



EXERCISE PACIFIC WAVE 13

A Pacific-wide Tsunami Warning and Enhanced Products Exercise

1–14 May 2013

Exercise Manual

Volume 1

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1. BACKGROUND

Most of the world's earthquakes and tsunamis occur in the Pacific Ocean and its marginal seas. On average, the Pacific is struck by a locally damaging tsunami every year or two, and by a major Pacific-wide tsunami a few times each century.

Over the past five years (2009–2013), the Pacific witnessed four destructive and deadly tsunamis that each placed PTWS (Pacific Tsunami Warning and Mitigation System) countries in various levels of warning for regional or distant tsunamis. Locally, six countries were impacted nearly immediately with people having only 10 to 30 minutes before the first large waves hit.

On 29 September 2009, Samoa, American Samoa, and Tonga were hit by a deadly tsunami that was the largest since the 1998 Sissano, Papua New Guinea, event. Altogether, 192 lives were lost locally. This was followed, five months later by the 27 February 2010 Chile tsunami where 124 lives were lost. And one year later, the Pacific and the world watched the 11 March 2011 Japan tsunami devastate the Honshu coastlines within 30 minutes claiming over 18,000 lives. Finally, on 6 February 2013, a local tsunami was generated by a powerful 8.0 magnitude earthquake that struck near the town of Lata, provincial capital of Temotu on Santa Cruz island, the eastern-most province in the Solomon Islands. Nine people were killed and hundreds of homes in five villages were damaged or destroyed.

In reviewing the Pacific Tsunami Warning System (IOC Technical Series, 92 [IOC/2010/TS/92] for 27 February 2010; and IOC Technical Series, 96 [IOC/2011/TS/96] for 11 March 2011), it can be said that while countries in general responded well to the 2010 and 2011 tsunamis as distant sources, there is still a need to reflect on how Member States can improve in responding to local tsunamis.

The Intergovernmental Oceanographic Commission (IOC) of UNESCO established the International Coordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU) in 1965 in response to the 1960 magnitude 9.5 earthquake off the coast of Chile that generated a tsunami killing 1,203 people locally, and 139 persons 22 hours later in Japan. The main focus of the Group is to facilitate the issuance of timely international warnings, and advocate for comprehensive national programmes in hazard assessment, warning guidance, and preparedness (ITSU Master Plan, 2004 [IOC/INF-1124 rev.]; PTWS Medium-Term Strategy 2009–2013 [ICG/PTWS-XXIII/3 (Annex V) and working document ICG/PTWS-XXIII/13]). In 2006, ITSU was renamed as the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS).

A Pacific-wide tsunami exercise is an effective tool for evaluating the readiness of PTWS countries and to identify changes that can improve its effectiveness. The international tsunami exercises were conceived and conducted in 2006 by the ICG/PTWS under the leadership of the PTWS Exercises Task Teams with strong contributions from the International Tsunami Information Centre (ITIC), the Pacific Tsunami Warning Center (PTWC), and the Japan Meteorological Agency (JMA). The first Pacific-wide exercise, Exercise Pacific Wave 06 (IOC/INF-1244), was carried out on 16 and 17 May 2006 using Philippines and Chile tsunami sources. Exercise Pacific Wave 08: A Pacific-wide Tsunami Warning and Communication Exercise (IOC/2008/TS/82), was carried out from 28 to 30 October 2008 using a northeast Japan source.

At the Twenty-third Session of the ICG/PTWS held in Apia, Samoa, from 16 to 18 February 2009 (ICG/PTWS-XXIII/3), Member States reviewed the findings and recommendations of Exercise Pacific Wave 08. Acknowledging the common occurrence of large earthquakes in the Southwest Pacific and its ensuing local tsunami hazard, and recognising exercises as a good vehicle to improve response and publicise awareness of tsunamis, Member States recommended to hold a third Pacific-wide tsunami exercise. Further, in the aftermath of the

2010 Chile and 2011 Japan local tsunamis, it was decided to conduct Exercise Pacific Wave 11 ([IOC/2011/TS/97VOL.1](#)) to encourage countries to evaluate their response readiness for local tsunamis.

At the Twenty-fourth Session of the ICG/PTWS ([ICG/PTWS-XXIV/3](#)) held in Beijing, China, from 24 to 27 May 2011, Member States approved the development of improved tsunami procedures and enhanced products by the PTWC, and the conduct of Exercise Pacific Wave 11 the 9 and 10 November 2011 to introduce and obtain feedback on the new products. PacWave11 provided countries with 10 destructive local tsunami scenarios to choose from. The PacWave11 Summary Report and other exercise documents are available on the PacWave11 website:

http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1686&Itemid=2331&lang=en

In May 2012, the Task Team on Pacwave11 and Enhancing PTWS Tsunami Warning Products established under Working Group on Detection, Warning and Dissemination (WG2) convened to evaluate the PacWave11 findings and to compile a list of feedback improvements that would allow PTWC to further refine its draft new products. Subsequently, the PTWS Steering Committee (PTWS-SC) convened on 24–25 May 2012 to review progress on the PTWS's inter-sessional activities. It approved the PacWave11 and Enhancing Tsunami Warning Products TT recommendations, the PTWC new products implementation time line, and the conduct of Exercise Pacific Wave 13 (PacWave13) to continue the enhanced products development process noting that PacWave13 would be important to enable informed decision-making at the next Intergovernmental Coordination Group (ICG). It is intended that the Pacific Tsunami Warning and Mitigation System (PTWS) Steering Committee would review the results of PacWave13 beforehand. The planned changeover date from the PTWC current products to its new products will be determined upon the formal approval of Member States at the next [ICG/PTWS-XXV](#) Session that will be held in Vladivostok, Russian Federation, from 11 to 13 September 2013. The goal continues to be for an official changeover in 2014.

2. EXERCISE PURPOSE

The aim of Exercise Pacific Wave 13 is to validate the understanding and use of the Pacific Tsunami Warning Center (PTWC) enhanced products.

The exercise provides an opportunity for Pacific countries to review enhancements of the new products, and review their tsunami response procedures. Regular exercises are important for maintaining staff readiness in case of a real event. This is especially true for tsunamis, which are infrequent, but when they occur, require a rapid response. Every Pacific country is encouraged to participate.

3. EXERCISE OBJECTIVE

The overall objectives for Exercise Pacific Wave 13 are to evaluate and provide feedback on PTWC new enhanced products.

- Objective 1. Evaluate the format and content of PTWC Enhanced Products.
- Objective 2. Provide feedback that a country is prepared to officially receive and utilize the PTWC Enhanced Products.

- Objective 3. Provide feedback that a country's stakeholders will be informed of the PTWC Enhanced Products to enable appropriate changes to their Tsunami Emergency Response Plans. Stakeholders include national/provincial/local government agencies, media, and the public.

Each country may expand and/or customise its own objectives for the exercise.

4. NEW ENHANCED PRODUCTS

At the Twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXIV/3) held in Beijing, China, from 24 to 27 May 2011, based on the work of the PTWS Task Team on Enhancing Tsunami Warning Products (Recommendation ICG/PTWS-XXIII.1, 2009) and recognition of improved capabilities of the PTWC in terms of its speed of response and growing ability to forecast impacts, Member States approved PTWC's proposal for new enhanced products.

The PTWC Enhanced Products will be threat-based on tsunami wave forecasts, rather than based upon earthquake magnitude thresholds and time or distance to impact. Several levels of tsunami threat have been established, and forecast threat levels are assigned to polygons representing segments of extended coastlines or to island groups. The improvements should greatly reduce the number of areas warned unnecessarily and also provide some advance notice of potential local tsunamis. Details on the PTWC New Enhanced Products for the PTWS are provided in IOC document User's Guide for the Pacific Tsunami Warning Center Enhanced Products for the Pacific Warning System (IOC/2013/TS/105). It can be downloaded from the PacWave13 website (<http://www.pacwave.info>)

The PTWC Enhanced Products were first introduced in Exercise Pacific Wave 11 (PacWave11) and feedback received through the post-exercise evaluation. Exercise Pacific Wave 13 will continue the development of the PTWC final products by introducing improved versions that address the feedback and comments received from PacWave11 and other meetings in 2011–2013.

Countries should also take note that the PTWC will begin the issuance of its new enhanced products in live trial phase to Member States of the ICG/PTWS on 15 April 2013. The PTWC will issue the new enhanced products in parallel with their existing products, and only by email to IOC officially-designated Tsunami Warning Focal Points (TWFP). This introduction and familiarization period is intended to also provide lead time for training on the new products and for countries to incorporate necessary changes to their National Tsunami Warning and Emergency Response Standard Operating Procedures. At the Twenty-fifth Session of the ICG/PTWS (September 2013), Member States will be asked to review and discuss the new products, and if ready, approve the products and agree on a official changeover date in 2014.

5. EXERCISE SCENARIO

Exercise Pacific Wave 13 should be held within the period of 1 to 14 May 2013. PacWave13 is recommended to be a Tabletop Exercise and will not be a live exercise. All messages will be available beforehand. Participant countries may choose to run their exercise at any time between 1 to 14 May 2013, allowing flexibility to avoid conflict with other important national events.

Three scenarios are available that will allow all Pacific countries to select and exercise a distant/regional/local source tsunami event. Countries are recommended to choose only one scenario to exercise. The exercise scenarios include major tsunamis generated by great earthquakes in the following areas:

- Off Northern Japan (Japan Trench)
- Philippines–South China Sea (Manila Trench)
- Off Northern Chile (Peru–Chile Trench)

The exercise will require Member State evaluation of PTWC new enhanced products, issuing of appropriate country specific alerts by National Tsunami Warning Centres (NTWCs), decision-making, including steps taken just prior to public notification. Member States may conduct the exercise through to the community level if they wish (however, this is not a requirement of the exercise).

Each country will be responsible for designing its own national, provincial and/or local level exercise(s) in line with the international Exercise Pacific Wave exercise framework.

6. TYPE OF EXERCISE

It is recommended that Exercise Pacific Wave 13 be carried out in a tabletop format (also referred to as a 'discussion exercise', or 'DISCEX').

Participants are presented with a situation or problem that they are required to discuss and for which they have to formulate the appropriate response or solution. Normally, the exercise requires no simulation other than the scenario and/or prewritten exercise injects. An exercise controller or moderator introduces a simulated scenario to participants and, as the exercise advances (in time), exercise problems and activities (injects) are further introduced. This type of exercise is used to practice problem solving and coordination of services with or without time pressures. There is no deployment or actual use of equipment or resources.

An example of a Tabletop Exercise may involve only key stakeholders, such as the National Tsunami Warning Center and the National Disaster Management Office, discussing their response to a tsunami threat in a particular area, where the only injects are tsunami messages from the international tsunami warning centres such as the PTWC in Hawaii, which describe the nature of the threat.

7. FURTHER GUIDANCE – HOW TO PLAN, CONDUCT AND EVALUATE TSUNAMI EXERCISES GUIDELINE

The IOC Manuals and Guides 58, *How to Plan, Conduct and Evaluate UNESCO/IOC Tsunami Wave Exercises* (IOC/2012/MG/58 REV, available in English and Spanish), has been developed to aid countries in planning, conducting, and evaluating a tsunami exercise at a national and/or provincial level. The guide is available at the [PacWave13](#) website.

8. ASSUMPTIONS

Each country will be responsible for determining what assumptions should be considered as part of its national, provincial, and/or local tsunami exercise.

9. EXERCISE PARTICIPATION

All Pacific countries are encouraged to participate in the exercise. However, it is up to each country to decide what level of governmental participation they will undertake. To meet the objectives of PacWave13, it is recommended the participation of the National Tsunami Warning Center and the National Disaster Management Office.

Each country's lead agency and its PacWave13 National Contact will be responsible for:

- **During the initial phase of exercise planning:**
 - Determining their country's level of participation.
 - Planning their exercise through the country's Exercise Planning Team.
- **During the exercise:**
 - Responding as necessary to fulfil their all-of-government and national, provincial and/or local arrangement obligations.
- **After the exercise:**
 - Encouraging the conduct of debriefs and evaluations by in-country agencies.
 - Completing the PacWave13 Exercise Evaluation Form based on in-country feedback.

10. EXERCISE DOCUMENTATION

The Exercise Pacific Wave 13 planning, conduct, and evaluation should take into account the following documents:

- **IOC Circular Letter No 2481:** PTWC Start of Issuance of Pacific Experimental Products, 15 April 2013 User's Guide for the PTWC Enhanced Products for PTWS (IOC TS-105); PTWS Pacific-wide Tsunami Exercise "PacWave13", 1–14 May 2013 (revised dates).
- *Exercise Pacific Wave 13. A Pacific-wide Tsunami Warning and Enhanced Products Exercise, 1–14 May 2013. Volume 1.* IOC Technical Series No 106. UNESCO/IOC 2013 (English only). (IOC/2013/TS/106Vol.1)
- *User's Guide for the Pacific Tsunami Warning Center Enhanced Products for the Pacific Tsunami Warning System.* IOC Technical Series No 105. UNESCO/IOC 2013 (English only). (IOC/2013/TS/105)
- *Exercise Pacific Wave 11. A Pacific-wide Tsunami Warning and Communication Exercise, 9–10 November 2011. Summary Report, Volume 2.* IOC Technical Series No 97. UNESCO/IOC 2013 (English only) (IOC/2013/TS/97Vol.2)
- **IOC Circular Letter No 2460:** PTWC Start of Issuance of Pacific Experimental Products, 1 February 2013; PTWS Pacific-wide Tsunami Exercise "PacWave13", April 2013, dated 7 December 2012.
- **ICG/PTWS-Steering Committee 3**, Summary Report Actions Items, May 2012.
- ICG/PTWS-XXIV, Recommendation 3 on PTWS Exercises, May 2011. (ICG/PTWS-XXIV.3)
- ICG/PTWS-XXIII, Recommendation 2 on PTWS Exercises, March 2009. (ICG/PTWS-XXIII.2)
- *Operational Users Guide for the Pacific Tsunami Warning and Mitigation System (PTWS).* IOC Technical Series No 87, Second Edition. UNESCO/IOC 2009 (English only.) (IOC/2011/TS/87rev).
- *How to plan, conduct and evaluate UNESCO/IOC tsunami wave exercises.* IOC. Manuals and guides; 58. UNESCO/IOC 2012. (English/Spanish). (IOC/2012/MG/58Rev.)

- *Tsunami Glossary*, 2013. Paris, UNESCO. IOC Technical Series No 85. (English/Arabic) ([IOC/2008/TS/85rev](#)). It includes general definitions relevant to the PTWS New Enhanced Products.

All information related to Exercise Pacific Wave 13 is available at the exercise website: <http://www.pacwave.info>

11. EXERCISE PRODUCTS

Unlike previous exercises, Pacific Wave 13 will NOT be played in real time, and thus will have no “dummy” kickoff exercise message. Participant countries should select a relevant scenario and its most convenient date and time to conduct the Tabletop Exercise within the 1-14 May 2013 time period.

All international products will be provided online at the Exercise Pacific Wave 13 website (<http://www.pacwave.info>) in advance to help countries plan and prepare. It is recommended to download from the PacWave13 website the international products and messages for the appropriate scenario prior to the day of the exercise.

Each scenario will have a suite of PTWC enhanced product messages and forecasts. The Japan and Manila Trench will also have Tsunami Advisories from the Northwest Pacific Tsunami Advisory Center (NWPTAC) of the Japan Meteorological Agency (JMA). Please note that each centre carries out its forecasting independently, so the forecasts may differ. Likewise, the sea level observations may also differ in the messages of the two international centres since they are based on independent simulations and/or historical observations of the centre.

The earthquake origin time default date and time of the messages (e.g. 1 May 2013 @ 0000 hours) can be adjusted by participant countries to coincide with their selected Tabletop Exercise local date and time. Subsequent message traffic issuance date and times should then also be adjusted accordingly.

All documentation and correspondence relating to this exercise is to be clearly identified as **Exercise Pacific Wave 13** and **For Exercise Purposes Only**.

Each country is also welcome to modify estimated arrival times or estimated wave amplitudes to suit their preference; for example, to have the arrival of tsunami sooner and with a larger amplitude.

12. EXERCISE DELIVERY/FORMAT

Only the suite of PTWC new enhanced products are being reviewed in Pacific Wave 13. The Northwest Pacific Tsunami Advisory Center (NWPTAC) of the JMA will be issued messages for the Off Northern Japan and Philippines–South China Sea scenarios for information purposes only, and all messages are listed in the Master Schedule of Events List (ANNEX I).

Distribution of the series of international messages for each scenario, available on the exercise website, will be the responsibility of each country.

Each Exercise Pacific Wave 13 National Contact and their Exercise Planning Team should decide whether the exercise scenario messages are made known to the other national, provincial and local agencies prior to the exercise.

During the exercise, the Exercise Control Team may choose to feed the bulletins into the exercise at times of their own choosing, or alternatively put them in envelopes with the time

they must be opened written on each, with each key participant agency having their own set of envelopes.

Country Exercise Planning Teams may want to add their own national and/or local injects.

12.1 MASTER SCHEDULE OF EVENTS LIST (MSEL) – EXERCISE SCRIPT

The Master Schedule of Events List (MSEL) is a detailed sequence of events used by Exercise Control Team to ensure that the exercise runs smoothly.

The International Master Schedule of Events List (MSEL) giving the timeline for issuance of international products, and the product types are given in ANNEX I.

Each country's Exercise Control Team will be responsible for executing Master Schedule of Events List.

13. POST-EXERCISE EVALUATION

All exercises should have a learning focus. Learning is maximised when there is a continuous process of review to draw out the lessons identified. Review is the process of evaluating and validating the exercise. The exercise should also test an agency's Standard Operating Procedures (SOPs). Areas that agencies are encouraged to evaluate include, but are not limited to:

- Are the format, content, and staging of the PTWC Enhanced Products satisfactory?
- Is the content of PTWC Enhanced Products understandable by stakeholders?
- Is your country prepared to officially receive and utilize the PTWC Enhanced Products?
- Is your National Tsunami Warning Centre prepared to issue appropriate country alert levels (e.g. warning, watch, advisory, etc.) after initial receipt and interpretation of the PTWC Enhanced Products?
- Are your country stakeholders aware that the current PTWC international warning/watch products will expire with the official implementation and changeover to the PTWC Enhanced Products in 2014?
- With the PTWC Enhanced Products, have your country's stakeholders been educated on what they should expect, when, and what they should do with the alerts that will now be issued by your National Tsunami Warning Centre?
- Is additional training, either by international experts or by country tsunami warning focal points, necessary to ensure the understanding, utilization, and limitations of the PTWC Enhanced Products?

A review and hot and cold debrief should evaluate the effectiveness of arrangements in place and identify if there are any corrective actions and gaps to fill. The hot and cold debriefs are then used to complete the Exercise Pacific Wave 13 post-exercise evaluation form.

All participating countries are asked to provide feedback through the Pacific Wave 13 evaluation form (ANNEX II) by 31 May 2013. Forms should be submitted online by visiting https://www.surveymonkey.com/s/pacwave13_eval. This feedback will greatly assist in the evaluation of Exercise Pacific Wave 13 and the finalization of the PTWC Enhanced Products.

13.1 DEBRIEFING

A post-exercise debrief is a critical review of the entire exercise. It identifies those areas that were handled well, those areas where issues were experienced, and recommendations for improvement.

The aim of organisational debriefing is for staff to communicate their experiences of the exercise so that lessons can be identified. Arrangements (plans, procedures, training etc.) can then be modified to reflect lessons identified along with best practice, and therefore improve the agency's ability to respond in future exercises/real events.

Each agency that participates in PacWave13 is expected to conduct its own debriefs after the exercise. This may take the form of a hot debrief (or hotwash) on the day of the exercise, with each participating agency conducting its own cold (formal) debrief within the week(s) following the exercise.

A formal exercise debrief inclusive of all participants in the respective countries will be required to facilitate a collective and official evaluation. The method (in person meeting, survey, teleconference, or other means) used to collect the data required is to be decided upon by the individual participant countries.

The feedback received from this structured debrief is then used to complete standard evaluation forms which are to be based on the overall exercise objectives, plus any additional evaluation forms or tools developed by each country.

A useful guide to debriefing is the one intitled Organisational Debriefing Information for the CDEM Sector [IS6/06], used by New Zealand Ministry of Civil Defence & Emergency Management. It can be found at:

[http://www.civildefence.govt.nz/memwebsite.nsf/Files/Information_Series/\\$file/DeBriefing Info Book.pdf](http://www.civildefence.govt.nz/memwebsite.nsf/Files/Information_Series/$file/DeBriefing%20Info%20Book.pdf) (ISBN 0-478-25467-9).

13.2 EXERCISE VALIDATION

The final stage of the exercise process is to determine whether or not the exercise has met its objectives. At the country level, a national exercise should compare the performance of the involved agencies during the exercise against the performance expected. After validation, countries and agencies may need to change or develop new plans, procedures, and training programmes. Exercise outcomes may be retested in future tsunami exercises, or new exercises written to meet newly identified needs.

13.3 EVALUATION CRITERIA

There will be two types of evaluation criteria. The first type will be international criteria based on the overall exercise objectives (see Section 3, EXERCISE OBJECTIVE). These are provided in ANNEX II. The second type will be criteria to be determined by each individual country to measure its own objectives.

In compiling the Exercise Pacific Wave Summary Report, the Exercise Task Team will only require the international evaluation from each participating country.

13.4 EVALUATORS

Countries may appoint Exercise Evaluators to observe and evaluate selected objectives during their exercise. Evaluators should be subject matter experts in the field they are

evaluating, such as in warning centre operations, emergency response, or in specific agency areas of responsibility.

Appointing and assigning evaluators is the responsibility of each participating country.

13.5 OBSERVERS

Exercise Pacific Wave 13 may generate interest within the wider sector or local community. Visitors from other agencies (whether local or international) may be invited to observe various exercise activities. Media may also be invited to observe as a way of helping to increase tsunami awareness. Some media may also participate or be simulated, if they are part of the official warning and evacuation dissemination chain.

The invitation of internal or external agency personnel invited to view the exercise is the responsibility of each participating country.

13.6 EVALUATION TOOLS

The goal of exercise evaluation is to validate strengths and identify opportunities for improvement within the participating organisations. This is to be accomplished by collating supporting data, analysing the data to compare effectiveness against requirements, and determining what changes need to be made by participating organisations. At the international level, this would involve the ICG/PTWS as the intergovernmental coordinating group supporting effective tsunami warning and decision making.

Evaluation of the exercise should focus on the adequacy of plans, policies, procedures, assessment capabilities, communication, resources and inter-agency/inter-jurisdictional relationships that support effective tsunami warning and decision-making at all levels of government. Participants that choose to include additional objectives, for example by exercising public warning and/or response plans, can expand the evaluation form accordingly. The evaluation of such additional objectives will be for the use of the particular participating agency only, and is not required for the PTWS Exercise Pacific Wave 13 Summary Report.

The evaluation tool aims to inform and facilitate individual participant country evaluations as well as the Exercise Pacific Wave 13 Summary Report.

All participating countries are asked to complete the official PacWave13 Exercise Evaluation Form (ANNEX II) **by 31 May 2013**. Forms should be submitted online by visiting https://www.surveymonkey.com/s/pacwave13_eval.

13.7 EXERCISE PACIFIC WAVE 13 SUMMARY REPORT

The Exercise Task Team will compile the Exercise Pacific Wave 13 Summary Report based on the official exercise evaluation forms received. The report will include the following:

- Exercise description.
- Post-exercise evaluation summary and findings.
- Identification of best practices or strengths.
- Identification of areas for improvement.
- Recommendations on plans of action for improvement.

14. REAL EVENTS DURING EXERCISE PLAY

In the case of a real event occurring during the exercise, PTWC and JMA/NWPTAC will issue their normal message products for the event. Such messages will be given full priority and a decision will be made by each international centre whether to continue or cease their participation in the exercise. Smaller earthquakes that only trigger a Tsunami Information Bulletin will not disrupt the exercise.

Nationally, each country may suspend or terminate the exercise for their own reasons.

15. RESOURCING

Although participating countries will have advance notice of the exercise and may elect to stand up a special dedicated shift to allow normal core business to continue uninterrupted, it is requested that realistic resource levels be deployed in order to reflect some of the issues that are likely to be faced in a real event.

16. MEDIA ARRANGEMENTS

The UNESCO Bureau of Public Information will issue an international Media Advisory one week before conduct of the Exercise Pacific Wave 13 providing details of the exercise, and announcing the trial introduction of tsunami forecast products by the PTWC.

ICG/PTWS Member States may optionally consider to issue a press release to their respective country's media. Member States' press releases would inform their country's population on the exercise and new services, and give local media opportunities to conduct interviews with key stakeholder agencies.

ANNEX III

SAMPLE PRESS RELEASE contains a sample press release that can be further customised by Member States. The sample press release is provided in English.

ANNEX I

INTERNATIONAL MASTER SCHEDULE OF EVENTS LISTS

Scenario	Off Northern Japan 38.1N, 142.9E, 20km, Mw=9.0			
Centre	PTWC		JMA/NWPTAC	
Time (UTC)	#	TYP	#	TYP
0:00	Earthquake Rupture Begins			
0:08		PTWC initial Mw=8.4. First tsunami forecast computed.		
0:10	1	Threat Message with M8.4		
0:15				JMA determines Mw=9.0
0:17			1	Advisory with M9.0
0:25		W-phase CMT completes. Mw=9.0. Forecast updated.		
0:35	2	Threat Message with M9.0		
0:45			2	Advisory with M9.0
		Initial deep ocean tsunami readings. Forecast updated.		
1:30	3	Threat Message with M9.0		
1:40			3	Advisory with M9.0
		More deep ocean tsunami readings. Forecast updated.		
2:30	4	Threat Message with M9.0		
2:40			4	Advisory with M9.0
3:30	5	Threat Message with M9.0		
3:40			5	Advisory with M9.0
4:30	6	Threat Message with M9.0		
4:40			6	Advisory with M9.0
5:30	7	Threat Message with M9.0		
5:40			7	Advisory with M9.0
6:30	8	Threat Message with M9.0		
6:40			8	Advisory with M9.0
7:30	9	Threat Message with M9.0		
7:40			9	Advisory with M9.0
8:30	10	Threat Message with M9.0		
8:40			10	Advisory with M9.0
9:30	11	Threat Message with M9.0		
9:40				
10:30	12	Threat Message with M9.0		
10:40				
11:30	13	Threat Message with M9.0		
11:40				
12:30	14	Threat Message with M9.0		
12:40				
13:30	15	Threat Message with M9.0		
13:40				
14:30	16	Threat Message with M9.0		
14:40				
15:30	17	Threat Message with M9.0		
15:40				
16:30	18	Threat Message with M9.0		
16:40				
17:30	19	Threat Message with M9.0		
17:40				
18:30	20	Threat Message with M9.0		
18:40				
19:30	21	Threat Message with M9.0		
19:40				
20:30	22	Threat Message with M9.0		
20:40				
21:30	23	Threat Message with M9.0		
21:40				
22:30	24	Threat Message with M9.0		
22:40				
23:30	25	Final Threat Message		

Scenario	Manila Trench Off Western Philippines 17.0N, 119.0E, 20km, Mw=9.0			
Centre	PTWC		JMA/NWPTAC	
Time (UTC)	#	TYP	#	TYP
0:00	Earthquake Rupture Begins			
0:08		PTWC initial Mw=8.8. First tsunami forecast computed.		
0:10	1	Threat Message with M8.8		
0:17			1	Advisory with M8.8
0:25		W-phase CMT completes. Mw=9.0. Forecast updated.		
0:35	2	Threat Message with M9.0		
0:45			2	Advisory with M9.0
		Initial coastal tsunami readings. Forecast updated.		
1:30	3	Threat Message with M9.0		
1:40			3	Advisory with M9.0
2:30	4	Threat Message with M9.0		
2:40			4	Advisory with M9.0
3:30	5	Threat Message with M9.0		
3:40			5	Advisory with M9.0
4:30	6	Threat Message with M9.0		
4:40			6	Advisory with M9.0
5:30	7	Threat Message with M9.0		
5:40			7	Advisory with M9.0
6:30	8	Threat Message with M9.0		
6:40			8	Advisory with M9.0
7:30	9	Final Threat Message		

Scenario	Off Northern Chile 22.5S, 70.7W, 20km, Mw=9.1	
Centre	PTWC	
Time (UTC)	#	TYP
0:00	Earthquake Rupture Begins	
0:06		PTWC initial Mw=8.6. First tsunami forecast computed.
0:08	1	Threat Message with M8.6
0:25		W-phase CMT completes. Mw=9.1. Forecast updated.
0:35	2	Threat Message with M9.1
		Initial deep ocean tsunami readings. Forecast updated.
1:30	3	Threat Message with M9.1
2:30	4	Threat Message with M9.1
3:30	5	Threat Message with M9.1
4:30	6	Threat Message with M9.1
5:30	7	Threat Message with M9.1
6:30	8	Threat Message with M9.1
7:30	9	Threat Message with M9.1
8:30	10	Threat Message with M9.1
9:30	11	Threat Message with M9.1
10:30	12	Threat Message with M9.1
11:30	13	Threat Message with M9.1
12:30	14	Threat Message with M9.1
13:30	15	Threat Message with M9.1
14:30	16	Threat Message with M9.1
15:30	17	Threat Message with M9.1
16:30	18	Threat Message with M9.1
17:30	19	Threat Message with M9.1
18:30	20	Threat Message with M9.1
19:30	21	Threat Message with M9.1
20:30	22	Threat Message with M9.1
21:30	23	Threat Message with M9.1
22:30	24	Threat Message with M9.1
23:30	25	Final Threat Message

ANNEX II

POST-EXERCISE EVALUATION

Exercise evaluation forms are to be completed by each participating agency and forwarded to the country Exercise Pacific Wave 13 National Contact, or the country Tsunami National Contact. **The Pacific Wave 13 National Contact will compile the country Evaluation Form and complete and submit this online no later than 31 May 2013.**

Note: Only one on-line evaluation form is to be completed per country.

The Pacific Wave 13 Evaluation Form can be found at
https://www.surveymonkey.com/s/pacwave13_eval

Alternatively, the country evaluation forms can be submitted by email or fax to the Exercise Pacific Wave 13 Task Team Chairs:

- Laura Kong (email: laura.kong@noaa.gov, fax: +1 808 532 5576), or
- Jo Guard (email: jo.guard@dia.govt.nz, fax: +64 4 473 9596).

EXERCISE PACIFIC WAVE 13 Instructions on how to complete this Evaluation Form		
Step	Who completes this step?	Description
1	Each participating Agency/Country	Decide if your agency/country will include additional evaluation questions for each objective. Country/agency evaluation questions can be added at the end of each section. However, do NOT change the reference numbers to the questions.
2	Each participating Agency/Country	Print this form and mark your evaluation answers on it.
3	Each participating Agency/Country	<ul style="list-style-type: none"> • Answer each statement with either Y (Yes) or N (No) • Comments can be used to explain/expand upon your Yes or No answer. • Write your comments on the page following the evaluation questions. • Note the question number in the left column and write your comments alongside.
4	Each participating Agency/Country	Send completed agency evaluation form to country PacWave13 National Contact so he/she can compile to complete Country PacWave13 Evaluation Form (this URL).
5	PacWave11 National Contact	PacWave13 National Contact should complete and submit the PacWave13 Evaluation Form by 31 May 2013 (https://www.surveymonkey.com/s/pacwave13_eval). If there are problems or questions, please contact the PacWave13 Task Team co-Chairs (Laura Kong, laura.kong@noaa.gov ; Jo Guard, jo.guard@dia.govt.nz)

**EXERCISE PACIFIC WAVE 2013
EVALUATION FORM**

CONTACT DETAILS

- Country
- Agency:
- Contact Name:
- Contact Position
- Contact Phone:
- Contact Mobile:
- Contact E-mail:

COUNTRY EXERCISE SCENARIO

Select Scenario Used:

- ☐ Off Northern Japan (Japan Trench)
- ☐ Philippines – South China Sea (Manila Trench)
- ☐ Off Northern Chile (Peru-Chile Trench)

OBJECTIVE 1

Evaluate the format and content of PTWC Enhanced Products for each scenario exercised.

- 1.1 Are the following products useful in helping you assess your national tsunami threat? Indicate Y or N, and provide comments as needed. If your answer is N, please comment on why it is not useful.

- ☐ Y ☐ N Text Message
- ☐ Y ☐ N Forecast Polygon Map
- ☐ Y ☐ N Forecast Polygon Table
- ☐ Y ☐ N Energy Forecast Map
- ☐ Y ☐ N Coastal Forecast Map
- ☐ Y ☐ N Coastal KMZ file

Comments:

- 1.2 Please rank the products in order of their usefulness from 1 to 6, where 1 is the most useful product and 6 is the least useful product?

- ☐ Text Message
- ☐ Forecast Polygon Map
- ☐ Forecast Polygon Table
- ☐ Energy Forecast Map
- ☐ Coastal Forecast Map
- ☐ Coastal KMZ file

Comments:

- 1.3 Format and Content: Is your country satisfied with the format and content of PTWC Enhanced Products?

Indicate Y or N, and provide comments as needed. If your answer is N, please provide comments on what improvements are needed.

☐ Y ☐ N Text Message
☐ Y ☐ N Forecast Polygon Map
☐ Y ☐ N Forecast Polygon Table
☐ Y ☐ N Energy Forecast Map
☐ Y ☐ N Coastal Forecast Map
☐ Y ☐ N Coastal KMZ file

Comments:

- 1.4 Format: The Forecast Polygon Map is intended to provide a very quick and general view of where a tsunami threat is forecast and the level of that threat. Is this map useful for that purpose? Indicate Yes or No, and provide comments as needed.

☐ Y ☐ N

Comments:

- 1.5 Content: Are the proposed Forecast Polygons and their names appropriate and useful for your country or area of responsibility? Indicate Y or N. If N, please suggest alternatives that would be better.

☐ Y ☐ N

Comments:

- 1.6 Content: Are there other information or products that should be included in the suite of Enhanced Products? Consider earthquake and tsunami information, and/or threat assessment products. Please provide comments as needed.

☐ Y ☐ N

Comments:

- 1.7 Public Release: Which of the enhanced products (or suggest other products) could be made public during events by PTWC and/or be redistributed by the NTWCs? The media and public will seek information about the threat during events and that information can help save lives. Whatever is made public, however, needs to be easily understood and not conflict with information from local authorities. Indicate Y or N. Please also provide your comments and suggestions.

☐ Y ☐ N Text Message
☐ Y ☐ N Forecast Polygon Map
☐ Y ☐ N Forecast Polygon Table
☐ Y ☐ N Energy Forecast Map

- ☐ Y ☐ N Coastal Forecast Map
☐ Y ☐ N Coastal KMZ file
☐ Y ☐ N Other. Please suggest other products.

Comments:

- 1.8 Staging: Should a forecast be included in the initial first product, knowing that earthquake magnitudes and tsunami forecasts are likely to change over the first hour as later-arriving seismic data and sea level data are received and analysed?

☐ Y ☐ N

Comments:

- 1.9 Do any features, other than listed above, need to be changed?

If Yes, please comment.

☐ Y ☐ N

Comments:

- 1.10 Do any new features, other than listed above, need to be added?

If Yes, please comment.

☐ Y ☐ N

Comments:

OBJECTIVE 2

Provide feedback that your country is prepared to officially utilize the PTWC Enhanced Products.

- 2.1 Does your National Tsunami Warning Centre (NTWC) understand the contents of the Enhanced Products, how to use the Products, and the limitations of the Products?
Indicate Y or N.

☐ Y ☐ N

Comments:

- 2.2 Does your National Disaster Management Office (NDMO) understand the contents of the Enhanced Products, how to use the Products, and the limitations of the Products?
Indicate Y or N.

☐ Y ☐ N

Comments:

2.3 Will your country's NTWC and NDMO be prepared to utilize the PTWC Enhanced Products in 2014? Your NTWC should be prepared to issue appropriate national alerts (e.g., Warning/Watch/Cancellations) based on the PTWC Enhanced Products. Indicate Y or N, and provide comments as needed on country status.

☐ Y ☐ N Currently ready.

☐ Y ☐ N Will be ready in 2014.

☐ Y ☐ N Need to develop new or revise existing SOPs.

