

Annex 1 to 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**

(draft for TOWS-WG consideration)

Tsunamis threaten the safety, resiliency and sustainability of nearly every coastal community on earth. Approximately 680 million people who live in low-lying coastal zones (<10 m above sea-level) are to varying degrees exposed to tsunami risks. This number is expected to increase to more than one billion by 2050 ([IPCC Special Report on Ocean and Cryosphere](#), September 2019).

Between 1992 and 2019, 295 confirmed tsunamis were observed worldwide. Thirty-five of these resulted in loss of life. We do not know when and where the next tsunami will hit, but we know the impacts can be devastating. The Indian Ocean Tsunami of December 2004 took nearly 230,000 lives in 14 countries and resulted in damages of almost US\$10 B. Small Island Developing States (SIDS) and Least Developed Countries (LDC) are especially vulnerable. The 2009 Samoa tsunami, for example, resulted in losses equal to 30% of the Samoan GNP. Major economies are not spared. In Japan, the 2011 Tohoku tsunami caused over 18,000 deaths and an economic damage of US\$220 B.

Timely and reliable tsunami warnings have saved, and will continue to save, countless lives around the world. When combined with dedicated public preparedness efforts, accurate tsunami amplitude and inundation forecasts enable communities to know what to do and precisely where to go when a tsunami is headed for the coast. Since most known tsunami source regions are close to populated coastlines, these **forecasts must be produced within minutes, if not seconds**, of tsunami generation. In extreme cases (e.g. Palu Bay, Indonesia in 2018), there may be insufficient time to produce *any* public alerts. In these instances, vulnerable communities must be educated and ready to act decisively based only on natural warning signs.

There have been major advances in the Tsunami Warning and Mitigation Systems around the globe since 2004. Under the auspices of the UNESCO-IOC, entirely new warning and mitigation systems have been established in the Indian Ocean, the Caribbean and Adjacent Regions, South China Sea and North-eastern Atlantic, the Mediterranean and connected seas. Still, critical capability gaps remain. Even for well-understood earthquake sources, the current system requires a minimum of 20-30 minutes after origin to produce useful tsunami wave height forecasts. This works well for tsunamis that reach coastlines hours after generation, but provides insufficient time for national and local authorities faced with protecting populations near a tsunami's source to execute anything more than generic, pre-planned responses. In such near-field locations, a tsunami can strike in as little as 5-10 minutes after origin, and any ordered actions are based on broad assumptions containing high degrees of uncertainty. In addition, accurate flooding or inundation forecasts cannot be produced for many locations around the globe due to lack of detailed coastal bathymetry data. Further, for tsunamis generated by poorly understood and/or non-seismic sources (e.g., landslides, volcanic eruptions, or weather-induced), or that occur within inland waterways or large lakes, virtually no capability to produce forecasts in real-time exists. Perhaps most importantly in terms of life safety, according to recent surveys more than 50% of tsunami-threatened countries do not have the tsunami evacuation maps and plans necessary to effectively and quickly respond to tsunami warnings.

Call to Action

As representatives of the Tsunami Warning and Mitigation Systems, we propose, under the UN Decade of Ocean Science for Sustainable Development, a **framework** from which actions can be developed to address critical gaps in the 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:

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.

The transformational gains in the tsunami warning and mitigation system will represent a significant programme within the Ocean Decade. Specifically, it would contribute to the **Safe Ocean, Predicted Ocean** and **Accessible Ocean** Outcomes explicitly via Ocean Decade Challenge 6 on **Multi Hazard Early Warning Services** and community resilience, and also via contributions to Ocean Decade Challenge 9 on **capacity development**. It aligns with all three Decade objectives related to the identification, generation and use of knowledge for sustainable development. It directly supports United Nations **Sustainable Development Goal 11** by applying advancements to Ocean Science to saving lives and reducing the number of affected people and economic losses in coastal cities and communities.

Through the Decade, the specific initiatives that will be implemented will be identified through Calls for Decade Actions at the level of programmes, projects, activities or contributions. Tsunami stakeholders from government, private, academic and other sectors have been approached to share their actions and contributions that could contribute to the Tsunami Programme. Likewise, the Tsunami Programme could consider other UN Decade actions.

The vision of the Tsunami Programme for the Decade seeks to encourage Actions that are transformative, collective and that connect diverse actors including generators and users of knowledge. In order to ensure that tsunami-related Decade Actions respond to these principles, a framework has been proposed to organize and cluster responses to the Ocean Decade from the tsunami community. This framework will be used by diverse actors to guide the development of a consolidated and collective approach and to track the contribution of the tsunami community to the Ocean Decade.

21 December 2020