

EXERCISE PACIFIC WAVE 11

A Pacific-wide Tsunami Warning and Communication Exercise

9–10 November 2011

Exercise Manual

Volume 1

UNESCO

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and Communication Exercise**
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IOC Technical Series, 97 (volume 1)
Paris, August 2011
English only

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For bibliographic purposes, this document should be cited as follows:

Exercise Pacific Wave 11. A Pacific-wide Tsunami Warning and Communication Exercise, 9–10 November 2011. Volume 1. IOC Technical Series No 97. UNESCO/IOC 2011
(English only)

Report prepared by: The Intergovernmental Coordination
Group for the Pacific Tsunami Warning
and Mitigation System

Printed in 2011
by United Nations Educational, Scientific
and Cultural Organization
7, Place de Fontenoy, 75352 Paris 07 SP

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Printed in France

(IOC/2011/TS/97Vol.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 three years (2009–2011), the Pacific witnessed three destructive and deadly tsunamis that each placed PTWS (Pacific Tsunami Warning and Mitigation System) countries in various levels of warning for distant tsunamis. Locally, five 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 the largest deadly tsunami 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 tens of thousands of lives.

In the 11 March 2011 tsunami in Japan, arguably the most tsunami-prepared country in the world, more than 25,000 people lost their lives. 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 and tsunami that occurred off the coast of Chile, killing about 5,000 people locally and 138 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; PTWS [IOC/INF-1124 rev.], Medium-Term Strategy 2009–2013 [ICG/PTWS-XXIII/3 (Rec. 5) and working document ICG/PTWS-XXIII/13]). In 2005, ITSU was re-established 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 the PTWS and to identify changes that can improve its effectiveness. 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. The second exercise "Exercise Pacific Wave 08" (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, Member States reviewed "Exercise Pacific Wave 08", its findings and recommendations. Acknowledging the common occurrence of large earthquakes in the Southwest Pacific and its ensuing tsunami hazard, and recognising exercises as a good vehicle to improve response readiness and publicise awareness of tsunamis, Member States recommended to hold a third Pacific-wide tsunami exercise to especially assist Pacific Island Countries in better preparing for the next tsunami.

At the Twenty-fourth Session of the ICG/PTWS held in Beijing, China, from 24 to 27 May 2011, Member States reviewed the proposal of the PTWS Exercise Task Team and approved the conduct of Exercise Pacific Wave 11 (Exercise Pacific Wave 11) on 9 and 10 November 2011

as a multi-scenario exercise to allow countries to improve their readiness for local and regional tsunamis (ICG/PTWS-XXIV/3, Rec. 3).

2. EXERCISE PURPOSE

The purpose (aim) of Exercise Pacific Wave 11 is to improve local and regional source tsunami warning and response capability in the Pacific.

The exercise provides an opportunity for Pacific countries to exercise their operational lines of communications, review their tsunami response procedures, and promote emergency preparedness. 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 OBJECTIVES

There are three key objectives for Exercise Pacific Wave 11. Sub-objectives are noted as bullet points.

- (i) To exercise and evaluate operations of the current PTWS:
 - Validate the issuance of tsunami advice from the Pacific Tsunami Warning Center (PTWC), the Japan Meteorological Agency/Northwest Pacific Tsunami Advisory Center (JMA/NWPTAC) and the West Coast and Alaska Tsunami Warning Center (WCATWC).
 - Validate receipt of this tsunami advice by Pacific Country Tsunami Warning Focal Points.
- (ii) To begin a process of exposure to an initial test version of PTWC experimental products that are being developed to provide a more rapid and quantitative forecast of tsunami impacts:
 - Review and evaluate PTWC experimental products that will be available in parallel with existing PTWC products for each scenario exercised.
 - Provide feedback on the staging, format, and content of the experimental products.
- (iii) To validate the readiness of Member States to respond to a local/regional source tsunami:
 - Validate the operational readiness of the National Tsunami Warning Centre (NTWC), or similar in-country function, and/or the National Disaster Management Office (NDMO).
 - Improve operational readiness. Before the exercise, ensure appropriate tools and response plan(s) have been developed, including public education materials.
 - Validate dissemination of warnings and information/advice by National Tsunami Warning Centre 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 are accurate and timely.

- Validate the elapsed time until the public would be notified and instructed/advised.

Countries may wish to consider additional objectives that take into account the use and value of public information material such as guiding response actions by the public to save their lives, especially in a local tsunami scenario. Validation of whether the public understands what to do, and whether authoritative messages to the public are useable and actionable (clear, concise and timely) are important to assess for effective tsunami warning.

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

4. EXPERIMENTAL PRODUCTS

In response to Recommendation ICG/PTWS-XXIII.1, Task Team on Enhancing Tsunami Warning Products, the PTWC has proposed new products based upon PTWC's improved capabilities in terms of its speed of response and growing ability to forecast impacts. Test products will be introduced with PacWave11, they will be developed and refined over the next two years, and then implemented operationally in 2013, after approval at the next session of the ICG/PTWS (ICG/PTWS-XXV).

Alerts will be threat-based rather than based strictly upon magnitude thresholds and time or distance to impact. Several levels of tsunami threat will be established, and forecast threat levels will be assigned to 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 and PTWC experimental product explanations are provided in [Annex I](#).

5. EXERCISE SCENARIO

Exercise Pacific Wave 11 will be held on 9 and 10 November 2011, and will involve multiple scenarios, played out in real time, to allow all Pacific countries to select and exercise a regional/local source tsunami event. Countries are recommended to choose only one scenario to exercise. However, countries may exercise more than one scenario simultaneously, if they wish. The exercise scenarios include major tsunamis generated by great earthquakes in the following areas:

- Kamchatka (Kuril–Kamchatka Trench)
- Ryukyu Islands (Nansei–Shoto Trench)
- Philippines–South China Sea (Manila Trench)
- Philippines–Pacific Ocean (Philippines Trench)
- Vanuatu (New Hebrides Trench)
- Tonga (Tonga Trench)
- Northern Chile (Peru–Chile Trench)
- Ecuador (Colombia–Ecuador Trench)
- Central America (Middle America Trench)
- Aleutian Islands (Aleutian Trench)

In each exercise scenario, the simulated tsunami will be propagate in real time. Each scenario will be started during the morning hours in the tsunami source region, and will last for approximately six to nine hours to simulate the earthquake occurrence, local/regional tsunami

propagation, and impact to nearby coasts. The scenarios and messages will terminate artificially since in real events most would continue for at least 24 hours.

The exercise will require Member State decision-making, including steps taken just prior to public notification. These steps may be played during the exercise dates in real time or in the following days. Member States may conduct the exercise through to the community level if they wish (however, this is not a requirement of the exercise).

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

A “How to Plan, Conduct and Evaluate Pacific Wave Exercises Guideline” (IOC/2011/MG/58) has been developed to aid countries in planning and conducting a tsunami exercise at a national and/or provincial level as part of Exercise Pacific Wave 11. This guideline is available at the PacWave11 website (www.pacwave.info).

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.

7. ASSUMPTIONS

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

8. TYPES OF EXERCISES

Exercise Pacific Wave 11 will be carried out in a readiness style that aims to involve communication and decision making at government levels, without disrupting or alarming the general public. Individual countries, however, may at their discretion, elect to extend the exercise down to the level of actually notifying and evacuating the public. Stakeholder agencies involved in the end-to-end tsunami warning, including non-government agencies as well post-disaster response and the media, may be involved.

Exercises stimulate the development, training, testing, and evaluation of tsunami warning and emergency response plans and standard operating procedures. Exercise participants may use their own past tsunami or multi-hazard drills (e.g. flood, typhoon, earthquake, etc.) as a framework to conduct PacWave11.

Exercises can be conducted at various scales of magnitude and sophistication. The following are examples of types of exercises conducted by Disaster Management Agencies, in coordination with Tsunami Warning Centres.

8.1 ORIENTATION EXERCISE

An orientation exercise may also be referred to as a ‘walk through’, and it can be conducted through a workshop. It puts people in a place where they would work during a tsunami response, or uses them as participants in a demonstration of an activity. This type of exercise is used to familiarise the players with the activity.

An example of an orientation exercise would be setting up a mock welfare centre to take in tsunami evacuees, and walking staff through how the centre is organised.

8.2 DRILL EXERCISE

In a drill exercise, staff physically handle specific equipment or perform a specific procedure or a single operation. A drill usually focuses on a single organisation, facility, or agency such as a hotel, school, village, etc. The exercise usually has a time frame element and is used to test procedures. Performance is evaluated in isolation; a drill is a subset of a full-scale exercise.

An example of a drill exercise would be activating an Emergency Operations Centre or using alternative communications (such as radios) in a tsunami exercise. Within a warning centre, a drill might consist of the operations for a local tsunami warning, or just the communication notification procedures for a local tsunami.

8.3 TABLETOP EXERCISE

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 from the international tsunami warning centres such as the PTWC in Hawaii, which describes the nature of the threat.

8.4 FUNCTIONAL EXERCISE

A functional exercise may be referred to as an 'operational' or a 'tactical' exercise. It takes place in an operational environment and requires participants to actually perform the functions of their roles.

A normally complex response activity is simulated, which may require multiple activities to carry out the response. Commonly, they involve the testing of standard operating procedures (SOPs) and internal/external communications between organisations. It lacks only the people "on the ground" to create a full-scale exercise.

Participants interact within a simulated environment through an exercise control group who provide prewritten injects and respond to questions and tasks developing out of the exercise.

An example of a functional exercise would be a multi-agency response to a devastating tsunami, where evacuation of a coastal community is required. Messages and injects are provided by exercise control and are handled by the participants in the way described in their standard operating procedures.

Functional exercises may also just focus on a specific aspect of warnings, such as command and control activities of emergency operations centres or the communications flow and procedures from international to national to provincial levels.

8.5 FULL-SCALE EXERCISE

A full-scale exercise may be referred to as a 'practical' or 'field' exercise. These include the movement or deployment of people and resources to include physical response 'on the ground' to a simulated situation. It could be labeled as the climax of a progressive exercise programme.

These exercises are typically used to test all aspects of a country's warning and emergency management systems and processes, using actual centres and communications methods. They can be 'ground' focused only or may include the higher-level response structures, and they can be simple (single agency) or complex (multi-agency, multi-levels of government from national to local).

Full-scale exercises are the largest, most costly, most-time consuming, and most complex to plan, conduct, and evaluate.

An example of a full-scale exercise would be a tsunami warning, dissemination, and emergency response with a school evacuating, volunteers portraying 'victims', and emergency services using real rescue equipment. Coordinated, multi-agency response to the event is exercised. Actual field mobilisation and deployment of response personnel are conducted.

8.6 SAMPLE TIME FRAMES FOR EXERCISE DEVELOPMENT

The different exercise types require different amounts of preparation and conduct time. The following table provides a general idea of how much time is necessary.

Exercise Type	Preparation Period	Duration	Comments
Orientation Exercise	Simple, 1 week	1–2 hours	Single agency/department, cross-sectional staff.
Drill	Simple, 1–2 weeks	1–4 hours	Functional staff.
Tabletop Exercise	Complex, but inexpensive1–3 months	2–4 hours, or longer	Single or multiple agency, staff of the same level with a warning/response role.
Functional Exercise	Complex, but expensive, 6–18 months	4 hours to 1 or more days	Multiple Agency participation, all staff with warning/response roles for that function.
Full-scale Exercise	Complex, and the most expensive, 6–18 months	2 hours to 1 or more days	Multiple Agency (National and International), all or specific staff with warning/response roles.

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. This could take the form of international to national, national to provincial, and/or provincial to local government.

Each country's lead agency and its PacWave11 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 PacWave11 Exercise Evaluation Form based on in-country feedback.

10. EXERCISE DOCUMENTATION

The Exercise Pacific Wave 1 planning should take into account the following documents:

- IOC Circular Letter No 2390: PTWS Pacific-wide Tsunami Exercise 'PacWave11', 9–10 November 2011, dated 13 May 2011.
- Exercise Pacific Wave 1, A Pacific-wide Tsunami Warning and Communication Exercise, including post-exercise evaluation forms (August 2011) (IOC/2011/TS/97)
- Exercise Pacific Wave 11 flyer
- ICG/PTWS-XXIII, Recommendation 2 on PTWS Exercises (2009)
- ICG/PTWS-XXIV, Recommendation 3 on PTWS Exercises (2011)
- Operational Users Guide for the Pacific Tsunami Warning and Mitigation System (PTWS), (IOC/2011/TS/87rev), revised in August 2011.
- How to Plan, Conduct, and Evaluate Tsunami Exercises, IOC Manuals and Guides No 58, July 2011.

All information related to Exercise Pacific Wave 11 is available at the exercise website: <http://www.pacwave.info>

11. EXERCISE PRODUCTS

All international products will be provided online at the Exercise Pacific Wave 11 website (<http://www.pacwave.info>) in advance to help countries plan and prepare. It is recommended to download from the PacWave11 website, the international products for the appropriate scenario prior to the day of the exercise. This is in order to be ready to further disseminate to other national, provincial and/or local government agencies during the actual exercise.

To avoid any possible misinterpretation, the only products issued by the international warning centres will be to start each scenario and they will be in a “dummy” exercise message format (**Annexes II to IV**) that will only indicate the start of a specific scenario.

All documentation and correspondence relating to this exercise is to be clearly identified as **Exercise Pacific Wave 11 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

The international tsunami warning centres participating in Exercise Pacific Wave 11 will be the Pacific Tsunami Warning Center (PTWC) in Hawaii, USA, the West Coast and Alaska Tsunami Warning Center (WC/ATWC) in Alaska, USA, and the Northwest Pacific Tsunami Advisory Center (NWPTAC) in Tokyo, Japan.

Each scenario will start with a dummy 'Exercise Start Message' message disseminated from the appropriate international warning centre(s). Different scenarios start at different times and there will be a different start message for each scenario. No other messages will be disseminated by the international centres. Distribution of the series of simulated international messages for each scenario, available on the exercise website, will be the responsibility of each country.

Each Exercise Pacific Wave 11 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 Planning 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.

Participant countries may elect to exercise according to their own timelines in order to achieve their particular objectives. For example, a particular country's Exercise Planning Team may decide to hold the exercise on another date to avoid conflict with other important national events.

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 staff to ensure that the exercise runs smoothly. The Master Schedule of Events List should only be circulated to Exercise Control staff and not to exercise participants.

The International Master Schedule of Events List (MSEL) giving the timeline for issuance of international products, and the product types are given in [Annex V](#), Table V.1. WMO product identifiers are given in [Annex V](#), Table V.2.

Each country's Exercise Control Team will be responsible for executing their International and National Master Schedule of Events List. National level injects will be the responsibility of the National Exercise Control Team and provincial or local level injects should be the responsibility of the Provincial Exercise Control Team.

12.2 TRACKING PROGRESS/OUTPUTS OF INJECTS

Sustaining exercise activity is achieved by the continuous injection of exercise information to the participants. This needs to be closely monitored to ensure that the information is released

at an appropriate time. Depending on how well participants react to the injects, the rate of injects in addition to the tsunami warning products (international and national or local), may need to be increased or slowed down. It may be necessary to add or remove injects to suit the pace of the exercise.

Exercise Control staff will need to monitor and follow up injects to determine the extent to which the actions they generate have been achieved. Injects are linked to exercise objectives and key performance indicators. The Exercise Director has the discretion to speed up or slow down exercise play, as long as this does not interfere with the overall exercise objectives. If your agency is struggling to keep up with the pace of the exercise, inform the Exercise Control team at the next level. Note that the rate of International Tsunami Bulletins is locked in, and will not be modified.

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 test an agency's Standard Operating Procedures (SOPs). Areas that agencies are encouraged to evaluate include, but are not limited to:

- Are there written SOPs for staff to follow?
- Are there templates or other pre-scripted communications to make the response faster and standardised?
- Have stakeholders been educated on what they should expect, when, and what they should do with the information your agency provides?

A review and hot and cold debrief should evaluate the effectiveness of arrangements in place and identify if there are any corrective actions. The hot and cold debriefs are then used to complete the Exercise Pacific Wave 11 evaluation forms.

All participating countries are asked to provide feedback through the PacWave11 Evaluation Form (Annex VI) within 90 days (by 12 February 2012) of the exercise. Forms should be submitted online by visiting https://www.surveymonkey.com/s/pacwave11_eval. This feedback will greatly assist in the evaluation of Exercise Pacific Wave 11 and assist in the development of subsequent exercises.

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 PacWave11 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 one used by New Zealand Ministry of Civil Defence & Emergency Management (ISBN 0-478-25467-9). It can be found at:
[http://www.civildefence.govt.nz/memwebsite.nsf/Files/Information_Series/\\$file/DeBriefing%20Info%20Book.pdf](http://www.civildefence.govt.nz/memwebsite.nsf/Files/Information_Series/$file/DeBriefing%20Info%20Book.pdf)

13.2 VALIDATION

The final stage of the exercise process is to determine whether or not the exercise has met its objectives. Exercise Pacific Wave 11 validation compares the performance of the PTWS, countries, and/or agencies and participants during the exercise against performance expected. After validation, the PTWS, countries, or 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 above). These are provided in [Annex VI](#). 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 11 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, as well as the PTWS as a coordinating group to support effective tsunami warning and decision making.

Evaluation of this exercise will 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 11 Summary Report.

The evaluation tool aims to inform and facilitate individual participant country evaluations as well as the Exercise Pacific Wave 11 Summary Report.

Official Exercise Evaluation Forms addressing the respective focus areas and objectives are included in [Annex VI](#). It is requested that the Evaluation Form be completed online at:

https://www.surveymonkey.com/s/pacwave11_eval

All participant countries are required to complete the official Exercise Evaluation Form and return only this form electronically to the Exercise Task Team within 90 days after the exercise (by 12 February 2012). The form is available at:

https://www.surveymonkey.com/s/pacwave11_eval

It is recommended that independent and objective exercise evaluators/observers be appointed at all exercise points to support the collection of such data. Evaluators/observers are to be guided by the exercise objectives and the information required in the Exercise Evaluation Forms.

In completing evaluation forms, participating organisations must have the ability to note areas for improvement and the actions that they plan to take without concern that the information carries political or operational risks. Thus, the official Exercise Evaluation Form is designated as “For Official Use Only” and will be restricted for use by the Exercise Task Team for the sole purpose of compilation of the Exercise Pacific Wave 11 Summary Report. Some participant countries may, however, decide to share their individual evaluation outcomes with the public.

13.7 EXERCISE PACIFIC WAVE 11 SUMMARY REPORT

The Exercise Task Team will compile the Exercise Pacific Wave 11 Summary Report based on the 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

In order to finalise the Summary Report, the PTWS PacWave11 Task Team will meet jointly with the PTWS Enhancing Products Task Team in May 2012.

The PacWave11 Summary Report will be submitted to the ICG/PTWS and IOC, and posted to the PTWS website. The Summary Report is expected to be completed in June 2012.

14. REAL EVENTS DURING EXERCISE PLAY

In the case of a real event occurring during the exercise, PTWC, NWPTAC, and/or WCATWC 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 the development of the Exercise Pacific Wave 11 providing details of the exercise.

ICG/PTWS Member States should consider issuing one or two exercise press releases to their respective country's media. Member States' press releases will give adequate alert to their country's population and give their local media time to conduct interviews and documentaries with participating exercise organisations in advance of the exercise.

A second Member State press release, one week before the exercise, in conjunction with the UNESCO release, would provide a more detailed description of exercise activities to take place within that country.

[Annex VII](#) contains a sample press release that can be customised by Member States. The sample press release is provided in English. Samples in other languages can be found at the PacWave11 website (www.pacwave.info).

ANNEX I

PTWC EXPERIMENTAL PRODUCTS

Recommendation ICG/PTWS-XXIII.1 (Enhancing Tsunami Warning Products) established a Task Team on Enhancing Tsunami Warning Products under PTWS Working Group 2 (WG2, Detection, Warning and Dissemination) to:

- Review current capabilities,
- Obtain customer feedback,
- Consider best practices,
- Develop recommendations to improve existing or create new products, and
- Improve dissemination for more effective, functional, and timely delivery.

At the Task Team 1 Meeting in March 2011 (see PTWS WG2 Report Annex for March Task Team WG2 Report), the Director of PTWC proposed new products based upon PTWC's improved capabilities in terms of its speed of response and growing ability to forecast impacts. These were approved by WG2.

Further discussion took place at the PTWC-JMA Coordination meeting in Honolulu, Hawaii, from 11 to 13 April, with an agreement to the following general changes in an experimental phase starting with PacWave11, and be operationally ready in 2013. (ICG/PTWS-XXIV Annex V and Annex II).

- *PTWC will lower its current initial warning advice threshold from magnitude 7.6 to magnitude 7.1 in order to provide some advance notice of potential local tsunamis.*
- *PTWC will begin using tsunami forecast models to classify the level of threat for sections of coast around the Pacific. Five levels of tsunami threat or potential threat will be established, and supplemental products will be issued.*

While the predictive capabilities of the forecast models are not perfect, they should be accurate enough to greatly reduce the number of areas warned unnecessarily, while also providing general guidance on the expected levels of impact to areas that are threatened.

At the ICG/PTWS-XXIV Meeting in May 2011, the ICG approved the recommendation of WG2 to move forward towards the implementation of these new products and it established the PTWS Enhancing Products Task Team to advise PTWC on their development (Recommendation ICG/PTWS-XXIV.1 on PTWS Governance). The initial step is to introduce the products to Member States for the scenarios of the PacWave11 Exercise and for the Task Team to review feedback and recommend changes or other improvements.

The following describes the essential features of the new products and their underlying procedures, at least as they are envisioned at this time.

PRODUCTS

The new suite of experimental products will include text as well as graphical products.

Standard Text Product

A standard text-only product, when fully implemented, will continue to be disseminated over the public and media accessible GTS circuit, as well as via AFTN, fax, email, EMWIN and other methods. It will contain key information about the forecast threat, the generating earthquake, estimated arrival times, and tsunami observations. The terms "warning" and "watch" that imply levels of alert will no longer be used, but will be replaced by discrete forecast threat levels. Text

products will continue to include the preliminary earthquake parameters – origin time, hypocentre (latitude, longitude, depth), and magnitude. They will continue to include the estimated arrival time of the first tsunami wave at key forecast points within threatened areas. They will also continue to include measurements of tsunami waves observed at coastal or deep-ocean gauges.

Other Text Products

More comprehensive and detailed tables of the forecast threat levels, arrival times, and observations, than those that appear in the standard text product, will only be available (when implemented) but only by dissemination methods such as email and/or a website that can handle the larger volume content of text content.

Graphical Products

The information created by numerical tsunami forecast models is probably most effectively communicated through the use of graphical products, particularly maps. These too can only be disseminated (when implemented) by methods such as email and/or a website that can handle that type of content.

Energy Map

One experimental graphical product will be a map of the Pacific region showing the location of the earthquake and the maximum tsunami amplitude at each point over the entire ocean, as indicated by a shaded color scale. Such plots provide a general sense of how the tsunami energy is directed away from the source and how it is focused or de-focused by bathymetric features as it crosses the ocean.

Threat Map

Another experimental graphical product will be a map of the Pacific region showing the expected threat level along coastal segments and for island groups, as indicated respectively by colored coastal line segments or oceanic areas shaded in color.

CRITERIA

The new criteria for designating threat levels in the experimental products will be based primarily upon numerical tsunami forecast models, rather than on the earthquake magnitude, the distance to the earthquake, or the time remaining until first tsunami arrival. It should be noted that because of the requirement for quick analysis, initial numerical tsunami forecasts will be based only on the preliminary seismic analysis, and therefore only a crude forecast is possible because the source is insufficiently constrained in this early time. As a consequence, the assignment of initial threat levels will be made very conservatively and limited to areas most immediately threatened or potentially threatened. Only after the numerical forecast models are sufficiently constrained and/or validated by later seismic analyses and tsunami wave observations can threat levels be assigned more wholly from the models and for zones covering up to the entire ocean basin, as appropriate.

PRODUCT STAGING

Tsunami warning operations must constantly strike a balance between the need to provide guidance as quickly as possible, and the need to provide guidance that is as accurate as possible. Consequently, the first message product will be designed to provide the quickest possible alert to areas closest to the earthquake and contain only a conservative, concise, and very preliminary analysis of the threat. Subsequent messages issued over approximately the next hour may significantly modify the threat levels due to changes in the earthquake parameters, or due to the initial sea level readings. Only after sufficient tsunami signals have been recorded on the nearest deep ocean sensors will the tsunami have been characterized

sufficiently that the threat levels should become stable. At this time, threat levels can be assigned and extended to far-reaching areas, if appropriate.

GUIDANCE ON HOW TO USE PRODUCTS IN PACWAVE 11

For Exercise Pacific Wave 11, the draft PTWC experimental products should be reviewed by all participants who normally receive and review the existing PTWC products during events.

However, it is recommended that countries continue to base their exercise actions on the existing PTWC products (e.g., Tsunami Information Bulletins, Watches and Warnings). This is because these experimental products are early in their development, and with country feedback, may change significantly over the next two years before they become official. Further, should an actual tsunami event occur before the new products become operational (planned in 2013/2014), Member State procedures and actions should continue to be based upon PTWC's existing products.

The purpose of distributing the experimental products for PacWave11 is to obtain feedback from participating Member States on the content, format, and staging of the proposed products to enable them to be as useful and effective as possible to each Member State. Information and feedback is requested in the Post-Exercise Evaluation Form (Annex VI) on the following questions:

- Is the use of threat levels and their criteria [no threat (<0.3m), potential threat, marine threat (0.3-1m), land threat (1-3m), major land threat (>3m)] versus warnings and watches useful and effective? Are these the right categories of threat?
- Does the suite of proposed products (standard text alerting product, energy distribution map, threat level map, comprehensive table of estimated first wave arrival times, and comprehensive table of threat levels for each coastal segment or island group) provide all the necessary information?
- What are the best way(s) to minimize any adverse effects should the forecast change significantly over the first hour or two as critical seismic and sea level data are received and analysed?
- How should extended coasts be divided into segments? How should boundaries to the segments be assigned? How should island groups be divided?
- How should changes in threat levels (as the forecast evolves with better data) be handled: a) Let threat levels change as the forecast dictates; b) Let threat levels increase, but not decrease prior to wave arrival; c) apply some other criteria automatically or manually?

FORECAST LIMITATIONS AND UNCERTAINTIES

Past PTWC procedures and criteria were developed prior to having the capability of producing tsunami forecasts in real time based on numerical models. Numerical forecast models now implemented at PTWC make it possible to more precisely define where a tsunami threat exists, as well as to assess the level of that threat. However, there are limitations. The two most critical unknowns in numerical forecasting are: 1) How the seafloor deformed (e.g., uplifted or dropped down in the vertical direction over different areas of seafloor near the earthquake epicentre) as this physically is the initiator of the tsunami wave; and 2) How the tsunami will be modified as it approaches the coast from deep water and then interacts in complex (non-linear) ways with the coastal bathymetry and topography.

