DRAFT PTWS MEDIUM TERM STRATEGY 2009-2013

This document has been prepared by the PTWS Officers with the support of the PTWS Steering Committee and the Secretariat. It is presented to the ICG/PTWS XXIII for adoption as is or with amendments.
Draft PTWS Medium Term Strategy 2009-2013
– Three Central Pillars –

1. Purpose of the document

The PTWS Medium Term Strategy (PTWS MTS) describes the basic directions of the Group (ICG/PTWS) to organize its activities towards improving the Pacific Tsunami Warning System during the period 2009-2013. It focuses on describing general, common but essential, strategic objectives. Details of the methods to accomplish these objectives are defined in the PTWS Implementation Plan.

In Section 2 the current state of the PTWS is analyzed; Section 3 introduces the main elements of the strategy that are detailed under Section 4. Section 5 discusses interoperability issues and Section 6 focuses on research aspects.

2. Analysis of the current state of the PTWS

The current state of the PTWS can be summarized as follows:

a) Pacific-wide and Regional Warning/Advisory provision services by PTWC, WCATWC and NWPTAC have been stably and robustly operated with high reliability. Those centers have been making ceaseless efforts to improve their services by introducing new technologies as well as to maintain the operational systems.

b) Other Regional and Local/National Warning systems are still under construction in some regions or Member States (MSs). Exchanging observational data between neighboring MSs (sometimes even within a single MS) or establishing a national system, which is reliable during times of emergency, remain great challenges.

c) A positive tendency is that MSs’ awareness of the urgent necessity for preparing countermeasures against tsunami threats has been increasing, especially after the 2004 Indian Ocean Tsunami disaster. Still, there is a need for more capacity building, disaster prevention education and other activities to achieve further and sufficient tsunami preparedness.

d) The budget for the ICG/PTWS provided by the governing body, UNESCO/IOC, and donated by Member States (MSs) through Trust Funds contributions is by far insufficient to cover all the relevant PTWS activities. The budget for them is mainly spent for ITIC’s activities and clerical jobs of the PTWS management. Other activities of the PTWS highly depend on national regular budgets from each MS to run tsunami warning/advisory operational centers, which are not included in this PTWS budget, or extra budgetary contributions offered by concerned organizations such as ISDR, UNDP and aid or technical agencies such as AusAID, USAid, JICA, Cosude or DIPECHO.
3. Three Central Pillars of the PTWS MTS

To formulate the PTWS Medium Term Strategy MTS we should consider the present situation described in section 2 and develop realistic strategic objectives that are achievable in 5 years. The driving question is “What can be done even with the present limited resources to at least make the population at risk evacuate and save their lives?” The response to this question makes it possible to prioritize the activities for improving the various components of the entire PTWS. These priorities may also be considered by aid and technical cooperation agencies as guidance for their support to the PTWS.

Taking this into consideration, and based on the long term experience of the PTWS and the lessons from the Indian Ocean Tsunami, the immediate central pillars of the PTWS Medium Term Strategy are the following 3 elements:\n
**Pillar 1:** Hazard Assessment  
**Pillar 2:** Warning  
**Pillar 3:** Preparedness

Interoperability might be put as the fourth element of the PTWS MTS as it is very important for the best use of resources and for establishing sustainable systems. Still, interoperability is rather a necessary condition for an efficient warning and for tsunami preparedness. To make the PTWS MTS structure simple, clear and more visible, these three above elements are specified as those essential to the PTWS MTS. Considerations on interoperability are briefly mentioned later in section 5.

Research, inseparable to many activities of the PTWS, can be classified as one of the driving forces for accomplishing and improving the above elements. The importance and function of tsunami research is mentioned under section 6.

4. Each Pillar of the MTS

This section describes the strategic objectives to be accomplished and the contents of each pillar as well as offering suggested priority actions. It is needless to say that the ICG/PTWS will support the activities addressing these strategic objectives as much as possible. Meanwhile, it is also important to encourage MSs’ initiative as the main stakeholders and actors in these activities.

**Pillar 1: Hazard Assessment**

Tsunami hazard assessment consists of several components such as specifying tsunami sources, estimating tsunami effects to the coasts or estimating damages. However, its final aim is to know where the dangerous places are and how strongly a tsunami could affect those areas. To put it straight, hazard assessment is to be conducted at and by each

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1 These elements were already pointed out in the ITSU Master Plan, which the Group has made continuous efforts to realize for long years.
Member State who knows the natural and social conditions of its coastal area more than any other countries, utilizing the existing scenarios of Pacific-wide tsunamis and developing local and regional scenarios as well. This assessment is an unavoidable starting point for efficient tsunami preparedness activities.