☐ Y ☐ N Need to inform and prepare other key stakeholders

☐ Y ☐ N Need NTWC or NDMO to conduct training for their national and local stakeholders

☐ Y ☐ N Need international experts to conduct more training for national stakeholders

☐ Y ☐ N Will not be ready in 2014

Comments:

OBJECTIVE 3

Provide feedback that your country's stakeholders (national/provincial/local government agencies) will be informed of the PTWC Enhanced Products to enable appropriate changes to their Tsunami Emergency Response Plans.

3.1 Do your country's stakeholder agencies understand that current PTWC international Watch/Warning products will be discontinued when the enhanced products are officially started, probably in early 2014? Member States will decide on the changeover date at the 25th Session of the ICG/PTWS (September, 2013, Vladivostok, Russia). Indicate Y or N, and provide comments as needed.

☐ Y ☐ N

Comments:

3.2 Do your country's stakeholder agencies understand that their National Tsunami Warning Centre, not PTWC, will be responsible for issuing national alerts (e.g., Watches/Warnings/Cancellations)? Indicate Y or N, and provide comments as needed.

☐ Y ☐ N

Comments:

- 3.3** Will your country's stakeholders be prepared for the official changeover to the PTWC Enhanced Products, probably in early 2014? Indicate Y or N, and provide comments as needed, including list of applicable agencies needing SOPs and/or training.

☐ Y ☐ N Currently ready.
☐ Y ☐ N Will be ready in 2014.
☐ Y ☐ N Need to develop new or revise existing SOPs.
☐ Y ☐ N Need NTWC or NDMO to conduct more training.
☐ Y ☐ N Will not be ready in 2014.

Comments:

- 3.4** Are you considering how to prepare your country's **stakeholder agencies** for the PTWC Enhanced Products changeover? Indicate Y or N, and provide comments as needed.

☐ Y ☐ N Orientation Workshop, Table Top, or other Exercise.
☐ Y ☐ N Development and distribution of outreach materials.
☐ Y ☐ N Training.
☐ Y ☐ N Awareness Campaign.
☐ Y ☐ N Other. Please list any other preparations.

Comments:

- 3.5** Are you considering how to prepare your country's **media organizations** for the PTWC Enhanced Products changeover? Indicate Y or N, and provide comments as needed.

☐ Y ☐ N Orientation Workshop, Table Top, or other Exercise.
☐ Y ☐ N Development and distribution of outreach materials.
☐ Y ☐ N Training.
☐ Y ☐ N Awareness Campaign.
☐ Y ☐ N Other. Please list any other preparations.

Comments:

- 3.6** Are you considering how to prepare your country's **general public** for the PTWC Enhanced Products changeover? Indicate Y or N, and provide comments as needed.

☐ Y ☐ N Orientation Workshop, Table Top, or other Exercise.
☐ Y ☐ N Development and distribution of outreach materials.
☐ Y ☐ N Training.
☐ Y ☐ N Awareness Campaign.
☐ Y ☐ N Other. Please list any other preparations.

Comments:

GENERAL EXERCISE OBSERVATIONS

OVERALL ASSESSMENT. Please provide comments as needed.

☐ Y ☐ N Country stakeholder agencies have a better understanding of the goals, responsibilities and roles in tsunami emergencies.

☐ Y ☐ N Gaps in capability and capacity have been identified.

Comments:

EXERCISE PLANNING. Please provide comments as needed.

☐ Y ☐ N Overall, the exercise planning, conduct, format and style were satisfactory.

☐ Y ☐ N Exercise planning went well.

☐ Y ☐ N The PacWave 13 exercise website pages were useful.

☐ Y ☐ N This evaluation form was easy to use.

☐ Y ☐ N PacWave13 Exercise Manual provided an appropriate level of detail.

☐ Y ☐ N IOC Manual & Guides 58: How to Plan, Conduct, and Evaluate IOC Tsunami Wave Exercises was useful.

Comments:

EXERCISE PACIFIC WAVE 13 EXPERIENCE

Please provide general statements on your Exercise Pacific Wave 13 experience.

- EXERCISE PLANNING

Please provide a general statement about what went well.

Please provide a general statement about what did not go well.

Please provide a general statement about what could be improved.

- EXERCISE CONDUCT

Please provide a general statement about what went well.

Please provide a general statement about what did not go well.

Please provide a general statement about what could be improved.

- EXERCISE DEBRIEF OR EVALUATION

Please provide a general statement about what went well.

Please provide a general statement about what did not go well.

Please provide a general statement about what could be improved.

ANNEX III

SAMPLE PRESS RELEASE

TEMPLATE FOR NEWS RELEASE

USE AGENCY MASTHEAD

Contact: (insert name)
(insert phone number)
(insert email address)

FOR IMMEDIATE RELEASE
(insert date)

FOURTH PACIFIC-WIDE TSUNAMI DRILL SET FOR MAY 2013

(Insert country name) will join over 40 other countries around the Pacific Rim as a participant in a mock tsunami scenario during 1-14 May 2013. The purpose of this Pacific-wide exercise is to evaluate and provide feedback on the content of proposed new enhanced forecast products provided by the U.S. Pacific Tsunami Warning Center (PTWC) to Pacific countries. The enhanced products will include tsunami wave forecasts and increase preparedness and response capabilities in each country.

"The recent events of the 2009 Samoa Islands, 2010 Chile, 2011 Japan, and the February 2013 Solomon Islands tsunamis have increased our need to be more prepared for such events," said (insert name of appropriate official). "This important exercise will validate the enhanced products for future official use by countries of the Pacific Tsunami Warning and Mitigation System.

The exercise, titled Exercise Pacific Wave 13 (PacWave13), will simulate Pacific countries being put into a Tsunami Warning situation requiring government decision-making. It is the fourth such exercise with the first having been carried out in May 2006, the second in October 2008, and the third in November 2011. Participating countries will select from 3 different Pacific scenarios and conduct a Tabletop Exercise within *(insert date, or use 'the first two weeks of May')*. Destructive Pacific-wide tsunamis will be simulated through international bulletins from PTWC and Japan's Northwest Pacific Tsunami Advisory Centre and reviewed by focal points designated by each country that are responsible for their country's tsunami response.

Insert paragraph tailored for specific country. Could identify participating agencies and specific plans. Could describe current early warning program, past evacuation drills (if any), ongoing mitigation and public education programs, etc. Could describe tsunami threat, history of tsunami hazards, if any.

The exercise is sponsored by UNESCO's Intergovernmental Oceanographic Commission through its Intergovernmental Coordination Group of the Pacific Tsunami Warning and Mitigation System (ICG/PTWS)

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On the Web:

Exercise Pacific Wave 13 information site:

<http://www.pacwave.info>

Media Resources:

http://itic.ioc-unesco.org/index.php?option=com_content&view=category&layout=blog&id=1150&Itemid=1150&lang=en

Pacific Tsunami Warning and Mitigation System:

http://www.ioc-tsunami.org/index.php?option=com_content&view=article&id=11&Itemid=12&lang=en

Pacific Tsunami Warning Center:

<http://ptwc.weather.gov>

Northwest Pacific Tsunami Advisory Centre:

http://www.jma.go.jp/en/distant_tsunami/WEPA40/index.html

West Coast / Alaska Tsunami Warning Center:

<http://wcatwc.arh.noaa.gov/>

[Insert country URLs]

ANNEX IV

LIST OF ACRONYMS

CDEM	Civil Defence and Emergency Management (Australia)
DISCEX	Discussion Exercise' or Tabletop Exercise
ICG/ITSU	International Coordination Group for the Tsunami Warning System in the Pacific (re-established as ICG/PTWS in 2005)
ICG/PTWS	Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (formerly ITSU)
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
ITIC	International Tsunami Information Center (UNESCO/IOC–NOAA)
JMA	Japan Meteorological Agency
MSEL	Master Schedule of Events List
NDMO	National Disaster Management Office
NOAA	National Oceanic and Atmospheric Administration of United States of America
NTWC	National Tsunami Warning Centre
NWPTA	Northwest Pacific Tsunami Advisory
NWPTAC	Northwest Pacific Tsunami Advisory Center (Japan)
PTWC	Pacific Tsunami Warning Center (USA)
PTWS	Pacific Tsunami Warning and Mitigation System
PTWS-SC	Pacific Tsunami Warning and Mitigation System Steering Committee
SOP	Standard Operating Procedures
TNC	Tsunami National Contact
TT	Task Team
TWFP	Tsunami Warning Focal Point
UNESCO	United Nations Educational, Scientific and Cultural Organization
WCATWC	West Coast and Alaska Tsunami Warning Center (USA)
WG	Working Group

IOC Technical Series

No.	Title	Languages
1	Manual on International Oceanographic Data Exchange. 1965	(out of stock)
2	Intergovernmental Oceanographic Commission (Five years of work). 1966	(out of stock)
3	Radio Communication Requirements of Oceanography. 1967	(out of stock)
4	Manual on International Oceanographic Data Exchange - Second revised edition. 1967	(out of stock)
5	Legal Problems Associated with Ocean Data Acquisition Systems (ODAS). 1969	(out of stock)
6	Perspectives in Oceanography, 1968	(out of stock)
7	Comprehensive Outline of the Scope of the Long-term and Expanded Programme of Oceanic Exploration and Research. 1970	(out of stock)
8	IGOSS (Integrated Global Ocean Station System) - General Plan Implementation Programme for Phase I. 1971	(out of stock)
9	Manual on International Oceanographic Data Exchange - Third Revised Edition. 1973	(out of stock)
10	Bruun Memorial Lectures, 1971	E, F, S, R
11	Bruun Memorial Lectures, 1973	(out of stock)
12	Oceanographic Products and Methods of Analysis and Prediction. 1977	E only
13	International Decade of Ocean Exploration (IDOE), 1971-1980. 1974	(out of stock)
14	A Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment and Baseline Study Guidelines. 1976	E, F, S, R
15	Bruun Memorial Lectures, 1975 - Co-operative Study of the Kuroshio and Adjacent Regions. 1976	(out of stock)
16	Integrated Ocean Global Station System (IGOSS) General Plan and Implementation Programme 1977-1982. 1977	E, F, S, R
17	Oceanographic Components of the Global Atmospheric Research Programme (GARP) . 1977	(out of stock)
18	Global Ocean Pollution: An Overview. 1977	(out of stock)
19	Bruun Memorial Lectures - The Importance and Application of Satellite and Remotely Sensed Data to Oceanography. 1977	(out of stock)
20	A Focus for Ocean Research: The Intergovernmental Oceanographic Commission - History, Functions, Achievements. 1979	(out of stock)
21	Bruun Memorial Lectures, 1979: Marine Environment and Ocean Resources. 1986	E, F, S, R
22	Scientific Report of the Interecalibration Exercise of the IOC-WMO-UNEP Pilot Project on Monitoring Background Levels of Selected Pollutants in Open Ocean Waters. 1982	(out of stock)
23	Operational Sea-Level Stations. 1983	E, F, S, R
24	Time-Series of Ocean Measurements. Vol.1. 1983	E, F, S, R
25	A Framework for the Implementation of the Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment. 1984	(out of stock)
26	The Determination of Polychlorinated Biphenyls in Open-ocean Waters. 1984	E only
27	Ocean Observing System Development Programme. 1984	E, F, S, R
28	Bruun Memorial Lectures, 1982: Ocean Science for the Year 2000. 1984	E, F, S, R
29	Catalogue of Tide Gauges in the Pacific. 1985	E only
30	Time-Series of Ocean Measurements. Vol. 2. 1984	E only
31	Time-Series of Ocean Measurements. Vol. 3. 1986	E only
32	Summary of Radiometric Ages from the Pacific. 1987	E only
33	Time-Series of Ocean Measurements. Vol. 4. 1988	E only

(continued)

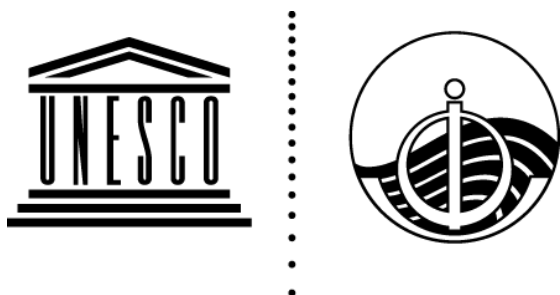
No.	Title	Languages
34	Bruun Memorial Lectures, 1987: Recent Advances in Selected Areas of Ocean Sciences in the Regions of the Caribbean, Indian Ocean and the Western Pacific. 1988	Composite E, F, S
35	Global Sea-Level Observing System (GLOSS) Implementation Plan. 1990	E only
36	Bruun Memorial Lectures 1989: Impact of New Technology on Marine Scientific Research. 1991	Composite E, F, S
37	Tsunami Glossary - A Glossary of Terms and Acronyms Used in the Tsunami Literature. 1991	E only
38	The Oceans and Climate: A Guide to Present Needs. 1991	E only
39	Bruun Memorial Lectures, 1991: Modelling and Prediction in Marine Science. 1992	E only
40	Oceanic Interdecadal Climate Variability. 1992	E only
41	Marine Debris: Solid Waste Management Action for the Wider Caribbean. 1994	E only
42	Calculation of New Depth Equations for Expendable Bathymetographs Using a Temperature-Error-Free Method (Application to Sippican/TSK T-7, T-6 and T-4 XBTS. 1994	E only
43	IGOSS Plan and Implementation Programme 1996-2003. 1996	E, F, S, R
44	Design and Implementation of some Harmful Algal Monitoring Systems. 1996	E only
45	Use of Standards and Reference Materials in the Measurement of Chlorinated Hydrocarbon Residues. 1996	E only
46	Equatorial Segment of the Mid-Atlantic Ridge. 1996	E only
47	Peace in the Oceans: Ocean Governance and the Agenda for Peace; the Proceedings of <i>Pacem in Maribus</i> XXIII, Costa Rica, 1995. 1997	E only
48	Neotectonics and fluid flow through seafloor sediments in the Eastern Mediterranean and Black Seas - Parts I and II. 1997	E only
49	Global Temperature Salinity Profile Programme: Overview and Future. 1998	E only
50	Global Sea-Level Observing System (GLOSS) Implementation Plan-1997. 1997	E only
51	L'état actuel de l'exploitation des pêcheries maritimes au Cameroun et leur gestion intégrée dans la sous-région du Golfe de Guinée (<i>cancelled</i>)	F only
52	Cold water carbonate mounds and sediment transport on the Northeast Atlantic Margin. 1998	E only
53	The Baltic Floating University: Training Through Research in the Baltic, Barents and White Seas - 1997. 1998	E only
54	Geological Processes on the Northeast Atlantic Margin (8 th training-through-research cruise, June-August 1998). 1999	E only
55	Bruun Memorial Lectures, 1999: Ocean Predictability. 2000	E only
56	Multidisciplinary Study of Geological Processes on the North East Atlantic and Western Mediterranean Margins (9 th training-through-research cruise, June-July 1999). 2000	E only
57	Ad hoc Benthic Indicator Group - Results of Initial Planning Meeting, Paris, France, 6-9 December 1999. 2000	E only
58	Bruun Memorial Lectures, 2001: Operational Oceanography – a perspective from the private sector. 2001	E only
59	Monitoring and Management Strategies for Harmful Algal Blooms in Coastal Waters. 2001	E only
60	Interdisciplinary Approaches to Geoscience on the North East Atlantic Margin and Mid-Atlantic Ridge (10 th training-through-research cruise, July-August 2000). 2001	E only
61	Forecasting Ocean Science? Pros and Cons, Potsdam Lecture, 1999. 2002	E only

No.	Title	Languages
62	Geological Processes in the Mediterranean and Black Seas and North East Atlantic (11 th training-through-research cruise, July- September 2001). 2002	E only
63	Improved Global Bathymetry – Final Report of SCOR Working Group 107. 2002	E only
64	R. Revelle Memorial Lecture, 2006: Global Sea Levels, Past, Present and Future. 2007	E only
65	Bruun Memorial Lectures, 2003: Gas Hydrates – a potential source of energy from the oceans. 2003	E only
66	Bruun Memorial Lectures, 2003: Energy from the Sea: the potential and realities of Ocean Thermal Energy Conversion (OTEC). 2003	E only
67	Interdisciplinary Geoscience Research on the North East Atlantic Margin, Mediterranean Sea and Mid-Atlantic Ridge (12 th training-through-research cruise, June-August 2002). 2003	E only
68	Interdisciplinary Studies of North Atlantic and Labrador Sea Margin Architecture and Sedimentary Processes (13 th training-through-research cruise, July-September 2003). 2004	E only
69	Biodiversity and Distribution of the Megafauna / Biodiversité et distribution de la mégafaune. 2006 Vol.1 The polymetallic nodule ecosystem of the Eastern Equatorial Pacific Ocean / Ecosystème de nodules polymétalliques de l’océan Pacifique Est équatorial Vol.2 Annotated photographic Atlas of the echinoderms of the Clarion-Clipperton fracture zone / Atlas photographique annoté des échinodermes de la zone de fractures de Clarion et de Clipperton Vol.3 Options for the management and conservation of the biodiversity — The nodule ecosystem in the Clarion Clipperton fracture zone: scientific, legal and institutional aspects	E F
70	Interdisciplinary geoscience studies of the Gulf of Cadiz and Western Mediterranean Basin (14 th training-through-research cruise, July-September 2004). 2006	E only
71	Indian Ocean Tsunami Warning and Mitigation System, IOTWS. Implementation Plan, 7–9 April 2009 (2 nd Revision). 2009	E only
72	Deep-water Cold Seeps, Sedimentary Environments and Ecosystems of the Black and Tyrrhenian Seas and the Gulf of Cadiz (15 th training-through-research cruise, June–August 2005). 2007	E only
73	Implementation Plan for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS), 2007–2011. 2007 (<i>electronic only</i>)	E only
74	Bruun Memorial Lectures, 2005: The Ecology and Oceanography of Harmful Algal Blooms – Multidisciplinary approaches to research and management. 2007	E only
75	National Ocean Policy. The Basic Texts from: Australia, Brazil, Canada, China, Colombia, Japan, Norway, Portugal, Russian Federation, United States of America. (Also Law of Sea Dossier 1). 2008	E only
76	Deep-water Depositional Systems and Cold Seeps of the Western Mediterranean, Gulf of Cadiz and Norwegian Continental margins (16 th training-through-research cruise, May–July 2006). 2008	E only
77	Indian Ocean Tsunami Warning and Mitigation System (IOTWS) – 12 September 2007 Indian Ocean Tsunami Event. Post-Event Assessment of IOTWS Performance. 2008	E only
78	Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (CARIBE EWS) – Implementation Plan 2008. 2008	E only

(continued)

No.	Title	Languages
79	Filling Gaps in Large Marine Ecosystem Nitrogen Loadings Forecast for 64 LMEs – GEF/LME global project Promoting Ecosystem-based Approaches to Fisheries Conservation and Large Marine Ecosystems. 2008	E only
80	Models of the World's Large Marine Ecosystems. GEF/LME Global Project Promoting Ecosystem-based Approaches to Fisheries Conservation and Large Marine Ecosystems. 2008	E only
81	Indian Ocean Tsunami Warning and Mitigation System (IOTWS) – Implementation Plan for Regional Tsunami Watch Providers (RTWP). 2008	E only
82	Exercise Pacific Wave 08 – A Pacific-wide Tsunami Warning and Communication Exercise, 28–30 October 2008. 2008	E only
83.	<i>Cancelled</i>	
84.	Global Open Oceans and Deep Seabed (GOODS) Bio-geographic Classification. 2009	E only
85.	Tsunami Glossary	E, F, S
86	Pacific Tsunami Warning System (PTWS) Implementation Plan (<i>under preparation</i>)	
87.	Operational Users Guide for the Pacific Tsunami Warning and Mitigation System (PTWS) – Second Edition. 2011	E only
88.	Exercise Indian Ocean Wave 2009 (IOWave09) – An Indian Ocean-wide Tsunami Warning and Communication Exercise – 14 October 2009. 2009	E only
89.	Ship-based Repeat Hydrography: A Strategy for a Sustained Global Programme. 2009	E only
90.	12 January 2010 Haiti Earthquake and Tsunami Event Post-Event Assessment of CARIBE EWS Performance. 2010	E only
91.	Compendium of Definitions and Terminology on Hazards, Disasters, Vulnerability and Risks in a coastal context	<i>Under preparation</i>
92.	27 February 2010 Chile Earthquake and Tsunami Event – Post-Event Assessment of PTWS Performance (Pacific Tsunami Warning System). 2010	E only
93.	Exercise CARIBE WAVE 11 / LANTEX 11—A Caribbean Tsunami Warning Exercise, 23 March 2011	
	Vol. 1 Participant Handbook / Exercise CARIBE WAVE 11 —Exercice d'alerte au tsunami dans les Caraïbes, 23 mars 2011. Manuel du participant / Ejercicio Caribe Wave 11. Un ejercicio de alerta de tsunami en el Caribe, 23 de marzo de 2011. Manual del participante. 2010	E/F/S
	Vol. 2 Report. 2011	E only
	Vol. 3 Supplement: Media Reports. 2011	E/F/S
94.	Cold seeps, coral mounds and deep-water depositional systems of the Alboran Sea, Gulf of Cadiz and Norwegian continental margin (17th training-through-research cruise, June–July 2008)	<i>Under preparation</i>
95.	International Post-Tsunami Survey for the 25 October 2010 Mentawai, Indonesia Tsunami	<i>Under preparation</i>
96.	Pacific Tsunami Warning System (PTWS) 11 March 2011 Off Pacific coast of Tohoku, Japan, Earthquake and Tsunami Event. Post-Event Assessment of PTWS Performance	<i>Under preparation</i>
97.	Exercise PACIFIC WAVE 11: A Pacific-wide Tsunami Warning and Communication Exercise, 9–10 November 2011	
	Vol. 1 Exercise Manual. 2011	E only
98.	Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and connected seas. First Enlarged Communication Test Exercise (ECTE1). Exercise Manual and Evaluation Report. 2011	E only
99.	Exercise INDIAN OCEAN WAVE 2011 – An Indian Ocean-wide Tsunami Warning and Communication Exercise	<i>Under preparation</i>

No.	Title	Languages
100.	Global Sea Level Observing System (GLOSS) Implementation Plan – 2012. 2012	E only
101.	Exercise Caribe Wave/Lantex 13. A Caribbean Tsunami Warning Exercise, 20 March 2013. Volume 1: Participant Handbook. 2012	E only
102.	<i>(In preparation)</i>	
103.	Exercise NEAMWAVE 12. A Tsunami Warning and Communication Exercise for the North-eastern Atlantic, the Mediterranean, and Connected Seas Region, 27–28 November 2012, Volume I: Exercise Manual. 2012	E only
104.	Seísmo y tsunami del 27 de agosto de 2012 en la costa del Pacífico frente a El Salvador, y seísmo del 5 de septiembre de 2012 en la costa del Pacífico frente a Costa Rica. Evaluación subsiguiente sobre el funcionamiento del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico. 2012	Español solamente (resumen en inglés y francés)
105.	Users Guide for the Pacific Tsunami Warning Center Enhanced Products for the Pacific Tsunami Warning System. 2013	E, S
106.	Exercise Pacific Wave 13. A Pacific-wide Tsunami Warning and Enhanced Products Exercise, 1–14 May 2013. Vol. 1 Exercise Manual. 2013	E only



EXERCISE PACIFIC WAVE 13

A Pacific-wide Tsunami Warning and Enhanced Products Exercise

1–14 May 2013

Summary Report

Volume 2

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EXERCISE PACIFIC WAVE 13

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1–14 May 2013

Summary Report

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Executive Summary

Most of the world's earthquakes and tsunamis occur in the Pacific Ocean and its marginal seas, and over history, 75% of the world's fatal tsunamis have occurred there. On average, the Pacific is struck by a locally damaging tsunami every one to two years, and by a major Pacific-wide tsunami a few times each century. Since 2005, there have been 11 deadly tsunamis and 6 of them have occurred in the Pacific. Local and regional tsunamis occur most frequently, and in the Pacific over history, have been the cause of 99% of tsunami casualties as they will impact shorelines in minutes.

In response to the 2004 Indian Ocean tsunami that killed nearly 230,000 people across the Indian Ocean, the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS) acted to organize the first ever international tsunami exercise with the goal of evaluating the readiness of the Pacific Tsunami Warning and Mitigation System (PTWS) in order to identify how to improve its effectiveness. The first Pacific-wide exercise, *Exercise Pacific Wave '06* (IOC/INF-1244) was carried out on 16 and 17 May 2006. Subsequent international exercises were conducted in the Pacific, each focusing on improving different aspects of tsunami warning and response: in 2008 (*Exercise Pacific Wave 08. A Pacific-wide Tsunami Warning and Communication Exercise Pacific, 28–30 October 2008*, (IOC/2008/TS/82), 2011 (*Exercise Pacific Wave 11. A Pacific-wide Tsunami Warning and Communication Exercise, 9–10 November 2011. Volume 1*, IOC/2011/TS/97Vol.1), and 2013 (*Exercise Pacific Wave 13. A Pacific-wide Tsunami Warning and Enhanced Products Exercise, 1–14 May 2013. Volume 1: Exercise Manual*. IOC/2013/TS/106Vol.1rev.).

Exercise Pacific Wave 13 (PacWave13) is the fourth Pacific-wide drill of what is envisioned to be a regular schedule of Pacific exercises. PacWave13 continued the development of the new enhanced tsunami products of the Pacific Tsunami Warning Center (PTWC), which had been approved for development by Twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System held in Beijing, China, from 24 to 27 May 2011 (ICG/PTWS-XXIV), and introduced through Exercise Pacific Wave 11 (PacWave11).

The new enhanced products will provide guidance on the levels of threat along coastal segments using real-time tsunami wave forecasts, and are expected to greatly reduce the number of areas that have been previously unnecessarily warned. The changeover date, expected to be in 2014, will be decided at the Twenty-fifth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System that will be held, Vladivostok, Russian Federation, from 9 to 11 September 2013 (ICG/PTWS-XXV, in progress).

PacWave13 recommended conducting a tabletop exercise between 1–14 May 2013 in order to validate the understanding and use of the PTWC enhanced products and to inquire on country expected readiness for a 2014 changeover. The exercise provided the last coordinated Pacific-wide opportunity for countries to review enhancements of the new products, and to review their tsunami response procedures. The exercise website, maintained by the International Tsunami Information Centre (ITIC), is located at:

http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1830&Itemid=2422&lang=en

A total of 34 countries (39 including subnational entities), have participated in the exercise. The strong majority of responding countries expressed a positive view of planning and conduct of PacWave13. Exercise objectives were exercised, evaluated and reported, thus enabling PTWS recommendations and lessons learned to be formulated so that were consistent with the *PTWS Medium Term Strategy 2014–2021* (IOC/2013/TS/108, in

progress). PacWave13 provided valuable feedback from countries on the proposed PTWC enhanced products, and this feedback has been provided to PTWC and the PTWS Working Group 2 Task Team on Enhanced Products. PacWave13 reinforced the integration of PTWC enhanced products in their country decision-making processes, and in their Standard Operating Procedures (SOPs).

Countries overwhelmingly welcomed the new procedures and forecast products as a significant improvement in the quality and quantity of tsunami threat advice over that currently provided through text products of PTWC. Countries generally understood the PTWC enhanced products and viewed them as adding important advice to guide them in providing more accurate national warnings. The text product was viewed as the most useful enhanced product that could also be released to the media.

Although most countries are currently not ready in 2013 to implement the enhanced products, they do expect to be ready upon 2014 official implementation. They indicated there is still a need for continued training and harmonization of the PTWC enhanced products among stakeholder agencies and the media.

The findings from PacWave13 are as follows:

- An overwhelming majority of respondents ranked the text message as the most useful product, followed by the forecast polygon map. Moderately useful products were the coastal forecast map, energy forecast map, and forecast polygon table. The coastal KMZ file was ranked the least useful product.
- The majority of respondents agreed that the format and content of PTWC enhanced products were satisfactory. Edits and additional information were suggested for the products.
- The majority of respondents recommended the text product at a minimum be made available to the public.
- The majority of respondents would like to see a forecast included in the initial product, knowing that earthquake magnitudes and tsunami forecasts are likely to change over the first hour.
- The majority of respondents indicated the National Tsunami Warning Centres (NTWCs) understand the contents of the enhanced products, how to use the products, and their limitations.
- Half of respondents indicated the National Disaster Management Office (NDMO) also understand the content of the products.
- The majority of respondents are currently not ready to implement and/or utilise the products in 2013. However, a strong majority of respondents anticipate being ready in 2014 through further training and harmonization with key stakeholder agencies.
- The majority of respondents indicated their stakeholders understand that current PTWC international Watch/Warning products will be discontinued.
- The majority of respondents understand that the National Tsunami Warning Centre, not PTWC, will be responsible for issuing future national alerts (e.g. watches/warnings/cancellations).
- Efforts will be undertaken by almost all respondents to prepare their stakeholder agencies and media for the enhanced products official implementation in 2014.

1. INTRODUCTION

1.1 INTERNATIONAL TSUNAMI EXERCISES

Most of the world's earthquakes and tsunamis occur in the Pacific Ocean and its marginal seas, and over history, 75% of the world's fatal tsunamis have occurred in the Pacific Ocean and its marginal seas. On average, the Pacific is struck by a locally damaging tsunami every one to two years and by a major Pacific-wide tsunami a few times each century. Since 2005, there have been 11 deadly tsunamis and 6 of them have occurred in the Pacific. Local and regional tsunamis occur most frequently, and in the Pacific over history, have been the cause of 99% of tsunami casualties as they will impact shorelines in minutes.

Exercise Pacific Wave 06 and Exercise Pacific Wave 08 provided the opportunity for participating countries to exercise general procedures and communications arrangements. Exercise Pacific Wave 11 and Exercise Pacific Wave 13 provided the opportunity for countries to focus their attention on rapid response to their local tsunami hazard and improve their preparedness, as well as to start to become familiar with new PTWC enhanced products that are expected to be officially implemented in 2014.

In 1960, a magnitude 9.5 earthquake occurred off the coast of Chile. It generated a mostly un-warned tsunami that caused damage and casualties across the entire Pacific – even as far away as Japan. Following that event, the Intergovernmental Oceanographic Commission (IOC) of United Nations Educational, Scientific and Cultural Organization (UNESCO) formed in 1965 the International Coordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU) to promote the exchange of seismic and sea level data for rapid tsunami detection and analysis, in order to provide warnings for such events, and to coordinate mitigation efforts among its Member States. The ICG/ITSU was renamed the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS) in 2005 to reflect the importance of adopting a comprehensive approach to mitigating the effects of tsunamis and the importance of intergovernmental coordination and commitment as the backbone of a successful international system. Presently, the ICG/PTWS encompasses 46 countries.

In response to the 2004 Indian Ocean tsunami that killed nearly 230,000 people across the Indian Ocean, the ICG/PTWS acted to organize the first international tsunami exercise with the goal of evaluating the readiness of the PTWS in order to identify how to improve its effectiveness. The first Pacific-wide exercise, Exercise Pacific Wave '06 (IOC/INF-1244) was carried out on 16 and 17 May 2006. Documents for the Exercise Pacific Wave '06 (EPW06) are posted to:

http://itic.ioc-unesco.org/index.php?option=com_content&view=category&layout=blog&id=1440&Itemid=1440&lang=en

In 2008, the ICG/PTWS conducted its second Pacific Wave exercise to establish such exercises as part of the routine work of maintaining the PTWS. PacWave08 documents are posted to:

http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1597:exercise-pacific-wave-08&catid=1395:intl-exercises-pac-exercise-pacific-wave-08&Itemid=1395

At the Twenty-third Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXIII) held in Apia, Samoa, from 16 to 18 February 2009, the ICG/PTWS recommended a third Pacific-wide tsunami exercise, Exercise Pacific Wave 10 (PacWave10). However, on 29 September 2009, just over seven months after the ICG/PTWS-XXIII, Samoa, American Samoa and Tonga were hit by a deadly tsunami. Altogether, 192 lives were lost. This was followed five months later by the

27 February 2010 Chile tsunami where 124 lives were lost. One year later on 11 March 2011, Japan was impacted by a devastating local tsunami that claimed ~18,000 lives. As a result, the exercise was postponed in order to evaluate and consider its goals and outcomes in the aftermath of the 2010 Chile and 2011 Japan tsunamis.

At the Twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXIV) held in Beijing, China, from 24 to 27 May 2011, Member States approved the conduct of Exercise Pacific Wave 11 (PacWave11) on 9 and 10 November 2011 to focus on responding to a regional or local tsunami where warning and emergency response must be very quick and actionable, and where pre-event preparedness and education are essential so that the public can and will act immediately to save their lives. PacWave11 documents are posted to: http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1686&Itemid=2331&lang=en

1.2 PACIFIC TSUNAMI WARNING CENTER ENHANCED TSUNAMI PRODUCTS

The Twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXIV) also approved the development of improved tsunami procedures and products by the Pacific Tsunami Warning Center (PTWC), and requested that Exercise Pacific Wave 11 (PacWave11) be used to introduce and obtain feedback from Member States on the new products (*Annex II, Recommendation ICG/PTWS-XXIV.3*). The new enhanced products will provide guidance on the levels of threat along coastal segments using real-time tsunami wave forecasts, and are expected to greatly reduce the number of areas that have been previously unnecessarily warned.

Task Teams (TT) on PacWave11 and on Enhancing Products established under the PTWS Working Group 2 on Tsunami Detection, Warning and Dissemination convened in the meeting held in Honolulu, United States of America, from 21 to 23 May 2012, to evaluate the PacWave11 findings and to compile a list of feedback improvements that would allow PTWC to further refine its draft new products. The *Exercise Pacific Wave 11. A Pacific-wide Tsunami Warning and Communication Exercise, 9–10 November 2011. Report, Volume 2. (IOC/2011/TS/97Vol.2)* was published by IOC in June 2013.

Subsequently, the meeting of the ICG/PTWS Steering Committee (SC) held in Honolulu, United States, on 24 and 25 May 2012, convened (Review and adoption of Summary Report, *ICG/PTWS-SC-III/3*, 20 September 2012) to review progress on the inter-sessional activities of the PTWS. It approved the recommendations made by the TT on PacWave11 and enhancing products, the PTWC new products implementation timeline, and the conduct of the Exercise Pacific Wave 13 (PacWave13) to continue the enhanced products development process noting that PacWave13 would be important to enable informed decision-making at the next session of the Intergovernmental Coordination Group (ICG). It is intended that the PTWS Steering Committee would review the results of PacWave13 before the Twenty-fifth Session of the ICG/PTWS. The planned date for the changeover from the PTWC current products to its new products will be in 2014, upon the formal approval of Member States at the Twenty-fifth Session of the ICG/PTWS that will be held in Vladivostok, Russian Federation, from 9 to 11 September 2013.

To effect a smooth transition from the current PTWC tsunami products to its new products, the ICG/PTWS-SC (May 2012) had approved three milestone transition activities for 2013:

- PTWC will begin issuing its new products in trial experimental mode starting on 15 February 2013 (later amended to 15 April). The products will be issued live and in parallel with the current existing products, but only via email to the designated PTWS Tsunami Warning Focal Points (TWFPs).

- Exercise Pacific Wave 13 (PacWave13) should be conducted in April 2013 (later amended to May 2013) by Member States to validate PTWC's new products. It was recommended that Member States conduct a tabletop exercise in order to measure the understanding and interpretation of the enhanced products and their use for national tsunami warning threat assessment. The PTWS Task Team on PacWave11, chaired by Dr Laura Kong of ITIC and Ms Jo Guard of New Zealand, at the request of the PTWS Steering Committee, will plan and oversee the conduct of PacWave13 under its existing Terms of Reference (ToRs).
- The International Tsunami Information Center (ITIC) and the Secretariat will work together to make training available on the PTWC new products to ensure that the products are understood, and that Member States know how to modify their Tsunami Warning Standard Operating Procedures accordingly.

2. EXERCISE PACIFIC WAVE 13

2.1 OVERVIEW

Exercise Pacific Wave 2013 is the fourth Pacific-wide drill of what is envisioned to be a regular schedule of Pacific exercises. Dr Wendy Watson-Wright, IOC Executive Secretary and UNESCO Assistant Director-General, formally announced PacWave13 through IOC Circular Letter No. 2460 (CL-2460) dated at 7 December 2012 (ANNEX I), and requested ICG/PTWS Member States to nominate National Contacts for the exercise.