Seafloor deformation can initially be estimated within a few minutes after the earthquake from the earthquake's location, depth, and magnitude. But, this is typically a crude estimate. Within about half-an-hour, the earthquake fault mechanism describing the faulting properties (e.g.,

how the two tectonic plates slipped or interacted) then becomes available, and this provides a better estimate of seafloor deformation. Finally, after one to two hours, tsunami observation readings from the nearest deep-ocean, sea-level gauges are received, and these then provide the most direct constraint on the area and size of seafloor deformation; but it is still just an estimate.

Using the estimated seafloor deformation at the source, and bathymetry of the ocean basin, an accurate tsunami simulation can be numerically generated and the wave propagated across the ocean basin fairly accurately as long as water depths are much, much less than the amplitude of the tsunami. However, as a tsunami wave shoals, the numerical problem becomes much more complex, and requires increasingly finer-scale grids of the coastal bathymetry and topography. The U.S. has been producing inundation forecast models based upon such gridded data for a limited number of domestic coastal locations identified as having a high tsunami risk. None, however, are available for international coasts.

To make estimates of tsunami amplitudes along international coasts, PTWC relies on “Green’s Law” (Synolakis, 1990) that relates the amplitude of a wave at one ocean depth to its amplitude at another ocean depth. The law is accurate for the situation of a uniformly decreasing ocean depth and a straight coastline. It is less accurate for complex near-shore bathymetry and/or irregular coastlines. The ‘Green’s Law’ approximation only provides an estimate of the maximum tsunami amplitude (how much above normal sea level the tsunami) at the coastline; it does not provide estimates of maximum run-up on shore, expected inundation limits, time of maximum, number of hazardous waves, etc. Nevertheless, for the recent major Pacific tsunamis (Samoa 2009, Chile 2010, and Japan 2011), this method did provide reasonable estimates of the general level of threat to the coastlines around the Pacific.

For users of the PTWC tsunami forecasts, it is important to understand these limitations. Knowledge about the source, upon which the forecast everywhere depends, is very limited initially (first 10 minutes) since only the earthquake location and magnitude are known, but characterization of the source typically improves after the first few hours as further seismic data and analysis and tsunami observations, are received. It is also very important to know that the estimates of the tsunami amplitude at the coast provide only the general level of threat, and that variations from the forecast may occur due to the limitations of the assumptions used.

SAMPLE PRODUCTS

The following are samples of the new experimental products. Some aspects of these products are still being finalized. Only a standard text product, tsunami energy map, and tsunami threat map are included here. The example products are for a great earthquake off the coast of Kamchatka, Russia, and a time of dissemination less than an hour after the earthquake. This is before the model source has been constrained by deep ocean observations, and therefore, before the threat levels have been extended across the entire Pacific.

All of the experimental products for the Exercise Pacific Wave 11 scenarios, as well as a complete description of their content and the procedures and criteria used in their creation, will be posted on the exercise website (<http://www.pacwave.info>) well in advance of the exercise.

Standard Text Product Sample

WEPA40 PHEB 092245
TSUPAC

TSUNAMI MESSAGE NUMBER 2
NWS PACIFIC TSUNAMI WARNING CENTER EWA BEACH HI
2245 UTC WED NOV 09 2011

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA. FOR INFORMATION REGARDING THE TSUNAMI THREAT TO THOSE AREAS GO TO [HTTP://WCATWC.ARH.NOAA.GOV](http://WCATWC.ARH.NOAA.GOV)

... A TSUNAMI THREAT IS CURRENTLY UNDERWAY ...

THERE IS THE HIGH PROBABILITY THAT A MAJOR TSUNAMI CAPABLE OF PRODUCING A WIDESPREAD HAZARD WAS GENERATED BY AN EARTHQUAKE WITH A PRELIMINARY MAGNITUDE OF 9.0 THAT OCCURRED NEAR THE EAST COAST OF KAMCHATKA...RUSSIA AT 2200 UTC ON NOVEMBER 9, 2011.

THE FOLLOWING THREAT LEVELS ARE CURRENTLY FORECAST.

- MAJOR LAND INUNDATION THREAT
RUSSIA
- LAND INUNDATION THREAT
JAPAN / GUAM / HAWAII
- MARINE THREAT
TAIWAN / PHILIPPINES / NORTHERN MARIANAS / YAP / POHNPEI / KOSRAE /
CHUUK / BELAU / MARSHALL ISLANDS / MIDWAY ISLAND
- NO THREAT
PDR KOREA / REP OF KOREA / CHINA / VIETNAM / CAMBODIA / THAILAND /
MALAYSIA / BRUNEI
- STANDBY
ALL OTHER AREAS OF THE PACIFIC REGION COVERED BY THIS MESSAGE

THREAT LEVELS ARE ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE. PERSONS IN THREATENED AREAS SHOULD FOLLOW INSTRUCTIONS FROM THEIR LOCAL GOVERNMENT OFFICIALS.

A COMPREHENSIVE MAP AND TABLE OF TSUNAMI THREAT LEVELS FOR EACH COASTAL SEGMENT OR ISLAND GROUP COVERED BY THIS CENTER CAN BE FOUND AT
[HTTP://PTWC.WEATHER.GOV](http://PTWC.WEATHER.GOV)

&&

THREAT LEVEL DEFINITIONS

MAJOR LAND INUNDATION THREAT - SEA LEVEL IS CURRENTLY FORECAST TO RISE BY AT LEAST 3 METERS ABOVE NORMAL AT THE COAST DUE TO THE TSUNAMI WAVES. TSUNAMIS OF THIS SIZE ARE CAPABLE OF CAUSING GREAT DESTRUCTION AND LOSS OF LIFE IN AFFECTED COASTAL AREAS.

LAND INUNDATION THREAT - SEA LEVEL IS CURRENTLY FORECAST TO RISE BY AT LEAST 1 METER ABOVE NORMAL AT THE COAST, BUT GENERALLY NOT MORE THAN 3

METERS, DUE TO THE TSUNAMI WAVES. TSUNAMIS OF THIS SIZE ARE A SIGNIFICANT THREAT TO HUMAN LIFE AND ARE CAPABLE OF FLOODING COASTAL AREAS AND DAMAGING OR DESTROYING COASTAL STRUCTURES.

MARINE THREAT - SEA LEVEL IS CURRENTLY FORECAST TO RISE BY AT LEAST 0.3 METERS ABOVE NORMAL AT THE COAST, BUT NOT MORE THAN 1 METER, DUE TO TSUNAMI WAVES. TSUNAMIS OF THIS SIZE ARE A HAZARD FOR RECREATIONAL AND OTHER ACTIVITIES IN COASTAL WATERS DUE TO STRONG AND UNUSUAL CURRENTS. THEY CAN ALSO CAUSE STRONG CURRENTS AND MINOR FLOODING IN HARBORS

STANDBY - THESE AREAS MAY ALSO HAVE A TSUNAMI THREAT AND SHOULD STANDBY FOR FURTHER INFORMATION. THE FORECAST IS STILL BEING REFINED.

&&

PRELIMINARY EARTHQUAKE PARAMETERS

ORIGIN TIME - 2200Z 09 NOV 2011
COORDINATES - 52.5 NORTH 159.5 EAST
DEPTH - 20 KM
LOCATION - OFF EAST COAST OF KAMCHATKA
MAGNITUDE - 9.0

&&

TSUNAMI CHARACTERISTICS

A TSUNAMI IS A SERIES OF WAVES THAT CAN CAUSE SEA LEVEL TO RISE AND FALL MANY TIMES AT THE COAST OVER A PERIOD OF HOURS TO DAYS. THE FIRST WAVE MAY NOT BE THE LARGEST. THE TIME BETWEEN WAVES CAN RANGE FROM 5 MINUTES TO AN HOUR. THE SEAFLOOR MAY...OR MAY NOT...BECOME EXPOSED AT THE COAST PRIOR TO INUNDATION. TSUNAMI IMPACTS CAN VARY GREATLY ALONG A COAST DUE TO LOCAL EFFECTS. TSUNAMI WAVES CAN TRAVEL AT SPEEDS OF 800KM/HR OR MORE IN THE DEEP OCEAN...BUT ARE NOT A HAZARD IN DEEP WATER AND PASS UNNOTICED BY SHIPS AT SEA. TSUNAMI WAVES SLOW DOWN AND GROW IN AMPLITUDE AS THE DEPTH OF THE SEA DECREASES NEAR SHORE. THEY ARE VERY LONG WAVES THAT CAN EASILY WRAP AROUND ISLANDS AND AFFECT COASTS FACING ALL DIRECTIONS. TSUNAMIS CAN TRAVEL FOR A LONG DISTANCE UP RIVERS AND STREAMS AND CAUSE FLOODING ALONG THE BANKS.

&&

ESTIMATED ARRIVAL TIMES

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT POINTS WITHIN THE AREAS CURRENTLY FORECAST TO BE UNDER A TSUNAMI THREAT.

LOCATION	FORECAST POINT	COORDINATES	ARRIVAL TIME
-----	-----	-----	-----
RUSSIA	PETROPAVLOVSK_K	53.2N 159.6E	2230Z 09 NOV
	UST_KAMCHATSK	56.1N 162.6E	2251Z 09 NOV
	MEDNNY_IS	54.7N 167.4E	2314Z 09 NOV
	URUP_IS	46.1N 150.5E	2324Z 09 NOV
	SEVERO_KURILSK	50.8N 156.1E	2348Z 09 NOV
JAPAN	KUSHIRO	42.9N 144.3E	0010Z 10 NOV
	HACHINOHE	40.5N 141.5E	0050Z 10 NOV
	KATSUURA	35.1N 140.3E	0100Z 10 NOV
	SHIMIZU	32.8N 133.0E	0221Z 10 NOV
	OKINAWA	26.2N 127.8E	0337Z 10 NOV
MARCUS IS.	MARCUS_IS.	24.3N 154.0E	0149Z 10 NOV
MIDWAY IS.	MIDWAY_IS.	28.2N 182.6E	0207Z 10 NOV
WAKE IS.	WAKE_IS.	19.3N 166.6E	0229Z 10 NOV

N. MARIANAS	SAIPAN	15.3N 145.8E	0314Z 10 NOV
GUAM	GUAM	13.4N 144.7E	0334Z 10 NOV
MARSHALL IS.	ENIWETOK	11.4N 162.3E	0348Z 10 NOV
	KWAJALEIN	8.7N 167.7E	0400Z 10 NOV
	MAJURO	7.1N 171.4E	0422Z 10 NOV
HAWAII	NAWILIWILI	22.0N 200.6E	0357Z 10 NOV
	HONOLULU	21.3N 202.1E	0411Z 10 NOV
	KAHULUI	20.9N 203.5E	0417Z 10 NOV
	HILO	19.7N 204.9E	0435Z 10 NOV
TAIWAN	HUALIEN	24.0N 121.7E	0357Z 10 NOV
	HUALIEN	24.0N 121.6E	0358Z 10 NOV
	TAITUNG	22.7N 121.2E	0401Z 10 NOV
	CHILUNG	25.2N 121.8E	0429Z 10 NOV
	KAOHSIUNG	22.5N 120.3E	0444Z 10 NOV
	HOMEL	24.2N 120.4E	0628Z 10 NOV
JOHNSTON IS.	JOHNSTON_IS.	16.7N 190.5E	0400Z 10 NOV
YAP	YAP_IS.	9.5N 138.1E	0410Z 10 NOV
PHILIPPINES	PALANAN	17.1N 122.6E	0420Z 10 NOV
	LAOAG	18.2N 120.6E	0445Z 10 NOV
	LEGASPI	13.2N 123.8E	0451Z 10 NOV
	SAN_FERNANDO	16.6N 120.3E	0505Z 10 NOV
	DAVAO	6.8N 125.7E	0518Z 10 NOV
	ZAMBOANGA	6.9N 122.1E	0655Z 10 NOV
	ILOILO	10.7N 122.5E	0714Z 10 NOV
	MANILA	14.6N 121.0E	0723Z 10 NOV
	PUERTO_PRINCESA	9.8N 118.8E	0741Z 10 NOV
POHNPEI	POHNPEI_IS.	7.0N 158.2E	0420Z 10 NOV
KOSRAE	KOSRAE_IS.	5.5N 163.0E	0423Z 10 NOV
CHUUK	CHUUK_IS.	7.4N 151.8E	0449Z 10 NOV
BELAU	MALAKAL	7.3N 134.5E	0450Z 10 NOV

A COMPREHENSIVE TABLE OF ESTIMATED ARRIVAL TIMES CAN BE FOUND AT
[HTTP://PTWC.WEATHER.GOV](http://PTWC.WEATHER.GOV)

&&

WE ADVISE ALL AREAS, INCLUDING THOSE NOT NAMED IN THE THREAT, TO MONITOR THE SITUATION CLOSELY. THE CURRENT FORECAST MAY CHANGE BASED ON ADDITIONAL DATA, MODIFYING THE AREA THREATENED AND/OR MODIFYING THE EXPECTED LEVEL OF THREAT.

MESSAGES WILL BE ISSUED HOURLY OR SOONER AS CONDITIONS WARRANT.

THE JAPAN METEOROLOGICAL AGENCY MAY ALSO ISSUE TSUNAMI MESSAGES FOR THIS EVENT TO COUNTRIES IN THE NORTHWEST PACIFIC AND SOUTH CHINA SEA REGION. IN CASE OF CONFLICTING INFORMATION... THE MORE CONSERVATIVE INFORMATION SHOULD BE USED FOR SAFETY.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

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Sample Tsunami Energy Forecast Map

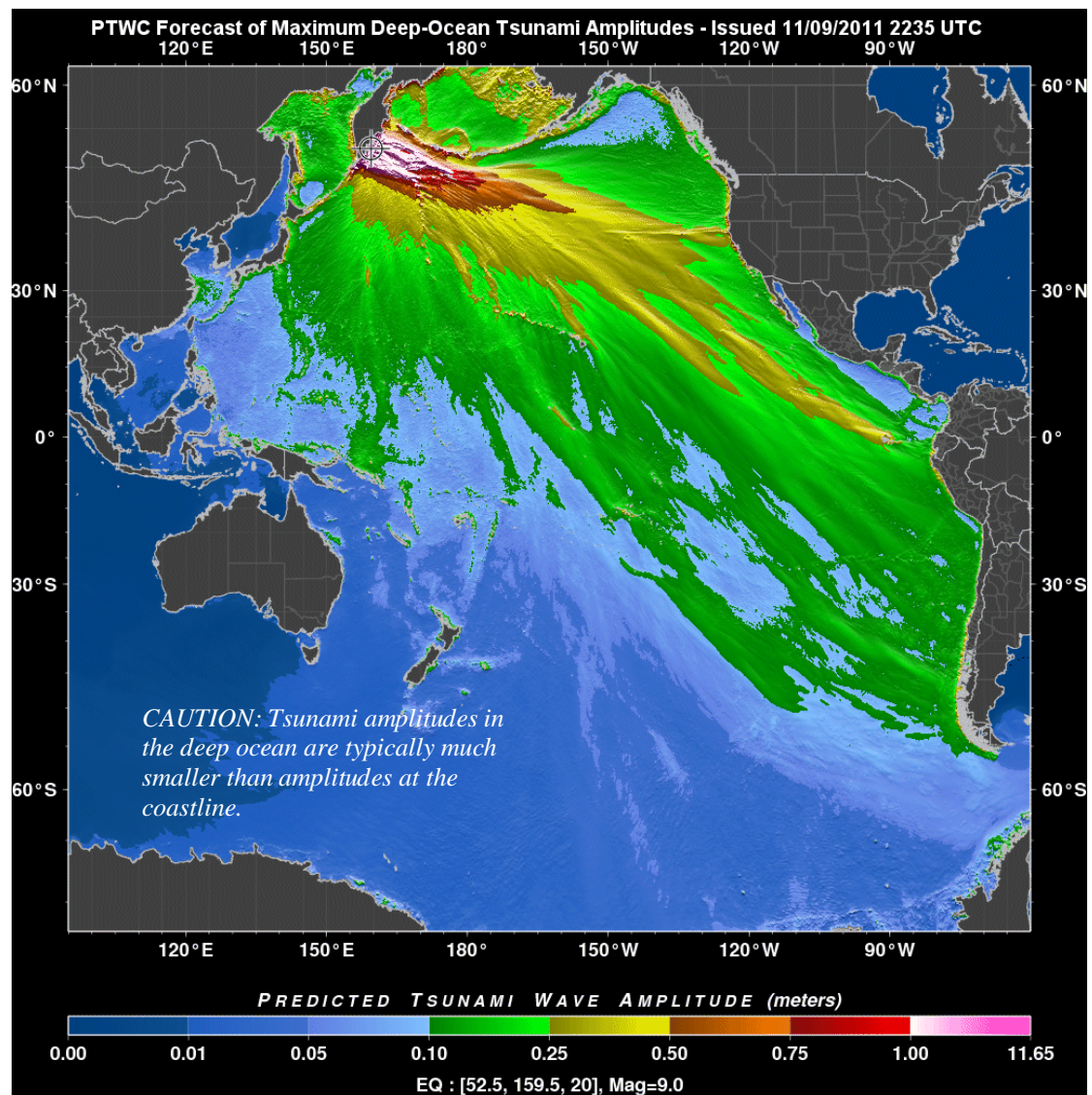


Figure I-1. PTWC Forecast of Maximum Deep-Ocean Tsunami Amplitudes (11/09/2011)

This map above shows, for the simulated tsunami, the maximum wave amplitudes across the Pacific. The amplitudes forecasted would be used by PTWC to assess and assign a threat level to different coastal segments. It is important to understand that the deep ocean amplitudes shown here are small compared with amplitudes at the coastline.

The map gives an indication of the directionality of the tsunami from the source, how the tsunami energy is focused and defocused by bathymetric features, how amplitudes decay with distance from the source by spreading, and areas shadowed from the tsunami by intervening land masses.

It is important to understand that the deep-ocean tsunami amplitudes shown here are small compared with amplitudes at the coastline.

Sample Coastal Tsunami Threat Map

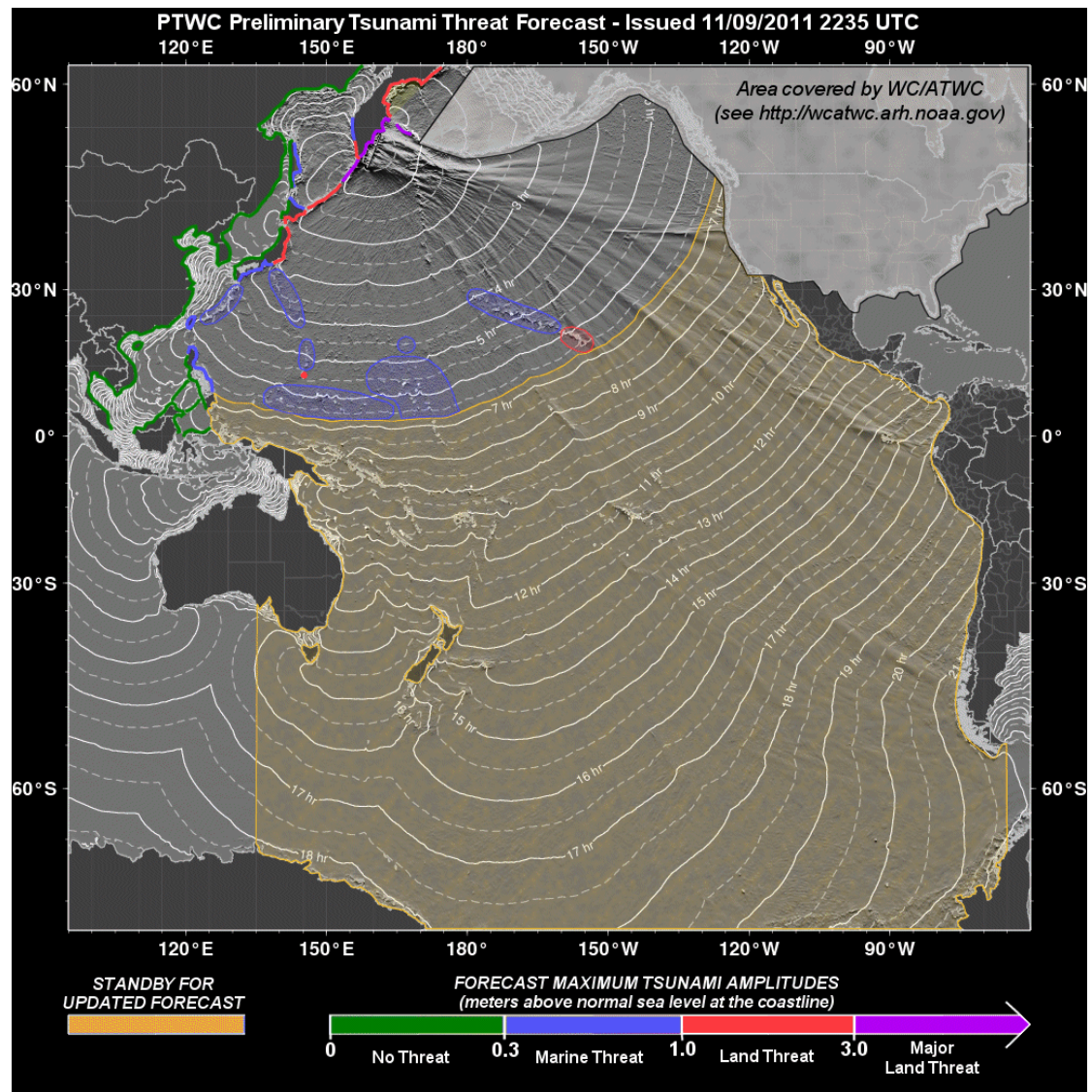


Figure I-2. PTWC Preliminary Tsunami Threat Forecast (11/09/2011)

This example threat map (Figure I-2) is intended to be a map that could be created just 35 minutes after the earthquake. At this time, the forecast model would be based only on the earthquake parameters, and not yet compared to, or constrained by sea level observations. For that reason, the area of forecast issued by PTWC would be limited to coasts located within about 6 hours travel time of the first tsunami wave, and to coasts where no threat would reasonably be expected (such as inside the South China Sea). All other areas are requested to standby for an updated forecast that is expected to be more accurate.

ANNEX II

PTWC DUMMY EXERCISE MESSAGE

The following is an example of the dummy message that will be issued by the Pacific Tsunami Warning Center during Exercise Pacific Wave 11. The dummy messages serve as substitutes for the first actual bulletin that would be issued by PTWC for each scenario. Only one message, this first dummy message, will be issued for each scenario.

All actual bulletins for each scenario are posted on the PacWave11 website (<http://www.pacwave.info>). They will include the current PTWS message products (from PTWC, JMA/NWPTAC, WCATWC) as well as the PTWC experimental products.

Please download messages for your scenario from the website. The country's Exercise Control Team is responsible for issuing all remaining PTWC bulletins according to the timetable after the PTWC dummy message triggers Bulletin 1

SAMPLE PTWC DUMMY MESSAGE

TEST... PACWAVE 11 TSUNAMI EXERCISE MESSAGE ...TEST
NWS PACIFIC TSUNAMI WARNING CENTER EWA BEACH HI
1308 UTC WED NOV 9 2011

TO: PARTICIPANTS OF THE PACWAVE 11 TSUNAMI EXERCISE.
ALL OTHERS PLEASE IGNORE.

SUBJECT: EXERCISE PACWAVE 11 - NORTHERN CHILE SCENARIO

THIS MESSAGE IS A PROXY FOR PTWC BULLETIN 1 OF THE PACWAVE 11 EXERCISE NORTHERN CHILE SCENARIO. IT IS ONE OF A SERIES OF MESSAGES THAT ARE BEING ISSUED BY THE PACIFIC TSUNAMI WARNING CENTER FOR EACH EXERCISE SCENARIO. THE EXERCISE IS DESIGNED TO TEST COMMUNICATIONS AND ACTIONS OF THE PACIFIC TSUNAMI WARNING SYSTEM THAT WOULD BE NEEDED IN THE EVENT OF AN ACTUAL TSUNAMI.

PARTICIPANTS IN THE EXERCISE SHOULD REFER TO THE PACWAVE 11 EXERCISE MANUAL AND PACWAVE 11 EXERCISE WEB SITE FOR PTWC BULLETIN 1 OF THE NORTHERN CHILE SCENARIO. SEE WWW.PACWAVE.INFO - USE LOWER CASE FOR WEB SITE.

THIS IS ONLY AN EXERCISE.

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ANNEX III

WC/ATWC DUMMY EXERCISE MESSAGE

The following message is the first exercise message that will be issued by the West Coast and Alaska Tsunami Warning Center during Exercise Pacific Wave 11.

Subsequent messages for each scenario are posted on the PacWave11 website (<http://www.pacwave.info>). Messages will consist of existing PTWS message products (PTWC, JMA/NWPTAC, WCATWC) and PTWC experimental products.

Please download messages for your scenario from the website. The country's exercise control team is responsible for issuing the remaining messages after WCATWC Bulletin 1.

SAMPLE WC/ATWC DUMMY MESSAGE.

WEPA41 PAAQ 231805
TSUWCA

TEST...TSUNAMI MESSAGE NUMBER 1...TEST
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK
0145 PM PDT TUE NOV 10 2011

... PACWAVE 11 TSUNAMI EXERCISE MESSAGE. REFER TO
WCATWC MESSAGE 1 AT THE EXERCISE WEB SITE.
THIS IS AN EXERCISE ONLY...

THIS MESSAGE IS BEING USED TO START OFF THE PACWAVE 11 TSUNAMI EXERCISE.
THE EXERCISE IS DESIGNED TO TEST COMMUNICATIONS AND ACTIONS THAT WOULD BE
NEEDED IN THE EVENT OF AN ACTUAL TSUNAMI.

PARTICIPANTS IN THE EXERCISE SHOULD REFER TO THE EXERCISE PACWAVE 11
EXERCISE MANUAL AND PACWAVE11 WEB SITE FOR SCENARIO WC/ATWC BULLETIN 1 AT
WWW.PACWAVE.INFO - USE LOWER CASE FOR WEB SITE.

THIS IS ONLY AN EXERCISE.

\$\$

ANNEX IV

NWPTAC DUMMY EXERCISE MESSAGE

The following message is the first exercise message that will be issued by the Northwest Pacific Tsunami Advisory Center (NWPTAC) during Exercise Pacific Wave 11.

Subsequent messages for each scenario are posted on the PacWave11 website (<http://www.pacwave.info>). Messages will consist of existing PTWS message products (PTWC, JMA/NWPTAC, WCATWC) and PTWC experimental products.

Please download messages for your scenario from the website. The country's Exercise Control Team is responsible for issuing the remaining messages after NWPTAC Bulletin 1.