**Strategic Objective**

Member States will specify and detail danger levels and dangerous areas at their own coast brought by tsunami phenomenon.

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Developing tsunami hazard map based on historical data or numerical simulation is the ideal goal. Simple and rough estimation, like using elevation data of coastal topography as inundation criterion, can serve temporarily until more accurate mapping develops in the future including through paleo-tsunami research.

**Suggested Mechanisms**

Steps for tsunami hazard assessment in MSs are,

1. Specify tsunami sources capable of generating tsunamis that affect its own coastal area. Local source or distant source? Which source is more likely to affect the coast?
   
   -> Specify them from the past tsunami records or consideration of tectonic circumstances. Data of past earthquakes and tsunamis are important, but past tsunami databases may lack the severest case(s). So it would be advisable to assume the largest scale of geophysically possible cases as well as referring to the past databases.
   
   -> Utilize maximum tsunami height distribution charts of wide areas by numerical simulation which can indicate tsunami energy direction.

2. Specify danger level at each coast or dangerous area
   
   -> by numerical simulation, past records and other available means

Since the works for the above steps includes technical and research capabilities, capacities and skills, it needs support from or cooperation with research communities. To make it relevant and timely a compromise solution should be sought in terms of accuracy in the short term, because it would take long time and large budgets to pursue it due to its continuous improvement.

In the long term, it would be ideal to have MSs’ own available experts who can deal with various technical matters. Such human resources development is essential for the sustainability of the system. It requires training courses, overseas or national opportunities for graduate or postgraduate education and scientific and technical networking.

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2 Mechanisms are expanded in the PTWS Implementation Plan
3 A Local tsunami is "a tsunami from a nearby source which destructive effects are confined to coasts within 100 km of the source. A local tsunami is usually generated by an earthquake, but can also be caused by as landslide or a pyroclastic flow from a volcanic eruption" (UNESCO/IOC Tsunami Glossary)
Pillar 2: Warning
Since the Pacific is the world’s largest ocean and has tsunami sources in wide-spread regions, it is appropriate to consider it in several geographical scales when we deal with tsunami warning systems. That is the outstanding characteristic of the PTWS, which differs from the other ICG systems. Tsunami warning system of the PTWS has the following 3 scales:

a. Local warning (or National warning)
b. Regional warning
c. Ocean-wide warning

The followings are descriptions of improvements needed for warning systems of each scale.

a. Local warning (or National warning)
Local warning systems or national warning systems are the most crucial part in the entire end-to-end system for both local and distant tsunamis, due to the inalienable national responsible function of informing people at risk and urge or order immediate evacuation.

This system should be established or improved prior to the regional or ocean-wide system.

**Strategic Objective**
- Develop National warning center or function by each MS.
- Establish emergency response mechanism on a 24/7 basis among concerned organizations.
- Build optimized procedure for all steps; from issuing warnings to evacuation. Master the procedure by continuous practices including through full scale evacuation exercises and drills.

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- Build (or improve) observational networks for seismic and sea level data and online communication system(s) to rapidly collect these data. Establish or reinforce capabilities to analyze those data, evaluate tsunami effects and issue tsunami warnings through improved communication networks for delivering warnings and information.

**Suggested Mechanisms:**
- Improvement of seismic and sea level observation networks requires considerable funding and human resources, so that it may be difficult for many countries to achieve this strategic objective.
- address improvements by better focusing on hazard assessment and building on efficient use of existing support mechanisms and international networks (such as CTBTO, FDSN and IRIS for seismic monitoring and GLOSS for sea level monitoring).
- While the precise production and definition of a tsunami warning requires specific capabilities, the delivery of warnings to the population is usually provided through
other mechanisms by mandated agencies (Interior, Cabinet, Civil Defence, Hydrometeorological and Weather Services). Early involvement of these bodies in the national tasks of the PTWS may help save time and money.

**note:** For local tsunamis, which occur just near the coast of a particular country, there is usually a very short time until the tsunami hits the coast. Therefore, local or national warning system should initiate emergency action on their own without waiting for information from overseas organizations. For distant tsunamis, local and national systems securely receive information from international centers, evaluate the effect on domestic coast and decide to issue national warnings.