A PacWave13 exercise website was established and maintained by ITIC to support the exercise, including the *How to plan, conduct and evaluate UNESCO/IOC tsunami wave exercises* (IOC/2012/MG/58 Rev), the Exercise Pacific Wave 11 Manual (IOC/2011/TS/97VOL.1), and actual exercise messages (http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1686&Itemid=2331&lang=en). UNESCO issued a Press Release on 6 May 2013 regarding the exercise, and participating countries were provided with a Media Advisory template for their national use (ANNEX II).

Exercise Pacific Wave 13 was requested to be conducted between 1–14 May 2013 with each country selecting a date and time for their exercise that best suited them. They could select from among three scenarios, each lasting between 7 and 23 hours, and then simulate the receipt of messages from the Pacific Tsunami Warning Center and/or the Northwest Pacific Tsunami Advisory Center (NWPTAC) of the Japan Meteorological Agency (JMA) (ANNEX III) for their tabletop exercise. Due to other conflicts in their schedules, some countries conducted PacWave13 in later May or June 2013.

The PacWave13 Exercise Manual (*Exercise Pacific Wave 13. A Pacific-wide Tsunami Warning and Communication Exercise Pacific, 1-14 May 2013*, IOC/2013/TS/106Vol.1rev.) was prepared and made available in April 2013 to guide exercise participants. A guideline, *How to plan, conduct and evaluate UNESCO/IOC tsunami wave exercises* (IOC/2012/MG/58rev.) was also broadly disseminated to assist countries in their exercise planning, conduct, and post-exercise evaluation.

After the exercise, each participating country was requested to submit a post-exercise evaluation describing their experience in PacWave13. The evaluation questionnaire was prepared and provided so that countries could assess themselves. This questionnaire was based on the recommendations of previous exercises and the recognition that more standard, simpler, and less time-consuming methods were needed to improve evaluation efficiency. To make the questions easier to answer and, at the same time, reduce manual tabulation of results, the PacWave13 questionnaire adopted a Yes/No or multiple choice format, with

optional comments, and was made available online in English. The survey was deployed as an online questionnaire using the Survey Monkey software tool.

2.2 COUNTRY PARTICIPATION

A total of 34 countries (39 including subnational entities) independently participated in PacWave13. A summary compiling the exercise plans of PTWS countries is provided in [ANNEX IV](#), and a compilation of exercise evaluation responses is provided in [ANNEX V](#). Pacific countries and sub-national jurisdictions that participated and submitted post-exercise evaluation forms were:

- Australia
- Brunei Darussalam
- Canada
- China – SOA, Hong Kong
- Colombia
- Chile
- Cook Islands
- Ecuador
- El Salvador
- Federated States of Micronesia – Chuuk, Pohnpei
- Fiji
- France – French Polynesia
- Guatemala
- Indonesia
- Japan – JMA NWPTAC
- Kiribati
- Malaysia
- Mexico
- Nauru
- New Zealand
- Nicaragua
- Niue
- Palau
- Peru
- Philippines
- Russian Federation
- Samoa
- Solomon Islands
- Thailand
- Tonga
- Tuvalu
- USA – American Samoa, Guam, Northern Mariana Islands, PTWC
- Vanuatu
- Vietnam

Fiji reported that it participated but submitted an empty post-exercise evaluation form. Several countries provided PacWave13 National Contacts, but did not participate. The Republic of the Marshall Islands planned to participate but had to cancel due to a drought emergency in their country.

This Exercise Pacific Wave 2013 Summary Report is based on the Post-Exercise Evaluation Forms, as developed by the PacWave13 Task Team.

3. CONCEPT OF THE EXERCISE

3.1 PURPOSE

The purpose (aim) of Exercise Pacific Wave 13 was to validate the understanding and use of the Pacific Tsunami Warning Center (PTWC) enhanced products.

The exercise provided an opportunity for Pacific countries to review enhancements of the new products, and review their tsunami response procedures. Regular exercises are important for maintaining staff readiness in case of a real event. This is especially true for tsunamis, which are infrequent, but when they occur, require a rapid response. Every Pacific country was encouraged to participate.

3.2 OBJECTIVES

There were 3 key objectives for Exercise Pacific Wave 13.

OBJECTIVES	
1	Evaluate the format and content of PTWC enhanced products.
2	Provide feedback that a country is prepared to officially receive and utilise the PTWC enhanced products.
3	Provide feedback that a country's stakeholders will be informed of the PTWC enhanced products to enable appropriate changes to their Tsunami Emergency Response (TER) plans. Stakeholders include national/provincial/local government agencies, media, and the public.

Table 1. key objectives for Exercise Pacific Wave 13

3.3 TYPES OF EXERCISE

It was recommended by the Exercise Pacific Wave 13 Task Team that the exercise be carried out in a tabletop format that would promote communication and decision making at government levels, without disrupting or alarming the general public.

A tabletop exercise may also be referred to as a 'discussion exercise', or 'DISCEX'. Participants are presented with a situation or problem that they are required to discuss and for which they have to formulate the appropriate response or solution. Normally, the exercise requires no simulation other than a scenario and/or prewritten exercise injects. An exercise controller or moderator introduces a simulated scenario to participants and, as the exercise advances (in time), exercise problems and activities (injects) are further introduced. This type of exercise is used to practice problem solving and coordination of services with or without time pressures. There is no deployment or actual use of equipment or resources.

An example of a tabletop exercise may involve participants discussing their response to a tsunami threat in a particular area, where the only injects are tsunami messages describing the nature of the threat from the international tsunami warning centres, such as the PTWC and JMA NWPTAC.

Exercises examine the readiness of an agency and/or stakeholders, and stimulate the development, training, testing, and evaluation of tsunami warning and emergency response plans and Standard Operating Procedures.

3.4 EXERCISE DESCRIPTION

The exercise placed Pacific countries into a tsunami alert situation that would require countries to practice their warning issuance and emergency response decision making for the arrival of a destructive tsunami upon their shores, and depending on the country, to take actions and test Standard Operating Procedures to the step just prior to public notification.

All international products were provided online at the Exercise Pacific Wave 13 website (<http://www.pacwave.info>) in advance to help countries plan and prepare.

Unlike previous exercises, Exercise Pacific Wave 13 was not intended to be played in real time, and thus no “dummy” kickoff exercise messages were required. Participating countries were able to select a relevant scenario and the most convenient date and time to conduct the tabletop exercise within the 1–14 May 2013 time period.

3.5 POST-EXERCISE EVALUATION

PTWS participants were requested to submit responses to a detailed questionnaire survey focusing on evaluating the following areas:

- Are the format, content, and staging of the PTWC enhanced products satisfactory?
- Is the content of the PTWC enhanced products understandable by stakeholders?
- Is your country prepared to officially receive and utilise the PTWC enhanced products?
- Is your National Tsunami Warning Centre (NTWC) prepared to issue appropriate country alert levels (e.g. warning, advisory, watch, etc.) after initial receipt and interpretation of the PTWC enhanced products?
- Are your country stakeholders aware that the current PTWC international warning/watch products will expire with the official implementation and changeover to the PTWC enhanced products in 2014?
- With the PTWC enhanced products, have your country’s stakeholders been educated on what they should expect, when, and what they should do with the alerts that will now be issued by your National Tsunami Warning Centre?
- Is additional training, either by international experts or by country Tsunami Warning Focal Points, necessary to ensure the understanding, utilisation, and limitations of the PTWC enhanced products?

A compilation of the findings is presented in **ANNEX V** based on responses from 34 countries.

3.6 EXERCISE PACIFIC WAVE 13 SCENARIOS

Exercise Pacific Wave 13 involved multiple scenarios (three in total), to allow all Pacific countries to select and exercise a regional/local source tsunami event. Countries were recommended to choose only one scenario to exercise.

The exercise scenarios include major tsunamis generated by great earthquakes in the following areas:

- Off Northern Japan (Japan Trench)
- Off North-western Philippines (Manila Trench, South China Sea)
- Off Northern Chile (Peru–Chile Trench)

Further details about the scenarios can be found at [ANNEX III](#).

4. POST-EXERCISE EVALUATION FINDINGS

4.1 INTRODUCTION

A total of 34 countries, representing 39 sub-national countries and agencies, submitted detailed evaluation forms.

A summary of the findings from the completed evaluation forms is provided in [ANNEX V](#).

PTWC and JMA NWPTAC message dissemination summaries can be found in the International Master List of Events table found in [ANNEX III](#).

4.2 SCENARIOS USED DURING PACWAVE13

The following graph depicts the number of countries/agencies that used the available scenarios.

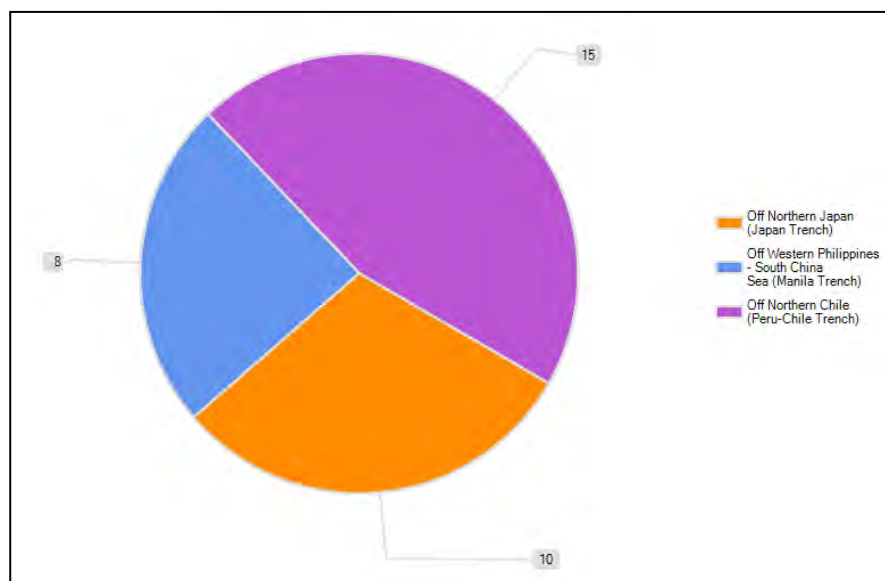


Figure 1. Pacwave13 scenarios

4.3 OVERALL FINDINGS

The majority of responding countries and agencies that completed the evaluation forms expressed an overwhelmingly positive view that Exercise Pacific Wave 13 met its objectives. PacWave13 provided valuable feedback from countries on the proposed PTWC enhanced products, and this feedback has been provided to PTWC and the PTWS Task Team on Enhanced Products. PacWave13 reinforced the integration of PTWC enhanced products in their country decision-making processes, and in their Standard Operating Procedures.

Countries overwhelmingly welcomed the new procedures and forecast products as a significant improvement in the quality and quantity of tsunami threat advice over that currently provided through PTWC's text products. The following are summary observations.

On the positive side, the majority of agencies indicated:

- The PTWC enhanced products were useful in helping countries assess their national tsunami threat.
- The text message was voted as the most useful product.
- The format and content of the enhanced products were generally satisfactory.
- The forecast polygon map is useful in providing a quick and general view of where a tsunami threat is forecast and the level of that threat.
- The proposed forecast polygons and their names were appropriate and useful for each country.
- National Tsunami Warning Centres understand the contents of the enhanced products, how to use the products, and the limitations of the products.
- Most countries understand that their stakeholder agencies understand that current PTWC international watch/warning products will be discontinued. Moreover, it is understood that their National Tsunami Warning Centre, not PTWC, will be responsible for issuing national alerts.

Following areas where additional consideration, action and/or decision is required:

- The PTWC enhanced products should be edited and improved based on comments from countries, prior to finalization and official implementation.
- There were varying degrees of usefulness of many of the enhanced products.
- There are a number of recommendations that were requested to be included in the suite of products, but were beyond what was tested during the exercise.
- Beside the text message, there was no clear product for additional release to the public. KMZ files were viewed as least useful.
- Only about half the respondent National Disaster Management Offices understand the enhanced products.
- Most countries are currently not ready to implement and/or utilise the enhanced products. However, most countries feel that they will be ready by the (early) 2014 official implementation date with more training from international experts.

4.4 CORE OBJECTIVE REVIEW

Findings arising from the evaluation about the effectiveness of the three core objectives for Exercise Pacific Wave 13 were:

Objective 1. Evaluate the format and content of PTWC enhanced products for each scenario exercised.

- An overwhelming majority of respondents ranked the text message as the most useful product, followed by the forecast polygon map. Moderately useful products were the coastal forecast map, energy forecast map, and forecast polygon table. The coastal KMZ file was ranked the least useful product.

- The majority of respondents agreed that the format and content of PTWC enhanced products were satisfactory. Edits and additional information were suggested for the products.
- The majority of respondents recommended the text product at a minimum be made available to the media/public.
- A strong majority of respondents would like to see a forecast included in the initial product, knowing that earthquake magnitudes and tsunami forecasts are likely to change over the first hour.

Objective 2. Provide feedback that your country is prepared to officially utilise the PTWC enhanced products.

- The majority of respondents are currently not ready to implement and/or utilise the products in 2013. However, a strong majority of respondents anticipate being ready in 2014 through further training and harmonization with key stakeholder agencies. Pacific Island Countries indicated the most concern on their readiness.
- The majority of respondents indicated their stakeholders understand that current PTWC international watch/warning products will be discontinued.

Objective 3. Provide feedback that your country's stakeholders (national/provincial/local government agencies) will be informed of the PTWC enhanced products to enable appropriate changes to their Tsunami Emergency Response plans.

- The majority of respondents indicated the National Tsunami Warning Centres understand the contents of the enhanced products, how to use the products, and the limitations of the products.
- Half of respondents also indicated the National Disaster Management Office understand the content of the products.

4.5 RECOMMENDATIONS

Based on a review of the responses to PacWave13, the following recommendations are made:

1. **On implementation of PTWC enhanced products**

To effect a smooth transition from the current PTWC tsunami watch/warning bulletins to its new enhanced products in 2014, conduct PacWave13 to further measure its understanding and interpretation in national tsunami warning threat assessment.

Recommendation: ICG/PTWS move forward with the selection of an official date to implement PTWC enhanced products in 2014 based on positive feedback on the enhanced products and findings from PacWave13.

2. **On feedback on PTWC enhanced products**

Member States that have participated in PacWave13 have provided a number of product improvement comments.

Recommendation: PTWS Task Team on Enhanced Products should further improve the product content based on PacWave13 results and comments before 2014 implementation

date. It should discern if country-requested improvements are warranted and feasible to include in the international product, either for 2014 or later.

3. On information released to the media/public on PTWC enhanced products

Determine what portion of PTWC enhanced products would be useful and understandable for media/public consumption.

Recommendation: Use text message product as a minimum for release to media/public. ICG/PTWS needs to determine if other enhanced products should also be released.

4. On regional trainings

A number of PTWS Member States request training on the PTWC enhanced products.

Recommendations:

- a. IOC sponsor follow up regional trainings on PTWC enhanced product harmonization and explore building “Training of Trainer” (ToT) capacity within PTWS Regional Working Groups for sustainability of operational readiness.
- b. Building from trainings on tsunami warning and emergency response standard operating procedures led by the International Tsunami Information Center, consider the provision of guidance templates specific to the PTWC enhanced products to assist countries in finalizing their SOPs.

5. On follow up in-country trainings

A number of PTWS Member States indicated further training is needed in-country with their stakeholder agencies to harmonize PTWC enhanced products.

Recommendation: IOC encourages Member States that have already received PTWC enhanced product training or are already familiar with the product content, to further conduct in-country trainings with their major stakeholders at various levels of government, prior to 2014 official implementation.

5. CONCLUSION

The occurrence of four destructive tsunamis in 5 years (29 September 2009 South Pacific tsunami – 192 deaths; 27 February 2010 Chile tsunami – 124 deaths; 11 March 2011 Japan tsunami – ~18,000 deaths; 6 February 2012 Santa Cruz, Solomon Islands – 10 deaths) were sober reminders to all of the need for every country to be prepared. This is especially true in the Pacific where tsunamis occur most often. Local and regional tsunamis occur most frequently, and in the Pacific over history, have been the cause of 99% of tsunami casualties as they will impact shorelines in minutes. Exercise Pacific Wave 06 and Exercise Pacific Wave 08 provided the opportunity for participating countries to exercise general procedures and communications arrangements. Exercise Pacific Wave 11 and Exercise Pacific Wave 13 provided the opportunity for countries to focus their attention on rapid response to their local tsunami hazard and improve their preparedness, as well as to start to become familiar with new PTWC enhanced products that are expected to be officially implemented in 2014.

A total of 34 countries (39 including subnational entities) have participated in the exercise. This Summary Report is based on post-exercise evaluation forms received from the countries and their jurisdictions.

The overwhelming majority of responding countries expressed a positive view of PacWave13 planning and conduct. PacWave13 objectives were exercised, evaluated and reported, thus enabling PTWS recommendations and lessons learned to be formulated that were consistent with the PTWS Medium Term Strategy 2014–2021. PacWave13 contributed to the improvement of PTWC enhanced products for implementation in 2014.

Countries viewed the new procedures and forecast products as a significant improvement in the quality and quantity of tsunami threat advice over that currently provided through PTWC's text products.

Countries generally understood the PTWC enhanced products and viewed them as adding important advice to guide them in providing more accurate national warnings. PacWave13 provided valuable feedback from countries on the proposed PTWC enhanced products, and this feedback has been provided to PTWC and PTWS Task Team on Enhanced Products. PacWave13 reinforced the integration of PTWC enhanced products in their country decision-making processes, and in their Standard Operating Procedures (SOPs). The text product was viewed as the most useful enhanced product that could also be released to the media.

Although most countries are currently not ready in 2013 to implement the enhanced products, they do plan to become ready upon 2014 official implementation. Thus, there is a need for continued training and harmonization of the PTWC enhanced products among stakeholder agencies and the media.

ANNEX I

EXERCISE PACIFIC WAVE 13 ANNOUNCEMENT



INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
COMMISSION OCÉANOGRAPHIQUE INTERGOUVERNEMENTALE
COMISIÓN OCEANOGRÁFICA INTERGUBERNAMENTAL
МЕЖПРАВИТЕЛЬСТВЕННАЯ ОКЕАНОГРАФИЧЕСКАЯ КОМИССИЯ
اللجنة الدولية الحكومية لعلوم المحيطات
政府間海洋学委员会

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IOC Circular Letter No. 2460
(Available in English only)

IOC/TA/BA/ba
Paris, 7 December 2012

- To : ICG/PTWS Tsunami Warning Focal Points (TWFP)
ICG/PTWS Tsunami National Contacts (TNC)
ICG/PTWS Chair and Vice-Chairs
- cc. : Official National Coordinating Body for liaison with IOC in IOC Member States
Permanent Delegates/Observer Missions to UNESCO of IOC Member States
National Commissions for UNESCO in IOC Member States
Directors of UNESCO and IOC Regional Offices in the Asia/Pacific Region
Regional Organizations cooperating with UNESCO/IOC
Director, Pacific Tsunami Warning Center
Director, International Tsunami Information Center

Object : PTWC Start of Issuance of Pacific Experimental Products, 1 February 2013;
PTWS Pacific-wide Tsunami Exercise "PacWave13", April 2013

At the Twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXIV) held in Beijing, China 24–27 May 2011, Member States approved the development of improved tsunami procedures and products by the the Pacific Tsunami Warning Center (PTWC), and the conduct of Exercise Pacific Wave 2011 (PacWave11) on 9–10 November 2011 to introduce and obtain feedback on the new products (Recommendation ICG/PTWS-XXIV.3, in attachment I). From 21 to 23 May 2012, the PTWS Working Group 2 Task Teams on PacWave11 and Enhancing Products convened to evaluate the PacWave11 findings and to compile a list of feedback improvements that would allow PTWC to further refine its draft new products. Subsequently, the PTWS Steering Committee (SC) convened on 24–25 May 2012 (see attachment II) to review progress on the PTWS's inter-sessional activities; it endorsed the Enhancing Products Task Team recommendations and approved the timeline for the implementation of the PTWC new products. The planned date for the changeover from the PTWC current products to its new products will be in early 2014, upon the formal approval of Member States at the next ICG/PTWS-XXV session to be held in Vladivostok, Russian Federation, in September 2013.

.../...

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TOGO

To effect a smooth transition from the current PTWC tsunami products to its new products, the PTWS SC approved three milestone transition activities for 2013:

- **PTWC will begin issuing its New Products in trial experimental mode starting on 15 February 2013.** The products will be issued live and in parallel with the current existing products, but only via email to the designated PTWS Tsunami Warning Focal Points (TWFP).
- **Exercise Pacific Wave 2013 should be conducted in April 2013 by Member States to validate PTWC's New Products.** It is recommended that Member States conduct a table-top exercise in order to measure the understanding and interpretation of the Enhanced Products and their use for national tsunami warning threat assessment. The PTWS Task Team on PacWave11 Exercises, chaired by Dr Laura Kong of ITIC and Jo Guard of New Zealand, at the request of the PTWS SC, is planning and overseeing the conduct of PacWave13 under its existing Terms of Reference.
- The International Tsunami Information Center (ITIC) and the Secretariat will work together to make training available on the PTWC New Products to ensure that the products are understood, and that Member States know how to modify their Tsunami Warning Standard Operating Procedures accordingly. To better assess training needs, **PTWS Member States are requested to inform the PTWS Technical Secretary (b.aliaga@unesco.org) and ITIC Director (laura.kong@noaa.gov) if they will require training in 2013 and/or 2014.**

PTWS PTWC New Products

The PTWC New Products, which include forecasts and graphical formats, were approved for development through Recommendation ICG/PTWS-XXIV.3 (May 2011). The new products establish four levels of tsunami wave amplitude threat to assist National Tsunami Warning Centres in assessing their national threat for subsequent issuance of national tsunami warnings to their populations. The New Products will provide general guidance on impact, and are expected to greatly reduce the number of areas warned unnecessarily, while still remaining conservative to protect lives. Exercise Pacific Wave 2011 introduced the new products, and provided feedback on the first drafts of the new products. Further feedback was received through a number of PTWS meetings and IOC/ITIC tsunami trainings in 2011 and 2012. PTWC has incorporated this feedback in the revised new products that will be used in PacWave13.

Exercise Pacific Wave 2013

Accordingly, PacWave13 will be an important warning centre milestone preparedness activity and we trust that you and your country authorities will support this exercise.

Exercise Aim

The aim of PacWave13 is to validate the understanding and use of PTWS-PTWC New Products.

Date and Conduct of table-top exercise

PacWave13 should take place during the month of April 2013, so that the post-exercise evaluation questionnaire can be returned by 30 April 2013. PacWave13 will simulate Pacific countries being placed into an ocean-wide major tsunami threat level, and will require Member State decision-making to assess their national threat. The exercise is suggested to be a table-top exercise and is not required to be conducted down to community levels. PacWave13 will include multiple scenarios to enable Member States to select a distant or regional event that will cause the greatest impact to their country.

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Exercise Documents

The PTWC New Products Users Guide and PacWave13 Exercise Manual will be distributed electronically on **15 January 2013**. The PTWC New Products Users Guide will document procedures, criteria, products, and provide guidance on the interpretation and limitations of the forecast products. The Exercise Manual will contain details on the scenarios, the Master Schedule of Events List (MSEL) for the PTWC, WC/ATWC, and NWPTAC, the post-exercise evaluation questionnaire, and guidance on how countries may want to conduct their table-top exercise. All exercise documents, including the actual exercise messages, will be posted at <http://www.pacwave.info>. For further exercise guidance, Member States should consult IOC Manuals and Guides, 58 "How to Plan, Conduct and Evaluate Tsunami Exercises" (2012, English, Spanish) available on the PacWave13 website.

PacWave13 National Contact Nomination

Member States are strongly encouraged to participate in the exercise. In order to ensure the commitment of participating countries is fully coordinated, we seek your nomination of a National Contact for PacWave13 with whom we will communicate about planning of the exercise. The designated PacWave13 National Contact will be expected to confirm the accuracy of existing points of contact for the receipt and dissemination of tsunami warnings downstream from the national tsunami warning centre. The designated PacWave13 National Contact will also be responsible for coordinating input to the exercise evaluation tool, which will be circulated as part of the Exercise Pacific Wave 2013 Exercise Manual.

I would be grateful if you could provide the details of your National Contact for PacWave13 by **7 January 2013** to the ICG/PTWS Technical Secretary through email to b.aliaga@unesco.org, cc to laura.kong@noaa.gov. You are also encouraged to further disseminate copies of this letter to appropriate organizations and authorities within your country. In the meantime I remain,

Yours sincerely,

[signed]

Wendy Watson-Wright
Executive Secretary, IOC
Assistant Director-General, UNESCO

Enclosures (3): Recommendation ICG/PTWS-XXIV.3, "PTWS Exercises"
ICG/PTWS Steering Committee Report, Actions on PacWave Exercises and
Enhanced Products
Exercise Pacific Wave 2013 Guidance

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Attachment I

**Recommendation ICG/PTWS-XXIV.3
PTWS Exercises**

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

Recalling Recommendation ICG/PTWS-XXIII.2,

Emphasising that 99% of deaths caused by tsunamis in the Pacific since the establishment of the PTWS is the result of local tsunamis,

Noting that during the inter-sessional period 2009–2011, three destructive and deadly tsunamis occurred in the Pacific, which placed PTWS countries in various levels of warning for distant tsunamis, and locally, five countries were impacted nearly immediately with people having only 10–30 minutes before the first large waves hit,

Recognizing all communities at risk need to be prepared for the next tsunami,

Recognising further that drills and exercises are an effective and important way to increase readiness and raise awareness,

Noting that the ICG/PTWS-XXIV agreed that PTWC should proceed with its development of improved tsunami procedures and products,

Decides to conduct Exercise Pacific Wave 2011 (PACWAVE 11) on 9 and 10 November 2011 and to continue with the PTWS Task Team on PACWAVE 11;

Decides further that:

1. The objectives of PACWAVE 11 will be to evaluate the readiness to respond to a local/regional source tsunami, and to also evaluate the understanding and use of new PTWC experimental products,
2. PACWAVE 11 will be conducted as a multi-scenario exercise with major tsunamis originating in various seismic zones of the Pacific to complement previous scenarios in other places,
3. The exercise manual including instructions to Member States regarding the exercise conduct and the evaluation instrument be prepared taking into account lessons learned and any need to collect additional information, provide feedback on the PTWC new products, and the recommendations of TOWS-WG Inter-ICG Task Team 2,
4. The exercise manual be distributed to Member States at least 90 days in advance of the exercise date,
5. An exercise guideline, How to Plan, Conduct, and Evaluate Tsunami Exercises be prepared in order to assist countries in preparing for PACWAVE 11 in collaboration with TOWS-WG Inter-ICG Task Team 2,
6. Participating Member States be asked to complete and return the evaluation instrument no more than 90 days following the exercise,
7. The PTWS Task Team on PACWAVE 11 and PTWS Task Team on Enhancing Products to meet after the exercise evaluation to compile a list of actions from the findings for consideration by the ICG/PTWS-XXV.

Financial implications: None

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Attachment II

From ICG/PTWS-SC-III/3 report, 20 September 2012



**Intergovernmental Oceanographic Commission (of UNESCO)
Intergovernmental Coordination Group for the Pacific Ocean Tsunami Warning and
Mitigation System (ICG/PTWS)
Meeting of the Steering Committee, Honolulu, United States of America 24–25 May 2012**

MEETING REPORT
(excerpt)

PACWAVE11 Report

The co-chairs of the WG2 Task Team on PACWAVE11, Ms Jo Guard and Dr Laura Kong, reported back to the Steering Committee on the assessment of the exercise.

The overall assessment of the exercise was that it had been well organized and that the planning, conduct and style at all levels had been satisfactory. External relationships had been enhanced, and the experimental products were understood and useful. The exercise documentation had been found to be appropriate and easy to use. Areas that require improvement include: notification was received by most NTWCs within 15-20 minutes, which may not be quick enough in a local tsunami; the majority of NTWCs received messages by fax and email, which may be subject to failure in a local earthquake.

Over half of the agencies reported not having evacuation signage and requested assistance in scheduling exercises. Further assistance in developing SOPs is also required.

The evaluation form had been found easy to use but there were too many questions. The time period between the exercise and the return of the evaluation forms was too long and "Survey Monkey" may need to be upgraded to better manipulate the data. A contractor will be employed to process the data and prepare the final report.

The feedback received on the experimental products was that they were useful but that a User Guide is required. The most useful features were: the threat level map, the inclusion of wave heights, travel and arrival times, and forecast amplitudes.

Many suggestions for improvement of the PTWC experimental products were received and these would be passed on to PTWC and WG2 for review and assessment of feasibility.

The chair thanked the Task Team co-chairs for their report and enquired if an exercise was being planned for 2013. If so, it would be necessary to decide on the level of exercise. The purpose would be to validate the new products, not the entire system. Mr Coetzee recommended keeping the exercise as simple as possible and suggested setting a deadline for feedback.

Dr McCreery commented that it would be reasonable to target early 2013 for the publishing of a User Guide for the products developed and in use before the exercise, which should be held before the next session of the ICG

Dr Kong presented a proposal and a timeline for implementation of products:

- Start Experimental Products: Feb 1, 2013
- Conduct PacWave13: April 2013

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- Evaluation forms returned: 30 April
- Evaluate PacWave13, validate PTWC new products and procedures by 31 May
- Review/approved by Steering Committee just prior to ICG

The Steering Committee requested the WG2 PacWave11 Task Team to continue until the 25th Session of the ICG/PTWS, to plan and conduct a PacWave Exercise in 2013 under its existing Terms of Reference, noting that the exercise will not be end-to-end and will focus on validation of the enhanced products.

The Task Team will decide on the number and format of exercise scenarios and recommend to the chair of WG2.

Potential new members of the Task Team are: Lt Willington Renteria Agurto (Ecuador), Dr Dominique Reymond (French Polynesia) and a member from Malaysia.

Task Team on Enhancing Products Report

Dr Chip McCreery, chair of the WG2 Task Team on Enhancing Products, provided a summary of the discussions that had taken place in the preceding Task Team meeting. He emphasized the key purposes of the proposed new PTWC products based on numerical forecast modelling that include: 1) improved advice regarding local tsunami threats, 2) reduced over-warning, 3) information to help distinguish between a marine threat, land inundation threat, and major inundation threat, and 4) threat information at a finer geographic scale.

The following points were discussed and taken into consideration:

- Past Recommendations of this Task Team
- TOWS Task Team Harmonized Product Recommendations
- Lessons learned from the recent Samoa, Chile, and Japan tsunamis
- PacWave11 feedback on the experimental products
- Scientific and technical capabilities and limitations of the :
 1. seismic data and analysis
 2. sea level data and analysis
 3. numerical tsunami forecast models

The following changes to the new products were agreed:

- Inclusion of latitude and longitude lines on maps for reference
- Inclusion of additional geographic features on plots for reference
- Geographical division of PTWC & JMA responsibilities in sea between Japan and Asian continent
- Scaled Green's Law approximation for small islands
- Harmonization of color palettes used for wave amplitudes in maps
- Levels of amplitude (0-0.3m, 0.3-1m, 1-3m, >=3m) with upper bound included in ranges.
- Add earliest arrival times in table of forecast zones
- Creation of Users Manual for new products
- Limit forecast in first product to domain of a few hours tsunami travel time
- Upgrade forecast based on earthquake mechanism
- Upgrade forecast based on sea level observations used as constraints
- The new products will only be distributed by email to the TWFPs during the experimental phase

The following suggested changes will stay under consideration for later versions of the products:

- Zoomed in maps for all regions (some zoomed-in maps necessary now though, e.g., SCS)
- Addition of historical data in maps
- Estimated arrival times other than first wave
- Add seismic focal mechanism, finite fault

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- Inclusion energy diagram as CISM and/or Google Earth layer files

The following suggested changes will not be implemented at this time:

- Forecast of inundation
- Special identification of tsunami prone areas (except through specific forecast points)
- Error bounds on forecasts (can give general guidance in Users Guide)
- Forecast number of waves
- Forecast time of maximum wave arrival
- Forecast time of last wave above threat threshold
- Use of local time in messages

The following issues are as yet unresolved:

- Review of coastal zone naming convention
- Involvement of Australia in discussions about enhanced warning products
- Which of the new products will be public and which will be restricted to the TWFPs/NTWCs.

The Task Team made the following recommendation to the Steering Committee:

The PTWC should continue with the development of its new products taking into consideration the information presented, discussions, issues raised, and advice of the Task Team during this meeting. PTWC should finalize procedures and software for an initial version of the products, including a Users Guide, and begin issuing the new products in an experimental mode in parallel with current products by February 1, 2013. Unresolved or new issues regarding the products during this development period can be addressed remotely by the Task Team and/or PTWS Steering Committee before the experimental period begins. In addition, the Task Team agreed that before full implementation there will need to be a comprehensive training program on the new products for PTWS Member States to ensure that the products are understood and that Member State SOPs are modified accordingly.

The Steering Committee noted the progress made by the Task Team and endorsed its recommendation. It also considered that training was of the utmost importance as many countries will have to revise their SOPs to deal with the new products.

In addition to the existing Task Team members already nominated, the following potential new Task Team members were identified: Dr Dominique Reymond (French Polynesia), Lt Willington Renteria Agurto (Ecuador), Samoa (Filomena Nelson *pro tem*), Patricio Carrasco (Chile), Malaysia. The chair requested these candidates to obtain formal nomination from their TNCs and forward to the Secretariat as soon as possible.

10.2 DECISIONS, RECOMMENDATIONS AND ACTIONS ARISING FROM STEERING COMMITTEE MEETING

Action: Full review before the next ICG

Task Team on PacWave Exercises

- The Steering Committee requested the PacWave11 Task Team to continue until the 25th Session of the ICG/PTWS to plan and conduct a PacWave Exercise in 2013 under its existing Terms of Reference, noting that the exercise will not be end-to-end and will focus on validation of the enhanced products.

Task Team on Enhancing Products

- The Steering Committee noted the progress reported by the Task Team and requested that PTWC should continue with the development of its new products taking into consideration the information presented, discussions, issues raised, and advice of the Task Team during this meeting. PTWC should finalize procedures and software for an initial version of the

products, including a Users Guide, and begin issuing the new products in an experimental mode in parallel with current products by February 1, 2013. Unresolved or new issues regarding the products during this development period can be addressed remotely by the Task Team and/or PTWS Steering Committee before the experimental period begins. In addition, the Task Team agreed that before full implementation there will need to be a comprehensive training program on the new products for PTWS Member States to ensure that the products are understood and that Member State SOPs are modified accordingly.

Timetable for Implementation of PTWC Enhanced Products

- Announcement of PacWave13: Oct. 1, 2012
- Start trial of Enhanced Products: Feb. 1, 2013
- Conduct PacWave13: April 2013
- Evaluation forms back: by 30 April
- Evaluate PacWave13, validate PTWC new products and procedures: 31 May
- VC/teleconf for TT: as required
- Review/approved by SC just prior to ICG

Training on Enhanced Products

- The Steering Committee requested the Secretariat to work with ITIC and the Working Group chairs to document the record of training conducted and planned, leading up to and beyond the implementation date of the enhanced products.

Attachment III

Exercise Pacific Wave 2013 Guidance

Exercise Aim and Objectives:

The aim of the Exercise Pacific Wave 2013 (PacWave13) is to validate the understanding of the new PTWS PTWC New Products. Participants should:

- Utilise and evaluate the PTWC experimental products, including forecast models and other science information, for timely national hazard assessment.
- Validate the process for issuance of tsunami advice from the PTWC and JMA/NWPTAC and WC/ATWC.
- Validate the process for receipt of tsunami advice by PTWS Tsunami Warning Focal Points.

Although not a primary objective, Member States may also take the opportunity to validate their readiness to respond to a distant/regional source tsunami. These include to:

- Validate the operational readiness of each national tsunami warning centre (NTWC) (or similar in-country function) and the National Disaster Management Office (NDMO).
- Validate that the dissemination of warnings and information/advice by NTWC to relevant in-country agencies and the public is accurate and timely.
- Validate the organisational decision-making process about public warnings and evacuations.
- Validate the methods used to notify and instruct the public.
- Validate the elapsed time until the public would be notified and instructed/advised.