SAMPLE NWPTAC DUMMY MESSAGE

WEPA40 RJTD 092210
(STX)
TEST...PACWAVE 11 TSUNAMI EXERCISE MESSAGE NUMBER 001...TEST
ISSUED BY NWPTAC (JMA)
ISSUED AT 2210Z 09 NOV 2011

PACWAVE 11 TSUNAMI EXERCISE - KAMCHATKA SCENARIO.
REFER TO NWPTAC BULLETIN 1 OF THE KAMCHATKA SCENARIO AT THE
EXERCISE WEB SITE.

THIS IS ONLY AN EXERCISE.

THIS MESSAGE IS A PROXY FOR NWPTAC BULLETIN 1 OF THE PACWAVE 11
EXERCISE KAMCHATKA SCENARIO. THE EXERCISE IS DESIGNED TO TEST
COMMUNICATIONS AND ACTIONS THAT WOULD BE NEEDED IN THE EVENT OF
AN ACTUAL TSUNAMI.

PARTICIPANTS IN THE EXERCISE SHOULD REFER TO THE PACWAVE 11
EXERCISE MANUAL AND PACWAVE 11 WEB SITE FOR NWPTAC BULLETIN 1
OF THE KAMCHATKA SCENARIO AT WWW.PACWAVE.INFO - USE LOWER CASE FOR WEB
SITE.

THIS IS ONLY AN EXERCISE.
=
(ETX)

ANNEX V

INTERNATIONAL MASTER SCHEDULE OF EVENTS LIST (MSEL)

Scenario		North Chile		Ecuador		Central Amer.		Aleutian Islands				Tonga Trench		Vanuatu		Kamchatka				Ryukyu Trench				Philippine Trench				Manila Trench			
Centre		PTWC		PTWC		PTWC		PTWC	WCATWC	PTWC	PTWC	PTWC	NWPTAC	PTWC	NWPTAC	PTWC	NWPTAC	PTWC	NWPTAC	PTWC	NWPTAC	PTWC	NWPTAC	PTWC	NWPTAC	PTWC	NWPTAC				
Date (UTC)	Time (UTC)	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP		
11/09	13:00	Quake																													
11/09	13:08	1	RW																												
11/09	13:45	2	RW																												
11/09	14:00			Quake																											
11/09	14:08			1	RW																										
11/09	14:45	3	PW	2	RW																										
11/09	15:00					Quake																									
11/09	15:08					1	RW																								
11/09	15:45	4	PW	3	PW	2	RW																								
11/09	16:45	5	PW	4	PW	3	PW																								
11/09	17:45	6	PW	5	PW	4	PW																								
11/09	18:00							Quake																							
11/09	18:05							1	WW																						
11/09	18:10							1	RW																						
11/09	18:45	7	PW	6	PW	5	PW	2	RW	2	WW																				
11/09	19:15									3	WW																				
11/09	19:45	8	PW	7	PW	6	PW	3	PW	4	WW																				
11/09	20:15									5	WW																				
11/09	20:45	9	PW	8	PW	7	PW	4	PW	6	WW																				
11/09	21:00										Quake																				
11/09	21:08										1	RW																			
11/09	21:15									7	WW																				
11/09	21:45	10	PW	9	PW	8	PW	5	PW	8	WW	2	RW																		
11/09	22:00											Quake		Quake																	
11/09	22:08											1	RW	1	RW																
11/09	22:10															1	TAB														
11/09	22:15									9	WW																				
11/09	22:45			10	PW	9	PW	6	PW	10	WW	3	PW	2	RW	2	RW														
11/09	22:50															2	TAB														
11/09	23:00																Quake														
11/09	23:05																	1	TAB												
11/09	23:10																	1	RW												
11/09	23:15									11	WW																				
11/09	23:45					10	PW	7	PW	12	WW	4	PW	3	PW	3	PW	3	TAB	2	RW										
11/09	23:50																	2	TAB												
11/10	00:00																	Quake													
11/10	00:08																	1	RW												
11/10	00:10																			1	TAB										
11/10	00:15									13	WW																				
11/10	00:45						8	PW	14	WW	5	PW	4	PW	4	PW	4	TAB	3	PW	3	TAB	2	RW							
11/10	00:50																					2	TAB								
11/10	01:15									15	WW																				
11/10	01:45						9	PW	16	WW	6	PW	5	PW	5	PW	5	TAB	4	PW	4	TAB	3	PW	3	TAB					
11/10	02:00																								Quake						
11/10	02:08																								1	RW					
11/10	02:10																									1	TAB				
11/10	02:15									17	WW																				
11/10	02:45						10	PW	18	WW	7	PW	6	PW	6	PW	6	TAB	5	PW	5	TAB	4	PW	4	TAB	2	RW			
11/10	02:50																										2	TAB			
11/10	03:45										8	PW	7	PW	7	PW	7	TAB	6	PW	6	TAB	5	PW	5	TAB	3	SW	3	TAB	
11/10	04:45										9	PW	8	PW	8	PW	8	TAB	7	PW	7	TAB	6	PW	6	TAB	4	SW	4	TAB	
11/10	05:45										10	PW	9	PW	9	PW	9	TAB	8	PW	8	TAB	7	PW	7	TAB	5	SW	5	TAB	
11/10	06:45											10	PW	10	PW	10	TAB	9	PW	9	TAB	8	PW	8	TAB	6	SW	6	TAB		
11/10	07:45																	10	PW	10	TAB	9	PW	9	TAB	7	SW	7	TAB		
11/10	08:45																			10	PW	10	TAB								

Table V–1. All Scenarios – International Master Schedule of Event List

A Dummy Message will only be issued from the participating Centres for Bulletin 1 of each scenario.

Legend Table V–1:

Centres		
PTWC	US NWS Pacific Tsunami Warning Center	
WCATWC	US NWS West Coast and Alaska Tsunami Warning Center	
NWPTAC	JMA Northwest Pacific Tsunami Advisory Center	
Bulletin Types (TYP)		
PTWC	RW	Regional Warning Watch
	PW	Pacific-Wide Warning
WC/ATWC	WW	Warning Watch Advisory
NWPTAC	TAB	Tsunami Advisory Bulletin

Product types and dissemination methods for Dummy Exercise Bulletins:

Center	WMO Product ID	GTS	AFTN	EMWIN	Fax	Email
NWPTAC	WEPA40 RJTD	Yes	No	No	Yes	Yes
PTWC	WEPA40 PHEB	Yes	Yes	Yes	Yes	Yes
WC/ATWC	WEPA41 PAAQ	Yes	Yes	Yes	Yes	Yes
	WEAK51 PAAQ	Yes	Yes	Yes	Yes	Yes

Table V–2. Product Types and Dissemination Methods

ANNEX VI

POST-EXERCISE EVALUATION

Exercise evaluation forms are to be completed by each participating agency and forwarded to the country Exercise Pacific Wave 11 National Contact, or the country Tsunami National Contact. The PacWave11 National Contact will compile the country Evaluation Form and complete and submit this online no later than 12 February 2012 (within 90 days of exercise).

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

The PacWave11 Evaluation Form can be found at
https://www.surveymonkey.com/s/pacwave11_eval

Alternatively, the country evaluation forms can be submitted by email or fax to the Exercise PacWave 11 Task Team Chairs:

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

Exercise Pacific Wave 11 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. Note: Objectives will be completed before, during and/or after the exercise. This information is noted at the top of each page for each objective. Make sure you are familiar with when each objective should be evaluated.
3	Each participating Agency/Country	<ul style="list-style-type: none"> Answer each statement with either Y (Yes), N (No), or Not Applicable (N/A) by ticking the relevant box. Comments should be used to explain/expand your Yes, No, or Not Applicable answers. Tick the C (Comment) box to indicate if you are providing comments. Write your comments on the page following the evaluation questions. Note the question number in the left column and write your comments alongside. <p>Example:</p> <p><input checked="" type="checkbox"/> Y <input type="checkbox"/> N <input checked="" type="checkbox"/> C <input type="checkbox"/> NA</p> <p>Ref No. Comment</p> <p>1 C.7 The national public safety decision-making and dissemination point received information at 14:35 UTC.</p>
4	Each participating Agency/Country	Send completed agency evaluation form to country PacWave11 National Contact so he/she can compile to complete Country PacWave11 Evaluation Form (this URL).
5	PacWave11 National Contact	PacWave11 National Contact should complete and submit the PacWave11 Evaluation Form by 12 February 2012 (https://www.surveymonkey.com/s/pacwave11_eval). If there are problems or questions, please contact the PacWave11 Task Team co-Chairs (Laura Kong, l.kong@unesco.org ; Jo Guard, jo.guard@dia.govt.nz)

Exercise Pacific Wave 11 Evaluation Form			
Contact Details			
Agency:		Country:	
Contact Name:		Contact Position:	
Contact Phone:		Contact Mobile:	
Contact E-Mail:			

Country Exercise Scenario	
Scenario Used:	Tick Scenario(s) used during PacWave11: <ul style="list-style-type: none"> <input type="radio"/> Kamchatka (Kuril–Kamchatka Trench) <input type="radio"/> Ryukyu Islands (Nansei–Shoto Trench) <input type="radio"/> Philippines – South China Sea (Manila Trench) <input type="radio"/> Philippines – Pacific Ocean (Philippines Trench) <input type="radio"/> Vanuatu (New Hebrides Trench) <input type="radio"/> Tonga (Tonga Trench) <input type="radio"/> Northern Chile (Peru–Chile Trench) <input type="radio"/> Ecuador (Colombia–Ecuador Trench) <input type="radio"/> Central America (Middle America Trench) <input type="radio"/> Aleutian Islands (Aleutian Trench)

OBJECTIVE 1

To exercise and evaluate operations of the current PTWS.

The evaluation of this objective must be completed **during** PacWave 11.

SUB OBJECTIVE 1A

Validate the issuance of tsunami advice from the PTWC, JMA/NWPTAC and WCATWC.

Who should complete this part of the form?

International Tsunami Warning Centres ONLY

Ref No	Evaluation Statements/Questions	Yes	No	Comment	Not applicable				
1A. 1	The information issued by the relevant international Tsunami Warning Centres was according to standard operating procedures.	<input type="checkbox"/>	Y	<input type="checkbox"/>	N	<input type="checkbox"/>	C	<input type="checkbox"/>	NA
1A. 2	What time was the initial PTWC, NWPTAC and/or WCATWC Exercise PacWave11 scenario exercise start message issued to the national tsunami warning centres? Please note the time using 24 hour clock and UTC, e.g., 14:35 UTC.	Note time on the following comment page							
1A. 3	The initial PTWC, NWPTAC and/or WCATWC Exercise Pacific Wave 11 scenario exercise start message was sent to national tsunami warning centres by the following methods. Please tick all methods that apply: <input type="radio"/> GTS <input type="radio"/> AFTN <input type="radio"/> EMWIN <input type="radio"/> Fax <input type="radio"/> Email <input type="radio"/> CISN(Real-Time Earthquake Display) <input type="radio"/> RANET Heads-up SMS <input type="radio"/> Other (Please specify):	Note other methods on the following comment page							

You may add additional individual agency evaluation statements in the section below. Insert as many lines as you need.

<input type="checkbox"/>	Y	<input type="checkbox"/>	N	<input type="checkbox"/>	C	<input type="checkbox"/>	NA
<input type="checkbox"/>	Y	<input type="checkbox"/>	N	<input type="checkbox"/>	C	<input type="checkbox"/>	NA

Please reference each comment with the relevant reference number from the previous page.

If you require more room use additional blank sheets.

Ref No	Comments
1A.2	
1A.3	

OBJECTIVE 1

To exercise and evaluate operations of the current PTWS.

The evaluation of this objective must be completed **during** PacWave 11.

SUB OBJECTIVE 1B

Validate the receipt of tsunami advice by PTWS Tsunami Warning Focal Points (TWFP).

Who should complete this part of the form? All agencies/countries

Ref No	Evaluation Statements/Questions	Yes	No	Comment	Not applicable
1B.1	The information issued by your country national Tsunami Warning Focal Point was according to standard operating procedures.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1B.2	The information issued by our national tsunami warning centre was timely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1B.3	The information issued by our national public-safety, decision-making and dissemination point was timely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1B.4	Is the national public-safety, decision-making and dissemination point different to the national tsunami warning centre?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1B.5	The initial PTWC, NWPTAC and/or WCATWC PacWave11 scenario exercise start message was received by our country TWFP.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1B.6	What time was the initial PTWC, NWPTAC and/or WCATWC PacWave11 scenario exercise start message received by our TWFP? Please indicate the time from each international TWC. Please note time using 24 hour clock and UTC, e.g., 14:35 UTC. – PTWC: – NWPTAC – WCATWC	Note time on the following comment page			
1B.7	How did the TWFP receive the international message(s)? Please indicate for each international TWC if they are different.	Note other methods and TWCs on the following comment page			

Ref No	Evaluation Statements/Questions	Yes	No	Comment	Not applicable				
	<p>Please tick all methods that apply:</p> <ul style="list-style-type: none"> <input type="radio"/> GTS <input type="radio"/> AFTN <input type="radio"/> EMWIN <input type="radio"/> Fax <input type="radio"/> Email <input type="radio"/> CISN (Real-Time Earthquake Display) <input type="radio"/> RANET Heads-up SMS <input type="radio"/> Other (Please specify): 								
1B.8	<p>If the national public-safety, decision-making and dissemination point is different to the country/national TWFP, what time did the national public-safety, decision-making and dissemination point receive the information? Please indicate the time from each international TWC. Please note the time using 24 hour clock and UTC, e.g., 14:35 UTC.</p>			Note time on the following comment page					
1B.9	<p>How did the national public safety decision-making and dissemination point receive the international message(s)? Please indicated for each international TWC if they are different. Please tick all methods that apply:</p> <ul style="list-style-type: none"> <input type="radio"/> GTS <input type="radio"/> AFTN <input type="radio"/> EMWIN <input type="radio"/> Fax <input type="radio"/> Email <input type="radio"/> CISN (Real-Time Earthquake Display) <input type="radio"/> RANET Heads-up SMS <input type="radio"/> Other (Please specify): 			Note other methods and TWCs on the following comment page					
1B.10	<p>Were there any problems with the receipt of initial PTWC, NWPTAC and/or WCATWC Exercise PacWave11 scenario exercise start message(s)? Please specify in comments on following page.</p>		Y		N		C		NA
1B.11	<p>Information provided in the relevant international warning centre messages was understood by the National Tsunami Warning Centre (NTWC)/National Disaster Management Office (NDMO).</p>		Y		N		C		NA

		Yes	No	Comment	Not applicable				
Ref No	Evaluation Statements/Questions								
1B.12	The information provided assisted with decision making, e.g., warning levels, earthquake parameters, estimated arrival times, forecast wave heights, etc.	<div></div>	Y	<div></div>	N	<div></div>	C	<div></div>	NA
1B.13	The information provided was fully utilised by the NTWC/NDMO.	<div></div>	Y	<div></div>	N	<div></div>	C	<div></div>	NA
1B.14	Existing in-country hazard information/local data was utilised.	<div></div>	Y	<div></div>	N	<div></div>	C	<div></div>	NA
1B.15	Additional in-country local/regional expert advice was utilised.	<div></div>	Y	<div></div>	N	<div></div>	C	<div></div>	NA
1B.16	If you answered yes to Q1B.15, what agency or agencies did you consult?	Note agencies on the following comment page							

You may add additional individual agency evaluation statements in the section below. Insert as many lines as you need.

<input type="checkbox"/>	Y	<input type="checkbox"/>	N	<input type="checkbox"/>	C	<input type="checkbox"/>	NA
<input type="checkbox"/>	Y	<input type="checkbox"/>	N	<input type="checkbox"/>	C	<input type="checkbox"/>	NA

Please reference each comment with the relevant reference number from the previous page.

If you require more room use additional blank sheets.

Ref No	Comments
1B.6 – 9, 15	

OBJECTIVE 2

To begin a process of exposure to an initial test version of PTWC experimental products.

This objective must be completed **during** PacWave11.

SUB OBJECTIVE 2A

Review and evaluate PTWC experimental products that will be available in parallel with existing PTWC products for each scenario exercised.

Who should complete this part of the form? All agencies/countries

Ref No	Evaluation Statements / Questions	Yes	No	Comment	Not applicable
2A.1	The information contained in the experimental products is understandable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2A.2	The information contained in the experimental products helps with your decision-making.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2A.3	What features of the experimental products are most useful? (<i>Note on the following comment page</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2A.4	What if any, features need to be changed?	<i>Note on the following comment page</i>			
2A.5	What if any new features should be added in the experimental products?	<i>Note on the following comment page</i>			

You may add additional individual agency evaluation statements in the section below. Insert as many lines as you need.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SUB OBJECTIVE 2A

Review and evaluate PTWC experimental products that will be available in parallel with existing PTWC products for each scenario exercised.

Who should complete this part of the form? All agencies/countries

Ref No	Comments
2A.3	
2A.4	
2A.5	

OBJECTIVE 2

To begin a process of exposure to an initial test version of PTWC experimental products.

This objective must be completed **during** PacWave11.

SUB OBJECTIVE 2B

Provide feedback on the staging, format and content of the experimental products

Who should complete this part of the form? All agencies/countries

		Yes	No	Comment	Not applicable	
Ref No	Evaluation Statements / Questions					
2B.1	Staging: Should forecast threat levels be included in the initial first product, knowing that forecasts are likely to change over the first hour as later-arriving seismic data and sea level data are received and analysed?		Y	N	C	NA
2B.2	Staging: Should forecast threat levels be given only for coasts within 6 hours of the estimated tsunami arrival time in initial products, knowing that initial forecasts will be based only upon the seismic parameters?		Y	N	C	NA
2B.3	Format: Does the primary text product contain the right information? If not, please specify what additional information is wanted. Consider information on the earthquake and the tsunami, and whether the evaluation description is adequate.		Y	N	C	NA
2B.4	Format: Does the proposed suite of products—primary text product, energy map, threat map, table of threat levels, table of arrival times—provide all the necessary information?Please note on comment page.		Y	N	C	NA
2B.5	Content: Are there other information or products that should be included in the suite of products? Consider earthquake and tsunami information, and/or threat assessment products. Please note on comment page.		Y	N	C	NA
2B.6	Content: Are the proposed forecast zones appropriate? If not, please suggest better zonations.		Y	N	C	NA
2B.7	Content: Are the proposed forecast levels: 0–0.3m, 0.3–1m, 1–3m, >3m adequate?		Y	N	C	NA
2B.8	Content: Should there be a 5 th level to describe for extreme tsunamis (e.g., 2004 Sumatra or 2011 Tohoku)? If yes, please specify the forecast level.		Y	N	C	NA

You may add additional individual agency evaluation statements in the section below. Insert as many lines as you need.

☐ Y ☐ N ☐ C ☐ NA

Please reference each comment with the relevant reference number from the previous page.

If you require more room use additional blank sheets.

Ref No	Comments

OBJECTIVE 3

To validate the readiness of Member States to respond to a local/regional source tsunami.

This objective must be completed **before** PacWave11.

SUB OBJECTIVE 3A

Validate the operational readiness of the National Tsunami Warning Centre (NTWC) (or like function) and/or the National Disaster Management Office (NDMO).

Who should complete this part of the form? All agencies/countries

		Yes	No	Comment	Not applicable	
Ref No	Evaluation Statements/Questions					
3A. 1	The NTWC/NDMO has an activation and response process (standard operating procedures) in place for the receipt of tsunami warnings.		Y	N	C	NA
3A. 2	The NTWC/NDMO knows its specific response role in the event of a tsunami.		Y	N	C	NA
3A. 3	The NTWC/NDMO has, prior to the exercise, engaged in tsunami response planning.		Y	N	C	NA
3A. 4	The NTWC/NDMO has undertaken activity to increase its capacity and capability to support a national tsunami response (for example, training, exercise, etc)–Note activities in Comment section.		Y	N	C	NA
3A. 5	The NTWC/NDMO has an appropriate management structure identified and documented to support tsunami response.		Y	N	C	NA
3A. 6	The NTWC/NDMO has a tsunami mass coastal evacuation plan.		Y	N	C	NA

You may add additional individual agency evaluation statements in the section below. Insert as many lines as you need.

☐ Y ☐ N ☐ C ☐ NA

Ref No	Comments

OBJECTIVE 3 To validate the readiness of Member States to respond to a local/regional source tsunami. This objective must be completed before PacWave11.
SUB OBJECTIVE 3B To improve operational readiness. Before the exercise, ensure appropriate tools and response plan(s) have been developed, including public education materials)
Who should complete this part of the form? All agencies/countries

		Yes	No	Comment	Not applicable	
Ref No	Evaluation Statements / Questions					
3B.1	Arrangements to assemble the in-country disaster management group relevant to decision-making on tsunami warning and response were in place before the exercise.		Y	N	C	NA
3B.2	A country tsunami emergency response plan (standard operating procedures) for regional/local tsunamis exists.		Y	N	C	NA
3B.3	Public education materials were developed and disseminated prior to the exercise.		Y	N	C	NA
3B.4	Regional/local tsunami exercises are routinely conducted in-country. Note last exercise in Comments section.		Y	N	C	NA
3B.5	Tsunami-related curriculum programmes are in place for all levels of education. Note which levels in Comments section.		Y	N	C	NA
3B.6	Communities have tsunami evacuation maps, routes, evacuation signs and assembly points for evacuation areas? Please note any gaps and future plans to fill gaps.		Y	N	C	NA

<i>You may add additional individual agency evaluation statements in the section below. Insert as many lines as you need.</i>

☐ Y
 ☐ N
 ☐ C
 ☐ NA

Ref No	Comments
3B.4–6	

OBJECTIVE 3

To validate the readiness of Member States to respond to a local/regional source tsunami.

This objective must be completed **during** PacWave11.

SUB OBJECTIVE 3C

Validate dissemination of warnings and information/advice by National Tsunami Warning Centres to relevant in-country agencies and the public is accurate and timely.

Who should complete this part of the form? All agencies/countries

Ref No	Evaluation Statements/Questions	Yes	No	Comment	Not applicable				
3C.1	The response activation process was followed when the initial PTWC, NWPATC and/or WCATWC Exercise PacWave11 scenario exercise start message was received.		Y		N		C		NA
3C.2	The warning was disseminated to: <ul style="list-style-type: none"> Emergency services Other national government agencies Science agencies/universities involved in assessment Local government: provincial/regional level Local government: city/district level. Public 		Y		N		C		NA
3C.3	What time was the initial PTWC, NWPATC and/or WCATWC Exercise PacWave11 scenario exercise start message sent to the agency or agencies listed in Q3.C2? Please note the time using 24 hour clock and UTC, e.g., 14:35 UTC.		Y		N		C		NA
3C.4	How did you send the initial PTWC, NWPATC and/or WCATWC Exercise PacWave11 scenario exercise start message to the agency or agencies listed in Q3.C2?		Y		N		C		NA

Note time on the following comment page

Note methods on the following comment page

SUB OBJECTIVE 3C

Validate dissemination of warnings and information/advice by National Tsunami Warning Centres to relevant in-country agencies and the public is accurate and timely.

Who should complete this part of the form? All agencies/countries

Ref No	Evaluation Statements / Questions	Yes	No	Comment	Not applicable	
3C.5	The method of communication <u>from</u> our public-safety, national decision-making and dissemination point to us was sufficient (timely, clear, accurate) to support decision-making.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3C.6	The method of communication between our public safety national decision making and dissemination point and individual response agencies and provinces/local jurisdictions was sufficient to support national information requirements and decision-making.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3C.7	Did a management group responsible for decision-making on tsunami warning and response assemble during the exercise?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3C.8	If you answered yes to Q 3C.7 (above), how many minutes/hours did it take for your management group to assemble after receiving the initial Exercise PacWave11 exercise start message?	Note time on the following comment page				
3C.9	If you answered yes to Q 3C.7 (above), was this timely to facilitate good decision-making?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

You may add additional individual agency evaluation statements in the section below. Insert as many lines as you need.

	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please reference each comment with the relevant reference number from the previous page.

If you require more room use additional blank sheets.

Ref No	Comments
3C.3	
3C.4	
3C.8	
3C.9	

OBJECTIVE 3

To validate the readiness of Member States to respond to a local/regional source tsunami.

This objective must be completed **during** PacWave11.

SUB OBJECTIVE 3D

Validate the organisational decision-making process about public warnings and evacuations.

Who should complete this part of the form? All agencies/countries

Ref No	Evaluation Statements/Questions	Yes	No	Comment	Not applicable	
3D.1	Did the national disaster management organisation (or equivalent) maintain communication with the National Tsunami Warning Centre throughout the event?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3D.2	If you answered yes to Q3D.1, what was the nature of the communication between the national disaster management organisation (or equivalent) with the national tsunami warning centre throughout the event?	Note answer on the following comment page				
3D.3	Did the national disaster management organisation (or equivalent) maintain communication with local/regional disaster management organisations (or equivalent)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3D.4	If you answered yes to Q3D.3, what was the nature of the communication between the national disaster management organisation (or equivalent) with local/regional disaster management organisations (or equivalent)?	Note answer on the following comment page				
3D.5	Were any areas evacuated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3D.6	If you answered yes to Q3D.5, please specify the following: <ul style="list-style-type: none"> The area(s) evacuated (name of the town or community) The time they were evacuated (use 24-hour clock in UTC time) Estimated number of people evacuated 	Note answer on the following comment page				
3D.7	Were tsunami inundation maps available for evacuated areas?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3D.8	Were tsunami evacuation maps available for evacuated areas?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3D.9	Did your tsunami warning centre use any numerical model tsunami scenarios during the exercise (e.g., Deep-ocean propagation and/or coastal inundation models?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements/Questions				
3D.10	<p>How did your country assess the tsunami threat during the exercise? Please tick as many as apply:</p> <ul style="list-style-type: none"> <input type="radio"/> National tsunami experts <input type="radio"/> National tsunami coordination committee <input type="radio"/> National tsunami historical database <input type="radio"/> NGDC/WDC-MGG tsunami historical database (web) <input type="radio"/> TsuDig historical database GIS tool (NGDC/ITIC offline) <input type="radio"/> National pre-computed tsunami scenarios <input type="radio"/> National tsunami forecasts <input type="radio"/> International tsunami forecasts. Note source of forecasts (PTWC, NWPTAC, WC/ATWC) in Comments. <input type="radio"/> Communication with outside sources (such as ITIC, media, other). Please specify: 				

Note answer on the following comment page

You may add additional individual agency evaluation statements in the section below. Insert as many lines as you need.

☐ Y ☐ N ☐ C ☐ NA

Please reference each comment with the relevant reference number from the previous page.
If you require more room use additional blank sheets.

Ref No	Comments
3D.2	
3D.4	
3D.6	
3D.10	

OBJECTIVE 3

To validate the readiness of Member States to respond to a local/regional source tsunami.

This objective must be completed **during** PacWave11.

SUB OBJECTIVE 3E

Validate the methods used to notify and instruct the public are accurate and timely.

