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Item **3.4.1** of the Provisional Agenda

WARNING AND MITIGATION SYSTEMS FOR OCEAN HAZARDS: TOWARDS AN OCEAN DECADE TSUNAMI PROGRAMME

Summary

In its report, the IOC Working Group on Tsunamis and other Hazards related to Sea-level Warning and Mitigation Systems (IOC/TOWS-WG-XIV/3), recommends the establishment of the Ocean Decade Tsunami Programme and a Scientific Committee tasked with the preparation of a Draft 10-Year Research, Development and Implementation Plan for this programme with Terms of Reference annexed to the proposed draft Dec. A-31/3.4.1.

This document provides the rational for the proposed Ocean Decade Tsunami Programme.

The financial and administrative implications: see paragraph 11.

The proposed decision is referenced as Dec. A-31/3.4.1 in the Action Paper (document IOC/A-31/AP Rev 2).

Protecting Communities from the World's Most Dangerous Waves: A Framework for Action under the UN Decade of Ocean Science for Sustainable Development[1]

Introduction

1. 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).

2. Between 1992 and 2019, 295 confirmed tsunamis were observed worldwide. Thirty-five of them 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 billion. 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 billion.

3. 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.

4. There have been major advances in the establishment of Tsunami Warning and Mitigation Systems around the globe since 2004. Under the auspices of IOC-UNESCO, four new regional 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 in addition to the precursor system in the Pacific. Still, critical capability gaps remain and many challenges remain to be overcome. Even for well-understood earthquake sources, the current system requires a minimum of 20-30 minutes after origin to produce useful forecasts of tsunami wave height. This works well for tsunamis that reach coastlines hours after generation, but provides insufficient time to national and local authorities to protect populations near a tsunami's source leaving barely enough time for generic, pre-planned responses. In such near-field locations, a tsunami can strike in as little as 5-10 minutes after origin. In such a context, any ordered actions are based on broad assumptions and a high degree of uncertainty. Added to this, the lack of detailed coastal bathymetry data in many locations around the globe prevents the production of accurate flooding or inundation forecasts. Regarding tsunamis generated by poorly understood and/or non-seismic sources (e.g., landslides, volcanic eruptions, or weather-induced), or occurring within inland waterways or large lakes, there is currently virtually no capability to produce forecasts in real-time. Most importantly in terms of life safety, a recent survey shows that 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

5. To address these challenges internationally and as a whole, expert members of the TOWS-WG, as representatives of the Tsunami Warning and Mitigation Systems, propose to develop a Tsunami Programme under the UN Decade of Ocean Science for Sustainable Development that would be a framework to develop actions and address issues across all regional systems. Progress

[1] A draft version of this document was originally distributed to all Member States as Annex 1 to IOC Circular letter, 2825, dated 6 January 2021

is envisioned particularly in the fields of rapid tsunami detection, measurement and forecasting capabilities, implementation of Tsunami Ready communities and related capacity development efforts, specifically targeting SIDS and LDCs. Additionally, the ambition is to identify and advance specific actions that align with the components of UNDRR People-centered early warning systems including:

1. Risk Knowledge

    (i) Improve our understanding of the tsunami hazard by expanding our knowledge of past or potential tsunami sources,

    (ii) Fully understand the impacts to critical infrastructure and marine assets and how to minimize them.

2. Monitoring and Warning

    (i) More quickly detect and measure tsunamis directly, through ocean observations to include instrumentation of undersea cables,

    (ii) Ensure critical tsunami generation parameters are identified through the optimal use and real-time sharing of new and existing sensors and data,

    (iii) Leverage the Nippon Foundation-GEBCO 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.

    (i) Ensure full integration of tsunami services within a multi-hazard early warning framework,

    (ii) 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

    (i) Tsunami evacuation maps must be available for all coastal communities,

    (ii) Ensure that 100% of communities at risk of tsunami around the world meet the indicators outlined in the IOC-UNESCO Tsunami Ready programme,

    (iii) 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

    (i) Enhanced capacity development is necessary for the understanding of the tsunami hazard to enhance timely warning, response and resilience,

    (ii) Ensure that SIDS and LDCs are fully integrated into all development phases of the global Tsunami Warning and Mitigation System.

6. The benefit of a global tsunami warning and mitigation system established through the proposed Ocean Decade Tsunami Programme will constitute a significant transformational driver of 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 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.

7. The specific initiatives that will be implemented in the framework of the Ocean Decade Tsunami Programme 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.

Scientific guidance

8. 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 Scientific Committee will be established to prepare a Draft 10-Year Research, Development and Implementation Plan, for endorsement by the TOWS-WG at its 15th meeting in 2022. This 10-Year Research, Development and Implementation Plan 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.

9. This vision is based on two over-arching aspects. The first aspect is to fully explore technological and observational advances that will allow us to move from a capability based largely on seismic assumptions and large uncertainties to one based on real-time dynamic assessment and low uncertainties. The second aspect will be to match these capability advancements with improved community preparedness efforts, including striving for 100% Tsunami Ready or comparable recognition of all at-risk coastlines.

10. A special Coalition for Tsunami Ready will be established in collaboration with other critical stakeholders across the UN structure as well as national civil protection agencies and will report to the TOWS-WG on Tsunami Ready aspects of the programme. In this way—by combining scientific and technological advances with unprecedented levels of understanding and preparedness—we look to achieve true long-term tsunami **resilience** where communities have access to accurate real-time tsunami impact forecasts that enable them to minimize impacts and maintain critical infrastructures and services even under extreme circumstances.

Financial and administrative implications

11. The financial and administrative implications of the proposal are expected to fall within the parameters of the regular budget of IOC, in particular for the governance roles of TOWS-WG related to the Ocean Decade Tsunami Programme. It will however require other substantial financing mechanisms to significantly contribute to the expected outcomes of the UN Decade of Ocean Science for Sustainable Development by the end of 2030.

Proposed decision

12. In light of the foregoing, the IOC Assembly may wish to consider Dec. A-31/3.4.1 in the Second revised Action Paper (IOC/A-31/AP Rev.2).