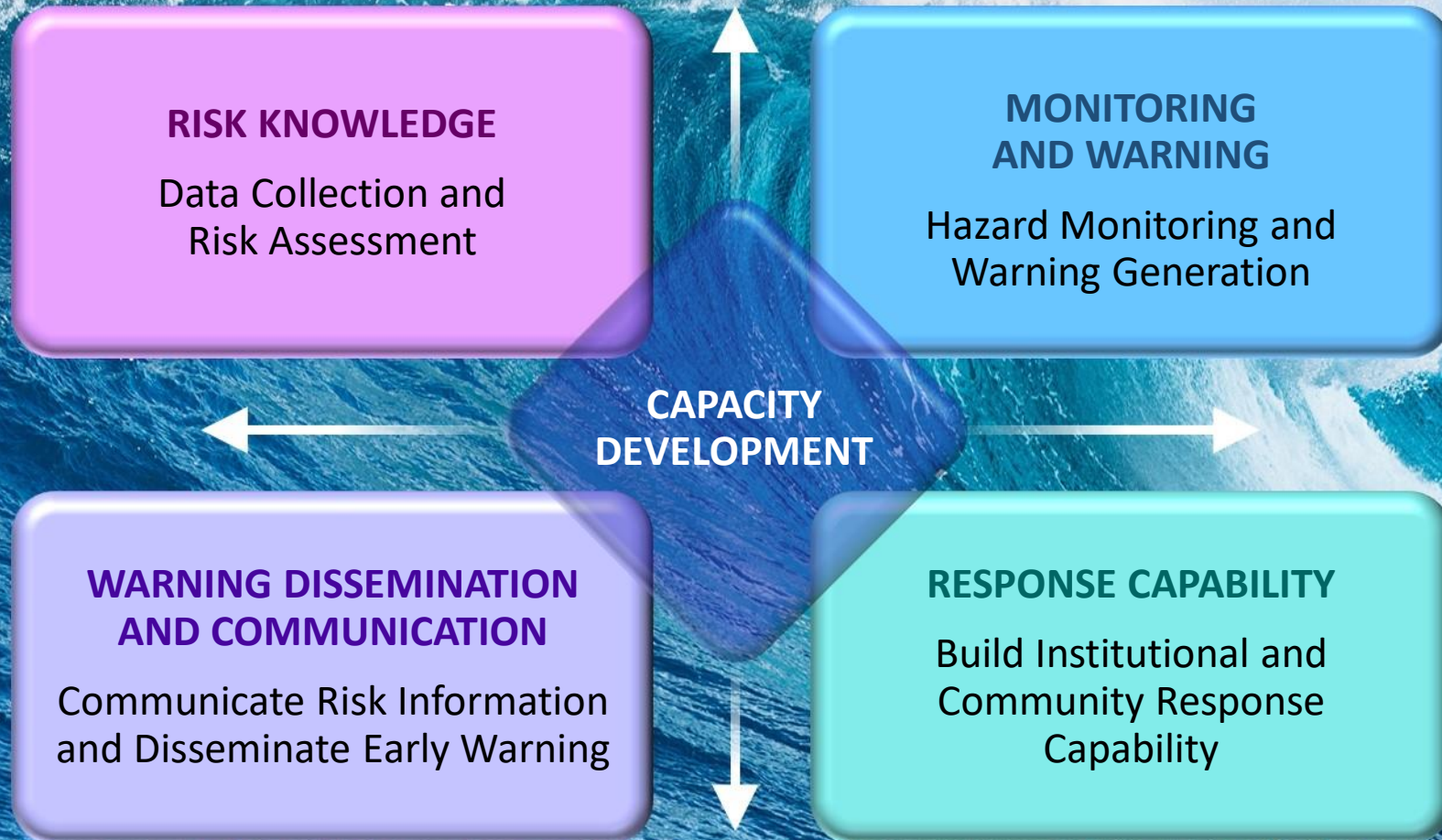


PEOPLE-CENTRED GLOBAL TSUNAMI WARNING AND MITIGATION SYSTEM



unesco

Intergovernmental
Oceanographic
Commission



Adapted from ISDR
Platform for the
Promotion of Early
Warning, 2006



2021 United Nations Decade
2030 of Ocean Science
for Sustainable Development



unesco

Intergovernmental
Oceanographic
Commission

31st Session (14-25 June 2021) of the Assembly for the UNESCO Intergovernmental Oceanographic Commission (IOC) approved the establishment of the **Ocean Decade Tsunami Programme**, including:

- **Scientific Committee** to prepare a **10-Year Research, Development and Implementation Plan**
- **Tsunami Ready Coalition** to help enhance community preparedness

“...this programme will seek to ensure that a country's ability to prepare for, defend against and recover from the tsunami threat is not dependent on what it can afford.”

Alexander Frolov, Jul 2021

OCEAN DECADE TSUNAMI PROGRAMME: Seeking Major Advances in SCIENCE and PREPAREDNESS



unesco

Intergovernmental
Oceanographic
Commission

New observational and analysis technologies to move from a **high-uncertainty** assumption-based capability to a **low-uncertainty** dynamic-based capability

RESILIENCE!