Who should complete this part of the form? All agencies/countries

Ref No	Evaluation Statements/Questions	Yes	No	Comment	Not applicable
3E.1	Was a tsunami warning and/or information issued to the public?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3E.2	If you answered yes to Q3E.1 note: <ul style="list-style-type: none"> Type of information that was released to the public (no action, prepare, evacuate). Whom it was issued by, and The time it was issued (use 24 hour clock in UTC time). 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3E.3	If you answered yes to Q3E.1, how was the warning/information communicated with the public? Please tick as many as apply: <input type="checkbox"/> Telephone <input type="checkbox"/> SMS <input type="checkbox"/> Cell/mobile phone broadcast <input type="checkbox"/> Public radio <input type="checkbox"/> Public TV <input type="checkbox"/> Twitter <input type="checkbox"/> Facebook <input type="checkbox"/> RSS <input type="checkbox"/> Websites <input type="checkbox"/> Sirens <input type="checkbox"/> Public Announcement systems <input type="checkbox"/> Police <input type="checkbox"/> Public call centre <input type="checkbox"/> Door-to-door announcements <input type="checkbox"/> Other (please specify):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note answer on the following comment page

Note answer on the following comment page

You may add additional individual agency evaluation statements in the section below. Insert as many lines as you need.

☐ Y ☐ N ☐ C ☐ NA

Please reference each comment with the relevant reference number from the previous page. If you require more room use additional blank sheets.

Ref No	Comments
3E.2	
3E.3	

OBJECTIVE 3

To validate the readiness of Member States to respond to a local/regional source tsunami.

This objective must be completed **during** PacWave11.

SUB OBJECTIVE 3F

Validate the elapsed time until the public would be notified and instructed/advised.

Who should complete this part of the form? All agencies/countries

		Yes	No	Comment	Not applicable				
Ref No	Evaluation Statements/Questions								
3F.1	The public were officially notified prior to the scenario wave arrival time	<input type="checkbox"/>	Y	<input type="checkbox"/>	N	<input type="checkbox"/>	C	<input type="checkbox"/>	NA

You may add additional individual agency evaluation statements in the section below. Insert as many lines as you need.

<input type="checkbox"/>	Y	<input type="checkbox"/>	N	<input type="checkbox"/>	C	<input type="checkbox"/>	NA
<input type="checkbox"/>	Y	<input type="checkbox"/>	N	<input type="checkbox"/>	C	<input type="checkbox"/>	NA

Please reference each comment with the relevant reference number from the previous page.

If you require more room use additional blank sheets.

Ref No	Comments

GENERAL OBSERVATIONS

Please complete this section **after** Exercise Pacific Wave 11.

		Yes	No	Comment	Not applicable	
Ref No	Evaluation Statements / Questions					
	Overall assessment					
4.1	The Agency has a better understanding of the goals, responsibilities and roles in civil defence emergencies.		Y	N	C	NA
4.2	Gaps in capability and capacity have been identified.		Y	N	C	NA
4.3	The Agency enhanced its external relationships and identified its interdependencies as a result of the exercise.		Y	N	C	NA
	Exercise planning (please make comments on the following page to all of the statements below)		Y	N	C	NA
4.4	Overall, the exercise planning, conduct, format and style were satisfactory.		Y	N	C	NA
4.5	Exercise planning at the international level went well.		Y	N	C	NA
4.6	Exercise planning at the national level		Y	N	C	NA

		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements / Questions				
	went well.				
4.7	Exercise planning at the provincial/local level went well.	Y	N	C	NA
4.8	The PacWave11 exercise website pages were useful.	Y	N	C	NA
4.9	The PacWave11 exercise website pages were updated in a timely manner.	Y	N	C	NA
4.10	This evaluation form was easy to use.	Y	N	C	NA
4.11	PacWave11 Exercise Manual provided an appropriate level of detail.	Y	N	C	NA
4.12	The How to Plan, Conduct, and Evaluate Tsunami Exercises guideline was useful.	Y	N	C	NA

Please provide a general statement on your Exercise Pacific Wave 11 experience.
You may comment about international, national, provincial and/or local level aspects.

Exercise Planning

Please provide a general statement about what went well.
<i>Insert comments</i>
Please provide a general statement about what did not go well.
<i>Insert comments</i>
Please provide a general statement about what could be improved.
<i>Insert comments</i>

Exercise Conduct

Please provide a general statement about what went well.
<i>Insert comments</i>
Please provide a general statement about what did not go well.
<i>Insert comments</i>
Please provide a general statement about what could be improved.
<i>Insert comments</i>

ANNEX VII

SAMPLE PRESS RELEASE

TEMPLATE FOR NEWS RELEASE

USE AGENCY MASTHEAD

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

FOR IMMEDIATE RELEASE
(insert date)

THIRD PACIFIC-WIDE TSUNAMI DRILL SET FOR NOVEMBER

(Insert country name) will join over (insert number) other countries around the Pacific Rim as a participant in a mock tsunami scenario during 9–10 November 2011. The purpose of this Pacific-wide exercise is to increase preparedness, evaluate response capabilities in each country and improve coordination throughout the region to a regional or local source tsunami.

“The recent events of the 2009 Samoa Islands, 2010 Chile and the March 2011 Japan tsunamis have increased our need to be more prepared for such events,” said (insert name of appropriate official). “This important exercise will test the current procedures of the Pacific Tsunami Warning System and help identify operational strengths and weaknesses in each country.”

The exercise, titled Exercise Pacific Wave 11 (PacWave11), will simulate Pacific countries being put into a Tsunami Warning situation requiring government decision-making. It is the third such exercise with the first having been carried out in May 2006 and the second in October 2008.

The exercise can be divided into two stages. The exercise will consist of 9 different scenarios to allow each participating country to respond to a regional or local source tsunami event. In the first stage, a destructive local tsunami will be simulated by international notifications from Japan’s Northwest Pacific Tsunami Advisory Center (NWPTAC), the U.S. Pacific Tsunami Warning Center (PTWC) and the U.S. West Coast and Alaska Tsunami Warning Center (WC/ATWC). Bulletins will be transmitted from these tsunami warning centres to focal points designated by each country that are responsible for that country’s tsunami response.

In the second stage, conducted simultaneously in response to receipt of the international messages and any national tsunami detection, analysis, and forecasting capabilities, government officials will simulate decision-making and alerting procedures down to the last step before public notification. Notification of emergency management and response authorities for a single coastal community will be used as a measure of the end-to-end warning and response process of the entire country for purposes of this exercise. Due care will be taken to ensure the public is not inadvertently alarmed.

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.

Should any actual tsunami threat occur during the time period of the exercise, the drill will be terminated.

Following the exercise, a review and evaluation will be conducted by all participants. “We see this exercise as an essential element in the routine maintenance of the Pacific Tsunami

Warning and Mitigation System,” said (insert name of appropriate official). “Our goal is to ensure a timely and effective early warning of tsunamis, educate communities at risk about safety preparedness, and improve our overall coordination. We will evaluate what works well, where improvements are needed, make necessary changes, and continue to practice.”

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)

###

On the Web:

Exercise Pacific Wave 11 information site: <http://www.pacwave.info>

Media Resources:

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

[unesco.org/index.php?option=com_content&view=category&layout=blog&id=1150&Itemid=1150&lang=en](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-](http://www.ioc-tsunami.org/index.php?option=com_content&view=article&id=11&Itemid=12&lang=en)

[tsunami.org/index.php?option=com_content&view=article&id=11&Itemid=12&lang=en](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 Center:

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 VIII

LIST OF ACRONYMS

AFTN	Aeronautical Fixed Telecommunications Network
DISCEX	Discussion Exercise' or Tabletop exercise
EMWIN	Emergency Managers Weather Information Network
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 & Atmospheric Administration (USA)
NTWC	National Tsunami Warning Center
NWPTAC	Northwest Pacific Tsunami Advisory Center (Japan)
PTWC	Pacific Tsunami Warning Center (USA)
SOP	Standard Operating Procedures
TNC	Tsunami National Contact
TWFP	Tsunami Warning Focal Point
UNESCO	United Nations Educational, Scientific & Cultural Organization
WC/ATWC	West Coast/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 Intercalibration 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 XXIII</i> , 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 —A Caribbean Tsunami Warning Exercise 23 March 2011 Vol.1 Participant Handbook / Exercise CARIBE WAVE 11 —Exercice d'alerte au tsunami dans les Caraïbes. 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
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



EXERCISE PACIFIC WAVE 11

A Pacific-wide Tsunami Warning and Communication Exercise

9–10 November 2011

Report

Volume 2

UNESCO

**EXERCISE PACIFIC WAVE 11
A Pacific-wide Tsunami Warning
and Communication Exercise**

9–10 November 2011

Report

Volume 2

UNESCO 2013

IOC Technical Series, 97 (volume 2)
Honolulu and Paris, March 2013
English only

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariats of UNESCO and IOC concerning the legal status of any country or territory, or its authorities, or concerning the delimitation of the frontiers of any country or territory.

For bibliographic purposes, this document should be cited as follows:

Exercise Pacific Wave 11. A Pacific-wide Tsunami Warning and Communication Exercise, 9–10 November 2011. Report, Volume 2. IOC Technical Series No 97. UNESCO/IOC 2013 (English only)

Report prepared by: The Intergovernmental Coordination
Group for the Pacific Tsunami Warning
and Mitigation System

United Nations Educational, Scientific
and Cultural Organization
7, Place de Fontenoy, 75352 Paris 07 SP

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(IOC/2011/TS/97Vol.2)

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- VII. REPORT PREPARATION
- VIII. LIST OF ACRONYMS

1. 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 in the Pacific Ocean and its marginal seas. On average, the Pacific is struck by a locally damaging tsunami every few years and by a major Pacific-wide tsunami a few times each century.

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 the 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, 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 2006 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. The Pacific Tsunami Warning and Mitigation System (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. EPW06 (Exercise Pacific Wave 06) documents 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 Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS) conducted its second exercise to establish such exercises as part of the routine work of maintaining the Pacific Tsunami Warning and Mitigation System. PacWave08 documents are posted to:

http://itic.ioc-unesco.org/index.php?option=com_content&view=category&layout=blog&id=1395&Itemid=1395&lang=en

The ICG/PTWS at its Twenty-third Session (ICG/PTWS-XXIII/3) that was held from 16 to 18 February 2009 in Apia, Samoa, 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 event 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 around 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 Chilean and then 2011 Japanese tsunami.

Accordingly, *Exercise Pacific Wave 11* (IOC/2011/TS/97VOL.1) was conducted 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.

Exercise Pacific Wave 11 (PacWave11) also included the introduction of new international tsunami products proposed by the Pacific Tsunami Warning Center (PTWC) and approved by the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation

System at its Twenty-fourth Session (ICG/PTWS-XXIV/3) held from 24 to 27 May 2011 at Beijing, China, for implementation in 2014. The new 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 heretofore have been unnecessarily warned. PacWave11 documents are posted to:

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

A total of 35 countries participated in the exercise. This Summary Report is based on 50 Post-Exercise Evaluation Forms received from the countries and their jurisdictions. The overwhelming majority of responding countries expressed a positive view of PacWave11 planning and conduct. PacWave11 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 2009–2013 (ICG/PTWS-XXIII/3, Annex V). PacWave11 contributed to the improvement and development of planning relating to country public warning and response.

Countries also generally understood the PTWC experimental products and viewed them as adding important advice to guide them in providing more accurate national warnings. PacWave11 provided valuable feedback from countries on proposed PTWC new products. Future tsunami exercises should continue to reinforce the integration of PTWC experimental products, where useful, in their country decision-making processes, and in their Standard Operating Procedures (SOPs).

One of the major areas of immediate concern of the PTWS is that many coastal communities still do not have evacuation maps identified by pre-disaster planning processes, and/or they do not have reliable and robust public alert communications “down to the last kilometre on the beach”. A local/regional tsunami requires rapid enabling of end-to-end tsunami warning and emergency response SOPs with delegated authority to 24/7 national/local response organizations to enact public evacuations, if necessary. As part of pre-disaster planning, countries are encouraged to develop and/or strengthen their tsunami response procedures, continue staff training, and conduct regular exercises at the national and local levels to build the capacity and commitment to sustain high levels of tsunami readiness.

Additionally, however, an important lesson learned from the recent deadly tsunamis has been that coastal communities should not solely depend on the timely receipt of official local tsunami warnings. For the Exercise Pacific Wave 13 (PacWave13), it took on average 11.2 minutes for the National Emergency Centre (NEC) to receive a message from the National Tsunami Warning Centre (NTWC). If a public evacuation announcement immediately follows, it will likely be before the tsunami wave hits, but just barely. This not-enough-time factor means that individuals themselves must be able to recognize tsunami natural warning signs and voluntarily self-evacuate. In other words, public awareness and education must remain the front line of preparedness for local tsunamis. Therefore, those countries with local tsunami threats are strongly encouraged to commit the necessary resources to ensure the education of their populations.

Finally, as in the past, countries are reminded to regularly review and confirm their 7x24 Tsunami Warning Focal Point (TWFP) contact data to the Intergovernmental Oceanographic Commission (IOC), as TWFP contact information needs to be 100% accurate, 100% of the time.

2. INTRODUCTION

2.1 EXERCISE PACWAVE 11

Exercise Pacific Wave 11 (PacWave11) was proposed and agreed to at the Twenty-third Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXIII/3) held in Apia, Samoa, from 16 to 18 February 2009. Recommendation ICG/PTWS-XXIII.2 on PTWS Exercises (Attachment I of the IOC Circular Letter No. 2390), in Annex III, called for a third Pacific-wide tsunami exercise that simulated countries responding to local and regional tsunami sources and that required decision-making taken to the step just prior to public notification. PacWave11 also introduced and evaluated the understanding and use of the new PTWC experimental products. All countries of the Pacific were encouraged to participate in PacWave11.

Exercise Pacific Wave 11 was the third 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 PacWave11 through IOC Circular Letter No. 2390 dated 13 May 2011 (ANNEX I), and requested ICG/PTWS Member States to nominate national contacts for the Exercise. The ICG/PTWS at its Twenty-fourth Session (ICG/PTWS-XXIV/3) held in Beijing, China, from 24 to 27 May 2011, through Recommendation ICG/PTWS-XXIV.3 on PTWS Exercises, Member States approved the continuation of the Working Group 2 Task Team on the PacWave11 Exercise (Recommendation ICG/PTWS-XXIV.1 on PTWS Governance, ANNEX II) and approved the details for the conduct of PacWave11 (ICG/PTWS-XXIV.3 on PTWS Exercises, ANNEX II). An exercise website was established and maintained by the International Tsunami Information Centre (ITIC) to support the exercise, including the *Exercise Pacific Wave 11: a Pacific-wide tsunami warning and communication exercise* (IOC/2011/TS/97VOL.1), *How to plan, conduct and evaluate UNESCO/IOC tsunami wave exercises* (IOC/2012/MG/58 REV.), 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 5 November 2011 one week before the exercise, and participating countries were provided with a Media Advisory template for their national use (ANNEX III).

Exercise Pacific Wave 11 was conducted on 9 and 10 November 2011 with each scenario (ANNEX IV) started by a live message from the Pacific Tsunami Warning Center, Japan Meteorological Agency's (JMA) Northwest Pacific Tsunami Advisory Center (NWPTAC), and/or West Coast and Alaska Tsunami Warning Center (WCATWC). Each country could choose from among ten scenarios, each lasting about 10 hours with messages available from the international tsunami warning centres. Once a scenario was started, each country was responsible for simulating the receipt of the remaining international messages, available on the **PacWave11 website**, according to the timeline provided by International Master Schedule of Events List (MSEL). PacWave11 began on 8 November 2011 at 1300 UTC with the first PTWC Message starting the Northern Chile scenario, and ended on 10 November 2011 at 0845 UTC with the last PTWC Message of the Philippine Trench Scenario.

The exercise manual, *Exercise Pacific Wave 11. A Pacific-wide Tsunami Warning and Communication Exercise* (IOC/2011/TS/97Vol.1), was prepared and made available in August 2011 to guide exercise participants. A draft guideline of the document *How to Plan, Conduct and Evaluate UNESCO/IOC Tsunami Wave Exercises* (now finalized and published, IOC/2012/MG/58 REV.) was also prepared and 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 **PacWave11** (ANNEX VI). An evaluation

questionnaire was prepared and provided that allowed countries to assess themselves. This questionnaire was significantly improved from the one used in 2006 and 2008 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 PacWave11 questionnaire was migrated to a Yes/No or multiple-choice format, with optional comments, and also made available online in English and Spanish.

Exercise Pacific Wave 11 was organised and coordinated by the Task Team on PacWave11 of Working Group 2 of PTWS (ANNEX VII) co-chaired by International Tsunami Information Centre (ITIC) and the New Zealand Ministry of Civil Defence & Emergency Management (MCDEM) and comprised of the ITIC, Ecuador, Japan, and New Zealand.

A total of 35 countries (50 including subnational entities) independently participated in PacWave11. Three additional countries (Kiribati, Nauru, Palau) planned to participate, but could not take part in it for various reasons. A summary compiling the exercise plans of PTWS countries is provided in ANNEX V, and a compilation of exercise evaluation responses is provided in ANNEX VI.

Pacific countries and sub-national jurisdictions that participated, or planned to participate, were:

Australia	New Zealand
Brunei	Nicaragua
Chile	Niue
China (mainland China and Hong Kong)	Palau
Colombia	Panama
Cook Islands	Papua New Guinea
Ecuador	Peru
El Salvador	Philippines
Federated States of Micronesia (Chuuk, Pohnpei, Yap)	Russia
Fiji	Samoa
France (French Polynesia)	Singapore
Guatemala	Solomon Islands
Indonesia	South Korea
Japan (NWPTAC)	Thailand
Kiribati	Tonga
Malaysia	Tuvalu
Marshall Islands	USA (PTWC, WCATWC, Northern Mariana Islands, Guam, American Samoa)
Mexico	Vanuatu
Nauru	Vietnam

This Exercise Pacific Wave 11 Summary Report (IOC/2011/TS/97Vol.2) is based on the post-exercise evaluation forms, as developed by the PacWave11 Task Team.

PTWC and JMA/NWPTAC messages were received by all countries; no countries used scenarios in which they were to receive WCATWC messages. A minority of countries reported some problems.

2.2 CONCEPT OF THE EXERCISE

2.2.1 Purpose

The purpose (aim) of Exercise Pacific Wave 11 was to improve local and regional source tsunami warning and response capability in the Pacific.

The exercise provided an opportunity for Pacific countries to exercise their operational lines of communications, review their tsunami response procedures, and promote emergency preparedness.

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. As such, every Pacific country was encouraged to participate.

2.2.2 Objectives

There were three key objectives for Exercise Pacific Wave 11. Sub-objectives are noted as bullet points.

Objectives	
1	<p>To exercise and evaluate operations of the current PTWS:</p> <ul style="list-style-type: none"> • Validate the issuance of tsunami advice from the Pacific Tsunami Warning Center (PTWC), the Japan Meteorological Agency/Northwest Pacific Tsunami Advisory Center (JMA/NWPTAC) and the West Coast and Alaska Tsunami Warning Center (WCATWC). • Validate receipt of this tsunami advice by Pacific Country Tsunami Warning Focal Points.
2	<p>To begin a process of exposure to an initial test version of PTWC experimental products that are being developed to provide a more rapid and quantitative forecast of tsunami impacts:</p> <ul style="list-style-type: none"> • Review and evaluate PTWC experimental products that will be available in parallel with existing PTWC products for each scenario exercised. • Provide feedback on the staging, format, and content of the experimental products.
3	<p>To validate the readiness of Member States to respond to a local/regional source tsunami:</p> <ul style="list-style-type: none"> • Validate the operational readiness of the National Tsunami Warning Centre (NTWC), or similar in-country function, and/or the National Disaster Management Office (NDMO). • Improve operational readiness. Before the exercise, ensure appropriate tools and response plan(s) have been developed, including public education materials. • Validate dissemination of warnings and information/advice by National Tsunami Warning Centre to relevant in-country agencies and the public is accurate and timely. • Validate the organisational decision-making process about public warnings

Objectives	
	<p>and evacuations.</p> <ul style="list-style-type: none">• Validate the methods used to notify and instruct the public are accurate and timely.

Table 1. Objectives and sub-objectives of PacWave11

2.2.3 Type of exercise

Exercise Pacific Wave 11 was carried out in a readiness style that aimed to involve communication and decision making at government levels, without disrupting or alarming the general public. Individual countries, however, may have chosen, at their discretion, to extend the exercise down to the level of actually notifying and evacuating the public. Stakeholder agencies involved in the end-to-end tsunami warning, including non-government agencies as well post-disaster response and the media, could be involved.

Exercises stimulate the development, training, testing, and evaluation of tsunami warning and emergency response plans and standard operating procedures (SOPs). Exercise participants could use their own past tsunami or multi-hazard drills (e.g. flood, typhoon, earthquake, etc.) as a framework to conduct PacWave11.

Exercises can be conducted at various scales of magnitude and sophistication. The following are examples of types of exercises conducted by disaster management agencies, in coordination with tsunami warning centres.

Orientation Exercise (Seminar)

An orientation exercise may also be referred to as a ‘walk through’, and it can be conducted through a workshop. It puts people in a place where they would work during a tsunami response, or uses them as participants in a demonstration of an activity. This type of exercise is used to familiarise the players with the activity.

An example of an orientation exercise would be setting up a mock welfare centre to take in tsunami evacuees, and walking staff through how the centre is organised.

Drill

In a drill exercise, staff physically handle specific equipment or perform a specific procedure or a single operation. A drill usually focuses on a single organisation, facility, or agency such as a hotel, school, village, etc. The exercise usually has a time frame element and is used to test procedures. Performance is evaluated in isolation; a drill is a subset of a full-scale exercise.

An example of a drill exercise would be activating an Emergency Operations Centre or using alternative communications (such as radios) in a tsunami exercise. Within a warning centre, a drill might consist of the operations for a local tsunami warning, or just the communication notification procedures for a local tsunami.

Table Top Exercise

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 from the international tsunami warning centres such as the PTWC in Hawaii, which describes the nature of the threat.

Functional Exercise

A functional exercise may be referred to as an 'operational' or a 'tactical' exercise. It takes place in an operational environment and requires participants to actually perform the functions of their roles.

A normally complex response activity is simulated, which may require multiple activities to carry out the response. Commonly, they involve the testing of standard operating procedures (SOPs) and internal/external communications between organisations. It lacks only the people "on the ground" to create a full-scale exercise.

Participants interact within a simulated environment through an exercise control group who provide prewritten injects and respond to questions and tasks developing out of the exercise.

An example of a functional exercise would be a multi-agency response to a devastating tsunami, where evacuation of a coastal community is required. Messages and injects are provided by exercise control and are handled by the participants in the way described in their standard operating procedures.

Functional exercises may also just focus on a specific aspect of warnings, such as command and control activities of emergency operations centres or the communications flow and procedures from international to national to provincial levels.

Full-Scale Exercise

A full-scale exercise may be referred to as a 'practical' or 'field' exercise. These include the movement or deployment of people and resources to include physical response 'on the ground' to a simulated situation. It could be labeled as the climax of a progressive exercise programme.

These exercises are typically used to test all aspects of a country's warning and emergency management systems and processes, using actual centres and communications methods. They can be 'ground' focused only or may include the higher-level response structures, and they can be simple (single agency) or complex (multi-agency, multi-levels of government from national to local).

Full-scale exercises are the largest, most costly, most-time consuming, and most complex to plan, conduct, and evaluate.

An example of a full-scale exercise would be a tsunami warning, dissemination, and emergency response with a school evacuating, volunteers portraying 'victims', and emergency services using real rescue equipment. Coordinated, multi-agency response to the event is exercised. Actual field mobilisation and deployment of response personnel are conducted.

2.2.4 Exercise development time frames

The different exercise types require different amounts of preparation and conduct time. The following table provides a general idea of how much time is necessary.

Exercise Type	Preparation Period	Duration	Comments
Orientation Exercise	Simple, 1 week	1–2 hours	Single agency/department, cross-sectional staff.
Drill	Simple, 1–2 weeks	1–4 hours	Functional staff.
Tabletop Exercise	Complex, but inexpensive 1–3 months	2–4 hours, or longer	Single or multiple agency, staff of the same level with a warning/response role.
Functional Exercise	Complex, but expensive, 6–18 months	4 hours to 1 or more days	Multiple Agency participation, all staff with warning/response roles for that function.
Full-scale Exercise	Complex, and the most expensive, 6–18 months	2 hours to 1 or more days	Multiple Agency (National and International), all or specific staff with warning/response roles.

Table 2. Types of tsunami wave exercises

2.2.5 Exercise description

The Exercise placed all Pacific countries into a tsunami warning situation that would require countries to practice their 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.

2.2.6 Post-exercise evaluation

PTWS participants were requested to submit responses to a detailed questionnaire survey focusing on evaluating the adequacy of plans, policies, procedures, assessment capabilities, communication, resources (including new experimental products) and inter-agency/inter-jurisdictional relationships to support effective tsunami warning and decision-making at all levels of government. A compilation of the findings is presented in ANNEX IV based on responses from 35 countries.

Member States requested that the Final Report be available in June 2012. Due to the large task of compiling results from the extensive post-evaluation survey, the Task Team was not able to complete a Summary Report until 2013. Preliminary results and feedback on the PTWC new products were presented and discussed at the PTWS PacWave and Enhancing Products Task Team, and PTWS Steering Committee Meetings in May 2012. A copy of the post-exercise evaluation forms can be found in ANNEX IV of the *Exercise Pacific Wave 11, Exercise Manual* (IOC/2011/TS/97Vol.1).

2.2.7 Exercise Pacific Wave 11 Scenarios

Exercise Pacific Wave 11 involved multiple scenarios (ten in total), played out in real time, 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. However, countries were permitted to exercise more than one scenario simultaneously, if they wished. The

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

- Kamchatka (Kuril–Kamchatka Trench)
- Ryukyu Islands (Nansei–Shoto Trench)
- Philippines–South China Sea (Manila Trench)
- Philippines–Pacific Ocean (Philippines Trench)
- Vanuatu (New Hebrides Trench)
- Tonga (Tonga Trench)
- Northern Chile (Peru–Chile Trench)
- Ecuador (Colombia–Ecuador Trench)
- Central America (Middle America Trench)
- Aleutian Islands (Aleutian Trench)

In each exercise scenario, the simulated tsunami was propagated in real time. Each scenario was started during the morning hours in the tsunami source region, and lasted for approximately six to nine hours to simulate the earthquake occurrence, local/regional tsunami propagation, and impact to nearby coasts. The scenarios and messages terminated artificially at about ten hours since in real events most would continue for at least 24 hours.

Further details about the scenarios can be found at ANNEX IV.

Note: The two "Phillippines" scenarios created some confusion, leading to wrong scenario reported times.