PTWS PTWC Enhanced Products:

In response to Recommendation ICG/PTWS-XXIII.1 (Feb., 2009), the PTWC proposed new products for the PTWS based upon PTWC's improved capabilities in terms of its speed of response and growing ability to forecast impacts. The development of enhanced PTWC products was approved by Recommendation ICG/PTWS-XXIV.3 (May, 2011). The new products are being implemented through a phased process consisting of: 1) introduction in PacWave11, 9-10 November 2011; 2) feedback and improvement in 2012; 3) live issuance of both the current existing and new products starting 15 February 2013; 4) and official changeover to the new PTWC products and discontinuation of the current products in 2014. Training is being made available, on request, to Member States to ensure the products are understood.

The enhancement of PTWS international tsunami products is being guided by the PTWS Task Team on Enhancing Products under Working Group 2 (Detection, Warning and Dissemination). It is working with PTWC to:

- Review the capabilities and plans of the international TWCs with respect to their operational products and product dissemination for the PTWS;
- Gather feedback from Member States regarding international TWC current and planned product content, format, and dissemination;
- Consider best practices based on social science as well as the experiences of the Member States;
- Consider the global harmonization of tsunami warning products and terminology;
- Develop recommendations to improve current products and /or develop new products.

Conduct of table-top exercise:

Exercise Pacific Wave 2013 (PacWave13) will simulate Pacific countries being placed into a ocean-wide major tsunami threat level, and require Member State decision-making to assess their national threat. Member States may also simulate further decision-making steps taken to just prior to public notification. These steps may be played during the exercise dates in real time or the following days.

In each scenario, the simulated tsunami will propagate in real time across the Pacific. An initial "Exercise Start Message" will be issued by the Pacific Tsunami Warning Center (PTWC), the Northwest Pacific Tsunami Advisory Center (NWPTAC), and the West Coast/Alaska Tsunami Warning Center (WC/ATWC). All message products, including both PTWC's current and new products, will be made available through the PacWave13 website, <http://www.pacwave.info> and referred to in the Master Schedule of Events List within the PacWave13 Exercise Manual. It is recommended to download all products that will be used in the Table Top Exercise prior to the exercise date.

A key point is that the exercise is intended to validate the use of the PTWC New Products by National Tsunami Warning Centers and their key stakeholders. PacWave13 does not require conduct through to community level. Further, it is optional to exercise further levels of communication, such as public broadcasts and sirens, and coastal community evacuations.

Due care should be taken so as not to inadvertently alarm the public, and a conservative approach is recommended.



INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
COMMISSION Océanographique Intergouvernementale
COMISIÓN OCEANOGRÁFICA INTERGUBERNAMENTAL
МЕЖПРАВИТЕЛЬСТВЕННАЯ ОКЕАНОГРАФИЧЕСКАЯ КОМИССИЯ
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IOC Circular Letter No. 2481
(Available in English only)

IOC/WWW/TA/BA/ba
Paris, 28 March 2013

- To : ICG/PTWS Tsunami Warning Focal Points (TWFP)
ICG/PTWS Tsunami National Contacts (TNC)
ICG/PTWS Chair and Vice-Chairs
- cc. : Official National Coordinating Body for liaison with IOC in IOC Member States
Permanent Delegates/Observer Missions to UNESCO of IOC Member States
National Commissions for UNESCO in IOC Member States
Directors of UNESCO and IOC Regional Offices in the Asia/Pacific Region
Regional Organizations cooperating with UNESCO/IOC
Director, Pacific Tsunami Warning Center
Director, International Tsunami Information Center

Object : **PTWC Start of Issuance of Pacific Experimental Products, 15 April 2013**
User's Guide for the PTWC Enhanced Products for PTWS (IOC TS-105) ;
PTWS Pacific-wide Tsunami Exercise "PacWave13", 1–14 May 2013
(revised dates)

Through [Circular Letter 2460](#), dated 7 December 2012, we announced the beginning of the trial period for the Pacific Tsunami Warning Center (PTWC) Enhanced Products, as recommended by the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS) at its Twenty-fourth session in May 2011.

Through this Circular Letter we confirm the following two activities in the framework of the ICG/PTWS with revised dates:

- **PTWC will begin issuing its Enhance Products in trial experimental mode starting on 15 April 2013**. The products will be issued live and in parallel with the current existing products, but only via email to the designated PTWS Tsunami Warning Focal Points (TWFP).

.../...

Chairperson

Dr Sang-Kyung BYUN
Principal Research Scientist
Climate Change & Coastal Disaster
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TOGO

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- **Exercise Pacific Wave 2013 should be conducted from 1 to 14 May 2013** by Member States to validate PTWC's Enhanced Products. It is recommended that Member States conduct a table-top exercise in order to measure the understanding and interpretation of the Enhanced Products and their use for national tsunami warning threat assessment.

In this view the *User's Guide for the Pacific Tsunami Warning Center Enhanced Products for the Pacific Tsunami Warning System* has just been released as IOC Technical Series, 105 attached to this letter. The Spanish version for this Guide will be available by the end of April 2013.

All exercise documents, including the *User's Guide*, Exercise Manual, and the exercise messages, will be available for download from the PacWave13 web site <http://www.pacwave.info>. For further exercise guidance, Member States should consult IOC Manuals and Guides, 58 *How to Plan, Conduct and Evaluate Tsunami Exercises* (2012, English, Spanish) available also on the PacWave13 website.

Exercise Pacific Wave 2013

Exercise Purpose

The aim of PacWave13 is to validate the understanding and use of the PTWC Enhanced Products.

Exercise Objectives

The overall objectives of PacWave13 are to evaluate and provide feedback on the PTWC Enhanced Products, specifically to:

1. Evaluate the format and content of the PTWC Enhanced Products for each scenario exercised.
2. Provide feedback that a country is prepared to officially receive and implement and utilize the PTWC Enhanced Products.
3. Provide feedback that a country's stakeholder agencies will be informed on the PTWC Enhanced Products so as to make appropriate future changes to their Standard Operating Procedures.

Date and Conduct of table-top exercise

Exercise Pacific Wave 13 should be held within the period of 1 to 14 May 2013. Three scenarios are available that will allow all Pacific countries to select and exercise a distant/regional/local source tsunami event. Countries are recommended to choose only one scenario to exercise. PacWave13 will simulate Pacific countries being placed into an ocean-wide major tsunami threat level, and will require Member State decision-making to assess their national threat. The exercise is suggested to be a table-top exercise and is not required to be conducted down to community levels.

PacWave13 National Contact Nomination

Member States are strongly encouraged to participate in the exercise. In order to ensure the commitment of participating countries is fully coordinated, we reiterate our call for Member States to nominate a National Contact for PacWave13 with whom we will communicate about planning of the exercise. The designated PacWave13 National Contact will be expected to confirm the accuracy of existing points of contact for the receipt and dissemination of tsunami warnings downstream from the national tsunami warning centre. The designated PacWave13 National Contact will also be responsible for coordinating input to the exercise evaluation tool, which will be circulated as part of the Exercise Pacific Wave 2013 Manual.

For the Member States which have not done so yet, I would be grateful if you could provide the details of your National Contact for PacWave13 by 19 April 2013 to the ICG/PTWS Technical Secretary through email to b.aliaga@unesco.org, cc to laura.kong@noaa.gov. You are also

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encouraged to further disseminate copies of this letter to appropriate organizations and authorities within your country. In the meantime I remain,

Yours sincerely,

[signed]

Wendy Watson-Wright
Executive Secretary, IOC
Assistant Director-General, UNESCO

Enclosures (2): Exercise Pacific Wave 2013 Guidance
*User's Guide for the Pacific Tsunami Warning Center Enhanced Products for
the Pacific Tsunami Warning System*

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Attachment I

Exercise Pacific Wave 2013 Guidance

Exercise Objectives:

The overall objectives of PacWave13 are to evaluate and provide feedback on the PTWC Enhanced Products, specifically to:

1. Evaluate the format and content of the PTWC Enhanced Products for each scenario exercised.
2. Provide feedback that a country is prepared to officially receive and implement and utilize the PTWC Enhanced Products.
3. Provide feedback that a country's stakeholder agencies will be informed on the PTWC Enhanced Products so as to make appropriate future changes to their Standard Operating Procedures.

Each country may expand and/or customise its own objectives for the exercise.

PTWS PTWC Enhanced Products:

In response to Recommendation ICG/PTWS-XXIII.1 (Feb., 2009), the PTWC proposed new products for the PTWS based upon PTWC's improved capabilities in terms of its speed of response and growing ability to forecast impacts. The development of enhanced PTWC products was approved by Recommendation ICG/PTWS-XXIV.3 (May, 2011). The new products are being implemented through a phased process consisting of: 1) introduction in PacWave11, 9-10 November 2011; 2) feedback and improvement in 2012; 3) live issuance of both the current existing and new products starting 15 April 2013; 4) and official changeover to the new PTWC products and discontinuation of the current products in 2014. Training is being made available, on request, to Member States to ensure the products are understood.

The enhancement of the PTWS international tsunami products is being guided by the PTWS Task Team on Enhancing Products under Working Group 2 (Detection, Warning and Dissemination). It is working with PTWC to:

- Review the capabilities and plans of the international TWCs with respect to their operational products and product dissemination for the PTWS;
- Gather feedback from Member States regarding international TWC current and planned product content, format, and dissemination;
- Consider best practices based on social science as well as the experiences of the Member States;
- Consider the global harmonization of tsunami warning products and terminology;
- Develop recommendations to improve current products and /or develop new products.

Exercise Format and Participation:

It is recommended that Exercise Pacific Wave 13 be carried out in a tabletop format (also referred to as a 'discussion exercise', or 'DISCEX').

In each scenario, the simulated tsunami will propagate in real time across the Pacific. All message products will be made available through the PacWave13 website, <http://www.pacwave.info> and referred to in the Master Schedule of Events List within the PacWave13 Exercise Manual. It is

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recommended to download all products that will be used in the Table Top Exercise prior to the exercise date.

In a Table Top exercise, participants are presented with a situation or problem that they are required to discuss and for which they have to formulate the appropriate response or solution. Normally, the exercise requires no simulation other than the scenario and/or prewritten exercise injects. An exercise controller introduces a simulated scenario to participants and, as the exercise advances (in time), exercise injects are further introduced. This type of exercise is used to practice problem solving and coordination of services with or without time pressures. There is no deployment or actual use of equipment or resources.

At a minimum, to meet the objectives of PacWave13, it is recommended that the National Tsunami Warning Center and the National Disaster Management Office, participate.

Exercise Conduct :

Unlike previous exercises, PacWave 13 will *NOT* be played in real time, and thus will have no "dummy" kickoff exercise message. Participant countries may select a scenario and convenient date and time to conduct the tabletop exercise within the 1-15 May 2013 time period.

All international products will be provided online at the Exercise Pacific Wave 13 website (<http://www.pacwave.info>) in advance to help countries plan and prepare. It is recommended to download from the PacWave13 website, the international products and messages for the appropriate scenario prior to the day of the exercise. Each scenario will have a suite of PTWC enhanced product messages and forecasts. The Off-Japan and Manila Trench will also have JMA NWPTAC Tsunami Advisories. The earthquake origin time default date and time of the messages (e.g. 1 May 2013 @ 0000 hours) can be adjusted by participant countries to coincide with their selected tabletop exercise local date and time. Subsequent message traffic issuance date and times should then also be adjusted accordingly.

Evaluation:

All participating countries are asked to provide feedback by completing the online PacWave13 Evaluation Form at https://www.surveymonkey.com/s/pacwave13_eval by 31 May 2013.

ANNEX II

UNESCO/IOC PRESS RELEASE AND SAMPLE TEMPLATE FOR NEWS RELEASE

Thirty nine States, territories, and commonwealths* are taking part in an exercise that will test Pacific Rim countries' reactivity in the event of a tsunami from 1 to 14 May. Organized by the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS), created under the aegis of UNESCO's Intergovernmental Oceanographic Commission (IOC), the simulation aims to validate proposed new tsunami forecasting products of the Pacific Tsunami Warning Center (PTWC) of the United States of America.

The new international products, under development since 2011 and slated for adoption in 2014, include tsunami wave forecasts that will help countries improve their response capability. The enhancements are expected to reduce significantly the number of areas warned unnecessarily and to help provide advanced notice of potential local tsunamis.

Exercise Pacific Wave 2013 (PacWave13), as the test is called, simulates a tsunami warning situation requiring government decision-making regarding three scenarios for possible earthquakes occurring either off the northern coasts of Japan, the Philippines or Chile, that will generate destructive tsunamis. Each country of the Pacific is selecting one of these three scenarios for its participation in the exercise, whose outcome will be evaluated by 31 May 2013. Messages are being sent from the Pacific Tsunami Warning Centre (PTWC) in Hawaii (U.S.A) and the Northwest Pacific Tsunami Advisory Centre in Japan to focal points designated in each country to respond to a threat of tsunami.

The ICG/PTWS was established in 1965 by UNESCO's Intergovernmental Oceanographic Commission following the deadly tsunami that hit the coasts of Chile, U.S.A, and Japan in 1960. The purpose of the Group is to facilitate the speedy dissemination of alerts across the region and to support countries' ability to respond to and mitigate tsunamis locally. PacWave exercises were carried out in 2006, 2008 and 2011.

About 75% of the world's deadly tsunamis have occurred in the Pacific Ocean and connected seas. Four struck the region over the past five years: Samoa, American Samoa (U.S.A.), and Tonga were hit in 2009, Chile in 2010, Japan in 2011, and the Solomon Islands in 2013. Worldwide, an average of one or two local tsunamis have struck every year over the past century.

*Australia, Brunei Darussalam, Canada, China, Colombia, Chili, Cook Islands, Ecuador, El Salvador, Fiji, France, Guatemala, Honduras, Indonesia, Japan, Kiribati, Malaysia, Marshall Islands, Mexico, Nauru, Micronesia, Nauru, New Zealand, Nicaragua, Niue, Palau, Papua New Guinea, Peru, Philippines, Russian Federation, Samoa, Solomon Islands, Thailand, Tokelau, Tonga, Tuvalu, USA (American Samoa, Guam, Northern Mariana Islands) Vanuatu, Vietnam. Kuwait and Pakistan are taking part as observers.

Media contact: Sue Williams, UNESCO Press Service:
+33 (0) 1 45 68 17 06, [s.williams\(at\)unesco.org](mailto:s.williams@unesco.org)

ANNEX III

EXERCISE PACIFIC WAVE 13 SCENARIOS AND MASTER SCHEDULE OF EVENTS LIST (MSEL)

INTRODUCTION

Exercise Pacific Wave 13 involved three scenarios to allow all Pacific countries to select and exercise a regional/local source tsunami event.

Annex III gives the three scenarios that were available, using one of the graphical products types (forecast polygon map), and the International Master Schedule of Events List (MSEL) giving the times and types of message products issued by each International Tsunami Warning Centre (ITWC).

PTWC's enhanced experimental products were used during the exercise, including the use of tsunami wave energy and coastal forecast graphical products, and threat level assessments along prescribed coastal segments. Feedback was first requested on the new products through the PacWave11 exercise evaluation process and enhancements were tested in Exercise Pacific Wave 13.

Scenario Graphical Forecast Polygon Maps

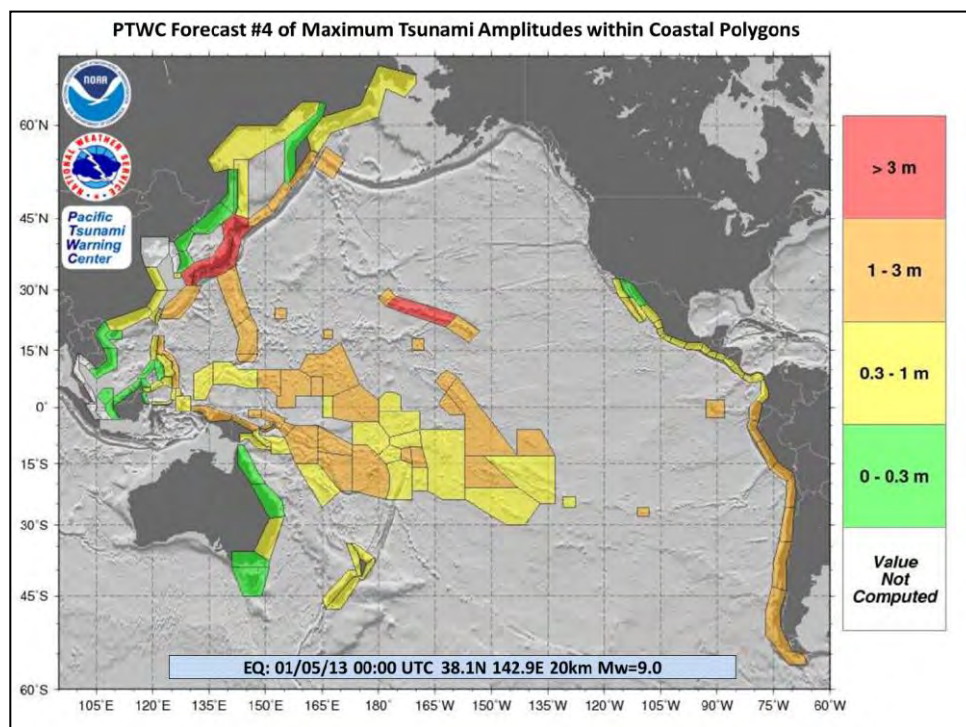


Figure III–1. Off-Northern Japan Scenario

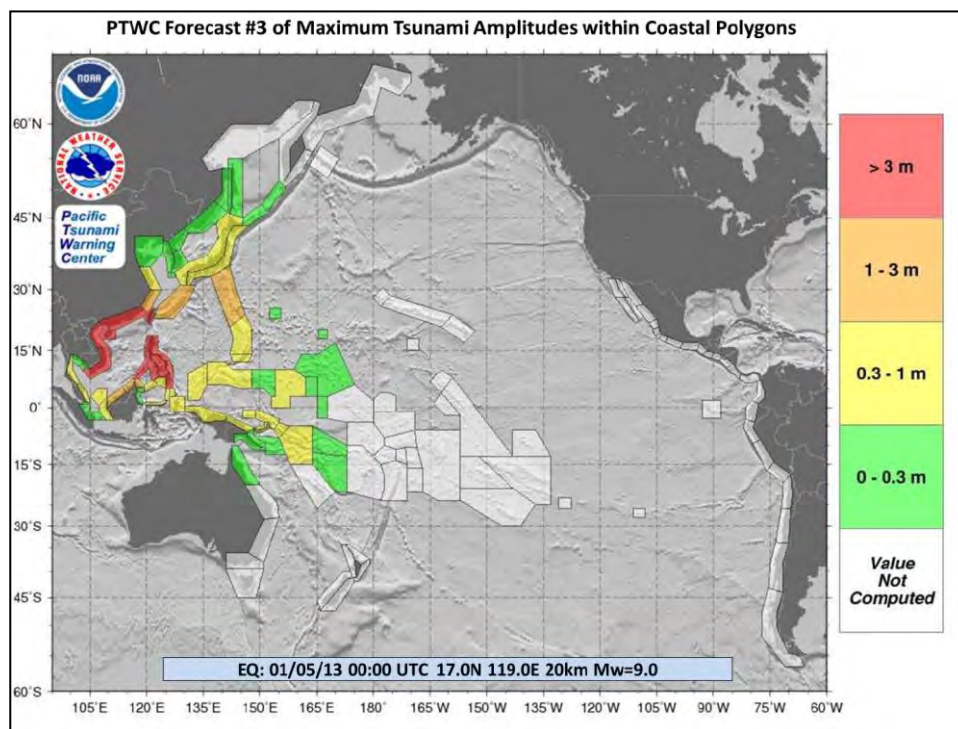


Figure III–2. Manila Trench
Off-Western Philippines Scenario

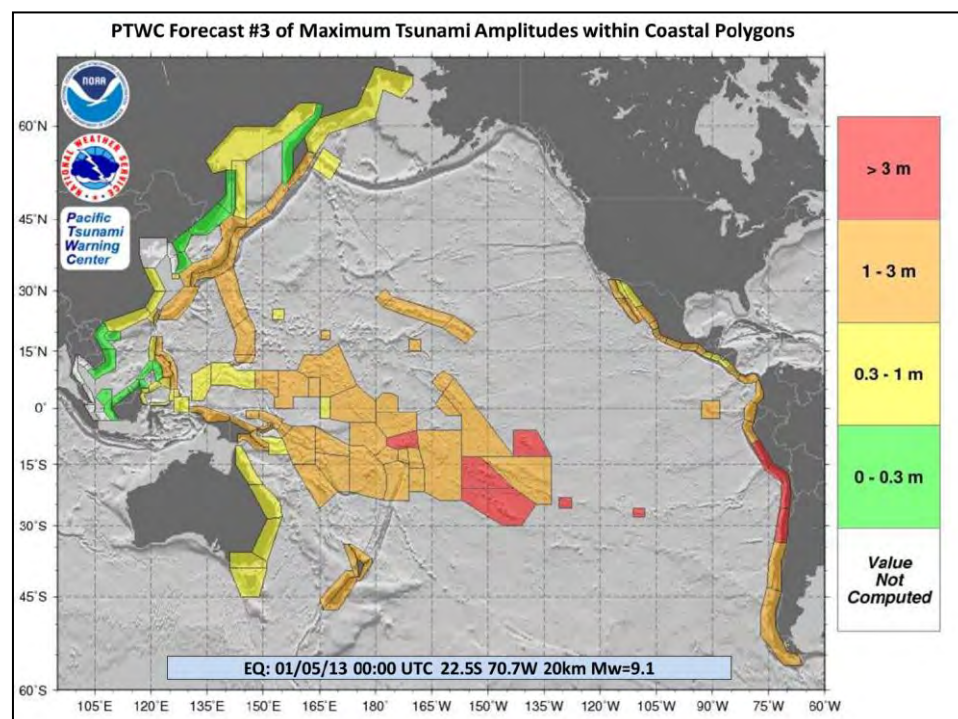


Figure III–3. Chile-Peru Trench Scenario

International Master Schedule of Events List

Scenario	Off Northern Japan 38.1N, 142.9E, 20km, Mw=9.0			
Centre	PTWC		JMA/NWPTAC	
Time (UTC)	#	TYP	#	TYP
0:00	Earthquake Rupture Begins			
0:08		PTWC initial Mw=8.4. First tsunami forecast computed.		
0:10	1	Threat Message with M8.4		
0:15				JMA determines Mw=9.0
0:17			1	Advisory with M9.0
0:25		W-phase CMT completes. Mw=9.0. Forecast updated.		
0:35	2	Threat Message with M9.0		
0:45			2	Advisory with M9.0
		Initial deep ocean tsunami readings. Forecast updated.		
1:30	3	Threat Message with M9.0		
1:40			3	Advisory with M9.0
		More deep ocean tsunami readings. Forecast updated.		
2:30	4	Threat Message with M9.0		
2:40			4	Advisory with M9.0
3:30	5	Threat Message with M9.0		
3:40			5	Advisory with M9.0
4:30	6	Threat Message with M9.0		
4:40			6	Advisory with M9.0
5:30	7	Threat Message with M9.0		
5:40			7	Advisory with M9.0
6:30	8	Threat Message with M9.0		
6:40			8	Advisory with M9.0
7:30	9	Threat Message with M9.0		
7:40			9	Advisory with M9.0
8:30	10	Threat Message with M9.0		
8:40			10	Advisory with M9.0
9:30	11	Threat Message with M9.0		
9:40				
10:30	12	Threat Message with M9.0		
10:40				
11:30	13	Threat Message with M9.0		
11:40				
12:30	14	Threat Message with M9.0		
12:40				
13:30	15	Threat Message with M9.0		
13:40				
14:30	16	Threat Message with M9.0		
14:40				
15:30	17	Threat Message with M9.0		
15:40				
16:30	18	Threat Message with M9.0		
16:40				
17:30	19	Threat Message with M9.0		
17:40				
18:30	20	Threat Message with M9.0		
18:40				
19:30	21	Threat Message with M9.0		
19:40				
20:30	22	Threat Message with M9.0		
20:40				
21:30	23	Threat Message with M9.0		
21:40				
22:30	24	Threat Message with M9.0		
22:40				
23:30	25	Final Threat Message		

Figure III–4. Off-Northern Japan Scenario

Scenario	Manila Trench Off Western Philippines 17.0N, 119.0E, 20km, Mw=9.0			
Centre	PTWC		JMA/NWPTAC	
Time (UTC)	#	TYP	#	TYP
0:00	Earthquake Rupture Begins			
0:08		PTWC initial Mw=8.8. First tsunami forecast computed.		
0:10	1	Threat Message with M8.8		
0:17			1	Advisory with M8.8
0:25		W-phase CMT completes. Mw=9.0. Forecast updated.		
0:35	2	Threat Message with M9.0		
0:45			2	Advisory with M9.0
		Initial coastal tsunami readings. Forecast updated.		
1:30	3	Threat Message with M9.0		
1:40			3	Advisory with M9.0
2:30	4	Threat Message with M9.0		
2:40			4	Advisory with M9.0
3:30	5	Threat Message with M9.0		
3:40			5	Advisory with M9.0
4:30	6	Threat Message with M9.0		
4:40			6	Advisory with M9.0
5:30	7	Threat Message with M9.0		
5:40			7	Advisory with M9.0
6:30	8	Threat Message with M9.0		
6:40			8	Advisory with M9.0
7:30	9	Final Threat Message		

Figure III–5. Manila Trench
Off-Western Philippines Scenario

Scenario	Off Northern Chile 22.5S, 70.7W, 20km, Mw=9.1	
Centre	PTWC	
Time (UTC)	#	TYP
0:00		Earthquake Rupture Begins
0:06		PTWC initial Mw=8.6. First tsunami forecast computed.
0:08	1	Threat Message with M8.6
0:25		W-phase CMT completes. Mw=9.1. Forecast updated.
0:35	2	Threat Message with M9.1
		Initial deep ocean tsunami readings. Forecast updated.
1:30	3	Threat Message with M9.1
2:30	4	Threat Message with M9.1
3:30	5	Threat Message with M9.1
4:30	6	Threat Message with M9.1
5:30	7	Threat Message with M9.1
6:30	8	Threat Message with M9.1
7:30	9	Threat Message with M9.1
8:30	10	Threat Message with M9.1
9:30	11	Threat Message with M9.1
10:30	12	Threat Message with M9.1
11:30	13	Threat Message with M9.1
12:30	14	Threat Message with M9.1
13:30	15	Threat Message with M9.1
14:30	16	Threat Message with M9.1
15:30	17	Threat Message with M9.1
16:30	18	Threat Message with M9.1
17:30	19	Threat Message with M9.1
18:30	20	Threat Message with M9.1
19:30	21	Threat Message with M9.1
20:30	22	Threat Message with M9.1
21:30	23	Threat Message with M9.1
22:30	24	Threat Message with M9.1
23:30	25	Final Threat Message

Figure III–6. Off-Northern Chile Scenario

ANNEX IV

COUNTRY EXERCISE PARTICIPATION

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Exercise Participants	Point of Contact
Australia	YES	Off Northern Chile (Peru-Chile Trench)	Functional and Tabletop	Australian Bureau of Meteorology, Geoscience Australia, Australian Government Crisis Coordination Centre (AGCCC)	Dr Yuelong Miao, Acting Head Tsunami Warning & Ocean Services (Australian Bureau of Meteorology)
Brunei Darussalam	YES				Dr Hj Sidup bin Hj Sirabaha, Acting Deputy Director, Brunei Darussalam Meteorological Department; Sallehudin bin Hj Ibrahim, Senior Superintendent, National Disaster Management Centre
Canada	YES	Off Northern Japan (Japan Trench)	Tabletop	Canadian Hydrographic Service Pacific Region tsunami response staff	Denny Sinnott, Supervisor of Tides Currents and Water Levels (Canadian Hydrographic Service-Pacific Region, Institute of Ocean Sciences)

¹ Orientation, drill, tabletop, functional, full-scale

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Exercise Participants	Point of Contact
Cambodia	NO				Department of Meteorology, Ministry of Water Resources. ITIC asked, with no reply
China	YES	Off Western Philippines - South China Sea (Manila Trench)	Tabletop	National Marine Environmental Forecasting Center, State Oceanic Administration, North Sea Forecasting Center, East Sea Forecasting Center, South Sea Forecasting Center, Liaoning Province Forecasting Center, Hebei Province Forecasting Center, Tianjin Province Forecasting Center, Shandong Province Forecasting Center, Jiangsu Province Forecasting Center, Shanghai Forecasting Center, Zhejiang Province Forecasting Center, Fujian Province Forecasting Center, Guangdong Province Forecasting Center, Guangxi Province Forecasting Center, Hainan Province Forecasting Center, Hong Kong Observatory, Security Bureau and other departments of the Hong Kong Special Administrative Region	Dr Yu Fujiang, Deputy Director (National Marine Environmental Forecasting Center)
China – Hong Kong	YES				HY Mok (Senior Scientific Officer)
China – Macau	NO				ITIC inquired - HKO informed that SOA to provide official info

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Exercise Participants	Point of Contact
Colombia	YES	Off Northern Chile (Peru-Chile Trench)	Orientation	National Tsunami Warning Center (or Corporación OSSO)	Hansjürgen Meyer, Director (OSSO)
Chile	YES	Off Northern Japan (Japan Trench)	Drill and Tabletop	Hydrographic and Oceanographic Service of the Chilean Navy (SHOA)	Lieutenant Commander Miguel Vasquez Arias, Head of Oceanography Department (SHOA, Servicio Hidrográfico y Oceanográfico de la Armada de Chile)
Cook Islands	YES	Off Northern Chile (Peru-Chile Trench)	Tabletop	National Tsunami Warning Center (or Meteorological Service) , National Disaster Management Office, Police, Agriculture, Media, Education, Health, Airport Authority	Arona Ngari, Director (Meteorological Service)
Costa Rica	NO				Jefe de Operaciones, Comisión Nacional de Emergencias. IOC asked
Democratic People's Republic of Korea	NO				No working email; previous contact info listed Met Svc
Ecuador	YES	Off Northern Chile (Peru-Chile Trench)	Tabletop	Instituto Oceanográfico de la Armada, NDMO, ECU911 (Integrated Security Centre), Dirección Nacional de Espacios Acuáticos, Instituto Geofísico	Willington Rentería, Chief of Ocean Science Department (INOCAR, Instituto Oceanografico de la Armada)

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Exercise Participants	Point of Contact
El Salvador	YES	Off Northern Chile (Peru-Chile Trench)	Tabletop	Ministerio de Medio Ambiente y Recursos Naturales (MARN)	Jeniffer Larreynaga, In Charge of Tsunami Unit (MARN)
Federated States of Micronesia – Chuuk	YES	Off Northern Japan (Japan Trench)	Tabletop	Department of Public Safety, Chuuk Weather Service Office, Department of Transportation, Department of Education, Office of the Governor, Disaster Coordinating Office	Frank Cholymay, Coordinator (Disaster Coordinating Office)
Federated States of Micronesia – Pohnpei	YES	Off Western Philippines - South China Sea (Manila Trench)	Tabletop	Weather Service Office, EOC at State Govt. office, EOC at Kosrae State	Eden Skilling, Officer in Charge (WSO Pohnpei)
Federated States of Micronesia – Yap	NO				ITIC asked WFO Guam (Chip Guard) re David Aranug. Did not participate - Aranug on sick leave
Fiji	YES	No Response	No Response	No Response	Malakai Finau, Director Mineral Resources Department (Mineral Resources Dept)
France – French Polynesia	YES	Off Northern Chile (Peru-Chile Trench)	Tabletop	CEA/DASE/LDG	Domique Reymond, Director, CPPT
France – New Caledonia	NO				Chief of MRCC or Maritime Operation Officer, Service de la sécurité civile du Haut

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Exercise Participants	Point of Contact
					commissariat de la République en Nouvelle Calédonie. ITIC and IOC asked, with no reply
France – Wallis & Futuna	NO				Administration Supérieure des Îles Wallis et Futuna, ITIC asked, with no reply
Guatemala	YES	Off Northern Chile (Peru-Chile Trench)	Tabletop	Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología (INSIVUMEH) Coordinadora Nacional para la Reducción de Desastres (CONRED)	Eddy Hardie Sanchez Benett, Director General. (INSIVUMEH)
Honduras	NO				TWFP are Mr. Alberto Tenorio, Fisico Sismologo, Universidad Nacional de Honduras, Mr. Juan Jose REYES, Jefe de la Unidad del Sistema de Alerta Temprana. ITIC asked with no reply. Comisión Permanente de Contingencias.
Indonesia	YES	Off Northern	Tabletop	1. NTWC : BMKG Headquarter 2.	Dr Prih Harjadi,

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Exercise Participants	Point of Contact
		Japan (Japan Trench)		BMKG Regional (Jayapura - Papua, and Manado - North Sulawesi). 3. NDMO Jakarta 4. Local DMO (Jayapura - Papua and Manado - North Sulawesi) 5. National TV Media (Metro Tv) 6. Local Media (TV and Radio : Jayapura - Papua and Manado - North Sulawesi)	Director for Earthquake and Tsunami Center Meteorological Climatological and Geophysical Agency
Japan – JMA NWPTAC	YES	Provided messages – Japan, Manila Trench		Japan Meteorological Agency (Northwest Pacific Tsunami Advisory Center)	Yohko Igarashi, Chief, International Tsunami Information Section (JMA)
Kiribati	YES	Off Northern Japan (Japan Trench)	Tabletop	Kiribati MET Service (Office of the President), NDMO (Office of The President)	Ueneta Toorua (Forecaster), Kamaitia Rubetaake (Assistant Climate Officer) Michael Foon (Policy Officer-DRM/NDMO)
Malaysia	YES	Off Western Philippines - South China Sea (Manila Trench)	Functional	Malaysian Meteorological Department, NDMO, Police, Search & Rescue, and Civil Defense	Irene Eu Swee Neo, Principal Assistant Director (Malaysian Meteorological Department)
Marshall Islands	YES, cancelled to Natl Drought Emergency				Reggie White (Weather Service Office)
Mexico	YES	Off Northern Japan (Japan Trench)	Drill	Centro de Alerta de Tsunamis, Secretaría de Marina, Secretaría de Gobernación, Secretaría de Comunicaciones y Transportes (Capitanía de Puerto,	Capitán de Navío CG DEM, Luis Ignacio Islas Martinez de Pinillos, Director (Centro de Alerta de

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Exercise Participants	Point of Contact
				Administración Portuaria Intergral), Comisión Federal de Electricidad	Tsunamis) PacWave13 evaluation also submitted by Oscar Guzman, Research (IOP)
Nauru	YES	Off Northern Chile (Peru-Chile Trench)	Tabletop	National Tsunami Warning Center, National Disaster Management Office, and Flight Information Center conduct role of NTWC as their secondary role.	Roy Harris, Deputy National Controller (Nauru Disaster Risk Management)
New Zealand	YES	Off Northern Chile (Peru-Chile Trench)	Tabletop	Ministry of Civil Defence & Emergency Management (MCDEM) and GNS Science	Jo Guard, Team Leader National Operations (Ministry of Civil Defence and Emergency Management)
Nicaragua	YES	Off Northern Chile (Peru-Chile Trench)	Functional	1. Instituto Nicaragüense de Estudios Territoriales (INETER 2. Secretaría Ejecutiva del Sistema para la Prevención, Mitigación y Atención de Desastres (SINAPRED) 3. Defensa Civil 4. Alcaldías 5. Instituciones gubernamentales	Angelica Munoz Director of Geophysics (Instituto Nicaragüense de Estudios Territoriales_
Niue	YES	Off Northern Chile (Peru-Chile Trench)	Tabletop	Niue Met Service, NDMO Office - Police	Sionetasi Pulehetoa, Director (Niue Meteorological Service)
Palau	YES	Off Western Philippines - South China Sea (Manila	Tabletop	Weather Service Office Koror, NDMO, NEMO	Alonzo Kyota, Coordinator (NEMO)

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Exercise Participants	Point of Contact
		Trench)			
Panama	NO				IOC asked; Country did participate to Regional Training (Feb 2013)
Papua New Guinea	NO				Mathew Moihoi, PMGO. PacWave13 Contact but did not participate
Peru	YES	Off Northern Chile (Peru-Chile Trench)	Drill	National Tsunami Warning Center, National Disaster Management Office	Commander Atilio Aste Evans, Sub - Lieutenant Ceci Rodriguez Cruz (Peruvian Tsunami Warning Center (CNAT), Oceanography Department, Directorate of Hydrography & Navigation, Peru Navy)
Philippines	YES	Off Western Philippines - South China Sea (Manila Trench)	Tabletop		Ishmael Narag, Officer-in-Charge, Seismological Observation and Earthquake Prediction Division (Philippine Institute of Volcanology and Seismology)
Republic of	NO				ITIC inquired with no

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Exercise Participants	Point of Contact
Korea					reply
Russian Federation	YES	Off Northern Chile (Peru-Chile Trench)	Tabletop	Sakhalin Tsunami Warning Center Primorje Tsunami Warning Center Kamchatka Tsunami Warning Center National Disaster Management Office Sakhalin branch of Geophysical Service of Russian Academy of Science	Tanya Ivelskaya, Chief (Sakhalin Tsunami Warning Center)
Samoa	YES	Off Northern Chile (Peru-Chile Trench)	Functional	National Tsunami Warning Center, National Disaster Management Office	Siosina Lui, Alternative Point of Contact (Meteorology Division)
Singapore	NO				Patricia Ee, Director (Weather Services Department), Meteorological Service Singapore/ National Contact but did not participate.
Solomon Islands	YES	Off Northern Japan (Japan Trench)	Tabletop	NTWC, NDMO	David Hirisia, Director (Meteorological Service)
Thailand	YES	Off Western Philippines - South China Sea (Manila Trench)	Tabletop	National Disaster Warning Center	Capt. Song Ekmahachai, Acting Director, Warning and Dissemination Section, (National Disaster Warning Center)
Timor Leste	NO				ITIC asked, emails bounced, JTIC contacted with no

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Exercise Participants	Point of Contact
					reply
Tokelau	NO				NZ and IOC sent email inviting them to participate and join IOC; Possible contact Jovilisi V Suveinakama, General Manager, Apia (National Public Service), Office of the Council for the Ongoing Government of Tokelau, Tokelau Apia Liaison Office
Tonga	YES	Off Northern Chile (Peru-Chile Trench)	Tabletop	Tonga Meteorological Service, NDMO, Geological Unit National Emergency Management Office (NEMO)	Moleni Tuuholoaki, Senior Forecaster (Tonga Meteorological Service)
Tuvalu	YES	Off Northern Chile (Peru-Chile Trench)	Tabletop	National Tsunami Warning Center (or Tuvalu Met Svc), National Disaster Management Office, and Red Cross.	Hilia Vavae, Chief Meteorological Officer (Tuvalu Met Svc)
UK – Pitcairn Islands					ITIC asked, emails bounced
USA – PTWC	YES	Provided messages - All scenarios			Brian Yanagi (ITIC), Charles McCreery (Pacific Tsunami Warning Center)
USA – American Samoa	YES	Off Northern Japan (Japan Trench)	Tabletop	American Samoa (AS) Dept of Homeland, NOAA Weather Service Office Pago Pago	Brian Yanagi (ITIC), Carol Baqui, Hans Malala (National Weather Service Pago Pago)

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Exercise Participants	Point of Contact
USA - Hawaii	NO				Brian Yanagi (ITIC), Charles McCreery (PTWC), Doug Mayne (Hawaii SCD Director)
USA – Guam	YES	Off Northern Japan (Japan Trench)	Tabletop	Guam Homeland Security, NOAA Weather Forecast Office Guam	Brian Yanagi (ITIC), Chip Guard (Weather Forecast Office Guam), Pilar Carbullido and Rolando Delfin (Guam OCD)
USA – Northern Mariana Islands	YES	Off Northern Japan (Japan Trench)	Tabletop	US Commonwealth of Northern Mariana Islands (CNMI) Homeland Security	Brian Yanagi (ITIC), Juan Camacho (Emergency Management Office)
Vanuatu	YES	No Response	No Response	Vanuatu Meteorology & Geo-Hazards Department	David Gibson, Manager-Forecasting & current Act/Director (Vanuatu Meteorology & Geo-Hazards Department)
Vietnam	YES	Off Western Philippines - South China Sea (Manila Trench)	Tabletop	Earthquake Information and Tsunami Warning Center, National Disaster Management Office	Nguyen Hong Phuong, Deputy Director Earthquake Information and Tsunami Warning Center
Other Regions					
Pakistan	NO				Zahid Rafi (Pakistan Meteorological

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Exercise Participants	Point of Contact
					Department)
Kuwait	NO				Khaled Al-Banna (Kuwait Institute for Scientific Research)

ANNEX V

POST-EXERCISE EVALUATION COMPILATION

This Annex contains a compilation of the responses provided by countries to the Exercise Pacific Wave 13 post-exercise evaluation form (Annex II, [IOC/2013/TS/106Vol.1rev.](#)). Altogether, 34 countries submitted evaluation forms between May and July 2013. Results were compiled using the Survey Monkey software tool.