### b. Regional warning

Regional systems are for protection from tsunamis that affect several MSs within the Pacific Ocean but do not have an impact over the whole ocean like the 1960 Chilean Tsunami. In other words regional systems are the systems whose area of responsibility (AoR)\(^4\) is a part of the Pacific Ocean. There are already two established regional systems which are operated by WCATWC and NWPTAC respectively. Meanwhile there are other regions where new regional systems are required, particularly for the regions that are adjacent to tsunami generation source and have many nations within small area. In such regions cooperation among neighboring MSs of exchanging or integrating real-time seismic and sea level data is essential. In that regard some regional systems should be considered with high priority just like local system establishment. (e.g. system in the Southwest Pacific region where proper detection of earthquakes is difficult in a single country due to sparse distribution of small islands)

**Strategic Objective**

- Existent two regional systems:
  - At least, maintain the present level of operational services provided by WCATWC and NWPTAC.
  - Achieve further improvement on Warning/Advisory services by these Centers.
- Other new regional systems:
  - Develop regional warning system to provide warning service for the region.

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- Existent two regional systems:
  - The USA and Japan continue their operational services in close cooperation for providing effective Warning/Advisory Services consistent with the PTWC’s Warning/Advisory service.
  - WCATWC will target providing tsunami height estimations.
  - Improve tsunami estimation accuracy.

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\(^4\) AoR of regional systems depend on cases. Some are fairly wide so that the systems have characteristics of ocean-wide system, some others are smaller and the systems have characteristics of local systems to some extent. For example, WCATWC and NWPTAC are the former and Pacific side of Central America system would be the latter.
Improve earthquake determination (location, depth and M) accuracy.

Other new regional systems:
Share real-time seismic and sea level data among MSs within the region.
Establish regional warning center if required and ensure steady operation.

**Suggested Mechanisms:**

**Existent two regional systems:**
The USA and Japan will continue their longstanding contributions to maintain stable operation and to improve their Tsunami Warning/Advisory services.

**Other new regional systems:**
Promote cooperation and coordination among countries concerned through regional WGs of the ICG/PTWS, receiving and utilizing information and suggestion from WGs which are addressing technical issues.
Securing of funding is a big problem, but basically it should be on the countries’ own expenses along with efforts to obtain support by international aid funds.

**Note:** If all the MSs in the region have capabilities to individually analyze the shared observational data and evaluate the tsunami impact on their own coasts, establishing a regional center that provides tsunami warning for the whole area of the region may be unnecessary. In that case each MS delivers its domestic tsunami warning in the same manner as in local systems.

c. **Ocean-wide warning**

Ocean-wide system deals with tsunamis capable of expanding in a vast area of the Pacific Ocean, affecting a number of countries. This system uses global observational networks of seismic and sea level data, and also requires prompt and reliable communication means to deliver warnings to scattered countries around the Pacific Ocean. This warning information has the role of triggering the national warning procedure in each MS for ocean-wide tsunamis.

**Strategic Objective**
At least, maintain the present level of operational services provided by the PTWC.
Achieve further improvement on Warning/Advisory services by the PTWC.

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The USA continues its operational services in close cooperation with other regional centers for providing consistent and effective Warning/Advisory Services. Any further improvement of the PTWS will be constructed on the basis of this present ocean-wide system and service.
PTWC will target providing tsunami height estimations.
Improve tsunami estimation accuracy.
Improve earthquake determination (location, depth and M) accuracy.
Keep the Tsunami Warning Focal Point (TWFP) list up to date and as complete and reliable as possible.
**Suggested Mechanisms:**

- The USA will continue their longstanding contributions to maintain stable operation and to improve their Tsunami Warning/Advisory services.
- The ICG/PTWS will reinforce its mechanisms for obtaining and updating the TWFP list.

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**note:** What is most important for tsunami warning systems of any scale described above (a., b. and c.) is to guarantee stability, reliability and sustainability in the end-to-end operation, from receiving/delivering warning at centers up to the population evacuation, and the system should always be ready for the occurrence of this quite rare natural phenomenon. In other words, the primary aim for a warning system should be to maintain the system as a whole and keep the necessary reliability after its construction, or to develop such system as to be easy to maintain and to assure reliability.

From that standpoint state-of-the-art technologies should be carefully assessed before bringing these into operational systems. It is essential to evaluate the newest, promising technologies from the viewpoints of not only effectiveness or attractive prospects but also operational reliability and robustness, when considering introducing them into the warning system.