3. POST-EXERCISE EVALUATION FINDINGS

3.1 INTRODUCTION

A total of 35 countries representing 50 sub-national countries and agencies submitted detailed evaluation forms.

A summary of the findings from the completed evaluation forms is provided in ANNEX VI.

PTWC, JMA/NWPTAC, and WCATWC message dissemination summaries are in the International Master Schedule of Events List table found in ANNEX IV.

3.2 SCENARIOS USED DURING PACWAVE11

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

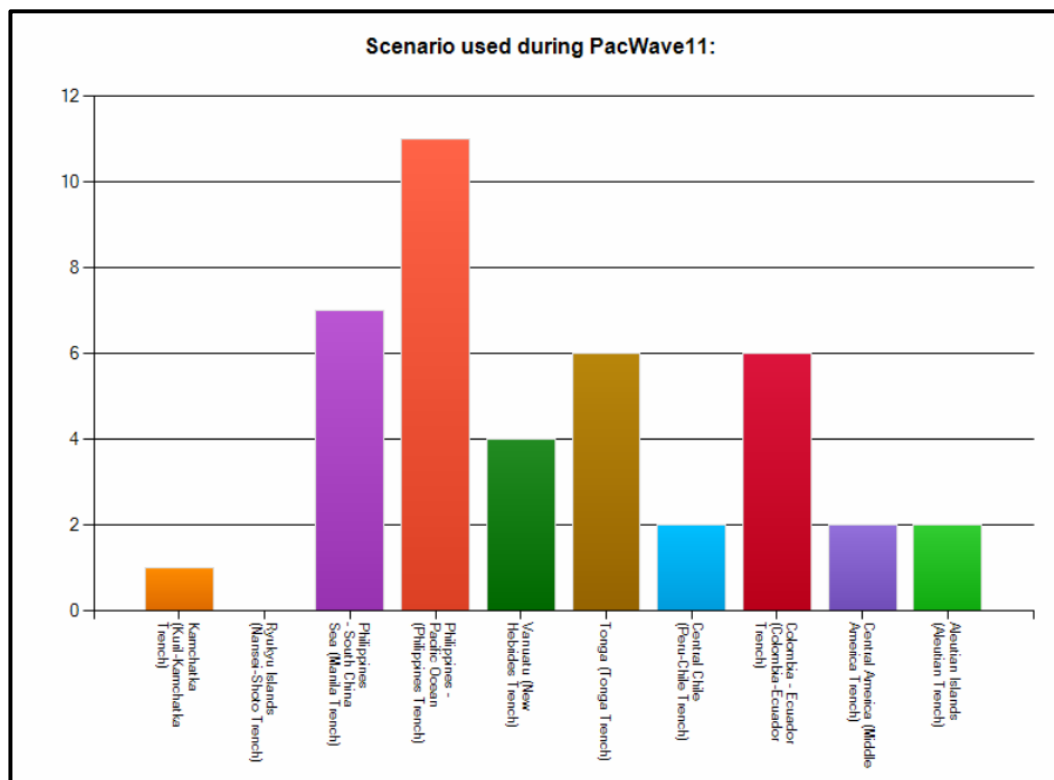


Figure 1. Scenarios used during the Exercise Pacific Wave 11

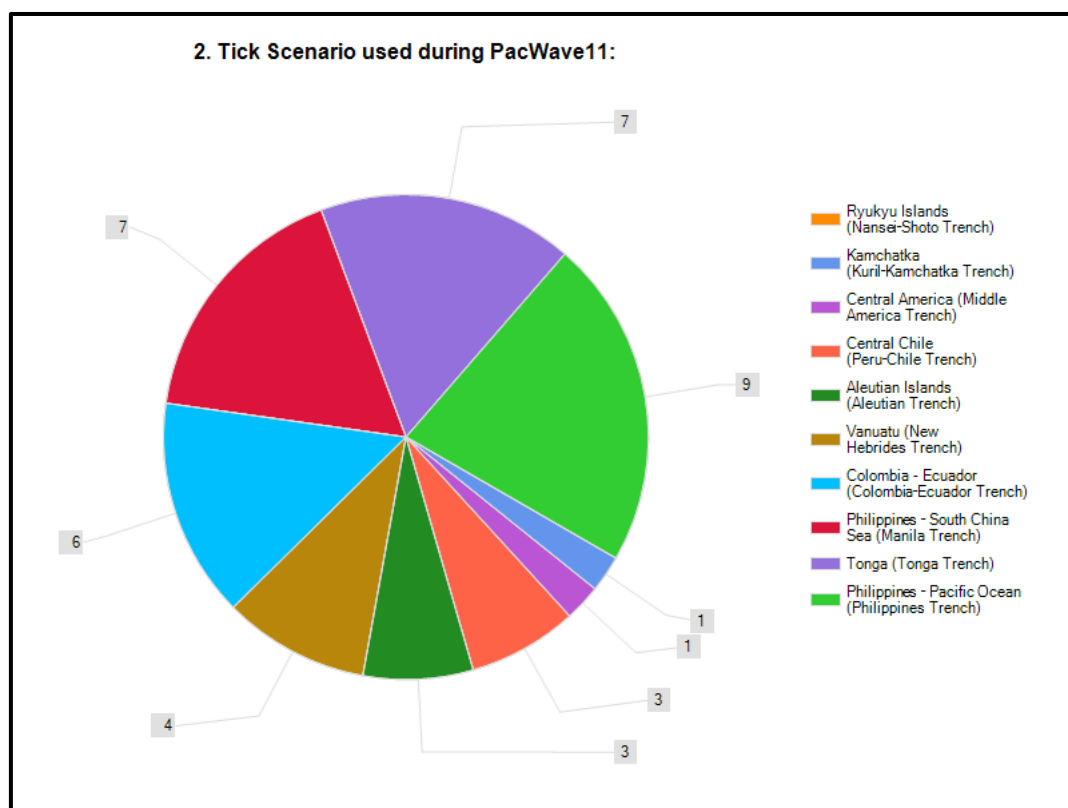


Figure 2. Scenarios used during Exercise Pacific Wave 11

3.3 OVERALL ASSESSMENT

The majority of responding countries and agencies that completed the evaluation forms expressed an overwhelmingly positive view that Exercise Pacific Wave 11 met its objectives. The following are summary observations.

On the positive side, the majority of agencies indicated:

- They enhanced their external relationships and identified their interdependencies as a result of the exercise.
- Overall, the exercise planning, conduct format and style were satisfactory.
- Exercise planning at international, national and local levels went well.
- The new PTWC experimental products were both understandable and useful in decision-making processes.
- The PacWave11 Exercise website pages were useful and updated in a timely manner.
- The evaluation form was easy to use.
- The Exercise Manual (IOC/2011/TS/97Vol.1) provided an appropriate level of detail.
- All agencies agreed that the *How to plan, conduct and evaluate UNESCO/IOC tsunami wave exercises* guideline was useful (IOC/2012/MG/58 Rev.).

Some improvement is required in the following areas:

- Majority of Tsunami Warning Focal Points (TWFP) National Disaster Management Organizations (NDMO) received initial TWC messages within 15–20 minutes after earthquake origin time. For distant tsunamis, this time is satisfactory. However, for local tsunamis, the public may not be officially notified in time before initial wave arrival. Thus, public awareness and education remain the front line of preparedness for local tsunamis.
- Majority of TWFPs and NDMOs received TWC messages primarily via email and fax. The primary method of notifying the public is through radio and television, and to a lesser extent siren systems. Local earthquake ground shaking could cause power outages adversely affecting email/fax/broadcast media communications and transmissions. Installation of back up generators is recommended. About one-third of TWFP receive messages via Global Telecommunication System (GTS), and a minority through Emergency Managers Weather Information Network (EMWIN), Response and Assistance Network (RANET), Aeronautical Fixed Telecommunication Network (AFTN), etc.
- Over half of the agencies do not have evacuation maps, signage, assembly points etc. Without these fundamental mitigation tools, the public will have difficulty feeling prepared for a local tsunami.
- Nearly half of the respondents need help with scheduling routine tsunami exercises. A country needs to conduct annual tsunami exercise to maintain a heightened state of readiness.
- A minority of respondents need to improve their communications.
- Some agencies required help to develop standard operating procedures.

3.4 CORE OBJECTIVE REVIEW

Findings arising from the evaluation about the effectiveness of the three core objectives for Exercise Pacific Wave 11 were:

Objective 1: To exercise and evaluate operations of the current PTWS.

- PacWave11 confirmed the dissemination and receipt process of warning messages from the PTWC, WCATWC, and NWPTAC to the involved countries. Tsunami bulletins were sent in a timely manner and methods used were effective.
- All countries received the international messages by at least one method. An updated fax number was requested by one country.
- 32 of 35 countries reported receipt times of the warning messages.
- Email (internet) and fax were the primary messaging systems reported.
- The average consistent time interval for receiving the initial message was 2.7 minutes, and the median time was less than a minute.
- However, there are a number of apparent problems in the message time data. Thirteen entries (countries/agencies) had specific timing issues, whereas 25 entries produced consistent times. Ten countries entered inconsistent times, wherein the local times reported apparently preceeded the initial warning message. Two countries possibly entered times for a different scenario than indicated. Three countries reported times with respect to NWPTAC for scenarios not initiated by NWPTAC.

Objective 2: To begin a process of exposure to an initial test version of PTWC experimental products that are being developed to provide a more rapid and quantitative forecast of tsunami impacts.

- The PTWC experimental products were well received by the countries participating in the exercise. In particular, respondent indications regarding the information included: understandable (87%), helped in decision making (90%), the proposed suite of products provides all the necessary information (93%), the proposed forecast zones are appropriate (79%), and the proposed forecast levels are adequate (85%).
- The most useful features of the experimental products were: threat level map, wave heights, arrival/travel times, and forecast amplitude.
- Valuable initial feedback and suggestions for improvements were provided.
- However, one country with its own national tsunami warning system indicated that the inclusion of its national forecast regions in the PTWC messages could cause a potential conflict with the national organisation and its public, if the level of warnings in PTWC and national products for national regions were different. Removal of these forecast regions from PTWC products was requested.

Objective 3: To validate the readiness of Member States to respond to a local/regional source tsunami.

- Most of the lead agencies were successful in disseminating the tsunami warnings in-country to their emergency services agencies, national government agencies and local, provincial and regional government agencies. A wide variety of communication methods were used including fax, telephone, email, SMS, dedicated landlines, satellite links, and radio communications. There was a positive response by 81% of participating countries and agencies, stating that the communication methods used and the timeliness of information issued was sufficient to support national information

requirements. Systems largely worked, but there were some difficulties with telecommunication systems in developing countries.

- The average time interval from receipt of the initial message at the Tsunami Warning Focal Point to its receipt by the national public-safety, decision-making and dissemination point was 8.5 minutes, and the median time was 3 minutes. The average time interval from receipt of the initial message to sending national agencies was 6.9 minutes, and the median time was 5 minutes.
- For those countries that depend on International Tsunami Warning Center advice (average 2.7 minutes to the National Tsunami Warning Center, NTCWC), this means that the earliest a NDMO could issue a public announcement for evacuation would be 11 minutes after the earthquake. For most local tsunamis, this would probably be before the first tsunami wave hits, but barely. The not-enough-time factor thus puts even greater priority on education and awareness, and encourages self-evacuation should a tsunami be likely.
- For most respondents, NTCWC and/or the National Disaster Management Office (NDMO) reported substantial readiness: 90% have standard operating procedures for the receipt of tsunami warnings (even if some are in draft form); 92% know their specific response role in the event of a tsunami; 90% engaged in tsunami response planning prior to the exercise; 90% undertook activity to increase their capacity and capability to support a national tsunami response; 90% had an appropriate management structure identified and documented to support tsunami response; 83% had arrangements in place, and 61% assembled (within 2 to 60 minutes) their in-country disaster management group relevant to decision-making on tsunami warning and response; 71% of the national disaster management organisations maintained communication with their tsunami warning centre and with local/regional disaster management organisations; 80% followed their response activation processes when the initial exercise start message was received; and 75% have a national tsunami response plan for regional/local tsunami.
- Nearly a third (32%) of respondents evacuated communities as part of the exercise, but only about half of these had evacuation or inundation maps for the evacuated areas.
- However, just over half (53%) of the respondents have a mass coastal evacuation plan; 55% do not have tsunami evacuation maps, routes, evacuation signs and assembly points for evacuation areas; 54% indicated that regional/local tsunami exercises are routinely conducted in-country; and 58% had developed and disseminated public education materials prior to the exercise.

3.5 RECOMMENDATIONS

It is relevant to review the recommendations from Exercise Pacific Wave 08 (IOC/2008/TS/82) in order to evaluate the success of PacWave11 and to formulate recommendations that will assist in the decision-making and planning for future exercises or drills. It should be noted, however, that there were scenario differences between the two exercises. In 2008, only one Japan earthquake-tsunami scenario was used for the entire Pacific, so most Member States treated the event as a real time, distant tsunami scenario. In Exercise Pacific Wave 11 (IOC/2011/TS/97VOL.1.), ten earthquake-tsunami scenarios were available for Member States to select and respond in real time to a regional/local event, and PTWC Experimental Products were introduced. Briefly, from Exercise Pacific Wave 08 (EPW08), the following recommendations were made:

- Regular Pacific-wide exercises, conducted in real time, should be carried out to continually encourage operational preparedness for a tsunami. This will assist

countries and agencies by in developing and testing warning and response plans. It is recommended by the Federated States of Micronesia (FSM) to conduct a PacWave-type exercise every six months, at least for the short-term, in order to assist countries to be ready before an actual tsunami event. Nationally, countries are encouraged to develop and conduct individual tsunami exercises to regularly exercise their national arrangements.

- In order for countries to properly prepare, it is recommended that IOC officially announce future PacWave activities at least three months prior to the event, and distribute documents at least two months before the event.
- It is generally not known how successful local communities will be in being alerted in a timely manner and then in effectively enacting an actual public evacuation on a 24x7 basis. No coastal communities enacted a public evacuation during PacWave08. It is recommended that an increased emphasis be placed on local community-based preparedness, training, and exercises that extend “to the last kilometer on the beach.”
- It is recommended that the PTWS Working Group III on Pacific Emergency Communications serve as a focal point providing information on methods of robust public alerting, especially down to the local levels within countries and the role of media in information dissemination.
- A key to enabling fast tsunami response is have plans pre-discussed and decided, e.g., standard operating procedures (SOPs) for end-to-end tsunami warning and emergency response. The IOC has a project, “Strengthening Tsunami Warning and Emergency Responses: Training Workshops on the Development of Standard Operating Procedures for Indian Ocean and Southeast Asian Countries,” and it is recommended that the PTWS request similar workshops.
- The FSM recommended that a feasibility study be conducted in all PTWS Member States to identify and evaluate relevant warning systems that can be utilized in those places lacking the financial resources and assets to improve their own warning coordination.
- Peru recommended that for future exercises, the bulletins be in the national language of each country in order to improve comprehension and facilitate faster action. Nicaragua also misinterpreted the English in the first message. A longer exercise preparation time would allow countries to translate the international English messages into their language(s) for use nationally.

Based on EPW08 and a review of the responses to PacWave11, the following PacWave13 recommendations are made:

(i) Tsunami Warning Focal Point contact data

Issue: TWFP contact information needs to be 100% accurate, 100% of the time.

Recommendation: Countries need to regularly review and confirm their 7x24 Tsunami Warning Focal Point contact data to the IOC, who will forward them to the international centers for immediate update.

(ii) Exercise announcements

Issue: Provide countries with sufficient time to prepare fully for the exercise.

Recommendation: IOC to continue to officially announce future PacWave activities at least six months (180 days) prior to the event, and distribute documents at least three months (90 days) prior.

(iii) PTWC Experimental Products

Issue: Although new, the experimental products were generally well received, understood, and applied by Member States.

Recommendation: Continue to include PTWC experimental products in future PacWave exercises for increased familiarization and use.

(iv) Local community preparedness

Issue: For local/regional tsunamis, countries and communities should rely on tsunami natural warning signs to enable voluntary self-evacuation actions. Moreover, a number of communities indicated that they do not have tsunami evacuation maps, evacuation signs, routes, assembly areas, etc. This would make it difficult to pre-plan.

Recommendation: The PTWS should place a high priority to assist communities without tsunami inundation/evacuation maps to strategize and generate a first generation evacuation map, which may or may not include detailed inundation modelling. Increased emphasis should be placed on local community-based awareness, preparedness, training, and exercises that extend “to the last kilometer on the beach.” Nationally, countries are encouraged to develop and conduct individual tsunami exercises on an annual basis to exercise their national arrangements.

(v) Timely Public alerting

Issue: For a local or regional tsunami, countries and communities should not solely rely on timely receipt of official TWC messages prior to wave arrival.

Recommendation: National and local response agencies with 24/7 capacity should establish redundant pathways to receive international TWC messages directly, in addition to official notification through TWFP protocols. Also, it is recommended that the PTWS Working Group III on Pacific Emergency Communications, with assistance from ITIC as required, continue to serve as a focal point providing information on methods of fast, reliable, robust public alerting, especially down to the local levels within countries and the role of media in information dissemination.

(vi) Tsunami plans and standard operating procedures (SOP)

Issue: A local/regional tsunami requires rapid enabling of tsunami SOPs with delegated authority to 24/7 national/local response organizations to enact public evacuations if necessary. Authority to evacuate a community routinely rests with local authorities. There is little time to assemble a national/local disaster management group for decision-making approval, nor instantaneously communicate with policy decision-makers. It is unclear how many local communities have this pre-determined in their plans.

Recommendation: A key to enabling fast tsunami response is to have plans pre-discussed/decided, e.g., standard operating procedures for end-to-end tsunami warning and emergency response. If countries are not ready, they should request training or other assistance. If training is a priority, countries should include a training budget in their annual national budget request.

- The IOC has had a project from 2007–2010 in the Indian Ocean covering some PTWS Southeast Asian Countries, “Strengthening Tsunami Warning and Emergency Responses: Training Workshops on the Development of Standard Operating Procedures (SOPs) for Indian Ocean and Southeast Asian Countries,” and it is recommended that the PTWS consider requesting similar workshops.
- The annual ITIC Training Programme (ITP–Hawaii) emphasizes SOPs using Hawaii as a case example of an operational end-to-end warning system.

ITP-Hawaii will be held in the summer of 2013 and have a focus on SOPs and tsunami exercises. Interested PTWS self funded countries should apply.

(vii) Warning systems

Issue: Some countries indicated that communication of warning down to local jurisdictions remains unknown for immediate response of coastal communities. This may be attributed to inadequate or inappropriate communication equipment.

Recommendation: It was recommended that a feasibility study be conducted in all PTWS countries to identify and evaluate relevant warning systems that can be utilized in those places lacking the financial resources and assets to improve their own warning coordination. The Australian Agency for International Development (AusAID) conducted Tsunami Capacity Assessments of Pacific Island Countries, and these reports provide a summary baseline as of 2009. The PTWS Working Group 3 survey is enabling a brief self-assessment by countries. The PTWS Task Team on Pacific Emergency Communications can assist in identifying alert technologies available.

(viii) Bulletins in other languages

Issue: In order to improve comprehension and facilitate a faster action, enable bulletins in the national language of the country.

Recommendation: A longer exercise preparation time would allow countries to translate the international English messages into their language(s) for use nationally. However, it would be difficult and time consuming for international TWC to translate their English written messages into various foreign languages for immediate and timely distribution. Thus, this is currently not a feasible practice for TWCs.

(ix) Post-exercise evaluation and Regional Recommendations
in the context of the PTWS Medium Term Strategy 2009–2013

Issues: Past PacWave questionnaires were not tuned to address PTWS Medium Term Strategy outcomes. PacWave11 employed a simpler evaluation questionnaire and also provided methods for submitting evaluations electronically online.

Recommendations: Countries found the new PacWave 11 post-exercise questionnaire was simpler and easier to use. Thus, continuation of this questionnaire is encouraged with a reduction in questions relevant to PTWC Experimental Products, and will directly correlate to and measure PTWS Medium Term Strategy outcomes.

4. SUMMARY

The occurrence of three destructive tsunamis in three years (29 September 2009 South Pacific tsunami with 192 fatalities, 27 February 2010 Chile tsunami with 124 fatalities, and 11 March 2011 Japan tsunami with around 18,000 fatalities) 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 (IOC/INF-1244) and Exercise Pacific Wave 08 provided the opportunity for participating countries to exercise general procedures and communications arrangements. PacWave11 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 experimental products that are expected to be officially implemented in 2014.

The overwhelming majority of responding countries expressed a positive view of PacWave11 planning and conduct. There was also positive feedback on the high value of PTWC's proposed products and they understood the need to begin the process to incorporate them

into their response procedures. International tsunami exercise bulletins were successfully received by all countries at the national level. However, only limited public evacuations were conducted.

The lesson learned from all of the recent deadly tsunamis has been that coastal communities should not solely depend on the timely receipt of local tsunami official warnings. Individuals must be able to recognize tsunami natural warning signs and voluntarily self evacuate. This will require increased awareness, training, and annual exercises at the national and local levels to build the capacity and commitment to sustain high levels of tsunami readiness.

One of the PTWS's major areas of immediate concern is that many coastal communities still do not have evacuation maps, road signage, escape routes and assembly areas identified through pre-disaster planning processes, and/or that they do not have reliable and robust public alert communications methods "down to the last kilometer on the beach." Local government needs to establish redundant communication pathways to receive international and especially national tsunami bulletins in a timely manner. Moreover, local government 24x7 response agencies should also be delegated the authority to enable automatic local tsunami response procedures to issue public evacuation notices if needed.

The majority of respondents reported that PacWave11 objectives were exercised, evaluated and reported, thus enabling PTWS recommendations and lessons learned to be formulated. Countries felt PacWave11 contributed to the improvement and development of planning relating to public warning and response activities. Future tsunami exercises should continue to reinforce the integration of PTWC experimental products in their country decision making processes.

ANNEX I

EXERCISE PACIFIC WAVE 11 ANNOUNCEMENT

IOC Circular Letter No. 2390
(Available in [English](#), [French](#), [Spanish](#))

IOC/WWW/BA/ss
Paris, 13 May 2011

- To ICG/PTWS Tsunami Warning Focal Points (TWFP)
Tsunami National Contacts (TNC)
ICG/PTWS Chair and Vice-Chairs
- cc. Official National Coordinating Body for liaison with the 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: SOPAC, CPPS

Subject: PTWS Pacific-wide Tsunami Exercise “PacWave 11”, 9–10 November 2011

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, 16–18 February 2009, Member States reviewed Exercise Pacific Wave 2008 and its findings and recommendations. Acknowledging the common occurrence of large earthquakes in the Southwest Pacific and its ensuing tsunami hazard, and recognising exercises as a good vehicle to improve response readiness and publicise awareness of tsunamis, Member States recommended a third Pacific-wide tsunami exercise to especially assist Pacific Island Countries in better preparing for the next tsunami (Attachment I).

On 29 September 2009, just over seven months after the ICG/PTWS-XXIII, Samoa, American Samoa, and Tonga were hit by the largest deadly tsunami 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 tens of thousands of lives.

The three destructive tsunamis in three far-away Pacific sub-regions during the inter-session period serve as 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 and local tsunamis can impact in minutes.

Exercise Pacific Wave 2011 (PacWave11, Attachment II) will be an important preparedness activity and we trust that you and your country authorities will support this exercise. This letter seeks to advise you of the planned exercise.

Exercise Aim and Objectives

The aim of the PacWave11 is to improve local and regional source tsunami warning and response capability in the Pacific. There are two main exercise objectives and a number of sub-objectives (Attachment II):

1. To validate understanding and use of new PTWS Experimental Products;
2. To validate the readiness of Member States to respond to a local/regional source tsunami.

Experimental Products

In response to Recommendation ICG/PTWS-XXIII.1, Task Team on Enhancing Tsunami Warning Products, the PTWC has proposed new products based upon PTWC's improved capabilities in terms of its speed of response and growing ability to forecast impacts. The new products will be implemented through an experimental phase starting with PacWave11 and operationally in 2013 (Attachment II). Five levels of tsunami threat will be established, and supplemental products will be issued. The improvements will provide general guidance on the levels of impact, and are expected to greatly reduce the number of areas warned unnecessarily.

Date and Conduct of Multiple-Scenario Exercise

Exercise Pacific Wave 2011 (PacWave11) will take place from 9–10 November 2011. PacWave was originally planned for 2010, but was postponed in order to evaluate and consider its goals and outcomes in the aftermath of the 2010 Chile tsunami.

PacWave11 will simulate Pacific countries being placed into a Tsunami Warning situation, and require Member State decision-making, and steps taken to just prior to public notification. The exercise is not required to be conducted through to community level. The exercise may be played during the exercise dates in real time or the following days.

PacWave11 will involve multiple scenarios to enable Member States the opportunity to select a regional/local source event. The exercise scenarios will include the following:

- Kamchatka (Kuril-Kamchatka Trench)
- Ryukyu Islands (Nansei-Shoto Trench)
- Philippines - South China Sea (Manila Trench)
- Philippines - Pacific Ocean (Philippines Trench)
- Vanuatu (New Hebrides Trench)
- Northern Chile (Peru-Chile Trench)
- Ecuador (Colombia – Ecuador Trench)
- Central America (Middle America Trench)
- Aleutian Islands (Aleutian Trench)

A PacWave 11 Exercise Manual will be distributed in August with further details on the scenarios as well as the text of simulated “Exercise Start Messages” from PTWC, WC/ATWC and NWPTAC and how participating countries should access following messages.

How to Plan, Conduct and Evaluate Tsunami Exercises Guideline

Available in July each country should decide and design its own national exercise that commences after receiving the initial “Exercise Start Message” from the international warning centres. A “How to Plan, Conduct and Evaluate Pacific Wave Exercises Guideline” is under development and will be disseminated in early July to aid countries further in developing and designing the exercise at a national and/or provincial level.

PacWave 11 National Contact Nomination

Member States are strongly encouraged to participate. In order to ensure the commitment of participating countries is fully coordinated, we seek your nomination of National Contact for

PacWave11 with whom we will communicate about planning of the exercise. The designated PacWave11 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 PacWave11 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 2011 Exercise Manual.

I would be grateful if you could provide the details of your National Contact for PacWave11 by 10 June 2011 to the ICG/PTWS Technical Secretary through email (b.aliaga@unesco.org, cc to I.kong@unesco.org). You are also encouraged to further disseminate copies of this letter to appropriate organizations and authorities within your country.