Country participation in Exercise Pacific Wave 13 and submission of the post-exercise evaluation survey is summarized in ANNEX IV. Surveys were completed online through the Survey Monkey online survey and questionnaire tool, or submitted by transmittal of the completed survey file to the PacWave13 Chairs. Surveys submitted to the Chairs were then input manually into the online tool in order to create a summary comprised of all responses. Several countries submitted multiple evaluations to reflect the participation and experience of their agencies. Where submissions were from different agencies within the same country, these were combined into a single survey to facilitate compilation.

However, geographically-distinct, sub-jurisdictions of Micronesia (Chuuk, Pohnpei, Yap, federal) and the United States (PTWC, American Samoa, Commonwealth of the Northern Marianas, Guam) were kept as independent survey responses. The Survey was available in English only at https://www.surveymonkey.com/s/pacwave11_eval

The Survey was divided into three sections according to the PacWave13 objectives, and evaluation statements and questions focused on different components of the warning and response process.

For each question, a short statement is provided that summarizes the responses, and this is followed by comments provided by countries by geographical sub-region. Translations of Spanish comments into English were done by ITIC.

Country Exercise Scenario: Select scenario used:

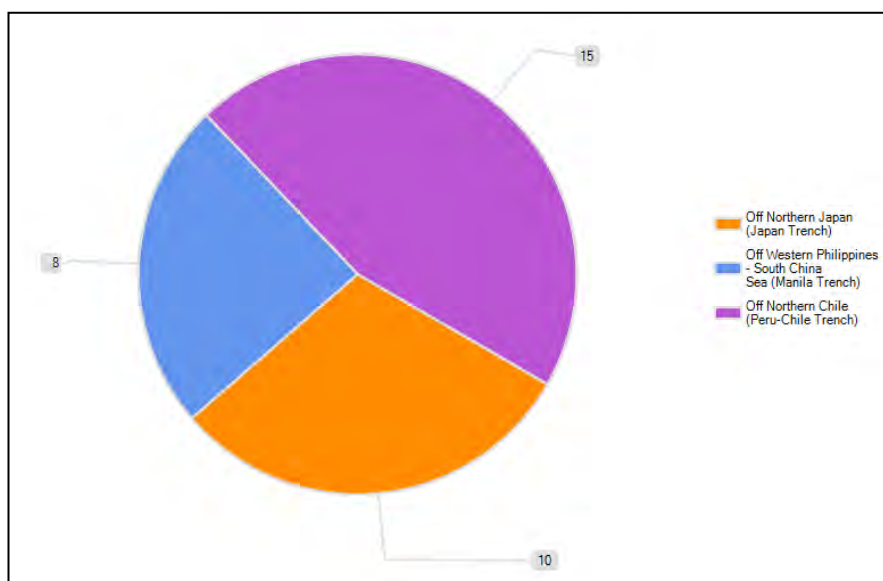


Figure V-I. Scenarios used during Exercise Pacific Wave 13

Nearly half of the countries (45%) used the Off Northern Chile tsunami source, while 30% selected the Off Northern Japan source. Countries bordering the South China Sea (~25%) selected the Off Western Philippines source.

Type of exercise: Select the type of exercise used for PacWave13:

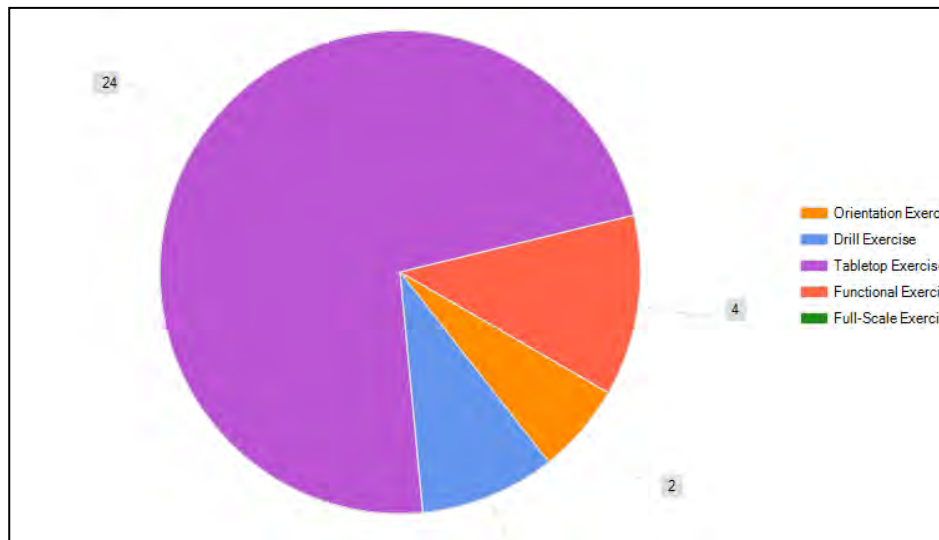


Figure V–II. Type of exercise used for PacWave13

The majority of countries (73%) conducted a tabletop exercise.

OBJECTIVE 1

- 1.1 Are the following products useful in helping you assess your national tsunami threat? Indicate Yes or No, and provide comments as needed. If your answer is No, please comment on why it is not useful.

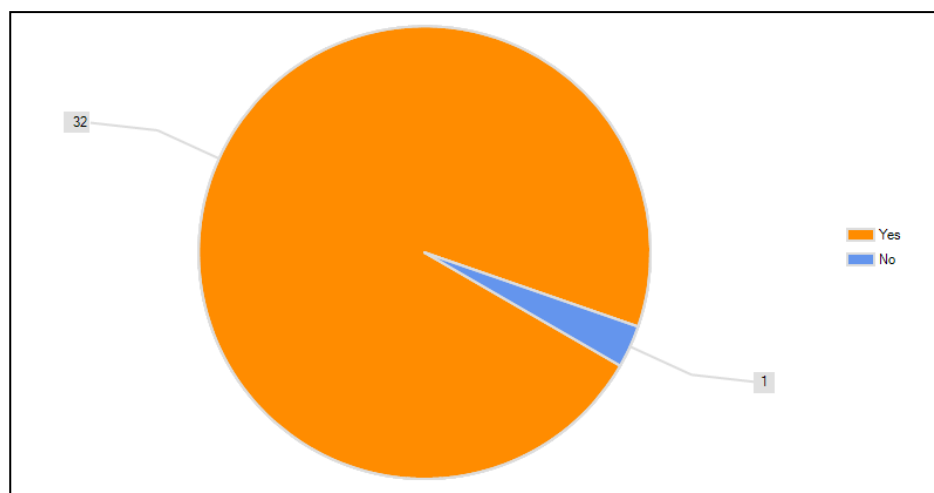


Figure V–III. Usefulness of PTWC enhanced products

The responses received for this question were nearly unanimous in agreement that the products are useful in helping countries assess their national tsunami threat. In detail, however, there are still minor edits and improvements that should to be made during finalization and before they are implemented.

The following information highlights responses from countries:

Text Message

- “Text message” is useful, but after Test Tsunami Threat Message the Preliminary Earthquake Parameters appear. Actual bulletin from PTWC shows us these parameters at the first page, helping to make fast decisions to our operators. (Peru)
- Bold face headings. Ex. Tsunami Threat Message, Recommended Actions and Potential Impacts. Be consistent and use standard conversions throughout text message. (Palau)
- Yes, easier to read and understand. (Pohnpei Weather Service Office, WSO)
- Yes, if the information given is nearly accurate. Time of arrival is ok but the points along the coastlines were wrong for Tongatapu. Two of the points were located inland and not along the coastline. (Tonga)

Forecast Polygon Map

- Models & Products: Useful forecasting tool and good visual aid for both local NWS and DMO. Wave heights and threat levels are good to know in advance for forecast and public warning. Would prefer to see feet versus meters. (United States)
- “Forecast Polygon Map” should add with a star like epicentre where earthquake have happened. In this exercise Polygon Map doesn't show where the epicentre was. (Peru)
- The graphs give a clear picture of the risk areas. (Cook Islands)
- The measures given by a colour scale are difficult to read for the small islands. (French Polynesia)

Forecast Polygon Table

- The forecast Polygon Table does not have the variables definitions, and does not give more information than the graphic products. (Chile)
- “Forecast Polygon Table” contribute a little bit in information but not like other PTWC products. We think that is irrelevant for our operators because shows: maximum, mean, median and STD no useful for fast decision. But it is important information for a next tsunami analysis in the following bulletins. (Peru)

Energy Forecast Map

- “Mucha ayuda para ver la trayectoria del tsunami y el tiempo estimado de arribo”. (Mexico/Guzman). Translated: Very helpful to see the trajectory and estimated time of arrival of the tsunami.
- The Energy Forecast Map does not give coastal amplitude information. (Chile)
- “Energy Forecast Map” is general and visual information when earthquakes happen. We think it is useful for visualizer wave directionality and which country will be threatened. (Peru)

Coastal Forecast Map

- Coastal Forecast Map is very useful and understandably because we need to know predicted tsunami wave amplitude in our coast. “Coastal KMZ file” is very useful but we need to know what is the different between Green Law and without Green Law for

a decision fast in tsunami. Legend is not the same value according file KMZ attachment. (Peru)

Coastal KMZ File

- All of the products (with some modifications) are useful for responders but the KMZ file may cause confusion particularly if it is made public. It is, however, useful for our Tsunami Experts panel and Duty Officers. (New Zealand)

Other Comments

- American Samoa: Models & Products: Useful forecasting tool and good visual aid for both local NWS and DMO. Wave heights and threat levels are good to know in advance for forecast and public warning, yet in this exercise it did not change throughout the 24 products. Will product change if wave height is higher or lower, and is the availability of models only made available in beginning or will it change and provided if new data or information is available? Guam: Would prefer to see feet versus meters. (United States)
- All the products were useful however we think that having a historical record of the past events of tsunami warnings being issued for Tuvalu and their corresponding earthquake measurements and site observations of sea levels and other information that were available during these events would be useful. (Tuvalu)
- All products are useful for assessment. (Vanuatu)
- The Yes answer to each product is made to help you collate feedback by pretending that Joint Australian Tsunami warning Centre (JATWC) rely on your products for its warning preparation. The reality is that JATWC conducts own independent threat assessment in the operational environment. The coastal KMZ file was not viewed during the exercise but was reviewed post. (Australia)
- These products are useful in helping to assess Brunei's national tsunami threat by providing extra information and data in addition to seismic data that are provided by its National Seismic Centre. (Brunei)

1.2. Please rank the products in order of their usefulness from 1 to 6, where 1 is the most useful product and 6 is the least useful product?

	1	2	3	4	5	6	Rating Average	Rating Count
Text Message	87.9% (29)	0.0% (0)	3.0% (1)	0.0% (0)	6.1% (2)	3.0% (1)	1.45	33
Forecast Polygon Map	0.0% (0)	42.4% (14)	21.2% (7)	15.2% (5)	12.1% (4)	9.1% (3)	3.24	33
Forecast Polygon Table	3.0% (1)	12.1% (4)	24.2% (8)	21.2% (7)	21.2% (7)	18.2% (6)	4.00	33
Energy Forecast Map	6.1% (2)	24.2% (8)	15.2% (5)	33.3% (11)	12.1% (4)	9.1% (3)	3.48	33
Coastal Forecast Map	3.0% (1)	15.2% (5)	30.3% (10)	18.2% (6)	30.3% (10)	3.0% (1)	3.67	33
Coastal KMZ file	0.0% (0)	6.1% (2)	6.1% (2)	12.1% (4)	18.2% (6)	57.6% (19)	5.15	33
answered question								33

Table V–I. Ranking of usefulness of the enhanced products

The responses received ranked the text message (88%) as the most useful product, followed by the forecast polygon map (42%). Moderately useful products were the coastal forecast map, energy forecast map, and forecast polygon table. The coastal KMZ file was ranked the least useful product.

The following information highlights responses from countries:

- Graphical displays (such as coastal forecast map and energy forecast map) are more easily understood by NDMC and other stakeholder agencies whereas text message and forecast polygon table provide useful information and data to NSC and TWFP (MET) for assessment of national tsunami threat. Forecast polygon map provides less useful information in that Brunei is a small country and its 'polygon' is better viewed as a bigger polygon together with Malaysia's coasts. (Brunei)
- All products are important (Vanuatu)

1.3. Format and Content: Is your country satisfied with the format and content of PTWC enhanced products? Indicate Yes or No, and provide comments as needed. If your answer is No, please provide comments on what improvements are needed.

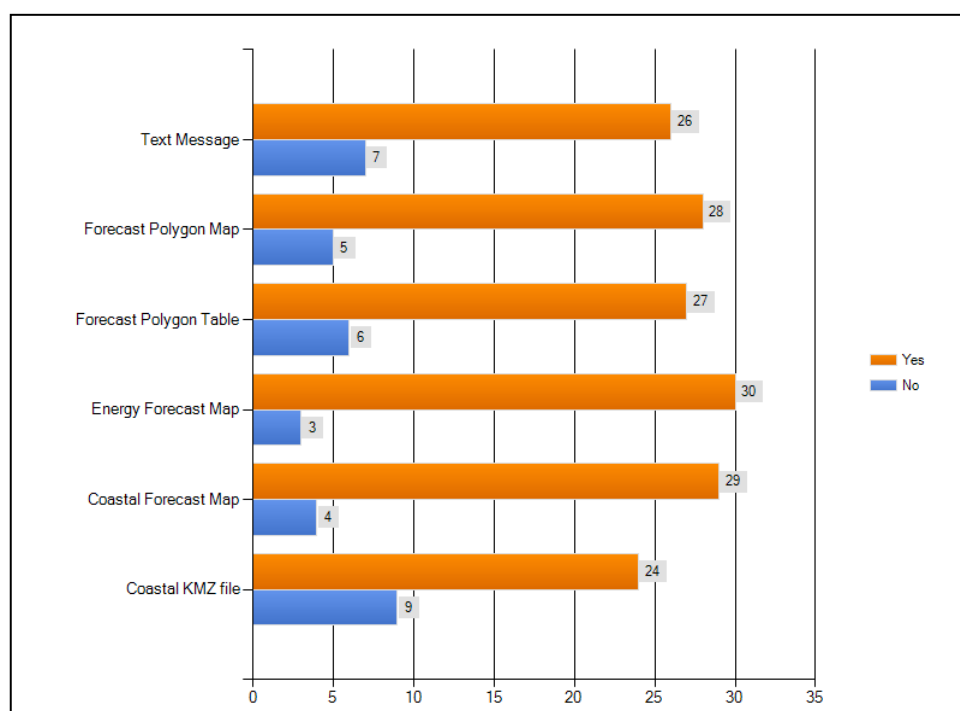


Table V–II. Satisfaction of format and content
of PTWC enhanced products

The responses for this question indicate strong majority (73 – 91%) agreement that the format and content of PTWC enhanced products are satisfactory by countries.

The following information highlights responses from countries:

Text Message

- We would like to add in the text message more sites of estimated arrival time forecast for El Salvador. For example: La Unión, La Libertad or Bahía de Jiquilisco. (El Salvador)

- The enhanced products are very clear, visual and easy to use. But it should be better if earthquake parameters are at the top of text messages or are more emphasized. (Russian Federation)
- Text message: Magnitudes need to be bolder and change font size. Change meters to feet and kilometres to miles. (United States)
- Text Message: There were no estimated time of arrival and actual observations specified for locations along the coast of southern China. We need a specified time and figure for reference (e.g. Hong Kong). (China)
- Text Message (Brunei)
 - When PTWC issues a Tsunami Threat Message listing Brunei as one of the affected countries with a coastal tsunami threat forecast of 1–3 metres, an Estimated Time of Arrival (ETA) of initial tsunami wave to a coastal point (location) in Brunei should also be made available in the Tsunami Threat Message itself.
 - A definitive statement such as ‘Individual country via its National Tsunami Warning Centre will be responsible for issuing national alerts (e.g. watches/warnings/cancellations) should be included in the Text Message to avoid any unnecessary misunderstandings or misinterpretations by other stakeholders agencies or the public.
- The text message mentions tsunami waves reaching Malaysia is 0.3 to 1 metres but there are no locations for Malaysia in the estimated times of arrival. With regards to the coastal KMZ file, our computers cannot download KMZ format. (Malaysia)
- The first Text Message bulletin is too long; it is better just considering one page with pertinent information. (Chile)
- The initial section in text messages which contains the reservations is much more singled out and stronger in the current bulletins (‘...only national and local government agencies have the authority...’) than in the enhanced text message (‘....It is issued as advice in support of...’), where it should be at least as strong. Our only failure to cancel a warning in time (Peru, 2007), entailing unnecessary evacuations, occurred when persons with immediate access to mass media made PTWC bulletins public and asked for evacuations. It may be convenient that this introductory part of the enhanced text messages states that national authorities have the task of evaluation (using historical information, local models and current local tide data) and thus the levels of threat and warning may change. (Colombia)
- Font: Font is too small especially with the additional words (summary). Bulleting numbers needs to be highlighted or in Bold especially with the additional Headers. Layout: The date and bulletin numbers need to be at the beginning of the headers before the other headers (WMO) Parameters: The earthquake parameters needs to be the first information available followed by the evaluation and threat forecast The current layout is informative and good but the parameters needs to be the first information that draws your attention followed by the evaluation and forecast. (Samoa)
- Too much information. Bulletins were 7 pages averaged. We have very limited resources (fax ribbon and foolscaps). (Tonga)
- No for all we’re not satisfied because without the text message we won’t be able to draw conclusions on a watch or warning status, we need to build capacity to understand the graphs and tables and so though. (Tuvalu)

- Text messages are all in Upper Case. Maybe only used in major headings and important text that needs to be highlighted. (Australia)
- Text Message: Overall the changed format is an improvement, however we have the following comments:
 - It would be useful to add another bullet point in the 'potential impacts' section that outlines what the implication of the wave period is.
 - A revised magnitude should be highlighted in some way in the 'evaluation' section as this is important information that currently does not stand out.
 - We would prefer to see the list of affected countries in the 'tsunami threat forecast' section appear in alphabetical order.
 - Like above, we would also prefer to see the list of countries in the 'Estimated Times of Arrival' list in alphabetical order (as a first column), followed by the forecast points for each country (in the second column).
 - We will review the list of forecast points and their naming conventions. (New Zealand)

Forecast Polygon Map

- As for the forecast polygon map, please see the comments for Question 1.4. (Japan).
- The forecast polygon map shows a low resolution for Chile. (Chile)
- All products are useful for our decision. It would be desirable each country may have this ability to develop locally diagnosis and products. (Ecuador)
- Polygon locations not clear on the map in terms of what countries/islands they represent. Meaning of the polygon legend of "Value Not Computed" not clear unless full knowledge of the User Guide. Also not clear whether wave amplitude is above normal tide. Suggest adding next to the legend "Wave Amplitude above astronomical tide". Inconsistency of the coverage area among maps for forecast #1 polygon map area should be for a smaller, consistent with the other maps. (Australia)
- Forecast polygon map (New Zealand)
 - Overall, we agree that the map provides a quick graphical view of where the tsunami threat is forecast and the level of threat. The Chatham Islands (New Zealand) is absent and this will need to be added.
 - Adding a star for the earthquake epicentre (like in other maps) will be useful.

Forecast Polygon Table

- Although satisfied with the content of the Forecast Polygon Table we did find it a little confusing. (Canada)
- Forecast Polygon Table: It is so busy; too much information for the decision maker. (United States)
- The Forecast Polygon Table does not give more information than the graphic products. (Chile)
- "Forecast Polygon Table" contributes a little bit in information but not like other PTWC products. We think that is irrelevant for our operators because shows: maximum, mean, median and STD no useful for fast decision. But it is important information for a next tsunami analysis in the following bulletins. (Peru)

- Provide a quick and general view of tsunami threat, shows a threat, maximum, mean, median forecast coastal tsunami, shows the maximum tsunami amplitude at each place in deep ocean, it shows how tsunami directed away from threat. (WSO, Pohnpei)
- Better description of the main headings on the polygon table, e.g., positive wave amplitude, minimum depth of water to qualify as “offshore”, and the implied depth of water for “coastal”. (Australia)
- Forecast Polygon Table (New Zealand)
 - This was useful to the Tsunami Experts Panel.
 - The text 'fell over' to the next line and became confusing – if possible all lines of text should remain on one line only.
 - We would also prefer to see the list of countries in alphabetical order.

Energy Forecast Map

- Energy Forecast Map does not give coastal amplitude information. (Chile)
- Energy Forecast Map. We take it that these are the maps titled “PTWC Ocean Tsunami Amplitude Forecast”. This map was quite useful, however, we recommend removing the numbers off the map indicating amplitudes in open-ocean as this could potentially be confusing or provide a false sense of comfort if ending up in the wrong hands. (New Zealand)

Coastal Forecast Map

- Coastal Forecast Map shows a variable distribution of ranges, making difficult to identify the wave amplitudes. (Chile)
- Map Title of the “Coastal Tsunami Amplitude Forecast” should include Estimated Time of Arrival to reflect the arrival time contours on the map. Epicentre mark is not on all maps. (Australia)
- Coastal Forecast Map. New Zealand did not find this map useful for response users, but will be useful for our Tsunami Experts Panel. So useful for tsunami scientists but not responders or the public. It could clash with or cause confusion against our own threat forecast that is also shown in maps using different colours for the threat levels and are more refined (i.e. 6 threat levels are used). We understand that this map could be useful for countries that do not conduct their own threat modelling and therefore suggest that the receipt of these maps be optional for individual countries. (New Zealand)

Coastal KMZ File

- Coastal KMZ file: Takes too long to set up in an operational mode. (United States)
- Kmz product is more useful for check the details information, using a software. (Chile)
- The size of the files might be a bit too big for some stakeholders especially the Kmz files due to the slow connections of internet. (Cook Islands)
- Coastal KMZ forecast. This is a useful product but we can see that it depends largely on your country having good bathymetry data; perhaps it is good to make known some of the limitations of this tool. (Samoa)
- Coastal KMZ file.

- This map is ok for use by those who understand how to interpret it, but like above we feel this could be quite confusing if the public were to get hold of it. The dots / scale do not match the colour scale used in New Zealand.
- The scale for the Chile scenario had incorrect colours (i.e. A dark brown series of dots appeared on the KMZ file but the associated scale did not have the same colour so this was very confusing). (New Zealand)

Other Comments

- Since new bulletins seem to become longer, we would appreciate it if you could add a symbol such as #, \$, etc. where you updated in your bulletin; for example, when you update the observed tsunami heights, could you mark values which have changed? Also, if the earthquake information is placed a little upper in the bulletin, it would be easier for us to find out for which event the bulletin is. (Japan)
 - The Tuamotu Archipelago is not concerned by tsunami warning, and they never experience or observe tsunami during the past because there is no tsunami amplification in these islands. The tsunami heights given (about 4 meters) for Tuamotu Archipelago should produce some panic for the authorities because these islands are only made of atoll without any high point or tsunami evacuation zone. Consequently it should be preferable to not mention the Tuamotu Archipelago in the Forecast Polygon table and map. (French Polynesia)
 - It would be good to include the country names on the map. Niue would like to be seen on the map. (Niue)
 - Yes, we've been using it for years and so long as the enhanced products are made simple to use. (Vanuatu)
- 1.4. Format: The forecast polygon map is intended to provide a very quick and general view of where a tsunami threat is forecast and the level of that threat. Is this map useful for that purpose? Indicate Yes or No, and provide comments as needed.

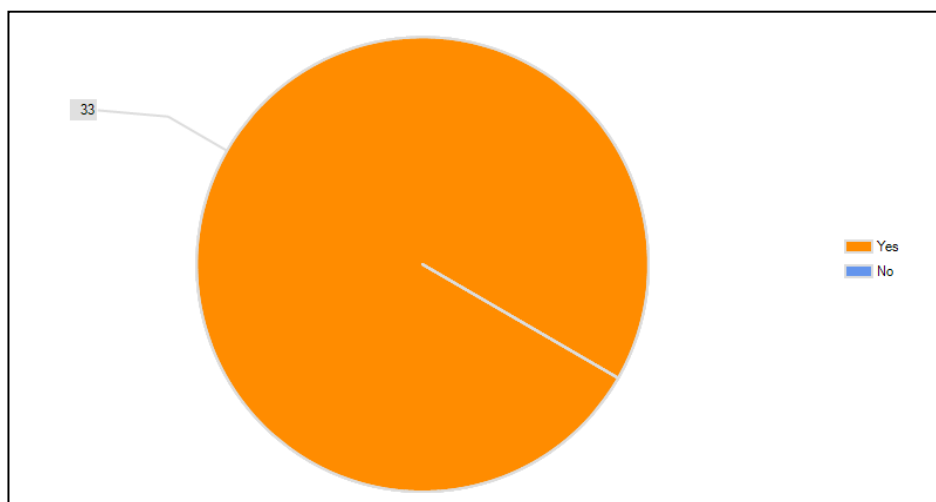


Figure V–IV. Usefulness of forecast polygon maps

The responses for this question indicate unanimous (100%) agreement that the forecast polygon map is useful to provide a very quick and general view of where a tsunami threat is forecast and the level of that threat.

The following are all comments from countries:

- But sometimes the forecast was false and the danger it's inside the institution because the people didn't believe it. (Mexico)
- It is easy and convenient to grasp the forecast threat. However, which text message to link is not clear. Currently, the map shows only the number such as "#1" but if you could add the time of issuance and the information on which text message to link, it would be appreciated. This request is not only for the polygon map but for others, including the polygon table too. Also, we would appreciate it if you could plot the epicentre on the map. There is a possibility that another earthquake occurs while tsunami bulletins are in effect. In the case, we need to know which map is for which event. (Japan)
- But for local stakeholders who are not familiar with the limitations of the map, it might create confusion since some polygons cover a large extent. (Philippines)
- Yes, this map is useful for that purpose. However, Brunei is a small country and in that sense, the map provides limited information for the country. (Brunei)
- For Chilean case, the dedicated maps are used to have an evaluation of distant tsunamis. (Chile)
- It is an excellent product for a quick and preliminary decision making. (Ecuador)
- Forecast Polygon Map is useful and necessary because it shows the threat in four levels and it is very understandably. We were wondering if PTWC could make this polygon in KMZ format. It will visualize with program Google Earth. (Peru)
- Great product. (Cook Islands)
- Same remark (i.e. yes) for Tuamotu Archipelago. (French Polynesia)
- More clarifications on Maximum Tsunami Amplitude with Coastal Polygons Map. How does one differentiate the two? (Palau)
- Provides a quick and general view of tsunami threat, given a colour depending upon his maximum level of threat. (WSO, Pohnpei)
- This is very useful and important because it gives at least an approximate idea of what the reality will be like, so it is important. (Vanuatu)
- Yes but polygon locations are not clear on the map in terms of what countries/islands they represent. (Australia)
- Yes, we agree that the map provides a quick graphical view of where the tsunami threat is forecast and the level of threat. It is missing the Chatham Islands (New Zealand) and this will need to be added. Indication of the earthquake epicentre will also add value from a quick interpretation perspective. (New Zealand)

- 1.5. Content: Are the proposed forecast polygons and their names appropriate and useful for your country or area of responsibility? Indicate Yes or No. If No, please suggest alternatives that would be better.

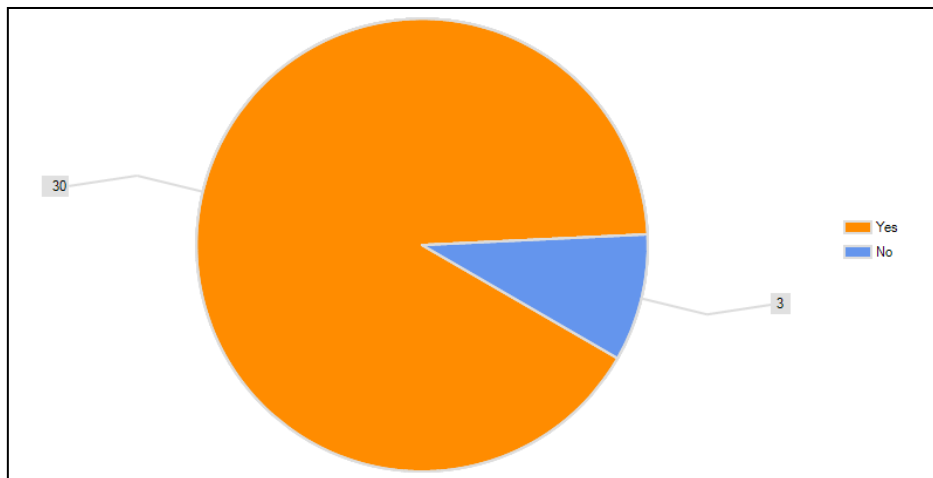


Figure V–V. Usefulness of proposed forecast polygons and their names

The responses for this question indicate the vast majority (91%) agree that the proposed Forecast Polygons and their names are appropriate and useful for their country.

The following information highlights responses from countries:

- The polygons and their names are good. It would be more useful if the polygon name would be shown when we move the cursor onto each polygon. (Japan)
- Suggest renaming to threat level forecast map. (China)
- The Pacific side of The Philippines covers a large area; we suggest that this polygon be subdivided further into three polygons. (Philippines)
- Since the sizes of the forecast polygons for Chile are too big, this product does not give enough information, therefore is a useless tool. Nevertheless, is possibly to work as a whole for the redefinition of them. (Chile)
- We think that is okay. PTWC provide punctual information necessary for a fast forecast. (Peru)
- Tuamotu Archipelago must not be listed in the forecast tables. (French Polynesia)
- Arrange country name in alphabetical order for easy reading, otherwise it is ok. (Nauru)
- It shows each polygon with a threat, the maximum, mean, and median forecast coastal tsunami height as well as the maximum, mean, and median offshore tsunami height. Provided are the deviation of values, height is measured relative to the tide level. (WSO, Pohnpei)
- It is useful and very appropriate for Vanuatu.
- Note that Australia has its own defined tsunami warning zones which are more refined. The map should further display Australian offshore territories like Lord Howe Island and Norfolk Island. (Australia)
- The colour scale and associated wave height markings are appropriate. (New Zealand)

- 1.6. Content: Are there other information or products that should be included in the suite of enhanced products? Consider earthquake and tsunami information, and/or threat assessment products. Please provide comments as needed.

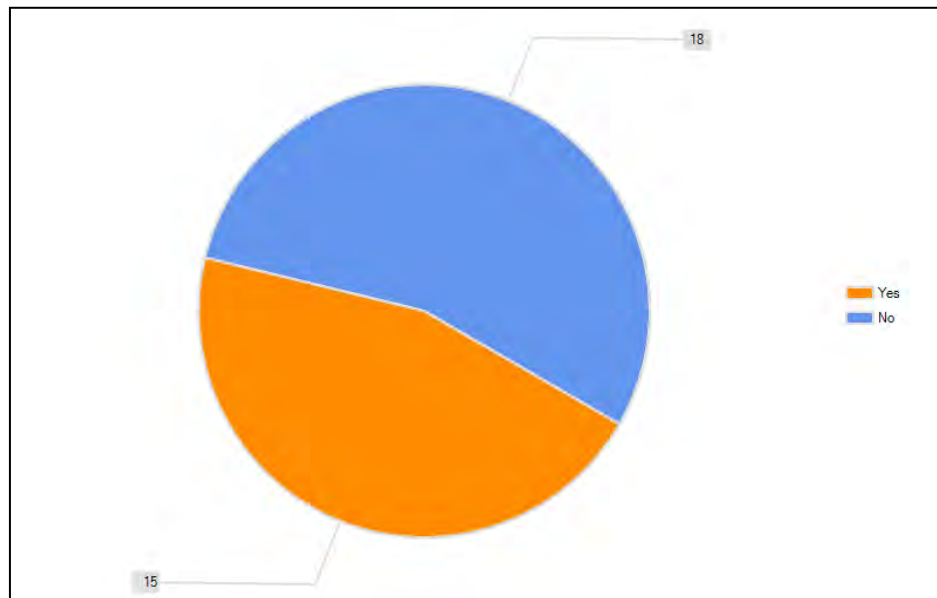


Figure V–VI. PTWC enhanced products should/should not add other information or products

The responses received for this question were split, with 55% indicating additional information is requested, and 45% indicating that the products are acceptable as proposed.