Communities respond to tsunami threats by combining accurate **real-time impact forecasts** with **deep community preparedness**.
Tsunami disaster impacts are minimized, enabling rapid restoration of critical infrastructure and services

Comprehensive institutional & community preparedness and capacity building efforts aimed at achieving **IOC Tsunami Ready** designation across all socio-economic categories



UN Ocean Decade Tsunami Programme Objectives



- The **first objective of the ODTP** is to develop the warning systems' capacity to send out actionable warnings within 10 minutes for tsunamis from all sources with the least amount of uncertainty, in order to evacuate the largest possible amount of endangered people before impact. To achieve this 10-minute target requires expanding existing monitoring systems and implementing further scientific and technological advances (Sumy et al., 2022).
- **The second objective of the ODTP** is that 100 percent of communities at risk to be prepared and resilient to tsunamis by 2030 through programmes like the IOC-UNESCO Tsunami Ready Recognition Programme (TRRP), which was approved by the IOC-UNESCO Executive Council in 2022. It embodies 12 Assessment, Preparedness and Response Indicators that support communities at risk to build capacities to effectively respond to warning and tsunami threats.

Executive Summary latest draft Research & Development Implementation Plan

Tsunami Risk Assessment:

- Understanding the risk and developing a plan to mitigate this risk is what saves lives.
- While tsunamis are infrequent and catastrophic ones are rare, the historical record shows that tsunamis have the potential to hit every coast around the world – we don't know when, where, or how big.
- Also, it is important to evaluate the geological history of tsunami-prone areas to identify the probable communities at risk. This evidence will be useful to these communities, to mitigate the loss during the next.
- Until recently only seismic sources were considered in Tsunami Hazard Assessment studies and operational warning procedures. This has been the case because seismic-originated tsunamis are the vast majority impacting near and far-field coasts.
- On the other hand, most non-seismic tsunamis have limited and localized areas of high impact. However, impacts related to recent events have highlighted the importance of non-seismic tsunamis. Hazard assessments should also include

Executive Summary latest draft Research & Development Implementation Plan



Tsunami Detection and Warning:

- A dense observation network plays a crucial role in the quick detection of the earthquake and its potential to generate a tsunami.
- Based on observations, the warning system determines whether communities are to be evacuated from the tsunami-prone areas, and if so, when they should be allowed to return.
- However, in the case of a local tsunami where the estimated tsunami arrival time to the nearest coast is less than 15 minutes, it is important to educate the community about physical signs of the tsunami such as long ground shaking, approaching roaring sound, rapid withdrawal of the water, etc.
- It is challenging to generate an accurate tsunami forecast in a short amount of time in the case of major earthquakes with ruptures that reach hundreds of kilometres.

Executive Summary latest draft Research & Development Implementation Plan

Tsunami Detection and Warning (cont):

To improve the 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 non-seismic/complex sources) and compute tsunami inundation forecasts for their coasts:

- Sensors include singularly or array-deployed high-quality seismometers and accelerometers, coastal sea level gauges and deep-ocean pressure systems such as Deep-ocean Assessment and Reporting of Tsunamis (DART) buoys, dedicated seafloor observatories and trans-basin undersea cables such as Science Monitoring and Reliable Telecommunications (SMART) cables, and Global Navigation Satellite System (GNSS) land and sea elevation buoys.
- High-resolution coastal bathymetry and topography or Digital Elevation Model (DEM) contributions are also highly significant, for example, the Nippon Foundation-GEBCO SEABED 2030 project.
- New data and methods, for both seismic and non-seismic sources, are needed to more precisely characterize rupture complexities of very large earthquakes within a few minutes to produce more accurate tsunami forecasts from numerical models.

Executive Summary latest draft Research & Development Implementation Plan

Preparedness and Response Capabilities

- As disasters are foremost local, coastal communities will suffer the brunt of the impact from the next tsunamis.
- Adding to the challenge, ocean-wide tsunamis are infrequent; before memories of the last tsunami fade away, we must put more effort into creating awareness and preparedness. In order to be successful, we will need continuing and enhanced engagement from governments, research institutes and universities, industry, communities, the media, and other interested parties.
- In an end-to-end warning system, the communities at risk must be aware of how to respond quickly after receiving warnings; it is equally important as detection and warning.
- The IOC-UNESCO Tsunami Ready Recognition Programme is a strong example of initiatives that motivates communities to take common-sense preparedness actions, which include hazard assessment, inundation and evacuation mapping, awareness and education and exercises.
 - It includes preparedness measures, such as response plans developed and operational, public awareness and education campaigns conducted, and public awareness and response tested and evaluated. Tsunami Ready is identified by most 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. Finally, World Tsunami Awareness Day (WTAD) on 5 November is also mentioned by Member States as a means of increasing awareness and preparedness.
 - The implementation of such initiatives is key to increasing tsunami preparedness and response.

UNESCO-IOC Tsunami Ready Recognition Programme

Community performance-based programme

Active collaboration of the public (community), community leaders, local and national emergency management agencies, and the national tsunami warning centre.

Based on 12 Indicators

Developed from **best practices and lessons learnt** worldwide.



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.