[signed]

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

Attachments: Recommendation ICG/PTWS-XXIII.2 PTWS Exercises
Exercise Pacific Wave 2011 Guidance

Attachment I

Recommendation ICG/PTWS-XXIII.2

PTWS Exercises

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System,

Recognizing that the PTWS requires regular testing and review,

Understanding that simulating scenarios and learning lessons from exercises is an effective way to improve preparedness,

Acknowledging the preliminary results of the Exercise Pacific Wave 08 (PACWAVE08) presented at the ICG/PTWS-XXIII meeting,

Realising that conducting the PACWAVE08 in real time allowed for better visualization of the tsunami propagation, and as a result, actions were taken,

Noting that participating countries disseminated exercise information to emergency services for immediate actions,

Noting that there were communications problems that arose in reaching the farthest islands within some island countries,

Recognising that the exercise was a good vehicle to publicize awareness of tsunami preparedness,

Recognizing the continuing challenges to and opportunities for more effective tsunami early warning demonstrated by PACWAVE08,

Recommends that a third end-to-end tsunami exercise be carried out during October 2010,

Encourages the conduct of separate regional exercises that take into account regional tsunami hazards as well as regional challenges and synergies regarding tsunami preparedness, warning and response.

Decides that a Task Team be formed under Working Group 2 with the following Terms of Reference:

- (i) Review the PACWAVE08 evaluation report.
- (ii) Identify lessons learned and develop recommendations based on the PACWAVE08 evaluation and submit recommendations to the PTWS Steering Committee.
- (iii) Design and carry out a third end-to-end Pacific-wide exercise with the following characteristics:
 - a. The exercise will take place preferably in the fourth quarter of 2010.
 - b. The exercise scenario be a major tsunami originating in the Central South Pacific (e.g., Tonga-Kermadec) to complement previous scenarios in other places.
 - c. The exercise date be finalized by the Task Team and the exercise announced to Member States at least 180 days in advance of the exercise date.
 - d. The exercise manual including instructions to Member States regarding their

participation and the evaluation instrument be prepared with content and structure similar to what was prepared for the previous two Pacific-wide exercises, but taking into account lessons learned and any need to collect additional information.

- e. The exercise manual be distributed to Member States at least 90 days in advance of the exercise date.
- f. Participating Member States be asked to complete and return the evaluation instrument no more than 90 days following the exercise.
- g. The exercise be played out in real time.
- h. The exercise is considered as a way to test new products from the international TWCs including graphical products.

Attachment II

Exercise Pacific Wave 11 Guidance

Exercise Aim and Objectives:

The aim of the Exercise Pacific Wave (PacWave11) is to improve local and regional source tsunami warning and response capability in the Pacific. There are two exercise objectives with a number of sub objectives (see ANNEX II):

1. To validate understanding and use of new PTWS Experimental Products.
 - Utilise and evaluate 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.
2. To validate the readiness of member states to respond to a local/regional source tsunami.
 - 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.

Experimental Products:

Recommendation ICG/PTWS-XXIII.1 established a Task Team on Enhancing Tsunami Warning Products under PTWS Working Group 2 (WG 2, Detection, Warning and Dissemination) to:

- review current capabilities,
- obtain customer feedback,
- consider best practices,
- develop recommendations to improve existing or create new products, and
- improve dissemination for more effective, functional, and timely delivery.

At the Task Team 1 March 2011 meeting, the Director of PTWC proposed new products based upon PTWC's improved capabilities in terms of its speed of response and growing ability to forecast impacts, and these were approved by WG 2.

Further discussion took place at the PTWC–JMA Coordination meeting 11–13 April, with an agreement to the following changes in an experimental phase starting with PacWave11, and be operationally ready in 2013 (see ICG/PTWS-XXIV Working Documents for Task Team report).

- PTWC will lower its current initial warning advice threshold from magnitude 7.6 to magnitude 7.1 in order to provide some advance notice of potential local tsunamis.
- PTWC will begin using tsunami forecast models to classify the level of threat for sections of coast around the Pacific. Five levels of tsunami threat or potential threat will be established, and supplemental products will be issued.

While the predictive capabilities of the forecast models are not perfect, they should be accurate enough to greatly reduce the number of areas warned unnecessarily, while also providing general guidance on the expected levels of impact to areas that are threatened.

Conduct of Multiple-Scenario Exercise:

Exercise Pacific Wave 2011 (PacWave11) will simulate Pacific countries being placed into a Tsunami Warning situation, and require Member State decision-making, and 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 and Alaska Tsunami Warning Center (WCATWC). Subsequent bulletins will be made available on the PacWave11 website and referred to in the PacWave11 Exercise Manual.

The PacWave 11 Exercise Manual will be distributed in August with further details on the scenarios as well as the text of simulated "Exercise Start Messages" from PTWC, WC/ATWC and NWPTAC.

A key point is that the exercise is not required to be conducted through to community level. Rather, the aim is to exercise the operational lines of communication within the PTWS without disrupting or alarming individual citizens. Member countries will, however, be encouraged to exercise, evaluate and report back on communication and decision making within a warning situation down to the level just prior to public notification.

Despite this, you will note that there remains an option to exercise further levels of communication, such as public broadcasts and sirens, and provide relevant feedback during exercise evaluation. This activity is regarded as optional.

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

ANNEX II

ICG/PTWS-XXIV EXERCISE PACIFIC WAVE 11 DECISIONS AND RECOMMENDATIONS

Recommendation ICG/PTWS-XXIV.1

PTWS Governance

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

Having met for its 24th Session from 24 to 27 May 2011 in Beijing, China,

Expresses its deep condolences to the people of Samoa, Chile, Indonesia and Japan for the loss of many lives caused by the earthquakes and tsunamis in 2009, 2010 and 2011;

Recalling IOC Resolution IV-6 that established the International Coordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU) and IOC Resolution XXXIX-8 that renamed ITSU to be the Pacific Tsunami Warning and Mitigation System (PTWS) and to provide continuity through the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

Reaffirming that the Pacific Tsunami Warning and Mitigation System (PTWS) will be a coordinated network of national systems and capacities, and will be part of a global network of early-warning systems for all ocean-related hazards,

Reaffirming further that each Member State has the responsibility to issue warnings within its respective territories,

Noting with appreciation the tsunami forecasting guidance materials provided for the Member States of the PTWS by the PTWC hosted by the USA and the NWPTAC hosted by Japan,

Recalling the Mauritius Declaration adopted at the Intergovernmental Coordination Meeting held at Grand Baie, 14–16 April 2005 to openly share and exchange tsunami-relevant realtime observational data in accordance with the UNESCO/IOC Oceanographic Data Exchange Policy,

Having noted IOC Resolution XXV-13 outlining the requirements for the future development of tsunami warnings, which established the TOWS-WG Inter-ICG Task Teams on Sea Level for Tsunami Purposes, Disaster Management and Preparedness, and Tsunami Watch Operations,

Having reviewed the progress made in the implementation of the PTWS since the 23rd Session of the ICG/PTWS,

Having considered **the reports of:**

- Working Group 1 on Tsunami Risk Assessment and Reduction
- Working Group 2 on Tsunami Detection, Warning and Dissemination and its Task Teams
- Working Group 3 on Tsunami Awareness and Response

- Regional Working Group on Tsunami Warning and Mitigation on the Central American Pacific Coast
- Regional Working Group on Tsunami Warning and Mitigation in the South East Pacific Region
- Regional Working Group on Tsunami Warning and Mitigation in the South West Pacific Region
- Regional Working Group on Tsunami Warning and Mitigation in the South China Sea
- 2nd Meeting of the PTWS Steering Committee held in Hawaii, USA, 17–20 August 2010
- Fourth Meeting of the TOWS-WG (Paris, 21–22 March 2011)
- North West Pacific Tsunami Advisory Center (NWPTAC)
- Pacific Tsunami Warning Center (PTWC)
- International Tsunami Information Center (ITIC),

Recognizing the difficulty in providing effective near-field tsunami warning in the recent events in Japan, Chile, and Samoa,

Acknowledging that the PTWS is effective in saving lives and reducing the impacts to communities in both near-field and distant-tsunami events through the three pillars of risk assessment and reduction, detection, warning and dissemination, and awareness and preparedness,

Noting the recommendations of the TOWS-WG of the need by ICGs to evaluate the impact and value of real time observations for tsunami warning,

Appreciates the recent report of the JCOMM Data Buoy Cooperation Panel and **endorses** the recommendations to help decrease the incidence of data buoy vandalism and seek to better understand the causes of damage and promote the importance of these observing systems for critical tsunami warning systems;

Encourages voluntary contributions to support Budget and Programme activities recommended by the ICG/PTWS either directly or through the IOC Special Account set up for the PTWS;

Recognizing the limited capacity of many Member States of the PTWS in hazard assessment and risk reduction;

Requests Member States to regularly review the list of Tsunami National Contacts (TNCs) and Tsunami Warning Focal Points (TWFPs) on the IOC website and inform the Secretariat of all changes;

Requests Member States to share any new forms of sea level data for tsunami warning purposes in accordance with the IOC Oceanographic Data Sharing Policy;

Requests PTWC not to use the terminology “warning” in its guidance to Member States in its new products on the tsunami threat across the region;

Decides to:

1. Continue existing Working Groups (WG):

WG1. Tsunami Risk Assessment and Reduction, with modified Terms of Reference as attached in Annex, Chair Dr François Schindelé (France);

WG2. Tsunami Detection, Warning and Dissemination, with modified Terms of Reference as attached in Annex, Chair Dr Charles McCreery (USA) and Vice-Chair Mr Daniel Jaksa (Australia);

- WG2 Task Team on Warning Dissemination
- WG2 Task Team on PACWAVE 11
- WG2 Task Team on Enhancing Products
- WG2 Task Team on Sea Level Monitoring
- WG2 Task Team on Seismic Data Sharing in the South West Pacific

WG3. Tsunami Awareness and Response, with Terms-of-Reference as attached in Annex, Chair Mr David Coetzee (New Zealand).

Sub-Regional Working Groups:

- Regional Working Group on Tsunami Warning and Mitigation on the Central American Pacific Coast, Chair Dr Alejandro Rodriguez (Nicaragua).
 - Regional Working Group on Tsunami Warning and Mitigation in the South East Pacific Region, with modified Terms of Reference as attached in Annex, Chair Lt. Edwin Pinto (Ecuador) and Vice-Chair to be nominated (Peru).
 - Regional Working Group on Tsunami Warning and Mitigation in the South West Pacific Region, Chair Ms Filomena Nelson (Samoa) and Vice-Chair Mr Don Anderson (Australia).
 - Regional Working Group on Tsunami Warning and Mitigation in the South China Sea with modified Terms of Reference as attached in Annex, Chair Dr Mohd Rosaidi bi Che Abas and Vice-Chair Dr Fujiang Yu (China).
2. Establish a WG1 Task Team on Tsunami Modelling Hazard Assessment with Terms of Reference as attached in Annex; Chair Dr Vasily Titov (USA);
 3. Establish a WG1 Task Team on Tsunami Risk Assessment with Terms of Reference as attached in Annex; Chair Dr Nguyen Hong Phuong (Vietnam);
 4. Continue the Steering Committee with modified Terms-of-Reference as attached in Annex;
 5. Disseminate a communication test message from the PTWC once a month on the same day and at the same time every month and two random unannounced tests annually to the PTWS Member State TWFPs starting October 2011;
 6. Conduct training workshops on hazard and risk assessment organised by WG1 in coordination with IUGG to enhance collaboration between the

operational and research communities as recommended by the TOWS-WG, subject to extra-budgetary funding support being identified;

7. Proceed with PTWC's development of improved tsunami procedures and products with the Task Team on Enhancing Products guiding and providing feedback and related documentation to PTWC and the ICG/PTWS regarding these changes, in accordance with the timeline in Annex V. Any new products and procedures will only be exercised in an experimental mode as they are developed and until they are approved for official use later by the ICG/PTWS.

Requests the Executive Secretary to:

1. Inform Member States of the timing and conduct of the PTWS communications tests by circular letter,
2. Survey the PTWS Member State TWFPs regarding their need to receive PTWC message products by fax by October 2011,
3. Inform the Member States about the website for TNC and TWFP contact details, provide them with passwords and advise them of the procedures for updating contact details,
4. Mobilise extra budgetary resources for follow up training in the configuration and use of seismic monitoring and analysis systems for Member States in the SW Pacific,
5. Also organize documentation on the IOC Tsunami website by discipline/topic to facilitate access and utility of reference material across Working Groups and ICGs,

Encourages Member States to include representation of National Disaster Management Organizations (NDMO's) in their delegations to the ICG and inter-sessional Working Groups;

Instructs the PTWS Steering Committee to finalise the summary of existing funding available to the PTWS from national, bilateral and multilateral sources to develop a strategy for funding ICG/PTWS activities, to be reported at ICG/PTWS-XXV;

Expresses its gratitude to the Government of China for kindly hosting the 24th Session of the ICG/PTWS in Beijing;

Accepts with appreciation the kind offer of the Russian Federation to host the 25th Session of the ICG/PTWS in Vladivostok in the time frame August or September 2013 subject to the approval of the Government, and

Accepts with appreciation the interest of USA to host the 26th session of the ICG/PTWS in Honolulu in 2015, subject to the approval of the Government.

Financial Implications: None

Annex to Recommendation ICG/PTWS-XXIV.1

**Working Groups and Steering Group
Terms of Reference**

**Terms of Reference Working Group 1:
Tsunami Risk Assessment and Reduction**

1. Review and report on existing arrangements with regard to tsunami hazard identification and characterization;
2. Advise on credible seismic scenarios that need to be captured for numerical tsunami modelling e.g., location, magnitude, rupture, orientation, dip, and probability of occurrence;
3. Review details on models that are currently used or in development and desirable standards of documentation (model inputs and outputs etc.);
4. Explore cooperation regarding coastal inundation models, including appropriate requirements for bathymetry;
5. Develop guidance on mandatory metadata including details of bathymetry, hydrography and topography;
6. Consider the issue of assessing hazard, vulnerability and risk, including the facilitation of access to models and mitigation measures;
7. Liaise with Working Groups from the other ocean basins, as well as other working groups within ICG/PTWS to coordinate and ensure efficient and effective information for tsunami warning and mitigation.

The Group will be composed of members nominated by Member States, with a Chair and a Vice-Chair to be elected.

WG1 Task Team on Tsunami Modelling Hazard Assessment
Chair Dr Vasily Titov (USA).

Terms of Reference:

1. Develop relevant methodology and recommend standards for tsunami modelling for hazard assessment;
2. Define and recommend tsunami risk and hazard assessment products, for planning and/or real-time hazard assessment.

WG1 Task Team on Tsunami Risk Assessment
Chair Dr Nguyen Hong Phuong (Vietnam).

Terms of Reference:

1. Define relevant methodology and required data and products for tsunami risk assessment based on existing ones;
2. Establish links with the WG3 activities, in particular the required products.

**Terms of Reference Working Group 2:
Tsunami Detection, Warning and Dissemination**

1. Review and report on existing arrangements with regard to seismic, sea level and other kind of measurements, data collection and exchange;
2. Advice on how best to ensure that all events likely to cause tsunami can be reliably located and sized in a timely manner;
3. Review and make recommendations regarding upgrades and enhancements to the PTWS seismic and sea level stations and networks, communications, processing and analysis, particularly those that are important for the rapid characterization of earthquakes capable of generating local tsunamis, to further reduce the time required for source characterization to meet desired warning responses;
4. Liaise with the appropriate organizations and relevant experts to ensure effective data representation and code forms are used for the exchange of data (standards, metadata requirements);
5. Review and report on various means of transmitting data to warning centres, and conduct tests of latency (timeliness) of transmissions as required;
6. Coordinate the development and operational implementation of [the upstream part of] warning systems in the Pacific;
7. Liaise with Working Groups from the other ocean basins, as well as other working groups within ICG/PTWS to coordinate and ensure efficient and effective information for tsunami warning and mitigation;
8. Coordinate and ensure training on existing and new operational procedures and products;
9. Coordinate regular exercises to test the end-to-end performance of the PTWS;
10. Review and report on various means of transmitting warning products end-to-end to improve their efficiency and effectiveness.

The Group will be composed of members nominated by Member States, with a Chair and a Vice-Chair to be elected.

WG2 Task Team on Warning Dissemination

Chair Ms Filomena Nelson (Samoa), Co-Chair Mr Edward Young (USA).

Terms of Reference:

1. To encourage Member States to develop arrangements for the transmission and receipts of tsunami warning alerts from international centres, and the dissemination of alerts and public safety actions within their countries;
2. To provide a forum to identify methods and systems currently available and planned for the future for alert dissemination within Member States, and internationally across the Pacific, and between oceanic basins;
3. To consult with National Tsunami Warning Focal Points to determine appropriate requirements for the dissemination of alerts from the Tsunami Warning Centres and exchange of information for the confirmation of reception.

WG2 Task Team on PACWAVE 11

Co-Chairs Ms Jo Guard (New Zealand) and Dr Laura Kong (ITIC, USA).

Terms of Reference:

1. Identify lessons learned and develop recommendations based on the PACWAVE 08 evaluation and submit recommendations to the PTWS Steering Committee;
2. Design and carry out a third end-to-end Pacific-wide exercise with the following characteristics:
 - The exercise will take place preferably in the fourth quarter of 2011.
 - The exercise scenarios will be major tsunamis originating in various seismic zones of the Pacific to complement previous scenarios in other places.
 - The exercise date be finalized by the Task Team and the exercise announced to Member States at least 180 days in advance of the exercise date.
 - The exercise manual including instructions to Member States regarding their participation and the evaluation instrument be prepared with content and structure similar to what was prepared for the previous two Pacific-wide exercises, but taking into account lessons learned and any need to collect additional information.
 - The exercise manual be distributed to Member States at least 90 days in advance of the exercise date.
 - Participating Member States be asked to complete and return the evaluation instrument no more than 90 days following the exercise.
 - The exercise be played out in real time.
 - The exercise be considered as a way to test new products from the international TWCs including graphical products.

WG2 Task Team on Enhancing Products

Chair Dr Chip McCreery (USA).

Terms of Reference:

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

WG2 Task Team on Sea Level Monitoring
Chair Mr Chris Ryan (Australia).

Terms of Reference:

1. Review the PTWS Medium Term Strategy and make recommendations for upgrading and improvements relating to sea-level measurements, in coordination with GLOSS and the Data Buoy Cooperation Panel (DBCP) International Tsunameter Partnership (ITP);
2. Review and recommend changes to the ICG/PTWS Implementation Plan in relation to sea-level monitoring;
3. Review and suggest changes to the procedures for assigning transmission slots for sea-level station data to meteorological geostationary satellites;
4. Review existing training documents and coordinate the organisation of a training workshop for sea-level instrument operators and users in 2011.

WG2 Task Team on Seismic Data Sharing in the South West Pacific
Chair Mr Ken Gledhill (New Zealand).

Terms of Reference:

1. To advocate seismic data sharing in the region;
2. To advise South West Pacific countries on data sharing protocols, techniques and technologies;
3. To work with SWP Countries and donors to ensure a common data sharing policy;
4. To ensure the recommendations of the ICG/PTWS-XXIII Sessional Working Group on Data Exchange in the South West Pacific are achieved.

**Terms-of-Reference Working Group 3:
Tsunami Awareness and Response**

1. Promote good practice examples of capacity and resilience building and emergency management to improve the management of tsunami risk through mitigation, preparedness and response activities. Such measures include the following:
 - Preparedness: capacity assessments, education for public awareness, training, response and evacuation planning and exercising
2. Develop and codify good practices in emergency operations and evacuation plans and procedures through consistent Standard Operating Procedures (SOPs) and drills;
3. Liaise with Working Groups from the other ocean basins, as well as other working groups within ICG/PTWS to coordinate and ensure efficient and effective information for tsunami warning and mitigation.

The Group will be composed of members nominated by Member States, with a Chair and a Vice-Chair to be elected.

Terms of Reference

Working Group for the Central American Pacific Coast

1. To assist the Central American countries in the development, improvement and implementation of their National Tsunami Warning and Mitigation Systems, and the countries which are becoming new members of ICG/PTWS in their integration into the ICG/PTWS;
2. To recommend CEPREDENAC to determine whether the National Tsunami Warning Centres of Nicaragua or El Salvador (or of both countries cooperating) could act as interim Regional Tsunami Warning Centre disseminating warnings to all Central American countries;
3. To invite CEPREDENAC to consider the implementation of a Technical Committee for the Development of Regional Tsunami Warning and Mitigation Systems;
4. To implement a regional communications and warning plan;
5. To facilitate Tsunami Hazard and Risk studies in the Central American Region. The Group will be composed of member from Member States Nicaragua, El Salvador, Guatemala, Costa Rica, Honduras and Panama (as soon as they finalized the formal procedure of joining ICG/PTWS), with a Chair and a Vice-Chair to be elected.

Terms of Reference

Working Group for the South East Pacific Region

1. To identify current gaps on the warning and mitigation capabilities of countries in the South East Pacific Region based upon the lessons learned from the last tsunami events. Understand and prioritize the new requirements from countries in the Southeast Pacific Region for the tsunami warning and mitigation services, and group them under the three central pillars of the Medium Term Strategy 2009-2013;
2. To organize the working plan and structure of the South East Pacific Region taking into account the three central pillars of the Medium Term Strategy 2009–2013;
3. To promote and facilitate tsunami hazard and risk studies in the region, through the active participation of appropriate national delegates from Member States, in the Working Group 1: Tsunami Risk Assessment and Reduction;
4. To facilitate cooperation in the establishment and upgrading of seismic and sea level stations and networks and communication systems in the region, and their interoperability in accordance with ICG/PTWS requirements, through the active participation of appropriate national delegates from Member States, in the Working Group 2: Tsunami Detection, Warning and Dissemination;
5. To improve the education programs with a regional criteria based on the regional social, cultural and economical reality, through the active participation of appropriate national delegates from Member States, in the Working Group 3: Tsunami Awareness and Response;
6. To facilitate capacity building and the sharing of tsunami information in the region, including the free and open exchange of data;
7. To promote and facilitate the creation of in-region trainers in order to meet the regional needs of training.

The Group will be composed of representatives nominated by the Member States of Colombia, Ecuador, Peru and Chile, with a Chair from Ecuador.

Terms of Reference

Working Group for the South West Pacific Region

1. To continually review and evaluate capabilities of and make recommendations for improvements to countries in the Southwest Pacific Region for providing end-to-end tsunami warning and mitigation services;
2. To support the involvement and contribution of SWP countries in the activities of the ICG/PTWS;
3. To promote and facilitate the tsunami hazard and risk studies in the SWP region;
4. To facilitate cooperation in the establishment and upgrading of seismic and sea level stations and networks in the region, and the interoperability of these systems in accordance with ICG/PTWS requirements;
5. To facilitate training and capacity building in the end to end tsunami warning and mitigation system in the region;
6. To encourage the sharing of tsunami information in the region, including but not limited to the free and open exchange of data, and
7. To facilitate tsunami awareness in school curricula, and development and dissemination of public educational materials;
8. To work in cooperation with PTWS Working Group 3, especially on activities which strengthen country capacity in tsunami emergency response,

The Group to be comprised of representatives from Member States and territories of the Secretariat of the Pacific Community (SPC) as members and observers with Chair and Vice Chair to be elected by the members of the Working Group and endorsed by the ICG/PTWS.

Terms of Reference

Working Group for the South China Sea

1. To evaluate capabilities of countries in the South China Sea Region for providing end-to-end tsunami warning and mitigation services;
2. To ascertain requirements from countries in the South China Sea for the tsunami warning and mitigation services;
3. To promote and facilitate tsunami hazard and risk studies in the region;
4. To facilitate cooperation in the establishment and upgrading of seismic and sea level stations and networks and communication systems in the region;
5. To facilitate improvement of the education programs on tsunami mitigation in the region;
6. To facilitate capacity building and the sharing of tsunami information in the region, including the free and open exchange of data.

The Group will be composed of members nominated by Member States Brunei, Cambodia, China, Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam and invited experts with a Chair and Vice-Chair to be elected.

Terms of Reference

Steering Committee:

1. The Steering Committee shall act in an advisory capacity to the Chair of the ICG/PTWS during the inter-sessional period;
2. The Steering Committee shall coordinate and integrate the work of ICG/PTWS in the inter-sessional periods, as implemented through the various technical and regional working groups and task teams, including but not limited to:
 - Maintain the PTWS Medium Term Strategic Plan.
 - Monitor, maintain and update the PTWS Implementation Plan.
 - Develop a Strategy for funding PTWS activities.
 - Monitor the performance of the PTWS.
3. The Steering Group will be composed of the ICG/PTWS Officers (Chair and three Vice-Chairs), Chairs of the Technical and Regional Working Groups, Directors of PTWC, NWPTAC and ITIC or their representatives, other members' representatives by invitation of the Chair.

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 Wave 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

ANNEX III

UNESCO IOC PRESS RELEASE AND SAMPLE TEMPLATE FOR NEWS RELEASE

Pacific Rim countries test their tsunami preparedness | United Nations Educational, Scientific and Cultural Organization

11/6/11 10:16 PM

[UNESCO » Media Services](#) » Pacific Rim countries test their tsunami preparedness

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Pacific Rim countries test their tsunami preparedness

On 9 - 10 November, some 30 Pacific Rim countries will take part in a tsunami warning exercise, PacWave11, organized under the aegis of UNESCO's Intergovernmental Oceanographic Commission (IOC). The test is destined to help governmental authorities in the countries involved prepare for major tsunami events.

In the first phase, the exercise will consist of ten different scenarios to allow each participating country to respond to a regional or local tsunami following a powerful earthquake off the shores of Russia, Ryukyu Islands, west and east of the Philippines, Vanuatu, Tonga, Chile, Ecuador, Central America, and Aleutian Islands. Countries engaged in the test will choose one of these scenarios and opt for a regional or local event to which they would have to react.

During a second phase, implemented simultaneously after receipt of warning messages, the authorities of the countries involved will test all the necessary steps to respond to a warning prior to alerting the public.

Simulated warnings will be sent by the Northwest Pacific Tsunami Advisory Centre (Japan), the Pacific Tsunami Warning Center (USA), and West Coast/Alaska Tsunami Warning Center (USA). They will be addressed to the focal points of each country called upon to respond to a tsunami warning.

The exercise will further improve countries' ability to respond to an alert and improve regional coordination in the event of a tsunami.

UNESCO's Intergovernmental Oceanographic Commission established an International Coordination Group for the Tsunami Warning System in the Pacific in 1965, following the major tsunami of 1960 that hit the coast of Chile and claimed close to 5,000 human lives. The purpose of the Group is to coordinate the ongoing development and enhancement of the Pacific Tsunami Warning Systems and to promote the establishment of national risk assessments, alert and response programmes.

Most tsunamis occur in the Pacific Ocean and connected seas. Three tsunamis have struck that region recently: Samoa (2009), Chile (2010) and Japan in 2011.

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04.11.2011

Source: UNESCOPRESS

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CONTACTS

Agnès BARDON
+33 (0) 1 45 68 17
64 French editor

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Les pays riverains du Pacifique testent leur capacité de réponse à un tsunami

Une trentaine de pays riverains du Pacifique participeront les 9 et 10 novembre à un exercice d'alerte au tsunami organisé sous l'égide de la Commission océanographique intergouvernementale de l'UNESCO. Baptisé « PacWave 11 », ce test mettra les autorités gouvernementales des pays participants en situation de réagir à un tsunami de grande ampleur.