The following information or products were recommended by respondents to be included in the suite of Enhanced Products (over and above what was tested during the exercise):

- No more information is considered to be necessary. (Mexico/de Pinillos)
- Focal mechanism of the earthquake (e.g. strike, dip and slip angles) used for generating the product or forecast. (China)
- More detailed information on earthquake parameters and focal mechanism (upon completion of WCMT analysis) should be provided in the Text Message. 'Mw' to be inserted in front of the number, e.g. Mw 8.8 in the Text Message to be consistent with other products (forecast polygon map, coastal forecast map, energy forecast map) where the magnitude is already stated as Mw. (Brunei)
- Information about tsunami amplitude used in the bulletins (i.e. mean sea level, tide record). (Chile)
- Further clarification between English and Spanish versions of the *User's Guide for the Pacific Tsunami Warning Center Enhanced Products for the Pacific Tsunami Warning System* (IOC/2013/TS/105 rev.) with regard to tide times (the tide at the time of wave arrival is an important factor of the threat level). The relevant information in both the English and Spanish version of the Manual is ambiguous and not coherent. The English version under 4.2 mentions "normal tide level" while in Spanish it is "habitual" (?). Under 4.4 it is "tide level" and "nivel de marea", which could also lead to misunderstanding, in both versions. 'Mean' and 'medio' should be added. Only under 5.0 is the mention of the tide level explicit and precise, in both versions. With the immense power of computing that goes into Enhanced Products many users could easily expect that local current tide levels are also being taken into account. Follow

up: Future comparisons of forecasts and actual wave heights could be helpful. (Colombia)

- Source parameters used for the PTWC forecast (this would enable countries to compare with their own results). (French Polynesia)
- I think there is sufficient information already. Our aim is to try and make it simple and useable. (Vanuatu)
- Shorter pulse earthquake bulletins that include a general statement about whether the detected earthquake is tsunami genic and advise users to follow their NTWC products. (Australia)

Several countries would like to add additional points of reference on their cost to the text products.

- We would like to add in the text message, more sites of estimated arrival time forecast for El Salvador. For example: La Unión, La Libertad or Bahía de Jiquilisco. (El Salvador)
- Add a buoy location map as an aid to coincide with the text messages (United States, American Samoa)

1.7. Public Release: Which of the enhanced products (or suggest other products) could be made public during events by PTWC and/or be redistributed by the NTWCs? The media and public will seek information about the threat during events and that information can help save lives. Whatever is made public, however, needs to be easily understood and not conflict with information from local authorities. Indicate Yes or No. Please also provide your comments and suggestions.

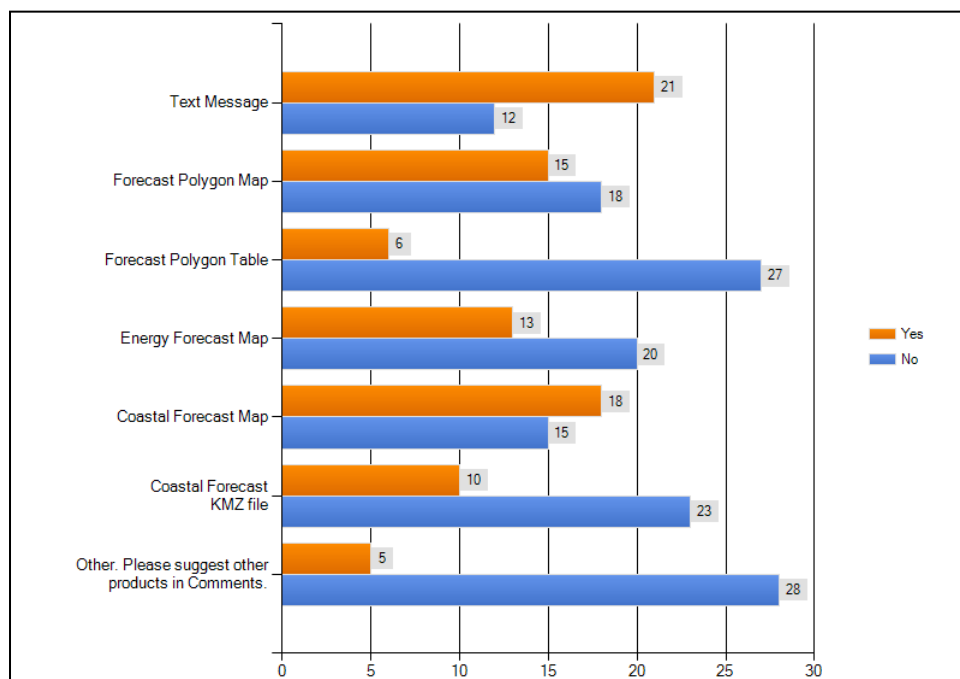


Table V–III. Enhanced products that will be release to the public during the events

The majority of respondents (64%) recommend the text product be made available to the public. Fifty-four percent (54%) of respondents also recommend that the coastal forecast map be made available. The remaining products received less than 50% approval and are therefore not recommended to be made public. The rationale behind the recommendation that some products not be disseminated publicly is that these are too technical, and therefore may easily be misinterpreted by the media and the public and result in confusion and conflicting or wrong public safety advice.

The following are all of the responses from countries:

- “Creemos que si los productos los obtiene alguien que no puede interpretar los mismo crearía una desinformación y podría generar caos en la población”. (Guatemala). Translated: If someone that is not properly trained interprets the products, this would result in misinformation creating chaos in the general public.
- Is very important let know to the media or training, such kinds of material trough seminars so they can to spread the information during the real event. (Nicaragua)
- To avoid conflict with information issued from the relevant NTWCs, detailed information needs to be kept among NTWCs and related organizations. (Japan)
- American Samoa: Coastal forecast map for American Samoa is not there, maybe it is too small. Commonwealth of the Northern Mariana Islands (CNMI): We would not disseminate the graphics but would tell people they are available on our website (only the forecast polygon map, energy forecast map, coastal forecast map would be placed on the website. We would need some explanation to put with these products. Can PTWC or ITIC provide that information? Guam: We will not disseminate graphics but tell people they are available on our website. We shall need some explanation to post the graphic products. Will PTWC or ITIC provide the information? (United States)
- The products and their limitations may not be easily understood by the public and may conflict with information from local authorities (HK). Forecast polygons table is not fit for public release since it refers to mathematical concepts such as Median Number which might not be familiar to the public. The public close to coasts would consider how high the highland they should go rather than scientific concepts like wave height. (China)
- The graphical product of PTWC should meet the Indonesia Tsunami Early Warning System (**InaTEWS**) warning segment area definition which indicates each district and province level. (Indonesia)
- The text messages and forecast KMZ may conflict with local NTWCs warning. (Malaysia)
- As we have not yet tested these products with the media and public, we prefer that these products be utilized only by the local NTWC. (Philippines)
- Energy forecast KMZ. (Thailand)
- Graphical displays are generally better understood by the media and public in seeking information about the country's threat during events. Text message and forecast polygon table provide more technical information and data, and may create confusion amongst non-technical persons. (Brunei)
- For Chile, initially it should spread just the text message by PTWC during events, since the media and public would made a bad interpretations of the forecast bulletins. However, by means implementation of a suitable educational process it would be possible release the enhanced products during an event in the future. (Chile)

- We recommend that only the text messages should be available to the mass media and general public (if such a limitation is possible at all); this is the only enhanced product that could work as a standalone, since it includes explanations and limitations. Forecast maps could be used with its 'face value' and thus entail actions not supported by TWFP and NDMO evaluations and decisions. There is in fact a much higher potential for conflict between a TWFP and its NDMO, if the TWFP's evaluation and conclusions lead to different threat levels than those contained in the enhanced products. Here, too, it could be helpful to include a strong comment in the text messages stating that additional information available to (or used by) the TWFP could entail different threat levels. (Colombia)
- I think both products can be redistributed by the NTWCs because they show information very important and simple information for any person. It is suggested that data messages can be as short as possible. (Ecuador)
- Forecast Polygon Table is difficult to explain to general people. Energy Forecast Map can create confuse with Coastal Forecast Map. (Peru)
- As we dispose of our own tsunami height estimations, there are some inconsistencies between the forecast tsunami height given by PTWC and ours, especially for Society Islands and Tuamotu Archipelago (because the green law amplify too much the tsunami height for these islands). The values given by PTWC are too high for theses archipelagos, thus they must not be given for public dissemination (to avoid panic of the population). The values forecasted PTWC for Marquesas Islands are in good agreement with ours. All the forecast evaluations and products must not be public, only dedicated to national security centre. Because these forecast publications could create confusion for local population between the national evaluation authority and the PTWC estimations (in case of a significant forecast difference as in this exercise). They should only be diffused to high authorities and TWFP. (French Polynesia)
- Several items were left blank without a yes or a no ticked. I have put these answers as no in order to be able to carry on filling out the rest of the evaluation online – JOG inputting on behalf of Kiribati. (Kiribati)
- Media and general public prefer visual than text. Information does need to be made simpler. (Niue)
- Our concern is that if PTWC releases most of the enhanced products, the public will make their own interpretation and this again might lead to confusion during real events. (Samoa)
- No for all products. All the products are too technical for the media and the public. Probably suggested products would be a text message saying where (latitude and longitude) the earthquake occurred, its magnitude, its expected hit time and likelihood direction (N, E, S, W) the tsunami is approaching the island. (Tuvalu)
- For the VMGD (VTWC) we feel that that we are mandated to prepare and issue Advisories or warnings regarding Tsunami, and that we have SOPs and Tsunami Directives, it would be formal if we keep to the fact that we are the formal contact point to receive any Tsunami alert before it gets out to the public. Otherwise, public loses confidence on the department. (Vanuatu)
- We don't believe any of these products should be made public in Australia as this is the responsibility of JATWC. Having said that, we think that the public will be happy to receive earthquake bulletins that include a general statement about whether the detected earthquake is tsunamigenic and advise users to follow their NTWC products. (Australia)

- Public release of energy forecast map should not include numbers as these will confuse. (New Zealand)
- 1.8. Staging: Should a forecast be included in the initial first product, knowing that earthquake magnitudes and tsunami forecasts are likely to change over the first hour as later-arriving seismic data and sea level data are received and analysed?

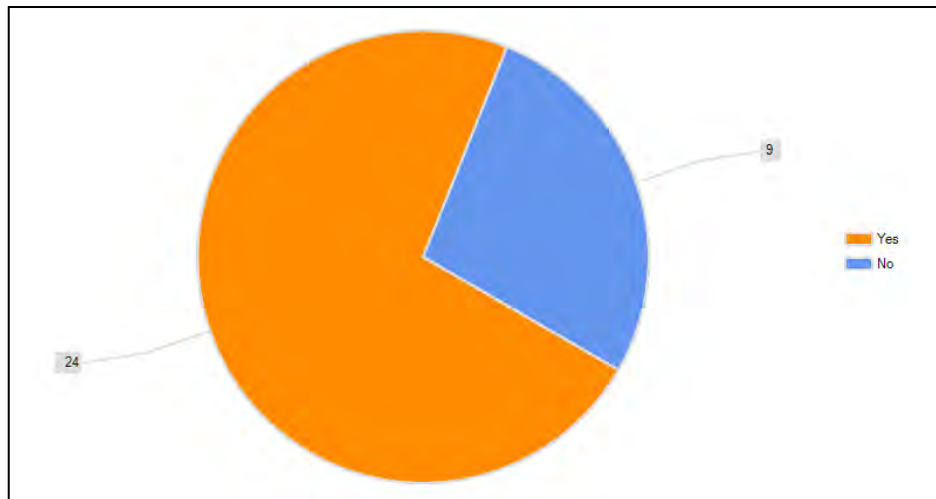


Figure V–VII. Adequacy of forecast information
in the initial first product

The majority of respondents (73%) would like to see a forecast included in the initial product, knowing that earthquake magnitudes and tsunami forecasts are likely to change over the first hour. It is recommended that a statement be included noting that it is an initial forecast and that future forecasts may quickly change as new data is received and analysed. Respondents indicated that they would prefer this information (knowing it has limitations), as soon as possible. Countries positively commenting were Australia, Ecuador, El Salvador, French Polynesia, China, Canada, Indonesia, New Zealand, Malaysia, Mexico, Peru, Philippines, Russia, and the United States (CNMI). It was noted that for some countries, this initial, quick forecast information could end up being the only forecast they receive before the first tsunami waves arrive.

The following are all of the responses from countries:

- Even if the first earthquake parameters are preliminaries, a forecast could help countries to take actions regarding the earthquake and the tsunami potential. (El Salvador)
- “Quedando en espera de mensajes de actualización para no provocar falsa alarma”. (Guatemala). Translated: Will wait for updates/messages to avoid causing a false alarm.
- Since we start making our protocols for preparing the bulletin with the use of the first product, as for this is what must be immediately done in order to warn the units in charge of civil protection. Forecasts will be used for the issue of further bulletins. (Mexico/de Pinillos)
- But need to be careful. When the forecast change direction or speed. (Mexico/Guzman)
- Good to have an idea as soon as possible. (Canada)
- It should be marked as a preliminary forecast. (Russian Federation)

- CNMI: But with explanation that they could change. Actually arrival times are pretty accurate. Guam: Arrival times are pretty much accurate. (United States)
- It will be the best if a forecast product is included. The National Tsunami Centre could compare its own products with the products from PTWC. We understand the limitation of the products but it would be better to have preliminary forecast as soon as possible. (China)
- Basically, all kinds of warning have to be disseminated as soon as possible. The forecast has not been delayed for up to an hour waiting for seismic and sea level data arriving. However the forecast should be up dated as the seismic and sea level data arrive. (Indonesia)
- For some countries, the first initial forecast may be the only forecast received before the tsunami waves arrive. (Malaysia)
- But we suggest that a statement should be included that these forecasts may immediately change as new data are received and analysed. (Philippines)
- A forecast can still be included in the initial first product, but has to be made very clear that this is only a forecast that can be revised as and when PTWC receives more later-arriving seismic data and sea level data for further analysis. (Brunei)
- The initial bulletin is used to take the first actions; a forecast result is not required until the level of uncertainty reached is minimal in the earthquake parameters. (Chile)
- But is very important to indicate it is preliminary information. (Ecuador)
- Yes, because this products are very necessary and important for our NTWC. (Peru)
- Resources should be optimised on the event earlier in the process. This allows then for clarity on the next bulletins. (Cook Islands)
- The initial value is very preliminary. (French Polynesia)
- Yes, a forecast should be included in the initial first product. (Tuvalu)
- It's a good idea for giving out preliminary information with fewer available data to get a rough idea which then improved on when enough data is received. (Vanuatu)
- Timing is critical to warn people even if information in hand is not perfect. (Australia)
- From the first and updated as more information becomes available. (New Zealand)

- 1.9. Features: Do any features, other than listed above, need to be changed? If yes, please comment.

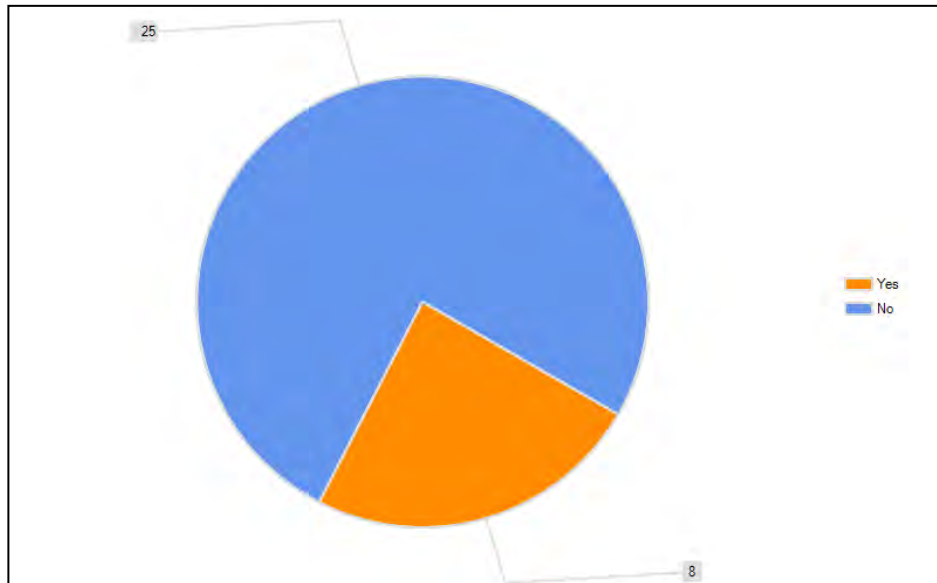


Figure V–VIII. Necessity of changing features

The majority of respondents (76%) indicated that no other features (other than those mentioned in previous questions) need changing. The respondents that indicated 'Yes' recommend the following:

- The average of the deep from the tsunami travelled. (Mexico/Guzman)
- Text messages: It should be better if earthquake parameters are at the top of text messages or are more emphasized. (Russian Federation)
- American Samoa: Should include conversions of meters to feet, UTC to local for models and products if made available to the public. CNMI: For domestic products: Change kilometres to miles and meters to feet. Add local time and date. Guam: For the domestic products: Change kilometres to miles and meters to feet. Add Chamorro standard time and date. (United States)
- In the PTWC Text message, we would prefer to omit word "authoritative" when referring to USGS earthquake information. (Philippines)
- For the Forecast Polygon Map it is suggested improve and increase the number of polygons for Chile. (Chile)
- There might be some but we just need to digest this lot of enhanced products first. (Cook Islands)
- As said above do not include the forecast tsunami heights for the Tuamotu Archipelago. (French Polynesia)
- Could be later when products are fully utilized, then we could assess their weaknesses and strengths. (Solomon Islands)
- Need to know criteria for picking coastal forecast points. (Tonga)
- Basically we're inclined towards a No, because we really need to understand the current features. (Tuvalu)

1.10 Features: Do any new features, other than listed above, need to be added? If yes, please comment.

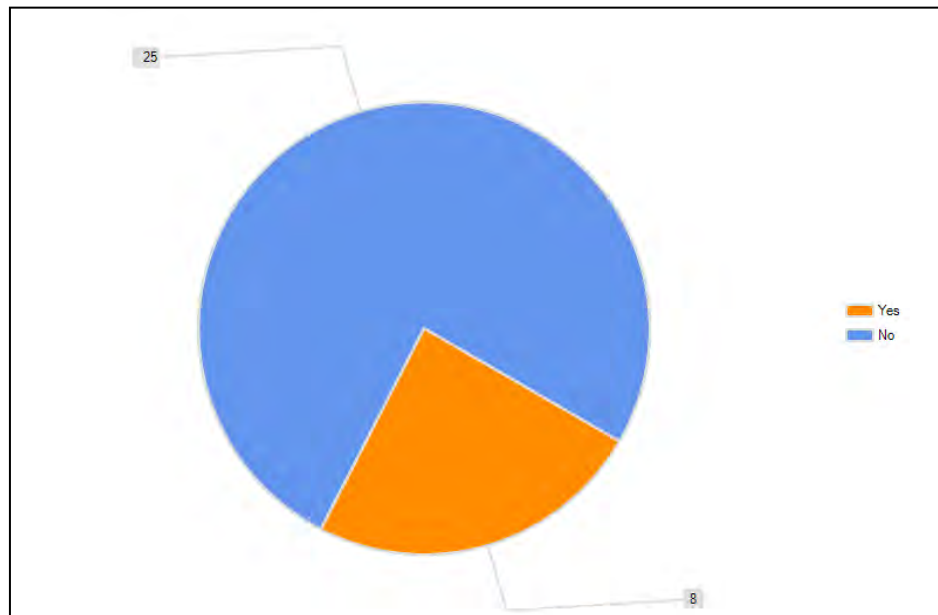


Figure V–IX. Necessity of adding features

The majority of respondents (76%) stated that no other new features, other than those listed previously, need to be added. Those that answered 'Yes' would like to see the following:

- American Samoa: As mentioned above. Buoy maps. Guam: For the domestic products, kilometres change to miles and meters to feet, also add local times and date. (United States)
- Suggest adding a forecast distribution map for maximum velocity of current flow along the coast. (China)
- Energy forecast KMZ. (Thailand)
- Name of principal port and cities in each country. (Ecuador)
- We will appreciate the publication of the main sources parameters issued from W-Phase inversion (at least the scalar moment, focal plane NP1) or other robust estimations. (French Polynesia)
- Again full understanding of the product is needed before we can confidently identify gaps. This is particularly true for countries with local capacity to fully comprehend these products. (Kiribati)
- Add country names. (Niue)
- Need to have a guidance that would assist us in when to cease the warning. (Tonga)
- Add a section on known damage or casualty reports in the text products. (Australia)

OBJECTIVE 2

- 2.1. Does your National Tsunami Warning Centre (NTWC) understand the contents of the enhanced products, how to use the Products, and the limitations of the Products? Indicate Yes or No.

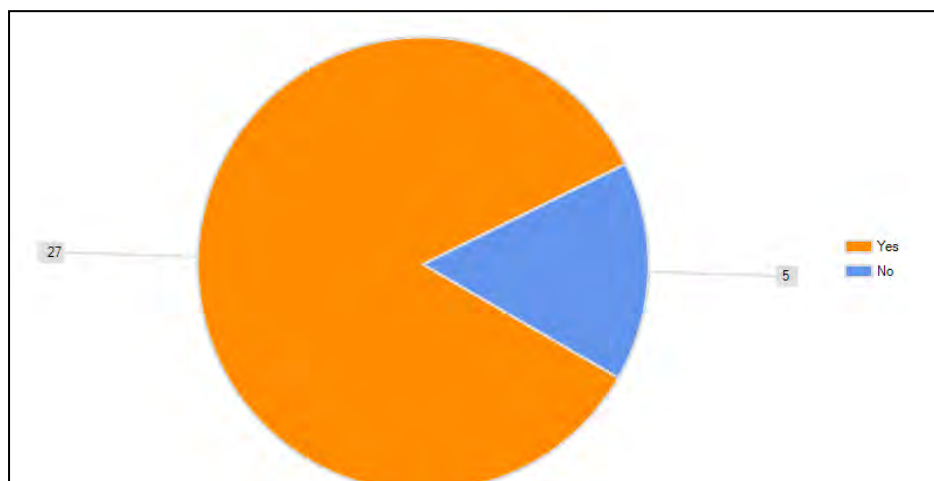


Figure V-X. Understanding of content, use and limitations of enhanced products by the NTWC

The responses received for this question indicate the 82% of the country National Tsunami Warning Centres understand the contents of the Enhanced Products, how to use the Products, and the limitations of the Products. The countries that did not answer in the affirmative tended to be South Pacific Island countries.

The following information highlights responses from countries:

- Majority understands contents of the Enhanced Products, how to use the Products, and the limitations of the Products, but understanding is limited in some countries.
- Countries have a general understanding of the areas at risk based on products, but require more training on interpreting products.

The following information highlights responses from countries where understanding is limited in the National Tsunami Warning Centre:

- Without training(s) to ensure they can properly interpret the level of waves and the initial impacts on land, National Tsunami Warning Centres are not confident enough to issue advise to the public based on new products.
- A concern is that only a limited number of National Tsunami Warning Centre personnel fully understand these products.

The following are all the comments from countries:

- Canadian Hydrographic Service is not the NTWC – we provide support to NTWC but we understand the contents. (Canada)
- The contents of the Enhanced products help to get quick initial detailed information about the event. Forecast maps are easy in use and text messages provide all necessary seismic and tsunami information and also enough readable. (Russian Federation)

- CNMI: We could if necessary spin up fairly rapidly, but this is really N/A for the CNMI. Guam: N/A. (United States)
 - All of the PTWC products are appropriate and easily understood by the InaTEWS watching standers. (Indonesia)
 - Only a limited number of people understand these products. (Philippines)
 - Yes. We are de National Tsunami Warning Centre. (Ecuador)
 - There is a general understanding of the risk areas but willingly to learn more on this. (Cook Islands)
 - We are ready. (French Polynesia)
 - We are not confident enough to issue advise to the public base on new products and therefore we require detail trainings and validations on the level of waves and the initial impacts on land. (Kiribati)
 - No, our understanding is limited i.e. (Tuvalu)
 - We cannot fully interpret the information in the polygon tables.
 - We are not sure of the threshold values for issuing a watch/warning/cancellation when given the maximum tsunami amplitudes in the forecast polygon maps.
 - VTWC understands the contents of the enhanced products, how to use them and will report any limitation if encounter any in the future (Vanuatu)
 - The products are useful to those NTWCs who don't have independent capacity to make their own tsunami threat assessment, with JATWC not one of them. In any case these products should not be released for public to digest. The model prediction seemed too high for Australia. The use of term “normal tide” is vague and misleading. Waves predicted are on top of any astronomical tides rather than on a particular tidal level called “normal”. (Australia)
 - We will be using the products to “kick start” our own evaluation and are understood and valuable for that purpose and comparison with our own models. (New Zealand)
- 2.2. Does your National Disaster Management Office (NDMO) understand the contents of the enhanced products, how to use the products, and the limitations of the products? Indicate Yes or No.

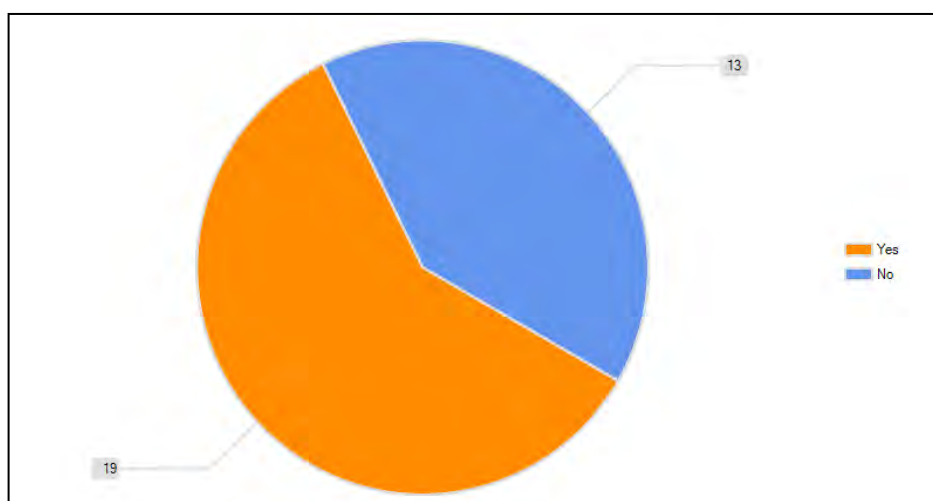


Figure V–XI. Understanding of content, use and limitations of enhanced products by the NDMO

The responses received for this question indicate the 58% of country NDMOs understand the contents of the Enhanced Products, how to use the Products, and the limitations of the Products.

The following information highlights responses from countries where understanding is limited in the National Disaster Management Office (NDMO):

- A general understanding on the products exists among some NDMO staff; however more training is needed to correctly and fully understand the products and their limitations.

The following are all comments from countries:

- They don't understand the products yet. We are in training with them. (El Salvador)
- Not sure as they did not participate. (Canada)
- CNMI: They understand, but this is not applicable to the CNMI. Guam: N/A. (United States)
- Most of the operation centre operators of National Disaster Management Office are not really understand with the warning. After receiving the product, they often have to confirm to the NTWC regarding the message of warning type, the height of tsunami and the impacted area. Many of the operators of Disaster Management Office are a new comer and have to be trained about the warning product regularly. (Indonesia)
- The Chilean Disaster Management Office (ONEMI), currently does not have the technical capacities implemented for a correct understanding of the Enhanced products. ONEMI must implement a process of training to achieve this aim in 2014. (Chile)
- Yes, but not all staff. (Ecuador)
- Yes but in general knowledge because our NDMO just use the product according our SOP-PERU. (Peru)
- Formal introduction of NDMO still pending. (Colombia)
- There is general understanding on the products; however more training is needed on the limitations of the products so as confidently direct response measures to any tsunami events. (Kiribati)
- They have seen the information for the first time and they rely heavily on Niue Met Service for guidance. There needs to be a session specifically to explain what the products mean. (Niue)
- No our NDMO require training to enable understand the Enhanced Products and in most of everything. (Tuvalu)
- National Disaster Management office sees that the Enhanced Products will assist the National Emergency Operation Centre to disseminate more appropriate evacuation announcement to community at risk during tsunami advisory and warning in the future. (Vanuatu)
- AGCCC relies on JATWC for Australia tsunami warnings but it uses the PTWC products to inform the Australian government about tsunami danger in other Pacific countries. AGCCC was aware of the types and content of the Enhanced Products through taking part in the exercise but not yet fully across the limitations of the Products. (Australia)

- 2.3. Will your country's NTWC and NDMO be prepared to utilise the PTWC enhanced products in 2014? Your NTWC should be prepared to issue appropriate national alerts (e.g., warning/watch/cancellations) based on the PTWC enhanced products. Indicate Yes or No, and provide comments as needed on country status.

	Yes	No	Rating Count
Currently ready.	31.3% (10)	68.8% (22)	32
Will be ready in 2014.	84.4% (27)	15.6% (5)	32
Need to develop new or revise existing SOPs.	84.4% (27)	15.6% (5)	32
Need to inform and prepare other key stakeholders.	78.1% (25)	21.9% (7)	32
Need NTWC or NDMO to conduct training for their national and local stakeholders.	84.4% (27)	15.6% (5)	32
Need international experts to conduct more training for national stakeholders.	59.4% (19)	40.6% (13)	32
Will not be ready in 2014.	21.9% (7)	78.1% (25)	32
Comments (optional) Show Responses			14
answered question			32

Table V–IV. Preparedness of country's NTWC and NDMO
to use PTWC enhanced products in 2014.

The majority of countries are not currently ready to implement and/or utilize the PTWC Enhanced Products. However, the majority (83%) anticipates being ready in 2014 if key stakeholders, including NTWC and NDMO staff, are engaged (e.g. training, outreach, etc.).

The majority of the countries requiring training (84%) are targeting national and local stakeholders. Fifty-nine percent (59%) requested international experts to conduct more training of national stakeholders. The regions requiring international training include countries within the PTWS Regional Working Groups, namely the Southeast Pacific, North Pacific Islands, South Pacific Islands, South China Seas and Central America and Mexico.

The following information highlights responses from countries where state of readiness requires further stakeholder engagement:

- The NTWC faces big challenges when interpreting the PTWC enhanced products and will not be ready in 2014 to utilize these products. Also, Internet is not reliable in certain remote islands (e.g. Funafuti).
- The NTWCs are ready, or can be in 2014. Training (including those conducted by international experts) will be needed in the future for stakeholders.

The following are all comments from countries:

- American Samoa: The transition period should be taken into consideration due to administrative. CNMI: This will not pertain to the CNMI until Domestic Products are provided in 2015. Guam: This is not applicable for Guam. The domestic products will be provided in 2015. (United States)

- Will not be ready in 2014 due to current constraints on capability and capacity. (Brunei)
- The Chilean TWC (SNAM/SHOA) will be prepared to utilize the PTWC Enhanced products in 2014. The Chilean DMO (Oficina Nacional de Emergencia del Ministerio del Interior y Seguridad Pública, **ONEMI**) must implement a process of training to be ready in 2014. International training will be needed in the future for stakeholders. (Chile)
- Only NTWC ready. (Colombia)
- Completely in mid-2014. (Ecuador)
- A review of the current SOPS in each country should call for regional workshop of these so that a standard format can be used. This will also include updates that can easily be made. (Cook Islands)
- Currently, there are only a hand full of MET staff who has limited exposure to the new products and only one from NDMO. Kiribati will not be ready by 2014 unless there are specific trainings on this. (Kiribati)
- If we can receive all the assistance then we are ready by 2014. (Nauru)
- Niue will be ready in 2014. (Niue)
- As reflected in our answers to objective 1, the Tuvalu Met Service (TMS) is facing big challenges when interpreting the PTWC enhanced products and will not be ready in 2014 to utilize these products. Other reasons are internet is not reliable in Funafuti and the rest of the other islands are far worse. From the tabletop exercise that we undertook; the tabletop exercise. NTWC TMS NDMO Pacwave13 taskforce stakeholders TTC TEC Amatuku. Tsunami forecasts were prepared in the TMS building using the enhanced products. It took about 30 minutes to complete the tsunami forecast issues. These forecasts were then hand delivered to the NDMO office right away. The stakeholders involved were Tuvalu Telecom Corporation (TTC), Tuvalu Electricity Corporation (TEC) and one islet community called Amatuku. They have been forewarned to expect receipt of tsunami forecasts and the need to test their operating procedures and therefore provide these procedures to the Pacwave13 task force. It took few days to realize that these stakeholders do not have SOPs. The task force was made up of three departments; TMS, NDMO and Red Cross. This is the working committee for Pacwave13 and it carries out all coordination for the tabletop exercise. (Tuvalu)
- Currently NTWC and National Emergency Operation Centre (NEOC) are looking at improvement of their communication links for dissemination of all hazards throughout the country. (Vanuatu)
- Since 2008, Australia has had its own advanced tsunami warning centre, the JATWC that independently predicts and assesses tsunami threat before issuing tsunami warnings for the Australian mainland and its offshore territories. It does not rely on PTWC products to produce warnings, but will brief the AGCCC on the interpretation of PTWC products. (Australia)
- We will amend procedures and conduct training with all stakeholders to be ready for 2014. This can all be done within New Zealand and we do not require international assistance. (New Zealand)

OBJECTIVE 3

- 3.1. Do your country's stakeholder agencies understand that current PTWC international watch/warning products will be discontinued when the enhanced products are officially started, probably in early 2014? Member States will decide on the changeover date at the 25th Session of the ICG/PTWS (September, 2013, Vladivostok, Russia). Indicate Yes or No, and provide comments as needed.

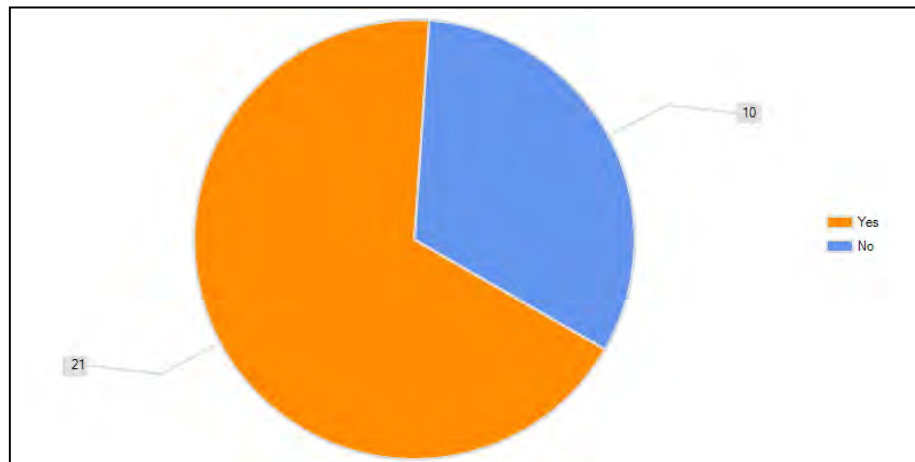


Figure V–XII. Understanding of the discontinuity of watch/warning products by country's stakeholder agencies.

The majority of countries (67%) indicate their stakeholders understand that current PTWC international Watch/Warning products will be discontinued. However, this is often limited to key agencies and limited staff within those agencies. Consequently many institutions/stakeholders do not understand that the enhanced products of PTWC will be implemented in early 2014.