### Pillar 3: Preparedness

Disaster Preparedness is to be promoted in those very places vulnerable to the effects of tsunami, and hence it is basically to be taken up by each MS. There are two levels of disaster preparedness, with one being the governmental level in that they issue warnings and/or instructions for evacuation, and the other being individual people’s level in that they receive warning and take their own evacuating action or response.

**Strategic Objective**

- Establish rapid and effective evacuation mechanism.
- For that, increase public awareness of tsunami disaster.

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- Specify areas at risk. See: 1) Hazard assessment
- Establish national warning function. See: 2) Warning
- Build evacuation map for residents, tourists, workers in around coastal area
- Capacity building for governmental officials
- Disaster prevention education (knowledge of tsunami phenomenon, how to react when receive warning etc.) to all concerned populations.
Suggested Mechanisms:

i) Training and instruction to responsible officials of government, and disaster education to the public
-> Make use of various training and educational programs offered by various organizations. First investigate what programs exist by questioning offering organizations and MSs actually using them, and then compile a list of them as reference information for all MSs.

ii) Translating existing good educational materials into local languages and delivering these materials to the people is one of the best ways for disaster prevention education.
-> Investigate what materials and supporting system exist by questioning the offering organizations and MSs actually using them.

For both of the above, it is very important to collect past activities and evaluate their effectiveness for further improvement.

Regarding capacity building and improving public awareness, ITIC takes the main role of activities described above as its main tasks.

iii) Full scale evacuation exercises and drills should be considered as reliable preparedness tools to test both warning systems and evacuation plans. It also helps to improve awareness and involvement of both local governments and population.

5. Interoperability

Regarding the PTWS, interoperability has two aspects. One is among the four responsible ICGs and the other is addressing tsunami and other hazards related to sea-level. The basic idea for both is to make the best and most efficient use of limited resources such as experts, infrastructure, and/or funding. Such interoperability should be noted and focused on when the three central pillars described above are considered, especially when developing observational systems and establishing national emergency response systems.

For enhancing such interoperability, IOC created the TOWS-WG to coordinate activities of the ICGs and of relevant organizations dealing with other ocean-related hazards. From recognizing that the ICG/PTWS (and its predecessor ICG/ITSU) has been continuously operated and successfully contributed to tsunami disaster mitigation in the Pacific for these forty years, the ICG/PTWS should share its experiences and knowledge within TOWS-WG.

Strategic Objective
Close cooperation with the other ICGs.
Share or integrate the systems and data of tsunami and other hazards related to sea-level as much as possible.

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Share with other ICGs various knowledge and experiences such as technical information, experts and protocols.
Cooperate with GLOSS and other relevant programs and organizations as regards sea level observation and analysis.
Contribute to developing and setting standards for tsunami hazard assessment and warning.

**Suggested Mechanisms:**
Examine and extract common characteristic issues and items for every technical matter in all ICGs. The results of documents and information will be shared through IOC website or by other appropriate means.
The PTWS MTS 2009-2013 and the PTWS Implementation Plan will be provided for discussion in the TOWS-WG. Current status, successes and failures of each ICG should be shared among all the four ICGs.
Cooperation between the PTWS and groups addressing other ocean hazards should be promoted in TOWS-WG.

### 6. Research

Utilizing scientific investigation results of characteristics of tsunami phenomenon as well as introducing advanced technologies developed in other technical fields such as communication technology is fundamental for improving tsunami disaster mitigation measures. In that regard, research plays one of the essential roles for fulfilling the three central pillars of the MTS.

There are many new research programs and technologies being conducted and developed day by day. Since they pursue the leading edge, some of them provide interesting and relevant results in theory, but they need to be validated in experimental stage in order to be put into practical use. Therefore we have to pre-assess new research results or technologies from various viewpoints such as relevance, effectiveness, efficiency, robustness, ease of maintenance easiness and sustainability before officially introducing them into operational systems.

However, it would not work so effectively only with the Group’s resources, so that the ICG/PTWS needs to promote closer cooperation with relevant research communities. The ICG/PTWS also should take the role of requesting research communities to conduct or develop research or technology necessary for improving tsunami warning and mitigation system and contribute to solving problems discovered or highlighted through our actual system operations or various other activities.

**Strategic Objective**
Provide MSs best practices methods issued of new research and technology with the potential of establishing and improving tsunami warning/mitigation systems.

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Evaluate research and technology developments by relevant WGs.
Construct further close relationships with research communities.