La première phase de l'exercice test consistera en dix scénarios possibles pour permettre aux pays de répondre à la survenue d'un tsunami régional ou local provoqué par un tremblement de terre puissant au large des côtes de Russie, des îles Ryukyu, des Philippines, de Vanuatu, de Tonga, du Chili, d'Equateur, d'Amérique centrale et des îles Aleutian. Les pays participants pourront choisir l'un de ces scénarios, et opter pour un événement régional ou local, qui déterminera la nature de leur réponse.

Dans une deuxième phase, conduite simultanément après réception de messages d'alerte, les autorités gouvernementales des pays participants testeront les dispositifs d'urgence à tous les niveaux précédant l'annonce à la population.

Les bulletins d'alerte fictifs seront envoyés par le Centre consultatif sur les tsunamis dans le Pacifique Nord-Ouest (Japon), le Centre d'alerte aux tsunamis dans le Pacifique (Etats-Unis), et le Centre d'alerte aux tsunamis pour la côte ouest et l'Alaska (Etats-Unis). Ils seront adressés aux points focaux de chaque pays chargés de répondre à une alerte au tsunami.

L'objectif de ce test est d'améliorer la

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Contacts

Agnès BARDON
+33 (0) 1 45 68 17
64 Rédactrice (français)

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capacité de réaction de chaque pays et de renforcer la coordination régionale en case de survenu d'un tsunami.

La Commission océanographique intergouvernementale de l'UNESCO a mis en place un Groupe international de coordination du Système d'alerte aux tsunamis dans le Pacifique en 1965, en réponse au tsunami de grande ampleur qui avait frappé en 1960 les côtes de Chili et causé la mort de près de 5000 personnes. L'objectif de ce Groupe est de coordonner le développement du Système d'alerte aux tsunamis dans le Pacifique et de promouvoir la mise en place de programmes nationaux d'évaluation des risques, de diffusion des alertes et de capacité de réponse aux tsunamis.

La plupart des tsunamis se produisent dans l'océan Pacifique et ses mers bordières. Au cours des trois années écoulées, trois tsunamis se sont produits à Samoa (2009), au Chili (2010) et au Japon (2011).

[Plus d'information](#)

04.11.2011
Source : UNESCOPRESS

SAMPLE PRESS RELEASE

TEMPLATE FOR NEWS RELEASE

USE AGENCY MASTHEAD

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

FOR IMMEDIATE RELEASE
(insert date)

THIRD PACIFIC-WIDE TSUNAMI DRILL SET FOR NOVEMBER

(Insert country name) will join over (insert number) other countries around the Pacific Rim as a participant in a mock tsunami scenario during 9–10 November 2011. The purpose of this Pacific-wide exercise is to increase preparedness, evaluate response capabilities in each country and improve coordination throughout the region to a regional or local source tsunami.

“The recent events of the 2009 Samoa Islands, 2010 Chile and the March 2011 Japan tsunamis have increased our need to be more prepared for such events,” said (insert name of appropriate official). “This important exercise will test the current procedures of the Pacific Tsunami Warning System and help identify operational strengths and weaknesses in each country.”

The exercise, titled Exercise Pacific Wave 11 (PacWave11), will simulate Pacific countries being put into a Tsunami Warning situation requiring government decision-making. It is the third such exercise with the first having been carried out in May 2006 and the second in October 2008.

The exercise can be divided into two stages. The exercise will consist of 9 different scenarios to allow each participating country to respond to a regional or local source tsunami event. In the first stage, a destructive local tsunami will be simulated by international notifications from Japan’s Northwest Pacific Tsunami Advisory Center (NWPTAC), the U.S. Pacific Tsunami Warning Center (PTWC) and the U.S. West Coast and Alaska Tsunami Warning Center (WC/ATWC). Bulletins will be transmitted from these tsunami warning centres to focal points designated by each country that are responsible for that country’s tsunami response.

In the second stage, conducted simultaneously in response to receipt of the international messages and any national tsunami detection, analysis, and forecasting capabilities, government officials will simulate decision-making and alerting procedures down to the last step before public notification. Notification of emergency management and response authorities for a single coastal community will be used as a measure of the end-to-end warning and response process of the entire country for purposes of this exercise. Due care will be taken to ensure the public is not inadvertently alarmed.

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.

Should any actual tsunami threat occur during the time period of the exercise, the drill will be terminated.

Following the exercise, a review and evaluation will be conducted by all participants. “We see this exercise as an essential element in the routine maintenance of the Pacific Tsunami Warning and Mitigation System,” said (insert name of appropriate official). “Our goal is to

ensure a timely and effective early warning of tsunamis, educate communities at risk about safety preparedness, and improve our overall coordination. We will evaluate what works well, where improvements are needed, make necessary changes, and continue to practice.”

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)

###

On the Web:

Pacific Wave 11 information site: <http://www.pacwave.info> (now archived to http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1686&Itemid=2331&lang=en)

Exercise Media Resources:

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

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

EXERCISE PACIFIC WAVE 11 SCENARIOS, MASTER SCHEDULE OF EVENTS LIST (MSEL), AND DUMMY EXERCISE MESSAGES

Introduction

Exercise Pacific Wave 11 involved multiple scenarios (ten in total), played out in real time, to allow all Pacific countries to select and exercise a regional/local source tsunami event.

PTWC introduced new experimental products 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 requested on the new products through the PacWave11 exercise evaluation.

Annex IV provides the ten scenarios using the graphical format for the forecasts, the International Master Schedule of Events List (MSEL) giving the times and types of message products issued by each International Tsunami Warning Center (ITWC) for each scenario, and the Dummy Exercise Messages used by each ITWC to start each scenario.

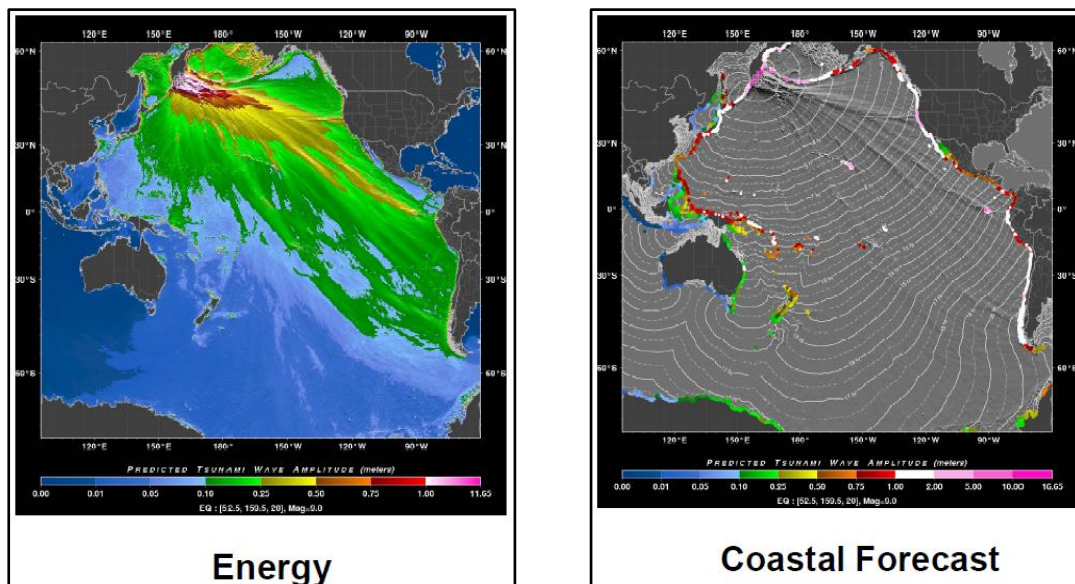


Figure IV-1. Kamchatka (Kuril–Kamchatka Trench)

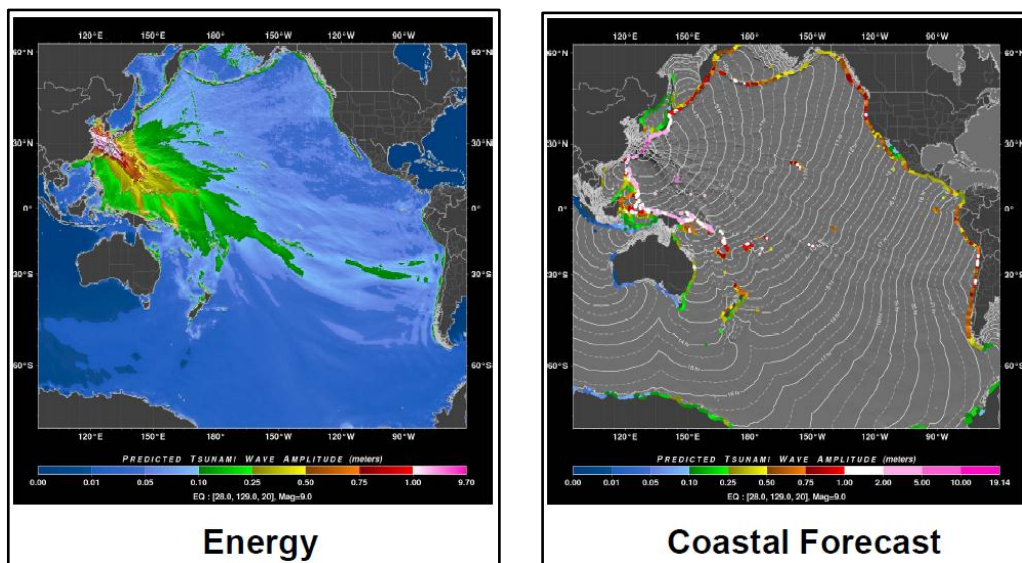


Figure IV-2. Ryukyu Islands (Nansei-Shoto Trench)

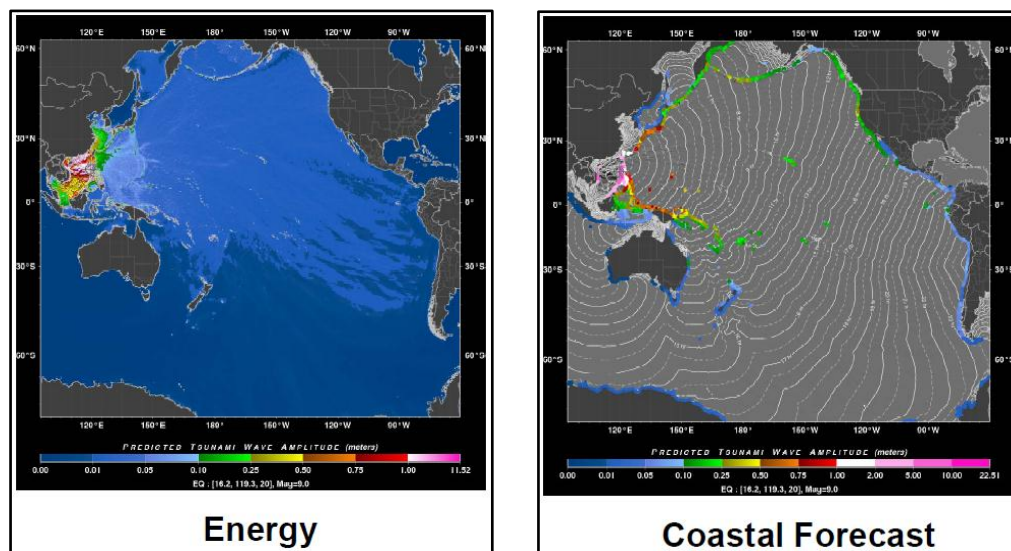


Figure IV-3. Philippines-South China Sea (Manila Trench)

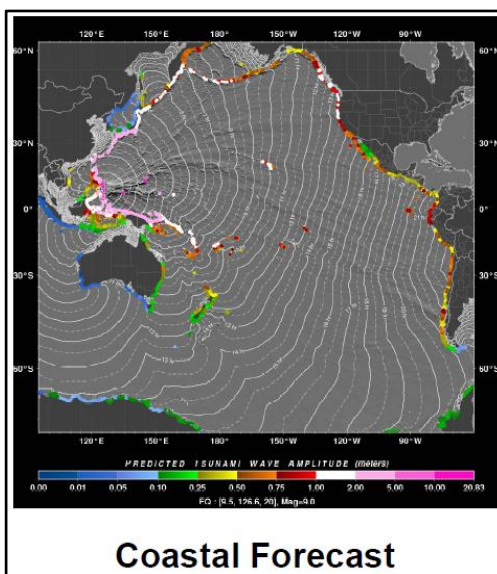
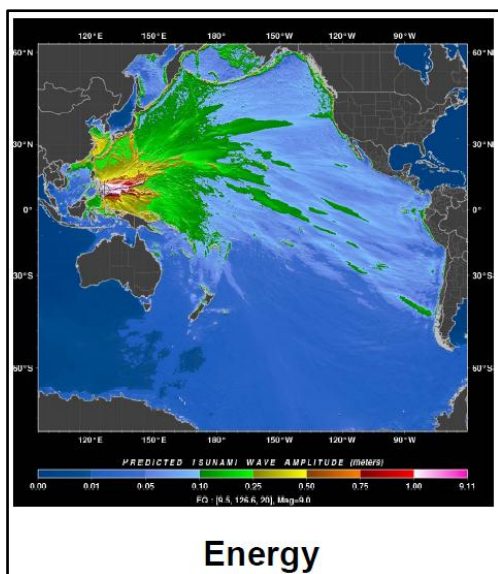


Figure IV-4. Philippines-Pacific Ocean (Philippines Trench)

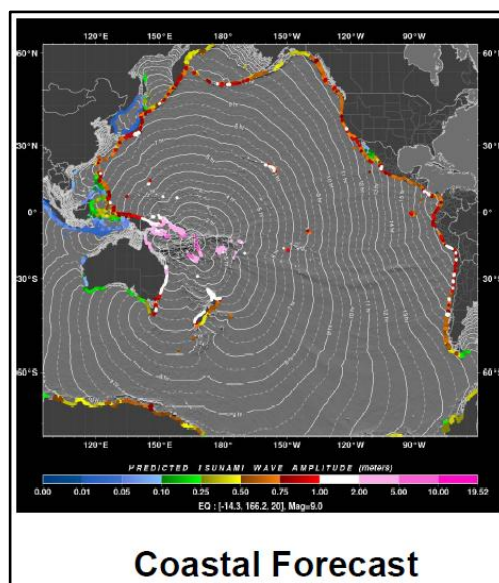
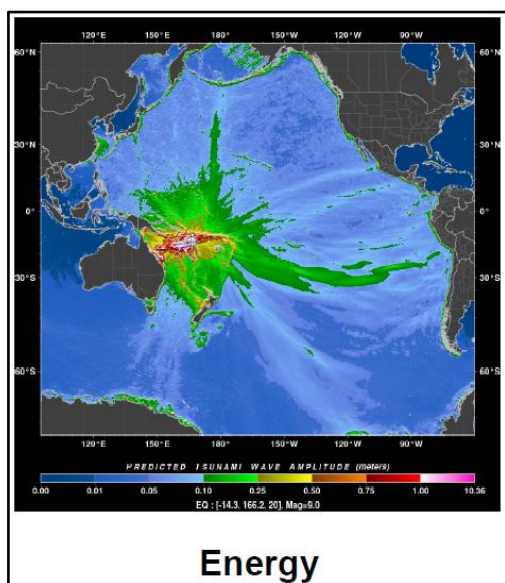


Figure IV-5. Vanuatu (New Hebrides Trench)

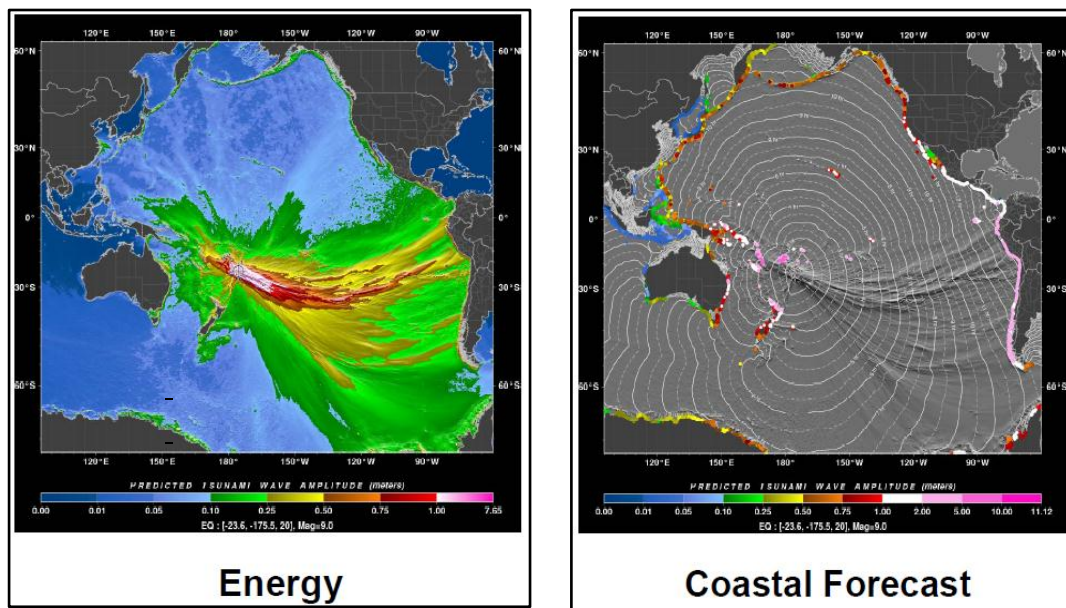


Figure IV-6. Tonga (Tonga Trench)

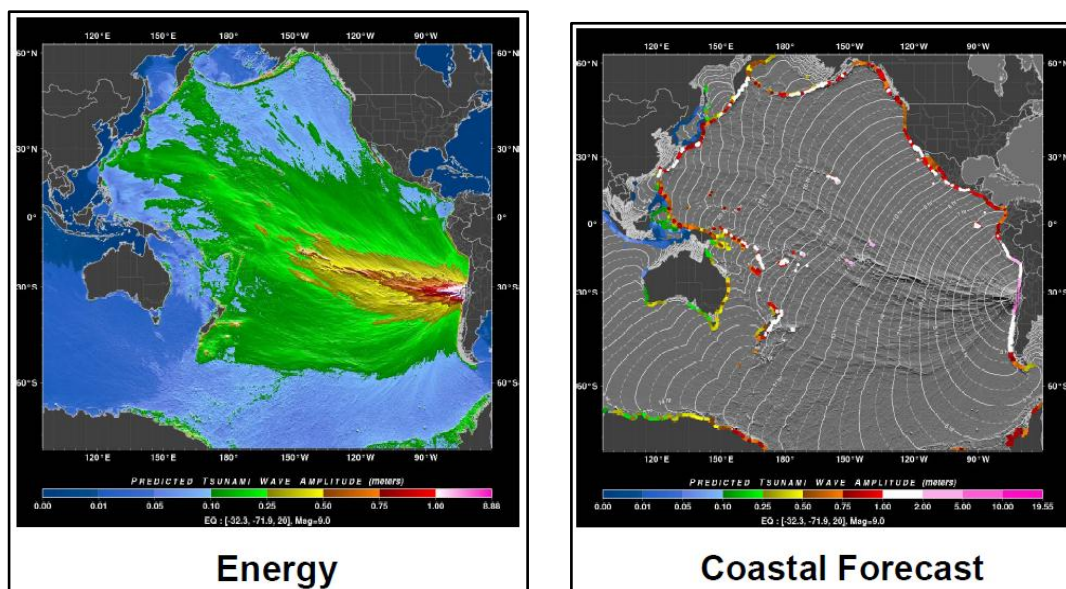


Figure IV-7. Northern Chile (Peru–Chile Trench)

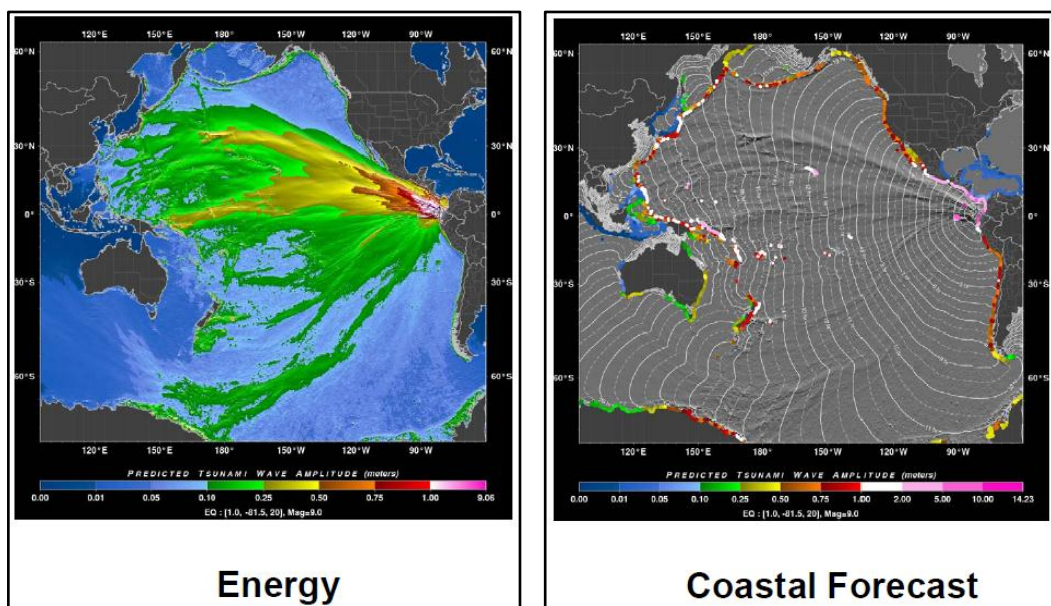


Figure IV-8. Ecuador (Colombia–Ecuador Trench)

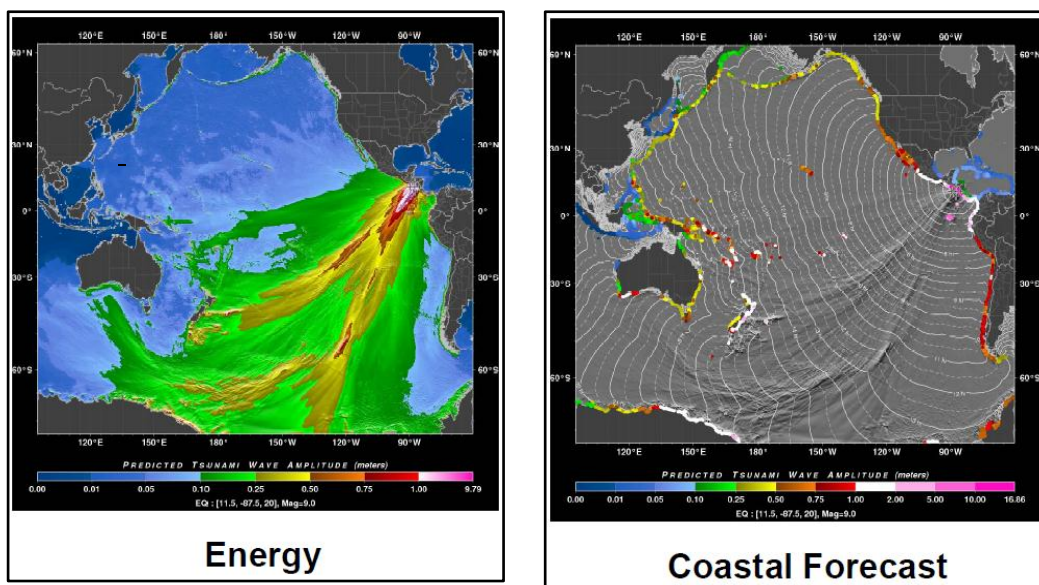


Figure IV-9. Central America (Middle America Trench)

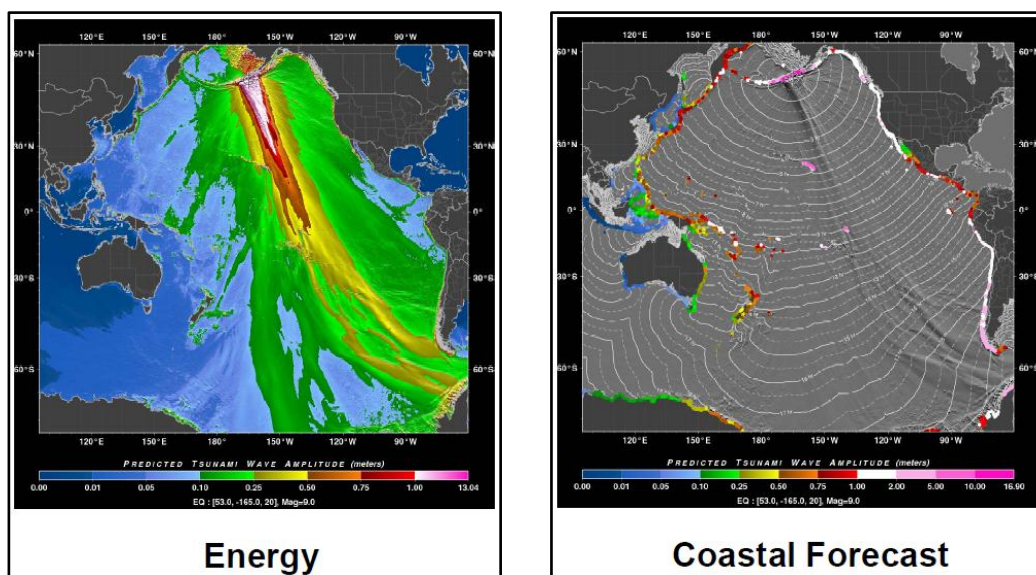


Figure IV-10. Aleutian Islands (Aleutian Trench)

INTERNATIONAL MASTER SCHEDULE OF EVENTS LIST (MSEL)

Scenario	North Chile	Ecuador	Central Amer.	Aleutian Islands				Tonga Trench	Vanuatu	Kamchatka				Ryukyu Trench				Philippine Trench				Manila Trench				
Centre	PTWC	PTWC	PTWC	PTWC	WCATWC	PTWC	PTWC	PTWC	PTWC	PTWC	NWPTAC	PTWC	NWPTAC	PTWC	NWPTAC	PTWC	NWPTAC	PTWC	NWPTAC	PTWC	NWPTAC					
Date (UTC)	Time (UTC)	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	#	TYP	
11/09	13:00	Quake																								
11/09	13:08	1	RW																							
11/09	13:45	2	RW																							
11/09	14:00			Quake																						
11/09	14:08			1	RW																					
11/09	14:45	3	PW	2	RW																					
11/09	15:00					Quake																				
11/09	15:08					1	RW																			
11/09	15:45	4	PW	3	PW	2	RW																			
11/09	16:45	5	PW	4	PW	3	PW																			
11/09	17:45	6	PW	5	PW	4	PW																			
11/09	18:00					Quake																				
11/09	18:05							1	WW																	
11/09	18:10					1	RW																			
11/09	18:45	7	PW	6	PW	5	PW	2	RW	2	WW															
11/09	19:15									3	WW															
11/09	19:45	8	PW	7	PW	6	PW	3	PW	4	WW															
11/09	20:15										5	WW														
11/09	20:45	9	PW	8	PW	7	PW	4	PW	6	WW															
11/09	21:00									Quake																
11/09	21:08										1	RW														
11/09	21:15										7	WW														
11/09	21:45	10	PW	9	PW	8	PW	5	PW	8	WW	2	RW													
11/09	22:00										Quake		Quake													
11/09	22:08										1	RW	1	RW												
11/09	22:10													1	TAB											
11/09	22:15										9	WW														
11/09	22:45		10	PW	9	PW	6	PW	10	WW	3	PW	2	RW	2	RW										
11/09	22:50														2	TAB										
11/09	23:00													Quake												
11/09	23:05															1	TAB									
11/09	23:10													1	RW											
11/09	23:15										11	WW														
11/09	23:45				10	PW	7	PW	12	WW	4	PW	3	PW	3	PW	3	TAB	2	RW						
11/09	23:50															2	TAB									
11/10	00:00																	Quake								
11/10	00:08																	1	RW							
11/10	00:10																			1	TAB					
11/10	00:15																									
11/10	00:45					8	PW	14	WW	5	PW	4	PW	4	PW	4	TAB	3	PW	3	TAB	2	RW			
11/10	00:50																					2	TAB			
11/10	01:15																									
11/10	01:45					9	PW	16	WW	6	PW	5	PW	5	PW	5	TAB	4	PW	4	TAB	3	PW	3	TAB	
11/10	02:00																							Quake		
11/10	02:08																						1	RW		
11/10	02:10																							1	TAB	
11/10	02:15																									
11/10	02:45					10	PW	18	WW	7	PW	6	PW	6	PW	6	TAB	5	PW	5	TAB	4	PW	4	TAB	
11/10	02:50																							2	TAB	
11/10	03:45									8	PW	7	PW	7	PW	7	TAB	6	PW	6	TAB	5	PW	5	TAB	
11/10	04:45									9	PW	8	PW	8	PW	8	TAB	7	PW	7	TAB	6	PW	6	TAB	
11/10	05:45									10	PW	9	PW	9	PW	9	TAB	8	PW	8	TAB	7	PW	7	TAB	
11/10	06:45											10	PW	10	PW	10	TAB	9	PW	9	TAB	8	PW	8	TAB	
11/10	07:45																	10	PW	10	TAB	9	PW	9	TAB	
11/10	08:45																					10	PW	10	TAB	

Table V-1. All Scenarios – International Master Schedule of Event List

Table IV-1. All scenarios – International Master Schedule of Event List

Each scenario began with the live issuance of a Dummy Message from the corresponding international tsunami warning centres. From this point on, countries were responsible for 'receiving' the messages according to the times of issuance in the MSEL.