The following are all comments from countries:

- Our country's stakeholder agencies doesn't know about the changes. (El Salvador)
- Nicaragua is clear the products will be discontinued, therefore the government to applies the SOPs crating the own scenario, with and event in front to Nicaragua Subduction Zone, based on tsunami hit in 1992. (Nicaragua)
- Emergency Management British Columbia is responsible for warnings and I am not sure of their understanding. (Canada)
- Many institution/stakeholders do not understand that the enhanced products of PTWC will be implemented in early 2014. (Indonesia)
- Other stakeholder agencies were not involved in the tabletop exercise (PacWave 13). New SOPs for tsunami warning has to be developed first prior to organizing an orientation workshop or tabletop exercise to prepare these stakeholder agencies for the new products. (Brunei)
- For Chile, the entities that evaluate the PTWC's bulletins issues (SHOA/ONEMI) are in knowledge that the PTWC will be discontinued the currently Bulletin and they will transmit this information to Chilean stakeholder. (Chile)

- This will be conveyed by the National Team in the near future. Only the key agencies are aware of this. (Cook Islands)
 - Initial consultations has begun on the new products, starting with a workshop on developing a Tsunami Support Plan for Kiribati and how these new products will feed in our Tsunami warning arrangements. However more consultation is needed so that stakeholders can fully grasp the situation that we will be in, given the limited capacity we have in both the MET service and the NDMO. (Kiribati)
 - NTWC together with NDMO will notify the stakeholders regarding the changes to be made to the current PTWC early warning enhance products to be ready for use in 2014. (Vanuatu)
 - The AGCCC has an interest in the enhanced products for tsunami threat outside Australia and has been told about the proposed changeover date. (Australia)
- 3.2. Do your country's stakeholder agencies understand that their National Tsunami Warning Centre, not PTWC, will be responsible for issuing national alerts (e.g., watches/warnings/cancellations)? Indicate Yes or No, and provide comments as needed.

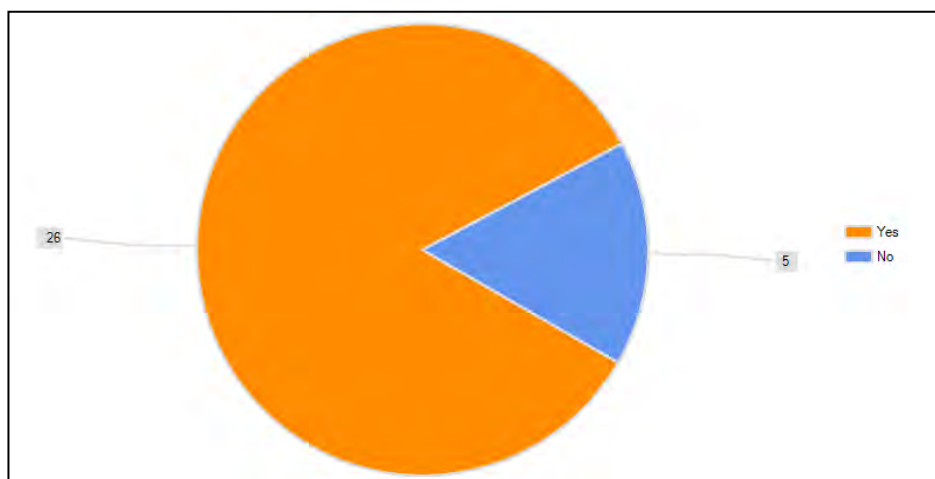


Figure V–XIII. Country's stakeholder agencies understand that their National Tsunami Warning Centre, not PTWC, will be responsible for issuing national alerts

The vast majority (84%) of countries indicate their country's key stakeholder agencies understand that their National Tsunami Warning Centre, not PTWC, will be responsible for issuing national alerts.

The following are all comments from countries:

- They always have known this. (El Salvador)
- Yes, and the NTWC recognized the weakness regarding to modelling the forecast polygon map and table, energy forecast map, coastal forecast map, and coastal KMZ file. This is a task pending. (Nicaragua)
- Emergency Management British Columbia is responsible for warnings and I am not sure of their understanding. (Canada)
- CNMI: N/A Guam: N/A. (United States)

- Generally the NTWC's role and responsibility have been well informed to others institution/stakeholder agencies, both national and regional through many activities such as orientation workshop, tabletop, or other Exercise, Development and distribution of outreach material, Training and Awareness Campaign. (Indonesia)
 - Other stakeholder agencies were not involved in the tabletop exercise (PacWave 13). (Brunei)
 - Formal introduction of NDMO still pending. (Colombia)
 - Yes, because our stakeholder have knowledge about our functions according to SOP-PERU. (Peru)
 - Only few agencies who able to attend the first consultation on Tsunami Support plan understand this. However, if we are to start awareness on this, there needs to capacity upgrading at out MET service so that we can confidently take on this role. (Kiribati)
 - NTWC will officially inform all its stakeholders about the changes and inform them that the issuing of tsunami alerts will be assumed by the Vanuatu Tsunami Warning Centre (VTWC) until PTWC resumes its responsibility to save lives and properties (Vanuatu)
 - This is very well understood by Australian State/Territory Emergency Services and they accordingly rely on tsunami warnings from JATWC to initiate their emergency response plans. (Australia)
- 3.3. Will your country's stakeholders be prepared for the official changeover to the PTWC enhanced products, probably in early 2014? Indicate Yes or No, and provide comments as needed, including list of applicable agencies needing SOPs and/or training.

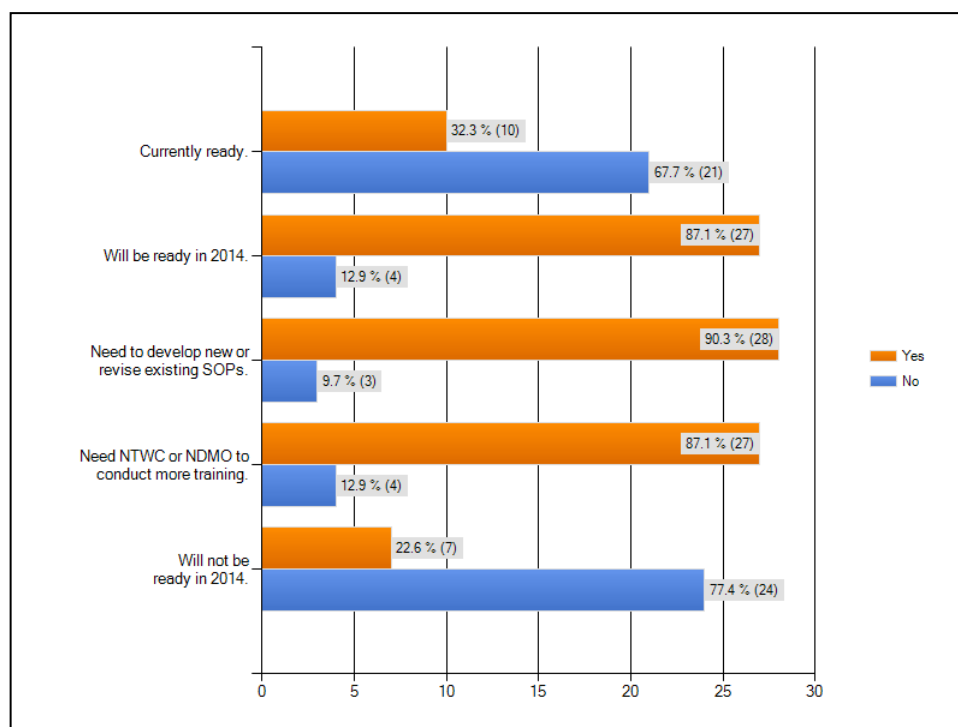


Table V–V. Preparation of country's stakeholders for the official changeover to the PTWC enhanced products.

While the majority (68%) of countries indicated their stakeholders are not currently prepared for the official changeover to the PTWC enhanced products, a revision and/or development of Standard Operating Procedures as well as training will ensure that nearly all (87%) are ready in 2014.

The following are all comments from countries:

- CNMI: N/A Guam: N/A. (United States)
 - List of agencies meeting SOPs and/or training: 1. NTWC 2. Regional NTWC 3. NDMO 4. Local DMO 5. Media. (Indonesia)
 - We will be ready in the middle or later part of 2014. (Philippines)
 - Will not be ready in 2014 due to current constraints on capability and capacity. (Brunei)
 - Once determined the final date in which the enhanced products are officially started, the necessary coordination's will beginning to modify the SOPs and train the personnel. (Chile)
 - Formal introduction of NDMO still pending, NDMO need training. (Colombia)
 - Training on the new products is urgently needed. (Kiribati)
 - If we receive all assistance then we are ready. (Nauru)
 - There is need for NEOC (National Emergency. Operation Centre) and NTWC to revise the existing SOPs and incorporate new arrangement and formalize the all the arrangements. (Vanuatu)
 - The AGCCC will need to changes their SOP's regarding consultation with JATWC on the interpretation of PTWC products. (Australia)
 - The Ministry of Civil Defence & Emergency Management (MCDEM), with support from GNS Science, will ensure that all stakeholders are sufficiently briefed on the upcoming changes in time for 2014. (New Zealand)
- 3.4. Stakeholders. Are you considering how to prepare your country's stakeholder agencies for the PTWC enhanced products changeover? Indicate Yes or No, and provide comments as needed.

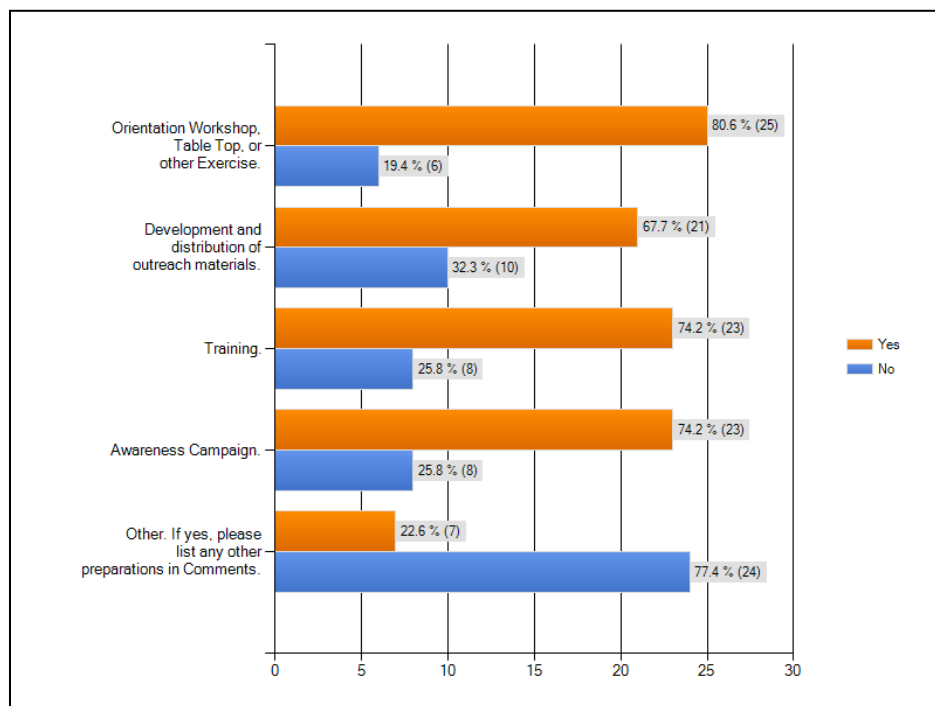


Table V–VI. Preparation of country's stakeholders
for the PTWC enhanced products

The majority of countries are considering the following methods for preparing stakeholder agencies: (1) orientation or tabletop exercise; (2) training and awareness campaigns; and (3) outreach materials. Others, such as Tuvalu, indicated electronic distribution of materials would be utilized.

The following are all comments from countries:

- Only the Mexican Tsunami Warning Centre will make use of the new PTWC products. (Mexico/de Pinillos)
- With the presently exercise the government has an idea the sites or communities will focuses in the awareness campaign. (Nicaragua)
- CNMI: Yes, but for 2015 not 2014. Guam: For 2015 not for 2014. (United States)
- Not applicable as the products are only received by the National Tsunami Warning Centre. (China)
- Low priority due to current constraints on capability and capacity. (Brunei)
- SOPS for stakeholders and especially at the community level. (Cook Islands)
- Need periodic trainings. (Federated States of Micronesia)
- PacWave13 is an important introductory exercise for our stakeholders and we hope that more is carried out. (Kiribati)
- We're hoping to carry out another tsunami exercise nationwide preferably in October 2013. Preparation of stakeholders for tsunami events will be a continuous activity nationwide and not necessary to prepare for the changeover. If there is going to be a changeover then we feel that the internet in Tuvalu by that time should be reliable. Staff in the Met should have been well trained, qualified and tested that they

can use the terms and tools in tsunami analysis and forecasting and can issue tsunami forecasts. The NDMO can handle the changeover. National tsunami response plans are in their final versions. Stakeholders have SOPs and they are up to date. (Tuvalu 17 June)

- No our NDMO require training to enable understand the Enhanced Products and in most of everything. (Tuvalu 23 June)
- Involve the other important stakeholders to participate in the training to use the PTWC Enhanced Product in their planning. (Vanuatu)
- Although Australian State/Territory Emergency Services need not be concerned about the PTWC products and the proposed changes, for their information, they will be informed about the changeovers at the coming Australian Tsunami Advisory Group meeting. (Australia)
- We will also use opportunities such as conferences, workshops etc. as they present themselves over that time. (New Zealand)

3.5. Media. Are you considering how to prepare your country's media organizations for the PTWC enhanced products changeover? Indicate Yes or No, and provide comments as needed.

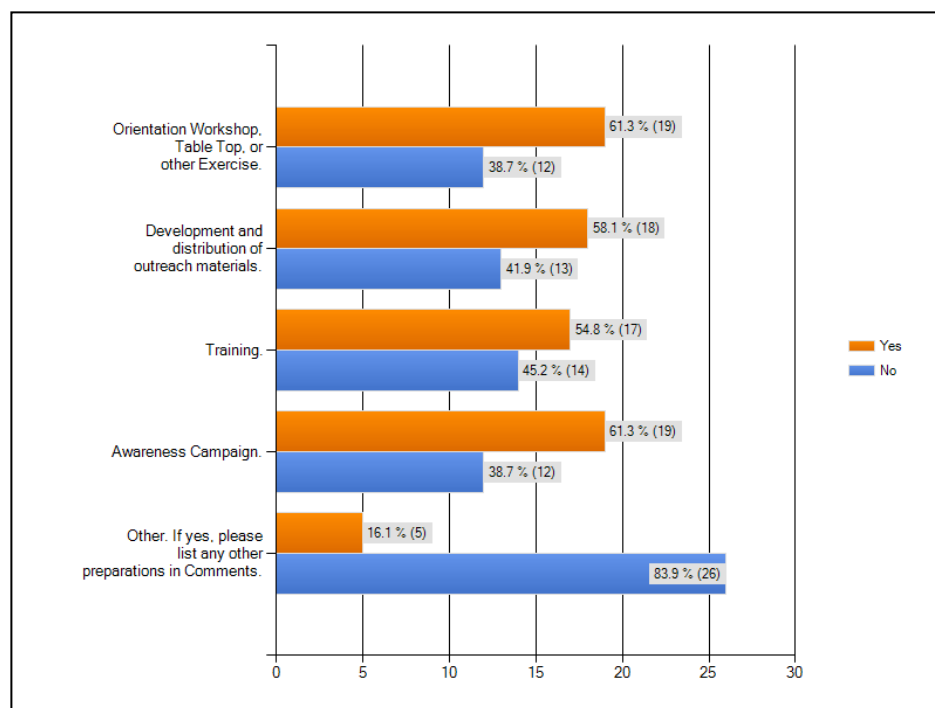


Table V–VII. Preparation of country's media organizations for the PTWC enhanced products

The majority of countries are considering the following methods for preparing media: (1) orientation or tabletop exercise and awareness campaigns; and (2) outreach and training.

The following are all comments from countries:

- Only the Mexican Tsunami Warning Centre will make use of the new PTWC products. (Mexico/de Pinillos)

- There is a Central American platforms for communication, through this platform is necessary to prepare an orientation workshop to let them know about PTWC Enhanced Products will change in 2014. (Nicaragua)
 - Emergency Management British Columbia (EMBC) should do this. (Canada)
 - American Samoa: It would be nice to have representation from PTWC/ITIC to assist with at least 1 orientation workshop with leaders and media. CNMI: Yes but for 2015 not 2014. Guam: For 2015 not 2014. (United States)
 - Low priority due to current constraints on capability and capacity. (Brunei)
 - Chilean TWC will not disseminate the new PTWC products directly, it will use them to analyse and evaluate the tsunami threat, but our products will be different for the moment. The media is aware that national agencies are responsible for the tsunami dissemination, not the PTWC. (Chile)
 - Shall be decided by NDMO and NTC. (Colombia)
 - Media organizations have been part of our consultations and we need targeted trainings to the media given that they are our primary warning mechanism for tsunami. (Kiribati)
 - The training will be organize once the Enhanced Products is up and running. (Vanuatu)
 - Australian Broadcast Corporation (ABC) will be informed of the PTWC Enhanced Products while conducting the broadcast tests with JATWC in the future. ABC has wide interest in the Pacific and will need to know about the product changes. (Australia)
 - We will explain to media via meetings first and then follow up with correspondence. (New Zealand)
- 3.6. Public. Are you considering how to prepare your country's general public for the PTWC enhanced products changeover? Indicate Yes or No, and provide comments as needed.

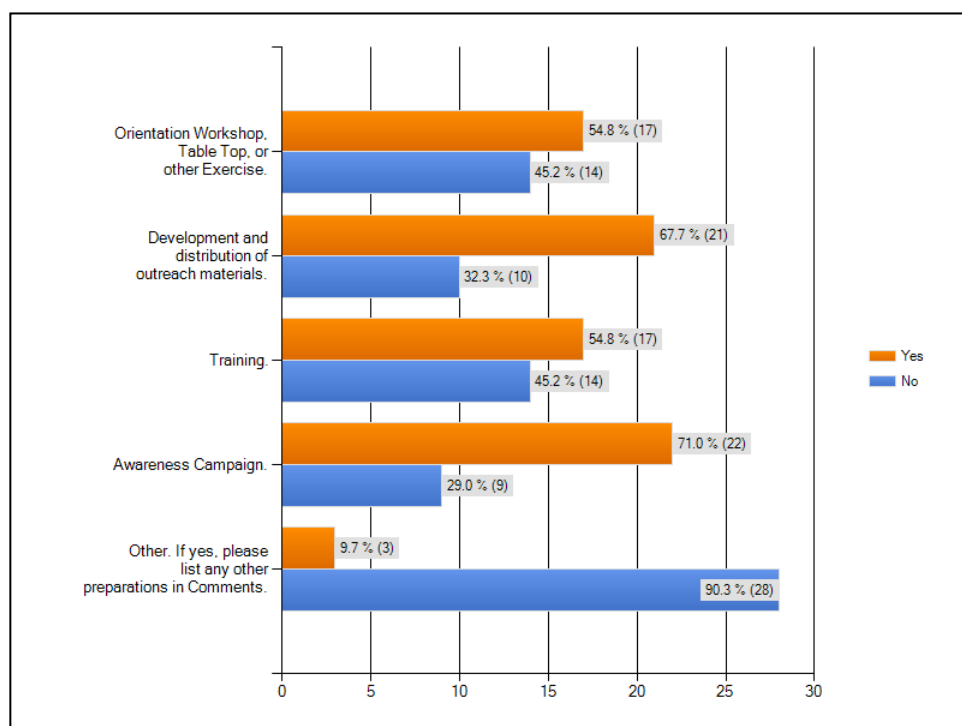


Table V–VIII. Preparation of country's general public for the PTWC enhanced products

In most cases, the media is being targeted to understand the PTWC enhanced products. Many countries have expressed that public will not be educated on PTWC Enhanced Products as they are urged to follow NTCW and/or NDMO instructions. Some countries considering informing the public about the PTWC Enhanced Products request support in developing outreach and awareness materials tailored to the country in terms of context and language.

The following are all comments from countries:

- Only the Mexican Tsunami Warning Centre will make use of the new PTWC products. (Mexico/de Pinillos)
- CNMI: Yes, but for 2015 not 2014. (United States)
- Low priority due to current constraints on capability and capacity. (Brunei)
- No, the public is not prepared to understand the new products. They have to be translated and simplified. (Chile)
- Our NDMO is not favourable to public dissemination of the PTWC forecast tsunami heights. (French Polynesia)
- To be decided with NDMO. (Colombia)
- In fact, the institution in charge is NDMO so that information is issue to people. (Peru)
- We need support in developing outreach materials on the new products that are tailored to the country in terms of context and language. (Kiribati)
- More outreach, more training, more exercise. (WSO, Pohnpei)
- VTWC and NEOC will prepare a one day workshop or awareness materials to inform general public about PTWC enhanced products. (Vanuatu)

- Public should not be concerned about the changeover at all. They should be educated to follow advices of their own NTWC. (Australia)
- We are not intending to educate the public on the new products as they are end recipients of our information via the media and they will not see any substantive difference. (New Zealand)

GENERAL EXERCISE OBSERVATIONS

OVERALL ASSESSMENT. Please provide comments as needed.

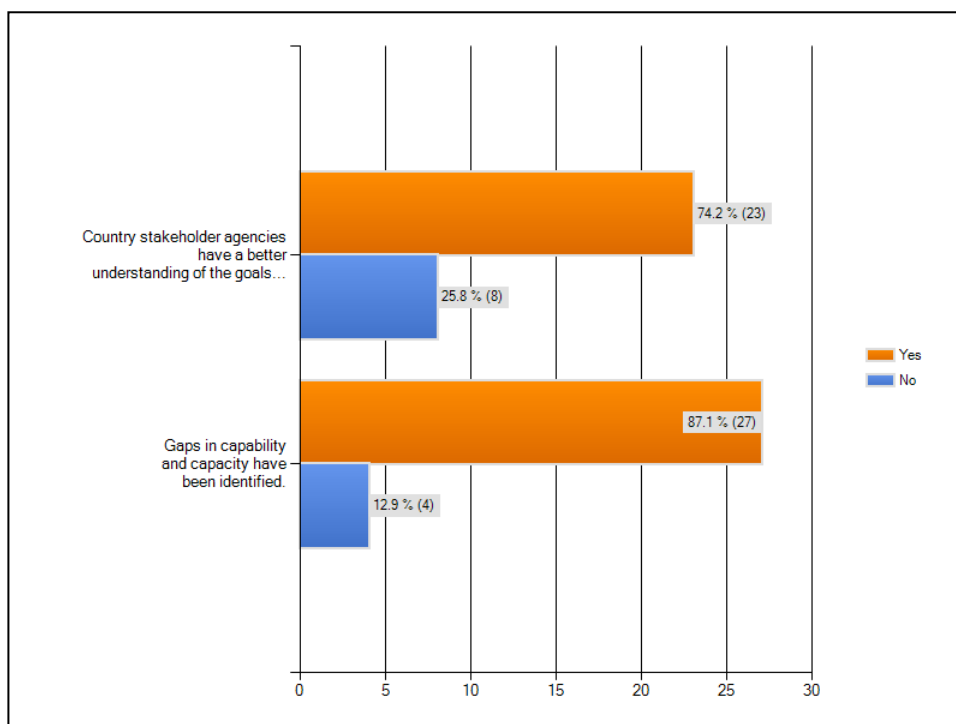


Table V–IX. Overall assessment

The majority of countries have a better understanding of the goals and have identified gaps in capacity that that need to fill to be ready for the changeover in 2014.

The following are all comments from countries:

- SINAPRED has identified some of them, but is needed a workshop to identified gaps and to propose it improvements. (Nicaragua)
- The simulation of Pacwave gives a better understanding of the goal, responsibility, and role to others national agency in term of tsunami emergency situation. However, share out their role and responsibility have to be justified into detail. Many institutions expect more to the NTWC's role and responsibility from the product dissemination to evacuation guidance. 2. The simulation had identified a number of the others national institution's and stakeholder's capacities. Though most of the chairmen of the institutions are getting understood well with the role and the responsibilities of their institution, but on the other hand, in the level of operators they are not familiar with the warning product. It may cause they are sometimes not immediately taking a simple decision regarding tsunami warning dissemination. Many of the operators of Disaster Management Office are a new comer and have to be trained about the warning product. 3. The Simulation had also identified the unexisting SOP for the far

field tsunami, In case of Regional BMKG, it has been existed an SOP with a magnitude less than 5 is under the regional BMKG responsibility. Furthermore in case of the magnitude equal or more than 5 is under NTWC responsibility. (Indonesia)

- Agencies which participated in the PacWave13 tabletop exercise do have a better understanding now of the goals, responsibilities and roles in tsunami emergencies. (Brunei)
- Our NDMO has recently made outstanding initiatives and efforts to improve its preparation and that of all stakeholders for tsunami warnings and occurrences. (Colombia)
- Our country stakeholder agencies have a better understanding of the goals, but not about responsibilities and roles in tsunami emergencies completely. All gaps have not been identified. (Ecuador)
- We have the same understanding of the tsunami risk as before. We realized now that a new difficulty appears when our NTWS evaluation of the risk is lower than PTWC evaluation. That's why we don't wish a public assessment of PTWC forecast. (French Polynesia)
- We are in the process of developing a tsunami support plan for Kiribati, with this; we hope that stakeholder agencies will be able to have better understanding of their roles. Also this process allows us to determine capability of respective agencies and capacity needs are documented. (Kiribati)
- Needs more training for stakeholder, needs more outreach, communication is a most problems, need radio, fax machine, mostly for the remote places. (WSO, Pohnpei)
- The exercise identified gaps not only in capability but also response. (Samoa)
- Improvement of current SOPS and Development of New SOP's for each responding agencies – Country Tsunami risk modelling to be improve ready for Enhanced Products (Vanuatu)
- The exercise participation was limited to JATWC and AGCCC. No State/Territory Emergency Services were involved. Although the Enhanced Products were provided to these two agencies according to the timeline during the exercise, the exercise independently tested the JATWC's tsunami warning system of assessing threat and issuing warnings with lessons learned. (Australia)
- We will review our tsunami national warning and advisory warning templates, tsunami plan and associated standard operating procedures as part of the transition to new products. In addition, we will roll out training to educate key stakeholders in the use of the new products. (New Zealand)

EXERCISE PLANNING. Please provide comments as needed.

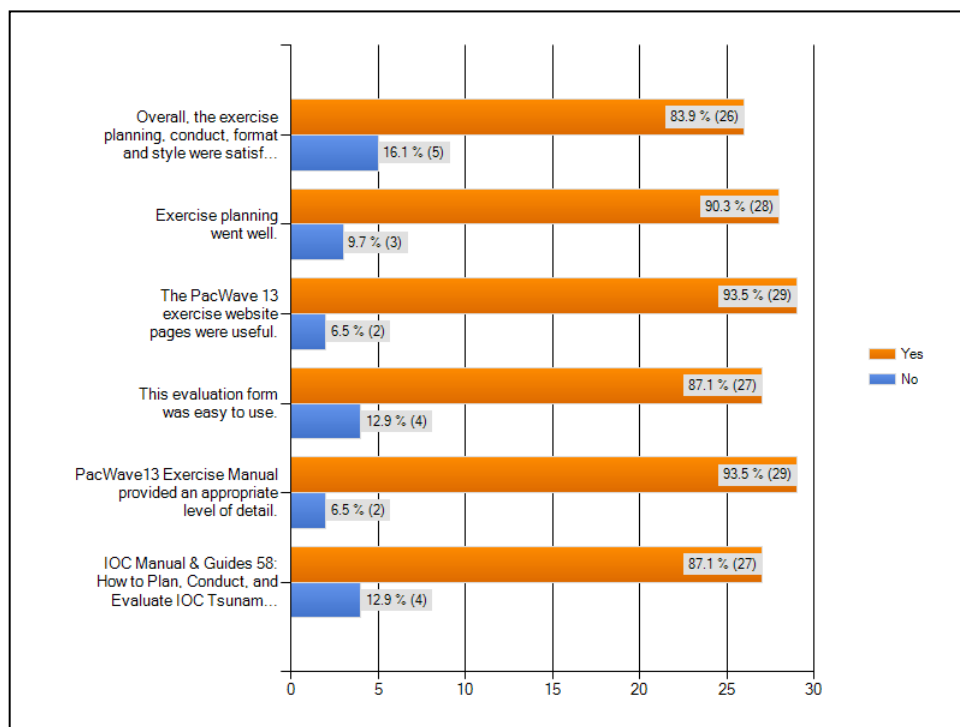


Table V–X. Exercise planning

The majority of countries felt all aspects of the exercise planning went well. The Exercise Pacific Wave 13 Manual (IOC/2013/TS/106VOL.1), website, easy-to-use evaluation form, and the How to plan, conduct and evaluate UNESCO/IOC tsunami wave exercises (IOC/2012/MG/58 REV.) were useful. However, several countries noted that there was not enough time to understand the materials; in these cases, availability of materials earlier and more explanation of products were needed (refer to questions on readiness, training, and outreach for country understanding on the use of the enhanced products). Addition of a Not Applicable (N/A) option would be useful in future evaluation forms.

The following are all comments from countries:

- At the beginning of the planning all the people involved was agreed about Central America needs an specific scenario for this exercise that allow us to use our protocols for a local tsunami. All the scenarios were distant for Central America and this gave us too much time to make decisions and issue a warning to the people at the coast. We decided to use the Chile scenario. (El Salvador)
- It would be better if the PTWC Enhanced Products were available in 2 – 3 weeks prior to the PacWave13. (Russian Federation)
- The Pacwave13 simulation should be conducted gradually started with participation of all of warning centres only without including others institution/stakeholders. There are still many products should be understood well by all of the NTWC's officers before disseminating all the products to others institution/stakeholders. (Indonesia)
- Remarks in the Yes or No answers are sometimes vague and unclear, making it difficult to decide on a Yes or No. (Brunei)
- Unfortunately, it was not possible yet to organize a formal exercise with the other primary institutions. (Colombia)
- Excellent preparatory documents. (Cook Islands)

- Exercise Manual was too long. (Kiribati)
- it was satisfactory, but the same day we had the exercise the fax down, poor communication, miscommunication, needs radio. (WSO, Pohnpei)
- The overall performance was not satisfactory. All members took part did not understand the products. There could be various reasons for it, might be they did not read the manuals or they read but it was too technical to understand. (Tonga)
- Although the announcement and the website were useful for the planning, their earlier release would help planning even more. The evaluation form was easy to follow but not easy to give the right answer. Many questions assume that the respondent countries rely on PTWC products before issuing own warnings. They did not take into account the fact that some countries including Australia have independent capacity to assess tsunami threat. Suggested improvement includes adding an option of Not Applicable in some questions. The form did not ask questions about whether it is appropriate to provide any of the Enhanced Products. It only focused on the usefulness and ranking of each products. (Australia)

EXERCISE PACIFIC WAVE 13 EXPERIENCE

EXERCISE PLANNING

Please provide a general statement about what went well.

Countries responding stated that the planning went generally well. Countries reporting overall that their planning went well were Brunei, Chile, China, Ecuador, El Salvador, Kiribati, Malaysia, Peru, Philippines, US Guam, and Samoa); other countries reported specific planning aspects that went well. Aspects included stakeholder/task force meetings for participation and clarification of roles, especially between the NTWC and DMO, and the PacWave13 exercise format (tabletop format), general instructions, and materials availability (guidance, background materials, MSEL, products). Several countries commented that the recommended tabletop exercise format made for an easier exercise to plan for and conduct.

Comments from countries reporting that overall planning went well:

- In general, the planning of the exercise was easy and all the people involve followed the instructions very well. They read the manual and the made questions regarding the conduct of the exercise. (El Salvador)
- The exercise was great experience although we do use domestic products it gave Guam the opportunity to see the international product. The planning went well and information was sufficient and fruitful in planning for our exercise. There were no negative feedbacks. Anything from Guam for any improvements. (United States – Guam)
- The local exercise master scenario and scheduled communication test before the exercise were well prepared. (China)
- The exercise was carried out to the district level and generally went well. (Malaysia)
- Documents for this exercise provided enough guidance in the planning and conduct of the tabletop exercise. (Philippines)
- Exercise planning went well in general as only three agencies were involved in the tabletop exercise. Each of these agencies has an important and relevant role to play in Brunei's tsunami warning responsibilities which include assessment of tsunami threat. (Brunei)

- The exercise planification was good; we did three meetings/exercises with different participants. The first with almost all the Operators and Professionals involved in the guard duties of our TWC to analyse the new PTWC products and discuss what to do in different cases. The second one we did the same, but we include NDMO personnel. Finally we did a practical exercise in the TWC, applying the new products to our actual SOP's, in order to identify more clearly what is needed to be changed and why. After the exercise, we did a hot debriefing to analyse and take notes about the results. In this opportunity, everything went well, because we had time to practice and to analyse the products before the exercise. The SOP's changes are the main point to improve, to adapt them to the new products. (Chile)
- I think everything has gone very well in terms of organization and planning of activities and delivery of documents. (Ecuador)
- We made coordination meeting with NDMO (INDECI). We made training to staff on duty at Peruvian Tsunami Warning Centre. We made a check list with our communication system. (Peru)
- Planning was short and easy given that Kiribati MET service, Kiribati Police and the Office of the President (NDMO) took part in the exercise (Kiribati).
- Planning went well because we had the documents in advance, this gave us time to prepare scenarios and things that we wanted to assess during the exercise. (Samoa)

Comments from countries reporting on specific planning aspects that went well:

- “La participación de los operadores en turno y el rol que se debe desempeñar ante cualquier evento”. (Guatemala) Translated: The participation of rotational duty officers and the expected role and responsibilities to be performed in the case of an event.
- The participation of all the emergency management authorities and the armed forces to support of the population. (México/de Pinillos)
- Scenarios well-presented and products well defined. (Canada)
- A specific goal is needed for each institution/stakeholder (NTWC [Headquarter and Regional], NDMO, Local DMO, Media) who involve in this simulation. (Indonesia)
- A plan was put in place. (Cook Islands)
- Good understanding between agencies on the new products. (Nauru)
- Bulletin sent in timely manner, respond fast while received, and disseminate quick for the other agencies. (WSO, Pohnpei)
- Obtaining information for the exercise was accessible. (Tonga)
- PacWave13 taskforce meetings. Assigning individual task among taskforce members. (Tuvalu)
- Since we have involved only the staff from VTWC from the VMGD and NEOC from the NDMO we mainly look at how effective our SOPs or Directives are. A lot was discussed but one thing that came out was the review of the tsunami local and regional thresholds. Thresholds need to be lowered from 7.4 to about 6.9 or 7.0. (Vanuatu)
- Two announcements were provided with links and details for the exercise. The exercise preparation meetings/teleconferences were held to coordinate the preparation efforts. Products for the exercise were modified for the correct exercise date and produced in hard copies ahead of time. (Australia)
- All the information was available on the pacwave.info website. (New Zealand)

Please provide a general statement about what did not go well.

Countries responding indicated that planning and preparation was difficult because there was not enough time to adequately prepare. More pre-exercise time was needed for stakeholder training to understand the enhanced products, to develop a realistic exercise scenario, and to make changes to and socialize their new product SOPs.

The following are all comments from countries:

- Some people didn't understand very well the type of exercise and that created confusion during the exercise. El Salvador National Disaster Management Office didn't participate in the exercise. (El Salvador)
- "Creemos que todo ha sido beneficioso y que todo salió tal y como se había previsto2. (Guatemala). Translated: Everything was beneficial and everything was performed as anticipated.
- It was not possible to gather the public as for the undertaking of evacuations from potentially threatened areas in case of flooding as a result of a tsunami. (México/de Pinillos)
- Not all stakeholders in the emergency response plan took part in the exercise so that some of the response actions have to be stimulated. (China)
- The NDMO (Office of Civil Defence) made significant changes in their organization and this made it difficult to schedule exercise activities with them. (Philippines)
- The simulation scenario was not well prepared because of unclear interpretation about the PTWC Product. (Indonesia)
- It takes more time for NCWT optimally manage all the products that were socialized in December 2012, because they require a lot of care. (Ecuador)
- We found a trouble in the Text Message because hypocentral parameters not appear in the first page after the first threat message of PTWC. (Peru)
- Not much response from stakeholders. (Cook Islands)
- Would require or suggest more training for focal point and contact person to fully understand the polygon scoring of a country. (Nauru)
- Communication problems, fax is not working, misunderstanding caused people understand what is going on. (WSO, Pohnpei)
- The scenarios that the planning team came up with required others to constantly call the NTWC and play other roles, this was not factored into the planning and it was only realized by the evaluation team during the exercise. (Samoa)
- When planning to have 1–2 hours exercise with 14 hours. (Tonga)
- PacWave13 taskforce members not well verse with their role within the PacWave exercise or access to copies of the whole exercise guidelines & planning. No specific guidelines in well planning the exercise. (Tuvalu)
- What went wrong was VTWC usually issues Advisory which is in their Tsunami Directive or SOPs. The term Advisory was found to create uncertainty when issued to the public whether to move up the higher ground or not because the word itself tells the public that it's just an advice and that Tsunami is not eminent if it is. so it makes it difficult for NDMO to enforce its evacuation plan (Vanuatu)
- The planning was rushed at short notice. (Australia)

Please provide a general statement about what could be improved.

Similar to the above, countries responding indicated that more lead time was needed for better understanding, more meaningful (and educated) stakeholder participation, and better development of realistic national exercise.

The following are all comments from countries:

- Give more training for the people involved in the exercise before the conduct. (El Salvador)
- Agregar más personal de las instituciones de monitoreo como de respuesta. (Guatemala). Translated: Involve more stakeholders from the monitoring/warning agencies as well as response agencies.
- The participation of the population as for assessing the response capacity of the Emergency Management Authorities. (México/de Pinillos)
- It would be better if the PTWC Enhanced Products were available in 2 - 3 weeks prior to the PacWave 13. (Russian Federation)
- To encourage more stakeholders in the emergency response plan to take part in the exercise. (China)
- Every player of the simulation has to make attention to the simulation goals. A good understanding of simulation goals will produce a simulation scenario be more directed. (Indonesia)
- Ample planning time has to be given to all parties involved in the exercise. (Malaysia)
- Other stakeholders should have been invited to participate in the exercise. (Philippines)
- Documents in Spanish language can be distributed early. (Ecuador)
- We can improve establishing more coordination meeting. (Peru)
- Examples from other members. (Cook Islands)
- General training for technicians/stakeholders. (Nauru)
- Communications, radios, fax machine, mobile. (WSO, Pohnpei)
- What needs to be improved from the planning side is for the planning team to plan and write in details the scenarios, break it down so that something was always happening especially with long distant event scenarios. (Samoa)
- Preparation time before the actual date of the exercise. (Tonga)
- Inclusion more key stakeholders for exercise brainstorming within the taskforce. (Tuvalu)
- So what rests for the VTWC to do is to review its current Tsunami Directive or SOPs to try and include the word Warning. In turn, the NEOC to also review its evacuation plan. (Vanuatu)
- Much longer lead-time is needed so that more details can be thought through before the exercise and a tailored exercise manual can be prepared. (Australia)
- The legends on the KMZ files need to reflect the colours used on the dots. The Chatham Islands needs to be re-included on maps and all maps need to have a timestamp. (New Zealand)

EXERCISE CONDUCT

Please provide a general statement about what went well.

Countries responding reported that the exercise conduct went well. These countries were Australia, Brunei, Chile, China, Cook Islands, Ecuador, El Salvador, Federated States of Micronesia–Pohnpei, France-French Polynesia, Guatemala, Indonesia, Malaysia, Mexico, Nauru, New Zealand, Peru, Philippines, Russia, Samoa, Tonga, Tuvalu, and US – American Samoa.

The tabletop format facilitated an easier-to-plan and conduct exercise, thus resulting in a more productive and useful outcome. This was in part because fewer stakeholders were involved and more discussion time was enabled since it was not a real-time exercise.

Valuable outcomes included:

- Evaluation of where countries were with respect to the new products;
- Improved understanding, cooperation, communication, and clarification on actions, e.g. when and what steps to take, and by whom amongst country stakeholders

The following are all comments from countries:

- The scenario (Chile-Peru) allowed us to have enough time to issue a warning and all the products needed for this purpose. (El Salvador)
- “El apoyo de la autoridades para planificar y ejecutar el ejercicio de alerta de tsunami”. (Guatemala). Translated: The support from authorities to plan and implement a tsunami warning exercise.
- The dissemination of the information through newsletters issued by the Tsunami Warning Centre was thoroughly carried out. (México/de Pinillos)
- Exercise was informative and useful for National Tsunami Warning Centres, National Disaster Management Office and media organizations. (Russian Federation)
- American Samoa: Very good conversation between the 2 agencies. Guam: The tabletop exercise was the best to utilize considering we use domestic product. No noticeable items for things that did not go well. No noticeable improvements to be made. (United States)
- The exercise was well coordinated and conducted smoothly. All participants were responded timely. (China)
- All of the simulation players conducted the simulation seriously, enthusiastic, and paid attention to all of simulation directions. The receiving of information through fax and email modes were getting better in time. The messages were received less than 5 minutes after the earthquake. The messages were treated immediately as news to be broadcasted through the television. (Indonesia)
- The communications between NTRC and NDMO were good. (Malaysia)
- Key personnel of the earthquake and tsunami monitoring division participated in the discussion. (Philippines)
- There was good participation amongst the three agencies involved and the participants themselves had many and productive deliberations throughout the exercise. (Brunei)

- The conduct exercise was good. This type of exercise was simple to conduct, considering the previous meetings and planification. (Chile)
- The exercise was well conducted. (Ecuador)
- The communications were made during the year and it was successfully. (Peru)
- The exercise was conducted on time. (Cook Islands)
- A good point is that we were free to organize the exercise schedule at our convenience. (French Polynesia)
- The introductory presentation to all participants and subsequent discussions on the initial event products and scenarios were well organised. (Kiribati)
- Good understanding between agencies on the new product. (Nauru)
- Disseminate bulletin fast, respond fast when received it, more cooperate, aware of what steps to take first. (WSO, Pohnpei)
- What worked well as that for the first time, everyone and every section in the Met Service participated and contributed to the exercise from the NTWC staff to the drivers and night watchman. (Samoa)
- We were able to evaluate where we are with respect to the new product. (Tonga)
- Tabletop exercise went well, local analysis using new PTWC enhance products went well. (Tuvalu)
- The scenario chosen and done as a tabletop exercise was found to give us more than enough time to prepare and execute our Directives and SOPs and got the Advisory issued well before the first wave arrived. (Vanuatu)
- JATWC process was fully tested from earthquake detection, assembling a response team, assessing tsunami threat, liaising with Regional Forecasting Centres, to preparing warning message and issuing warnings. (Australia)
- The **GNS** Science and MCDEM duty officers got together to conduct the exercise jointly and this worked well. (New Zealand)

Please provide a general statement about what did not go well.

Countries responding reported some difficulties with communication methods, and for countries that did exercise in real-time using a local tsunami scenario, slow speed in decision-making and action.

As commented in previous questions, it was reported that the products were not fully understood by stakeholders in a number of countries, and that stakeholder participation was not strong in some countries.

The following are all comments from countries:

- In some cases people on duty didn't understand all the information of the new products. This will make us to have more training. (El Salvador)
- "Había muchos boletines repetitivos y con la misma información". (Guatemala). Translated: There were too many repetitions of bulletins conveying the same information.
- In some agencies, the lack of enthusiasm in taking part in the exercise, especially at local levels in some municipalities. (México/de Pinillos)

- The time management of the decision making and dissemination messages from NDMO to local DMO were not really going well. In contrast with NDMO, The NTWC and TV Media implemented a time management of the decision making and dissemination messages process appropriately. (Indonesia)
- There were some miscommunication and delayed communication lines. (Malaysia)
- The NDMO did not participate in the exercise. (Philippines)
- In this case all the communications system was successful. (Peru)
- Not as much response from stakeholders as wanted. (Cook Islands)
- The discrepancy between PTWC forecast tsunami heights and our own estimations could create a serious confusion if they are given for public dissemination especially for Society Islands and Tuamotu Archipelago. (French Polynesia)
- Not enough time given for the exercise given busy schedule of those participating. (Kiribati)
- Some stakeholder has no way of communicate, no fax, or fax broken, no telephone, sometimes telephone not working, etc. (WSO, Pohnpei)
- In the beginning of the exercise, it was very slow and it took a while before the participants took the exercise seriously, (Samoa)
- It was a mixture of both lecture and exercise. (Tonga)
- Local exercise select not well organize. Some selected stakeholders for the exercise do not have any SOPs in office. (Tuvalu)
- What did not went well was it took a while for us to decide whether the NEOC to be activated or wait for the VTWC to decide whether to issue the Information, Advisory or the Warning and whether the Tsunami was eminent. (Vanuatu)
- Although the PTWC Enhanced Products were provided to forecasters at set times according to the timeline, forecasters did not pay much attention to them. They were trained to independently assess and issue warnings using the JATWC system. The evaluation of the PTWC Enhanced Products was the additional task that was not in the Standard Operation Procedure, even though this is part of the exercise. (Australia)

Please provide a general statement about what could be improved.

Countries reported the following areas where exercise conduct could be improved:

- Inclusion of a local scenario for the country, which would also allow for better and faster decision-making for local tsunamis;
- Better communication at all levels;
- Better participation by all stakeholders, as there was a lack of interest in some countries;
- More training, outreach for the new products, especially if the media or public will be ask to understand and act upon the products
- Conduct of more involved exercise, such as a functional or full-fledged exercise.

The following are all comments from countries:

- We would like to exercise the new products with a local scenario to determine whether our SOP 's are correct or they need an improvement. (El Salvador)
- The participating agencies should take this kind of exercises more seriously, so they can identify strengths and weaknesses in their local emergency plans. (México/de Pinillos)
- CNMI: This evaluation form was too long. It was appropriate for the international group, but should have been shortened for the Domestic Group. Are we going to go through this again next year? (United States)
- A more in-depth exercise testing emergency response of concerned departments would be more beneficial. (China)
- 1. The dissemination and decision time should be more quickly. In case of tsunami emergency, a late of time dissemination may make a chaotic condition due to the growing issues in the societies, 2. Many players only implemented the dissemination process without doing a warning level interpretation (major warning, warning, and advisory) to be disseminated; 3. The TV media as well as The NDMO operators had a number of difficulties of understanding the map product. 4. A number of trainings and workshops are needed for others institution/stakeholder. (Indonesia)
- Better communication at all levels. (Malaysia)
- Representatives of key stakeholders should have been part of the tabletop discussion. (Philippines)
- Strengthen and integrate the communication of these exercises with other countries in the region. (Peru)
- Turn it into a functional or fully fledged exercise. (Cook Islands)
- More time allocated for this exercise. (Kiribati)
- More training, outreach, needs fund for purchasing tools. (WSO, Pohnpei)
- For future exercises, it would be best to get everyone together and emphasize the seriousness of the exercise and not to take it lightly. (Samoa)
- Only conduct the exercise when all members declared they understand all the materials about the exercise. (Tonga)
- Exercise to take place again once key stakeholders SOPs have in place for testing their response plan, preferable sometimes this year. (Tuvalu)
- That VTWC and NEOC need to improve on is to review and have consistency in their SOPs. (Vanuatu)
- Nothing in particular, the exercise was well run. (Australia)

EXERCISE DEBRIEF OR EVALUATION

Please provide a general statement about what went well.

Countries indicated that holding timely debriefs immediately after was a useful activity. The evaluation form was also simple to understand and use.

A number of comments were also made on the conduct of PacWave13, which may be duplicative to, or need to be added as additional comments to other questions.

Comments on Exercise Debrief and what went well:

- The evaluation is very simple in the way that asks you specifically whether the new products are useful for your country. (El Salvador)
- All went well. (Russian Federation)
- American Samoa: Information sharing. (United States)
- Every observer and facilitator was watching the simulation seriously and attempting to give a number of inputs for making a better simulation in the future. (Indonesia)
- Evaluation was provided within the first week of the exercise. (Malaysia)
- The debriefing and final comments were developed without relevant observations. (Chile)
- It was very general. (Ecuador)
- A debrief was carried out. (Cook Islands)
- Turn out of participants is satisfactory with Senior Level Representation from all participating agencies. (Kiribati)
- Good understanding between agencies on the new products. (Nauru)
- The hot debrief immediately after the exercise. (Samoa)
- Attendance was very good. (Tonga)
- Timing is very important. Time of receiving the bulletin from PTWC, timing for VTWC to prepare and disseminate it and for NDMO to receive it and activate and execute its National Emergency Operation (NEO) Plan. VTWC receives after 15 minutes and prepares and disseminates it to the NDMO and by then it takes 20 to 30 minutes for NEOC to be activated and inform the stakeholders. (Vanuatu)
- Timely debriefs – We had the exercise debrief on the next working day within the Bureau of Meteorology, then the all-agency debrief three days later. (Australia)

Comments not related to the Exercise Debrief and what went well:

- The bulletin sent to all the different units was received in due time and proper form. New products from the PTWC were very useful for analysing the information. Emergency meetings were held by the authorities before the tsunami threat. In some areas, the exercise was disclosed through the media. (México/de Pinillos)
- Exercise messages were promptly sent to all participants via various communication channels such as fax, email and government internal network. (China)
 - The time between the issuing (Dirección de Hidrografía y Navegación, **DHN**) and institution receptor (Instituto Nacional de Defensa Civil, **INDECI**) were ok according established schedule. (Peru)
- This exercise was a good test for comparing the forecast tsunami heights calculated by PTWC, and ours numerical simulations; it was also a good occasion for a fruitful debriefing with Civil Defence about the new products. The forecast tsunami height for Marquesas archipelago was in good agreement with our numerical simulations. (French Polynesia)
- People can be ready for real warning, (WSO, Pohnpei)

Please provide a general statement about what did not go well.

Of the few that responded, it was indicated post-exercise debrief did not have good participation. Most responses were not related to the Exercise Debrief and what did not go

well. These other comments were made on the conduct of the exercise, which may be duplicative to, or need to be added as additional comments to other questions.

Comments on Exercise Debrief and what did not go well:

- Exercise debriefing was not conducted since comments were already made during the tabletop exercise. (Philippines)
- Not much stakeholder participation. (Cook Islands)
- Not everyone that was involved during the exercise was available for both the debrief and evaluation. (Samoa)

Other comments not related to the Exercise Debrief and what did not go well:

- The evaluation doesn't ask you whether the new products were useful for the scenario selected. We believe it will be different for a local scenario than a distant one. (El Salvador)
- Evacuation protocols are needed before an imminent danger of tsunami. This was presented as the greatest weakness of the units responsible for civil protection. (México/de Pinillos)
- 1. The information about PTWC Products and its format are not well informed to others institution. 2. The dissemination mode mechanism of PTWC products to be delivered to NTWC has not to be defined yet clearly. 3. The graphical product of PTWC has not met the InaTEWS product yet. It should include a warning segment area definition which indicates each district and province level. 4. The simulation identified a difficulty of converting the PTWC Product to NTWC Product. A converting template is needed to be provided. (Indonesia)
- It was successful. (Peru)
- Some forecast tsunami heights are largely over-estimated (like Tuamotu and Society archipelagos). If they are published for public dissemination, they may create a confusion/panic for the populations of theses archipelago. (French Polynesia)
- Not enough time and also could have included other aspects such as testing communication equipment's. (Kiribati)
- Mostly communications problem (WSO, Pohnpei)
- Understanding the new products was exacerbated by errors in the location of some of the coastal points given by the RIFT model. (Tonga)
- NEOC was kind of hesitating to quickly disseminate the public evacuation message, because the alert was issued in a form of advisor. NEOC will fully enforce evacuation message only if the alert has been issued as a warning to potential affected sites. (Vanuatu)
- Limited inter-comparison done between the PTWC Enhanced Products and the JATWC products, and between the enhanced and existing PTWC products. (Australia)

Please provide a general statement about what could be improved.

Of the few that responded, it was suggested that more time should be spent so that productive debriefs are conducted. Most responses were not related to the how the Exercise Debrief can be improved.

Comments on the Exercise Debrief and what could be improved:

- Continue reminders for an evaluation (Cook Islands)
- Timing of the evaluation process and also emphasise that evaluations are not personalized. (Samoa)
- Threshold, Directives or SOPs to be reviewed and improved while utilizing enhanced PTWC products so that appropriate decision could be taken to evacuate people when there is eminent Tsunami (Vanuatu)
- The JATWC should have allocated more time for the exercise de-briefing and product evaluation, and also has not yet involved tsunami modelling scientists in the product evaluation. (Australia)
- The exercise debrief or evaluation was conducted at National Disaster Management Centre and chaired by its Acting Assistant Director. Participants also included representatives from Meteorological Department and National Seismic Centre, Public Works Department, both of which are responsible for the nation's tsunami warning responsibilities. (Brunei)

Other comments not related to how the Exercise Debrief and what can be improved:

- We would like to exercise the new products with a local scenario to determine whether our SOP 's are correct or they need an improvement. (El Salvador)
- The creation of maps that include evacuation routes in case of tsunami. Updating of evacuation plans with the participation of local authorities. (México/de Pinillos)
- American Samoa: More training and providing education to involve: Evaluation is only appropriate for international community and not for domestic. (United States)
- A simple template made by PTWC to extend the message to be news is needed for the media. (Indonesia)
- Improve definition and result about Coastal Forecast KMZ file. Specify the sequence of products by event date. (Peru)
- Continue reminders for an evaluation (Cook Islands)
- The colour scale used for the coastal forecast map is not easy to read. (French Polynesia)
- More specialized training on the new products would have made the exercise more meaningful to all participants especially those who have just seen the products. (Kiribati)
- Needs more training, more education, workshops. (WSO, Pohnpei)
- Timing of the evaluation process and also emphasise that evaluations are not personalized. (Samoa)
- Guidance when to cease the threat message. (Tonga)
- The JATWC should have allocated more time for the exercise de-briefing and product evaluation, and also has not yet involved tsunami modelling scientists in the product evaluation. (Australia)
- New Zealand will review the list of forecast points locations as we think these could be refined. We are reviewing our SOPs, national warning and advisory templates, tsunami plan and training. We will check the latitude/longitude for New Zealand locations. (New Zealand).

ANNEX VI

REPORT PREPARATION / FINAL REPORT

The planning, conduct, and evaluation of Exercise Pacific Wave 2013 were coordinated by the PTWS Exercise Pacific Wave 2013 Task Team (TT). The Exercise Pacific Wave 2013 Summary Report and Annexes IV and V were compiled by Ms Jo Guard (Ministry of Civil Defence & Emergency Management, New Zealand), and Dr Laura Kong, Nicolas Arcos, and Brian Yanagi (International Tsunami Information Center). Translation of Annex V evaluation comments from Spanish to English was provided by ITIC.

Task Team Members (official):

- Ms Jo Guard, New Zealand, Ministry of Civil Defence and Emergency Management, Task Team Co-Chair.
- Dr Laura Kong, USA, ITIC Director, Task Team Co-Chair.
- Mr David Coetzee. NZ, WG 3 Chair.
- Dr Ken Gledhill, NZ, PTWS Chair.
- Mr Takeshi Koizumi, Japan, JMA Senior Coordinator for International Earthquake and Tsunami Information.
- Lt Willington Renteria, Ecuador.
- Mr Brian Yanagi, USA, ITIC.

ANNEX VII

LIST OF ACRONYMS

ABC	Australian Broadcast Corporation
AGCCC	Australian Government Crisis Coordination Centre
AS	American Samoa
CL	Circular Letter
CNMI	Commonwealth of the Northern Mariana Islands
CONRED	Coordinadora Nacional para la Reducción de Desastres de Guatemala
DHN	Dirección de Hidrografía y Navegación del Perú
DISCEX	Discussion exercise
EMBC	Emergency Management British Columbia
EPW06	Exercise Pacific Wave '06 ()
FSM	Federated States of Micronesia
ICG/ITSU	International Coordination Group for the Tsunami Warning System in the Pacific
ICG/PTWS	Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System
InaTEWS	Indonesia Tsunami Early Warning System
INDECI	Instituto Nacional de Defensa Civil del Perú
INETER	Instituto Nicaragüense de Estudios Territoriales
INSIVUMEH	Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología de Guatemala
IOC	Intergovernmental Oceanographic Commission
ITIC	International Tsunami Information Centre
ITWC	International Tsunami Warning Centre
JATWC	Joint Australian Tsunami warning Centre
JMA	Japan Meteorological Agency
MCDEM	Ministry of Civil Defence & Emergency Management of New Zealand
MSEL	Master Schedule Of Events List

NDMO	National Disaster Management Office
NEMO	National Emergency Management Office () of Tonga
NEOC	National Emergency Operation Centre
NTWC	National Tsunami Warning Centre
NWPTAC	Northwest Pacific Tsunami Advisory Center
ONEMI	Oficina Nacional de Emergencia del Ministerio del Interior y Seguridad Pública de Chile
OSSO	Observatorio Sismológico y Geofísico del Suroccidente Colombiano
PacWave	Exercise Pacific Wave
PTWC	Pacific Tsunami Warning Center
PTWS	Pacific Tsunami Warning and Mitigation System
SHOA	Servicio Hidrográfico y Oceanográfico de la Armada de Chile
SINAPRED	Secretaría Ejecutiva del Sistema para la Prevención, Mitigación y Atención de Desastres de Nicaragua
SOP	Standard Operating Procedure
TEC	Tuvalu Electricity Corporation
TMS	Tuvalu Met Service
ToR	Terms of Reference
ToT	Training of Trainer
TT	Task Team
TWFP	Tsunami Warning Focal Point
UNESCO	United Nations Educational, Scientific and Cultural Organization
VTWC	Vanuatu Tsunami Warning Centre
WSO	Pohnpei Weather Service Office

IOC Technical Series

No.	Title	Languages
1	Manual on International Oceanographic Data Exchange. 1965	(out of stock)
2	Intergovernmental Oceanographic Commission (Five years of work). 1966	(out of stock)
3	Radio Communication Requirements of Oceanography. 1967	(out of stock)
4	Manual on International Oceanographic Data Exchange - Second revised edition. 1967	(out of stock)
5	Legal Problems Associated with Ocean Data Acquisition Systems (ODAS). 1969	(out of stock)
6	Perspectives in Oceanography, 1968	(out of stock)
7	Comprehensive Outline of the Scope of the Long-term and Expanded Programme of Oceanic Exploration and Research. 1970	(out of stock)
8	IGOSS (Integrated Global Ocean Station System) - General Plan Implementation Programme for Phase I. 1971	(out of stock)
9	Manual on International Oceanographic Data Exchange - Third Revised Edition. 1973	(out of stock)
10	Bruun Memorial Lectures, 1971	E, F, S, R
11	Bruun Memorial Lectures, 1973	(out of stock)
12	Oceanographic Products and Methods of Analysis and Prediction. 1977	E only
13	International Decade of Ocean Exploration (IDOE), 1971-1980. 1974	(out of stock)
14	A Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment and Baseline Study Guidelines. 1976	E, F, S, R
15	Bruun Memorial Lectures, 1975 - Co-operative Study of the Kuroshio and Adjacent Regions. 1976	(out of stock)
16	Integrated Ocean Global Station System (IGOSS) General Plan and Implementation Programme 1977-1982. 1977	E, F, S, R
17	Oceanographic Components of the Global Atmospheric Research Programme (GARP) . 1977	(out of stock)
18	Global Ocean Pollution: An Overview. 1977	(out of stock)
19	Bruun Memorial Lectures - The Importance and Application of Satellite and Remotely Sensed Data to Oceanography. 1977	(out of stock)
20	A Focus for Ocean Research: The Intergovernmental Oceanographic Commission - History, Functions, Achievements. 1979	(out of stock)
21	Bruun Memorial Lectures, 1979: Marine Environment and Ocean Resources. 1986	E, F, S, R
22	Scientific Report of the Interecalibration Exercise of the IOC-WMO-UNEP Pilot Project on Monitoring Background Levels of Selected Pollutants in Open Ocean Waters. 1982	(out of stock)
23	Operational Sea-Level Stations. 1983	E, F, S, R
24	Time-Series of Ocean Measurements. Vol.1. 1983	E, F, S, R
25	A Framework for the Implementation of the Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment. 1984	(out of stock)
26	The Determination of Polychlorinated Biphenyls in Open-ocean Waters. 1984	E only
27	Ocean Observing System Development Programme. 1984	E, F, S, R
28	Bruun Memorial Lectures, 1982: Ocean Science for the Year 2000. 1984	E, F, S, R
29	Catalogue of Tide Gauges in the Pacific. 1985	E only
30	Time-Series of Ocean Measurements. Vol. 2. 1984	E only
31	Time-Series of Ocean Measurements. Vol. 3. 1986	E only
32	Summary of Radiometric Ages from the Pacific. 1987	E only
33	Time-Series of Ocean Measurements. Vol. 4. 1988	E only

(continued)

No.	Title	Languages
34	Bruun Memorial Lectures, 1987: Recent Advances in Selected Areas of Ocean Sciences in the Regions of the Caribbean, Indian Ocean and the Western Pacific. 1988	Composite E, F, S
35	Global Sea-Level Observing System (GLOSS) Implementation Plan. 1990	E only
36	Bruun Memorial Lectures 1989: Impact of New Technology on Marine Scientific Research. 1991	Composite E, F, S
37	Tsunami Glossary - A Glossary of Terms and Acronyms Used in the Tsunami Literature. 1991	E only
38	The Oceans and Climate: A Guide to Present Needs. 1991	E only
39	Bruun Memorial Lectures, 1991: Modelling and Prediction in Marine Science. 1992	E only
40	Oceanic Interdecadal Climate Variability. 1992	E only
41	Marine Debris: Solid Waste Management Action for the Wider Caribbean. 1994	E only
42	Calculation of New Depth Equations for Expendable Bathymetographs Using a Temperature-Error-Free Method (Application to Sippican/TSK T-7, T-6 and T-4 XBTS. 1994	E only
43	IGOSS Plan and Implementation Programme 1996-2003. 1996	E, F, S, R
44	Design and Implementation of some Harmful Algal Monitoring Systems. 1996	E only
45	Use of Standards and Reference Materials in the Measurement of Chlorinated Hydrocarbon Residues. 1996	E only
46	Equatorial Segment of the Mid-Atlantic Ridge. 1996	E only
47	Peace in the Oceans: Ocean Governance and the Agenda for Peace; the Proceedings of <i>Pacem in Maribus</i> XXIII, Costa Rica, 1995. 1997	E only
48	Neotectonics and fluid flow through seafloor sediments in the Eastern Mediterranean and Black Seas - Parts I and II. 1997	E only
49	Global Temperature Salinity Profile Programme: Overview and Future. 1998	E only
50	Global Sea-Level Observing System (GLOSS) Implementation Plan-1997. 1997	E only
51	L'état actuel de l'exploitation des pêcheries maritimes au Cameroun et leur gestion intégrée dans la sous-région du Golfe de Guinée (<i>cancelled</i>)	F only
52	Cold water carbonate mounds and sediment transport on the Northeast Atlantic Margin. 1998	E only
53	The Baltic Floating University: Training Through Research in the Baltic, Barents and White Seas - 1997. 1998	E only
54	Geological Processes on the Northeast Atlantic Margin (8 th training-through-research cruise, June-August 1998). 1999	E only
55	Bruun Memorial Lectures, 1999: Ocean Predictability. 2000	E only
56	Multidisciplinary Study of Geological Processes on the North East Atlantic and Western Mediterranean Margins (9 th training-through-research cruise, June-July 1999). 2000	E only
57	Ad hoc Benthic Indicator Group - Results of Initial Planning Meeting, Paris, France, 6-9 December 1999. 2000	E only
58	Bruun Memorial Lectures, 2001: Operational Oceanography – a perspective from the private sector. 2001	E only
59	Monitoring and Management Strategies for Harmful Algal Blooms in Coastal Waters. 2001	E only
60	Interdisciplinary Approaches to Geoscience on the North East Atlantic Margin and Mid-Atlantic Ridge (10 th training-through-research cruise, July-August 2000). 2001	E only
61	Forecasting Ocean Science? Pros and Cons, Potsdam Lecture, 1999. 2002	E only

No.	Title	Languages
62	Geological Processes in the Mediterranean and Black Seas and North East Atlantic (11 th training-through-research cruise, July- September 2001). 2002	E only
63	Improved Global Bathymetry – Final Report of SCOR Working Group 107. 2002	E only
64	R. Revelle Memorial Lecture, 2006: Global Sea Levels, Past, Present and Future. 2007	E only
65	Bruun Memorial Lectures, 2003: Gas Hydrates – a potential source of energy from the oceans. 2003	E only
66	Bruun Memorial Lectures, 2003: Energy from the Sea: the potential and realities of Ocean Thermal Energy Conversion (OTEC). 2003	E only
67	Interdisciplinary Geoscience Research on the North East Atlantic Margin, Mediterranean Sea and Mid-Atlantic Ridge (12 th training-through-research cruise, June-August 2002). 2003	E only
68	Interdisciplinary Studies of North Atlantic and Labrador Sea Margin Architecture and Sedimentary Processes (13 th training-through-research cruise, July-September 2003). 2004	E only
69	Biodiversity and Distribution of the Megafauna / Biodiversité et distribution de la mégafaune. 2006 Vol.1 The polymetallic nodule ecosystem of the Eastern Equatorial Pacific Ocean / Ecosystème de nodules polymétalliques de l’océan Pacifique Est équatorial Vol.2 Annotated photographic Atlas of the echinoderms of the Clarion-Clipperton fracture zone / Atlas photographique annoté des échinodermes de la zone de fractures de Clarion et de Clipperton Vol.3 Options for the management and conservation of the biodiversity — The nodule ecosystem in the Clarion Clipperton fracture zone: scientific, legal and institutional aspects	E F
70	Interdisciplinary geoscience studies of the Gulf of Cadiz and Western Mediterranean Basin (14 th training-through-research cruise, July-September 2004). 2006	E only
71	Indian Ocean Tsunami Warning and Mitigation System, IOTWS. Implementation Plan, 7–9 April 2009 (2 nd Revision). 2009	E only
72	Deep-water Cold Seeps, Sedimentary Environments and Ecosystems of the Black and Tyrrhenian Seas and the Gulf of Cadiz (15 th training-through-research cruise, June–August 2005). 2007	E only
73	Implementation Plan for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS), 2007–2011. 2007 (<i>electronic only</i>)	E only
74	Bruun Memorial Lectures, 2005: The Ecology and Oceanography of Harmful Algal Blooms – Multidisciplinary approaches to research and management. 2007	E only
75	National Ocean Policy. The Basic Texts from: Australia, Brazil, Canada, China, Colombia, Japan, Norway, Portugal, Russian Federation, United States of America. (Also Law of Sea Dossier 1). 2008	E only
76	Deep-water Depositional Systems and Cold Seeps of the Western Mediterranean, Gulf of Cadiz and Norwegian Continental margins (16 th training-through-research cruise, May–July 2006). 2008	E only
77	Indian Ocean Tsunami Warning and Mitigation System (IOTWS) – 12 September 2007 Indian Ocean Tsunami Event. Post-Event Assessment of IOTWS Performance. 2008	E only
78	Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (CARIBE EWS) – Implementation Plan 2013–2017 (Version 2.0). 2013	E only

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No.	Title	Languages
79	Filling Gaps in Large Marine Ecosystem Nitrogen Loadings Forecast for 64 LMEs – GEF/LME global project Promoting Ecosystem-based Approaches to Fisheries Conservation and Large Marine Ecosystems. 2008	E only
80	Models of the World's Large Marine Ecosystems. GEF/LME Global Project Promoting Ecosystem-based Approaches to Fisheries Conservation and Large Marine Ecosystems. 2008	E only
81	Indian Ocean Tsunami Warning and Mitigation System (IOTWS) – Implementation Plan for Regional Tsunami Watch Providers (RTWP). 2008	E only
82	Exercise Pacific Wave 08 – A Pacific-wide Tsunami Warning and Communication Exercise, 28–30 October 2008. 2008	E only
83.	<i>Cancelled</i>	
84.	Global Open Oceans and Deep Seabed (GOODS) Bio-geographic Classification. 2009	E only
85.	Tsunami Glossary	E, F, S
86	Pacific Tsunami Warning System (PTWS) Implementation Plan (<i>under preparation</i>)	
87.	Operational Users Guide for the Pacific Tsunami Warning and Mitigation System (PTWS) – Second Edition. 2011	E only
88.	Exercise Indian Ocean Wave 2009 (IOWave09) – An Indian Ocean-wide Tsunami Warning and Communication Exercise – 14 October 2009. 2009	E only
89.	Ship-based Repeat Hydrography: A Strategy for a Sustained Global Programme. 2009	E only
90.	12 January 2010 Haiti Earthquake and Tsunami Event Post-Event Assessment of CARIBE EWS Performance. 2010	E only
91.	Compendium of Definitions and Terminology on Hazards, Disasters, Vulnerability and Risks in a coastal context	<i>Under preparation</i>
92.	27 February 2010 Chile Earthquake and Tsunami Event – Post-Event Assessment of PTWS Performance (Pacific Tsunami Warning System). 2010	E only
93.	Exercise CARIBE WAVE 11 / LANTEX 11—A Caribbean Tsunami Warning Exercise, 23 March 2011	
	Vol. 1 Participant Handbook / Exercise CARIBE WAVE 11 —Exercice d'alerte au tsunami dans les Caraïbes, 23 mars 2011. Manuel du participant / Ejercicio Caribe Wave 11. Un ejercicio de alerta de tsunami en el Caribe, 23 de marzo de 2011. Manual del participante. 2010	E/F/S
	Vol. 2 Report. 2011	E only
	Vol. 3 Supplement: Media Reports. 2011	E/F/S
94.	Cold seeps, coral mounds and deep-water depositional systems of the Alboran Sea, Gulf of Cadiz and Norwegian continental margin (17th training-through-research cruise, June–July 2008)	<i>Under preparation</i>
95.	International Post-Tsunami Survey for the 25 October 2010 Mentawai, Indonesia Tsunami	<i>Under preparation</i>
96.	Pacific Tsunami Warning System (PTWS) 11 March 2011 Off Pacific coast of Tohoku, Japan, Earthquake and Tsunami Event. Post-Event Assessment of PTWS Performance	<i>Under preparation</i>
97.	Exercise PACIFIC WAVE 11: A Pacific-wide Tsunami Warning and Communication Exercise, 9–10 November 2011	
	Vol. 1 Exercise Manual. 2011	E only
	Vol. 2 Report. 2013	E only
98.	Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and connected seas. First Enlarged Communication Test Exercise (ECTE1). Exercise Manual and Evaluation Report. 2011	E only

No.	Title	Languages
99.	Exercise INDIAN OCEAN WAVE 2011 – An Indian Ocean-wide Tsunami Warning and Communication Exercise, 12 October 2011 Vol. 1 Exercise Manual. 2011 Supplement: Bulletins from the Regional Tsunami Service Providers Vol. 2 Exercise Report. 2013	E only
100.	Global Sea Level Observing System (GLOSS) Implementation Plan – 2012. 2012	E only
101.	Exercise Caribe Wave/Lantex 13. A Caribbean Tsunami Warning Exercise, 20 March 2013. Volume 1: Participant Handbook. 2012	E only
102.	<i>(In preparation)</i>	
103.	Exercise NEAMWAVE 12. A Tsunami Warning and Communication Exercise for the North-eastern Atlantic, the Mediterranean, and Connected Seas Region, 27–28 November 2012, Volume I: Exercise Manual. 2012	E only
104.	Seísmo y tsunami del 27 de agosto de 2012 en la costa del Pacífico frente a El Salvador, y seísmo del 5 de septiembre de 2012 en la costa del Pacífico frente a Costa Rica. Evaluación subsiguiente sobre el funcionamiento del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico. 2012	Español solamente (resumen en inglés y francés)
105.	Users Guide for the Pacific Tsunami Warning Center Enhanced Products for the Pacific Tsunami Warning System. 2013	E, S
106.	Exercise Pacific Wave 13. A Pacific-wide Tsunami Warning and Enhanced Products Exercise, 1–14 May 2013. Vol. 1 Exercise Manual. 2013 Vol. 2 Summary Report. 2013	E only
107.	Tsunami Public Awareness and Educations Strategy for the Caribbean and Adjacent Regions. 2013	E only