PTWC DUMMY EXERCISE MESSAGE

The following message is the first exercise message that was issued by the Pacific Tsunami Warning Center during Exercise Pacific Wave 11. The dummy messages served as a substitute for the first actual bulletin that would be issued by PTWC for each scenario. Only one message, this first dummy message, was issued for each scenario.

All actual bulletins for each scenario were posted on the PacWave11 website (http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1686&Itemid=2331&lang=en). They included the current PTWC message products (from PTWC, JMA/NWPTAC, WCATWC), as well as the PTWC experimental products.

Countries were recommended to download messages for their scenario from the website. The country's Exercise Control Team was responsible for issuing the remaining messages after WC/ATWC Bulletin 1.

SAMPLE PTWC DUMMY MESSAGE

TEST... PACWAVE 11 TSUNAMI EXERCISE MESSAGE ...TEST
NWS PACIFIC TSUNAMI WARNING CENTER EWA BEACH HI
1308 UTC WED NOV 9 2011

TO: PARTICIPANTS OF THE PACWAVE 11 TSUNAMI EXERCISE.
ALL OTHERS PLEASE IGNORE.

SUBJECT: EXERCISE PACWAVE 11 – NORTHERN CHILE SCENARIO

THIS MESSAGE IS A PROXY FOR PTWC BULLETIN 1 OF THE PACWAVE 11 EXERCISE NORTHERN CHILE SCENARIO. IT IS ONE OF A SERIES OF MESSAGES THAT ARE BEING ISSUED BY THE PACIFIC TSUNAMI WARNING CENTER FOR EACH EXERCISE SCENARIO. THE EXERCISE IS DESIGNED TO TEST COMMUNICATIONS AND ACTIONS OF THE PACIFIC TSUNAMI WARNING SYSTEM THAT WOULD BE NEEDED IN THE EVENT OF AN ACTUAL TSUNAMI.

PARTICIPANTS IN THE EXERCISE SHOULD REFER TO THE PACWAVE 11 EXERCISE MANUAL AND PACWAVE 11 EXERCISE WEB SITE FOR PTWC BULLETIN 1 OF THE NORTHERN CHILE SCENARIO. SEE WWW.PACWAVE.INFO – USE LOWER CASE FOR WEB SITE.

THIS IS ONLY AN EXERCISE.

WCATWC DUMMY EXERCISE MESSAGE

The following message is the first exercise message that was issued by the West Coast and Alaska Tsunami Warning Center during Exercise Pacific Wave 11.

Subsequent messages for each scenario were posted on the PacWave11 website (<http://www.pacwave.info>, now archived to: http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1686&Itemid=2331&lang=en).

Messages consisted of existing PTWS message products (PTWC, JMA/NWPTAC, WCATWC) and PTWC experimental products.

Countries were recommended to download messages for their scenario from the website. The country's Exercise Control Team was responsible for issuing the remaining messages after WC/ATWC Bulletin 1.

SAMPLE WC/ATWC DUMMY MESSAGE

WEPA41 PAAQ 231805
TSUWCA

TEST...TSUNAMI MESSAGE NUMBER 1...TEST
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK
0145 PM PDT TUE NOV 10 2011

... PACWAVE 11 TSUNAMI EXERCISE MESSAGE. REFER TO
WCATWC MESSAGE 1 AT THE EXERCISE WEB SITE.
THIS IS AN EXERCISE ONLY...

THIS MESSAGE IS BEING USED TO START OFF THE PACWAVE 11 TSUNAMI
EXERCISE. THE EXERCISE IS DESIGNED TO TEST COMMUNICATIONS AND ACTIONS
THAT WOULD BE NEEDED IN THE EVENT OF AN ACTUAL TSUNAMI.

PARTICIPANTS IN THE EXERCISE SHOULD REFER TO THE EXERCISE PACWAVE 11
EXERCISE MANUAL AND PACWAVE11 WEB SITE FOR SCENARIO WC/ATWC
BULLETIN 1 AT WWW.PACWAVE.INFO - USE LOWER CASE FOR WEB SITE.

THIS IS ONLY AN EXERCISE.

NWPTAC DUMMY EXERCISE MESSAGE

The following message was the first exercise message that was issued by the Northwest Pacific Tsunami Advisory Center (NWPTAC) during Exercise Pacific Wave 11.

Subsequent messages for each scenario were posted on the PacWave11 website (<http://www.pacwave.info>, now archived to http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1686&Itemid=2331&lang=en).

Messages consisted of existing PTWS message products (PTWC, JMA/NWPTAC, WCATWC) and PTWC experimental products.

Countries were recommended to download messages for their scenario from the website. The country's Exercise Control Team was responsible for issuing the remaining messages after NWPTAC Bulletin 1.

SAMPLE NWPTAC DUMMY MESSAGE

WEPA40 RJTD 092210
(STX)
TEST...PACWAVE 11 TSUNAMI EXERCISE MESSAGE NUMBER 001...TEST
ISSUED BY NWPTAC (JMA)
ISSUED AT 2210Z 09 NOV 2011

PACWAVE 11 TSUNAMI EXERCISE - KAMCHATKA SCENARIO.
REFER TO NWPTAC BULLETIN 1 OF THE KAMCHATKA SCENARIO AT THE
EXERCISE WEB SITE.

THIS IS ONLY AN EXERCISE.

THIS MESSAGE IS A PROXY FOR NWPTAC BULLETIN 1 OF THE PACWAVE 11
EXERCISE KAMCHATKA SCENARIO. THE EXERCISE IS DESIGNED TO TEST
COMMUNICATIONS AND ACTIONS THAT WOULD BE NEEDED IN THE EVENT OF
AN ACTUAL TSUNAMI.

PARTICIPANTS IN THE EXERCISE SHOULD REFER TO THE PACWAVE 11
EXERCISE MANUAL AND PACWAVE 11 WEB SITE FOR NWPTAC BULLETIN 1
OF THE KAMCHATKA SCENARIO AT WWW.PACWAVE.INFO – USE LOWER CASE FOR
WEB SITE.

THIS IS ONLY AN EXERCISE.

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(ETX)

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ANNEX V

COUNTRY EXERCISE PARTICIPATION

Exercise info as provided by countries prior to PacWave11.

Scenarios:

- Kamchatka (Kuril–Kamchatka Trench),
- Ryukyu Islands (Nansei–Shoto Trench),
- Philippines–South China Sea (Manila Trench),
- Philippines–Pacific Ocean (Philippines Trench),
- Vanuatu (New Hebrides Trench),
- Tonga (Tonga Trench),
- Chile (Peru–Chile Trench),
- Colombia–Ecuador (Colombia–Ecuador Trench),
- Central America (Middle America Trench),
- Aleutian Islands (Aleutian Trench)

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Agencies Involved, Exercise Plan	Point of Contact
Australia	YES	Vanuatu (New Hebrides Trench)	Functional	Eastern states and one offshore territory of Australia will participate (Queensland, New South Wales, Victoria, Tasmania and Norfolk Island). JATWC, State Emergency Services, Police Force in Queensland and Tasmania and the National Crisis Co-ordination Centre (Attorney General's Department in the national capital city)	Rick Bailey, Don Anderson (Bureau of Meteorology)
Brunei Darussalam	YES	Manila Trench	Orientation	Meteorological Service, Department of Civil Aviation, Natural Disaster Management Centre.	Hj Sidup Hj Sirabaha (Meteorological Service)
Canada	NO			British Colombia participated to US PACIFEX tsunami exercise, March 2011	Denis D'Amours, Canadian Hydrographic Service, Fisheries and Oceans Canada
Cambodia	NO				
China	YES	Manila Trench	Full-scale	NMEFC, local governments, 300 villagers and students evacuated to safe places in what was expected to be the worst-hit city, Huizhou, Guangdong Province	Fujiang Yu (Deputy Director, National Marine Environmental Forecasting Center, State Oceanic Administration)
China–Hong Kong	YES	Manila Trench	Tabletop	30 govt organizations	HY Mok (Hong Kong Observatory)
China–Macau	NO			Planning exercise next year	Ivan Leong (Chief Seismological Monitoring, Meteorological and Geophysical Bureau)
China–Taiwan	NO				Wei-Sen Li (National Science and Technology Center for Disaster Reduction); Central Weather Bureau

¹ Type of Exercise: Orientation, Drill, Tabletop, Functional, Full-scale.

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Agencies Involved, Exercise Plan	Point of Contact
Colombia	YES	Not provided in advance, but will not be Colombia-Ecuador Trench (local)	Drill–multi-institution	TWFP will not communicate the chosen scenario beforehand. Coastal communities have been educated to react to prolonged strong shaking ('alerta personal'). All institutions between TWFP and last local (Tumaco) level before actual public warning to participate, e.g., institutions represented in 'Comité Técnico Nacional de Alerta de Tsunami' representing main communications path between TWFP, National Risk Management Authority, regional and local risk mgmt committees. Full institutional warning communication procedure to be tested.	Hansjürgen Meyer (OSSO, El Observatorio Sismológico y Geofísico del Suroccidente)
Chile	YES	Chile	Full-scale	NTWC (SHOA), Natl Seismological Service, NDMO (Onemi), population. Compressed time (2 hours). Expect limited communications (only VHF/satellite comms), no electricity (generators used). NDMO to send TWC Mercalli intensity report, Seismological service inform on hypocenter, and bulletin issued). Following, NDMO evacuation in Tarapacá region. TWC and NDMO to continue issuing information. Will have exercise conductor, evaluators, pre exercise (nov. 7), briefings, hot-debriefing, press and authorities pressure (simulated), press coverage, etc.	Nicolas Guzman, Miguel Vasquez (SHOA, Servicio Hidrográfico y Oceanográfico de la Armada de Chile)
Cook Islands	YES	Tonga	Full-scale–Functional	Will run exercise 1 hour earlier to accommodate schools and govt depts. Some evacuation processes to be implemented by schools and government departments. 6 sirens that are in place will be sounded.	Arona Ngari (Meteorological Service) William Tuivaga (Emergency Management)

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Agencies Involved, Exercise Plan	Point of Contact
Costa Rica	NO				Information per Bernardo Aliaga, ICG/PTWS Technical Secretary
Democratic People's Republic of Korea	NO				
Ecuador	YES	Colombia– Ecuador	Full-scale	INOCAR (focal point), Risk National Secretary (Risk and Emergency Agency), Esmeraldas Municipality (Gubernamental city)	Patricia Arreaga, Edwin Pinto (INOCAR, Instituto Oceanografico de la Armada)
El Salvador	YES	Colombia– Ecuador	Functional	Techinal office (SNET, Tsunami Focal Point), National Civil Defense office, Local Civil Defense offices in coastal sites previously selected	Jeniffer Larreynaga, Francisco Gavidia (SNET, Servicio Nacional de Estudios Territoriales)
Federated States of Micronesia– Chuuk	YES	Philippines –Pacific Ocean	Tabletop	At a minimum, WSO, DCO, Police, Fire, Health, Environment offices	Johannes Berndon (Weather Service Office)
Federated States of Micronesia– Kosrae	YES	Philippines –Pacific Ocean	Tabletop	At a minimum, WSO, DCO, Police, Fire, Health, Environment offices	Lipar George (Disaster Coordination Office)
Federated States of Micronesia– Pohnpei	YES	Philippines –Pacific Ocean	Tabletop	At a minimum, WSO, DCO, Police, Fire, Health, Environment offices	Eden Skilling (Weather Service Office)
Federated States of Micronesia– Yap	YES	Philippines –Pacific Ocean	Functional	Stakeholders that will be involved are as follows: Disasters Control Office (DCO), Public Safety, Public Health, Public Transportation System/Sea Transportation, Red Cross, Media	Kensley Ikosia (Disaster Coordination Office), David Aranug (Weather Service Office)
Fiji	YES	Tonga	Full-scale	Schools tsunami evacuation mock drill to take place	Sefa Sefanaia (Mineral Resources Department)

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Agencies Involved, Exercise Plan	Point of Contact
France - French Polynesia	YES	Aleutian Trench	Tabletop	Civil Defense headquarters, CPPT (Centre Polynésien de Prévention des Tsunamis)	Dominique Reymond (CPPT, Centre Polynésien de Prévention des Tsunamis)
France - New Caledonia	NO				
France - Wallis & Futuna	NO				Benjamin Gerard, Chef des Services du Cabinet du Préfet, Chargé de communication du Préfet, Administrateur Supérieur des îles Wallis et Futuna
Guatemala	YES	Colombia-Ecuador	Tabletop	INSIVUMEH and CONRED (Coordinadora para la reducción de Desastres en Guatemala)	Victoria Cáceres (Departamento de Geofísica, INSIVUMEH, Instituto Nacional de Sismología, Vulcanología, Meteorología y Hidrología)
Honduras	NO				Juan Jose Reyes (SAT COPECO, Permanent Commission for Emergencies)
Indonesia	YES	Manila Trench	Tabletop / Functional	BMKG (NTWC); recently participated as Regional Tsunami Service Provider to Indian Ocean Wave (12 Oct 2011)	Suhardjono (BMKG, adan Meteorologi, Klimatologi, dan Geofisika)
Japan-JMA NWPTAC	YES	4 scenarios	Functional	Northwest Pacific Tsunami Advisory Center to issue messages for 4 scenarios	Takeshi Koizumi (JMA, Japan Meteorological Agency)
Kiribati	NO	Vanuatu	Orientation	Kiribati Met Service, Disaster Risk Management Office, 1st-ever tsunami exercise planned, but did not carry out	T Ueneta ((Meteorological Service)
Malaysia	YES	Manila Trench	Full-scale	2 drills at Kudat (Sabah) and Labuan involving Disaster Agencies at Federal, State and District Levels. At Kudat, town community will be involved whereas at Labuan, 3 villages will evacuate.	Mohd Rosaidi Che Abas, Irene Eu Swee Neo (Meteorological Department)

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Agencies Involved, Exercise Plan	Point of Contact
Marshall Islands	YES	Philippines –Pacific Ocean	Tabletop	At a minimum, WSO, NDMO, Police, Fire, Health, Environment offices	Reggie White (Weather Service Office)
Mexico	YES	Central America	Functional	Not Known	Juan Carlos Orantes Zenteno (Civil Protection)
Nauru	NO	Vanuatu	Tabletop	Met, Police, Nauru Rehab, Transport Dept, Fire service, NDRMC; exercise planned, but did not carry out	Roy Harris (Nauru Govt)
New Zealand	YES	Vanuatu	Tabletop	Large number of organisations involved, including Civil Defence Groups, Health, Police, Fire, Maritime, Welfare agencies, GNS Science	David Coetzee, Jo Guard (Ministry of Civil Defense and Emergency Management)
Nicaragua	YES	Colombia–Ecuador, Central America	Tabletop	Civil Defense, SINAPRED, INETER coordinated exercise; governmental staff and communities organizations along Pacific Coast, to rejarce or test the radio communications.	Alejandro Rodríguez Alvarado, Executive Director; Emilio Talavera, Sismology Director; Angélica Munoz (INETER, El Instituto Nicaragüense de Estudios Territoriales)
Niue	YES	Tonga	Functional	Police, Telecom, Met, Education, Health and Broadcasting/Television	Sionetasi Pulehetoa (Meteorological Service) Mark Chenery (Police Dept)
Palau	NO	Philippines –Pacific Ocean	Limited Tabletop (originally Functional)	Due to Presidential Declaration No. 11–05, Declaration of a State of Emergency, regarding a catastrophic fire at the Aimeliik Power Plant which completely destroyed at least one generator and all of the controls for the facility, Natl Emergency Committeer (NEC) decided to do exercise early next year to test our own communications and SOPs (originally planned participatnts WSO Koror, NEMO, Education, Bureau of Public Safety (BPS))	Maria Ngemaes (Weather Service Office)

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Agencies Involved, Exercise Plan	Point of Contact
Panama	YES	Colombia-Ecuador	Tabletop	Instituto de Geociencias de la Universidad de Panama received FAX messages and developed communication tests (radio) with the Sistema Nacional de Proteccion Civil (SINAPROC-PANAMA). SINAPROC was busy with inundation emergencies. Geociencias developed estimation of impact from the chosen scenario	Luque Nestor (University of Panama Institute of Geosciences)
Papua New Guinea	YES	Philippines - Pacific Ocean	Functional	PNG National Disaster Center with colleagues at the provinces, Port Moresby Geophysical Observatory, Provincial Authorities , LLG and Ward members, Police and other line agencies, NWS	Chris McKee, Mathew Moihoi (Port Moresby Geophysical Observatory)
Peru	YES	Chile	Drill - Full-scale	Civil Defense, All Naval Stations near coast, National Port Authority, Terminal Maritime Port and Geophysical Institute IGP. For DHN, will use all communication system (iridium, radio VHF, HF, fax, local telephone), monitoring system, and software to estimate arrival wave. Each naval station will simulate the evacuation of their buildings. Recommended to Civil Defense to evacuate population in the south of Perú , because the wave arrival time, will be 130 hours later.	Atilio Aste, Lorena Marquez, Javier Tejada (DHN, Dirección de Hidrografía y Navegación)
Philippines	YES	Philippines - Pacific Ocean	Functional	The Office of Civil Defense and its regional offices will participate. The National Mapping Resource and Information Authority (NAMRIA) may participate. Early next year, the Philippines intend to do a full-scale exercise using the Manila Trench scenario.	Renato Solidum, Ishmael Narag (PHIVOLCS, Philippine Institute of Volcanology and Seismology)
Republic of Korea	YES	Ryukyu Islands	Drill	KMA (Korea Meteorological Administration), NEMA (National Emergency Management Agency), Local government.	Yonghae Oh, (Earthquake monitoring Division, Korea Meteorological Agency)

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Agencies Involved, Exercise Plan	Point of Contact
Russian Federation	YES	Kamchatka	Full-scale-Functional	All members of the Russian tsunami Warning Service	Tanya Ivelskaya (Sakhalin Tsunami Warning Center)
Samoa	YES	Tonga	Full-scale	NTWC, DAC, Villages of Mutiatele, Malaela, Poutasi, Faleu-tai and Satupaitea district (Vaega, Mosula, Pitonuu and Satufia	Filomena Nelson (DMO, (Meteorological Division)
Singapore	YES	Manila Trench	Drill-Comms	just participated to IOWave with 15-govt agencies Table Top	Patricia Ee, Lesley Choo (NEA, National Environmental Agency)
Solomon Islands	YES	Colombia-Ecuador	Functional	Met, NDMO, Media, Telekom, Nat. Referral Hospital, NDC, N-DOC, N-DOC Clusters, PDC, P-DOC and P-DOC Clusters. This includes the involvement of from the National, Provincial and Community Level.	David Hirisia (Meteorological Service), Loti Yates (National Disaster Center)
Thailand	YES	Manila Trench	Functional	NDWC	Capt. Song Ekmahachai, Burin Wechbunthung (National Disaster Warning Center)
Tokelau	NO			Recently conducted Cyclone exercise	from David Coetzee (NZ MCDEM)
Tonga	YES	Tonga	Functional	Met, NEMO, GSU, Media, Members of NEMC	Ofa Fa'anunu (Meteorological Service)
Tuvalu	YES	Vanuatu	Drill; Functional	Met Office, Disaster Office, Outer Island Met Offices; NDC, Media, TTC, Police, Red Cross, PWD, TEC, Marine, Aviation, IDCs, Schools, Hospitals	Tauala Katea, Hilia Vavae (Meteorological Service)
UK - Pitcairn Islands	NO				
USA - PTWC, WC/ATWC	YES	All 10 scenarios; Aleutians	Functional	PTWC to issue messages for 10 scenarios; WCATWC to issue messages for 1 scenario	Charles McCreery (Pacific Tsunami Warning Center), Paul Whitmore (West Coast and Alaska Tsunami Warning Center)

Country	Participation (Yes/No)	Scenario	Type of Exercise ¹	Agencies Involved, Exercise Plan	Point of Contact
USA– American Samoa	YES	Tonga	Functional – full-scale	NWS Pago Pago (lead), TEMCO/ASDHS, EAS Committee, Department of Public Safety(DPS), Department of Education (DOE), Star Kist, Territorial Agency for Old Age. EAS / sirens activated. 3 schools (east, central, west), StarKist tuna factory to participate with evacuation. T.V/radio media blitz to increase awareness. Businesses encouraged to get involved. Government agencies asked to review Emergency Plans. Some villages may participate.	Mase Akapo (National Weather Service Pago Pago) Faletoa Ulufale (AS Dept of Homeland Security)
USA–Guam	YES	Philippines –Pacific Ocean	Tabletop	Will activate EOC which includes about 30 response agencies	Chip Guard (Weather Forecast Office Guam), Edeine Camacho (Office of Civil Defense)
USA– Northern Mariana Islands	YES	Philippines –Pacific Ocean	Tabletop	Will activate EOC which includes about 20 response agencies	Juan Camacho (Emergency Management Office)
Vanuatu	YES	Vanuatu	Full-scale	VMGD (Meteo, Geohazards), NDMO, Education, Health, TRR, and media/VBTC	Jotham Napat (Meteorological Service), Eslene Garaebiti ((Meteorological Service, Geohazards)
Vietnam	YES	Not known	Not known	Not Known	Le Huy Minh, Deputy Director, Nguyen Hong Phuong, TWFP, Institute of Geophysics, Vietnam Academy of Science and Technology

ANNEX VI

POST-EXERCISE EVALUATION COMPILATION

Responses to the Exercise Pacific Wave 11 post-exercise evaluation survey are summarized in **ANNEX V**. All 35 countries that participated to PacWave11 submitted post-exercise evaluations. Surveys were completed online through the Survey Monkey online survey and questionnaire tool, or submitted by transmittal of the completed survey file to the PacWave11 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 and Spanish.

(https://www.surveymonkey.com/s/pacwave11_eval,
https://www.surveymonkey.com/s/pacwave11_eval_sp).

Spanish-language responses were translated into English by the Hydrographic and Oceanographic Service of the Navy of Chile (SHOA).

The Survey was divided into three sections according to the PacWave11 objectives, and evaluation statements and questions focused on different components of the warning and response process. The objectives were:

OBJECTIVE 1: To exercise and evaluate operations of the current PTWS.

- SUB OBJECTIVE 1A: International Tsunami Warning Centres ONLY. Validate the issuance of tsunami advice from the PTWC, JMA/NWPTAC and WCATWC.
- SUB OBJECTIVE 1B: Validate the receipt of tsunami advice by PTWS Tsunami Warning Focal Points (TWFP).

OBJECTIVE 2: To begin a process of exposure to an initial test version of PTWC experimental products.

- SUB OBJECTIVE 2A: Review and evaluate PTWC experimental products that will be available in parallel with existing PTWC products for each scenario exercised.
- SUB OBJECTIVE 2B: Provide feedback on the staging, format and content of the experimental products.

OBJECTIVE 3: To validate the readiness of Member States to respond to a local/regional source tsunami.

- SUB OBJECTIVE 3A: Validate the operational readiness of the National Tsunami Warning Centre (NTWC) (or like function) and/or the National Disaster Management Office (NDMO).
- SUB OBJECTIVE 3B: To improve operational readiness. Before the exercise, ensure appropriate tools and response plan(s) have been developed, including public education materials).

- SUB OBJECTIVE 3C: Validate dissemination of warnings and information/advice by National Tsunami Warning Centres to relevant in-country agencies and the public is accurate and timely.
- SUB OBJECTIVE 3D: Validate the organisational decision-making process about public warnings and evacuations.
- SUB OBJECTIVE 3E: Validate the methods used to notify and instruct the public are accurate and timely.
- SUB OBJECTIVE 3F: Validate the elapsed time until the public would be notified and instructed/advised.

GENERAL OBSERVATIONS

- Overall assessment
- Exercise planning

A summary of all responses is provided below. Where noted, grey-shaded text provides a summary or highlights noteworthy comments that provided feedback to PTWC on their experimental products, and/or contributed to the Report Recommendations and Summary.

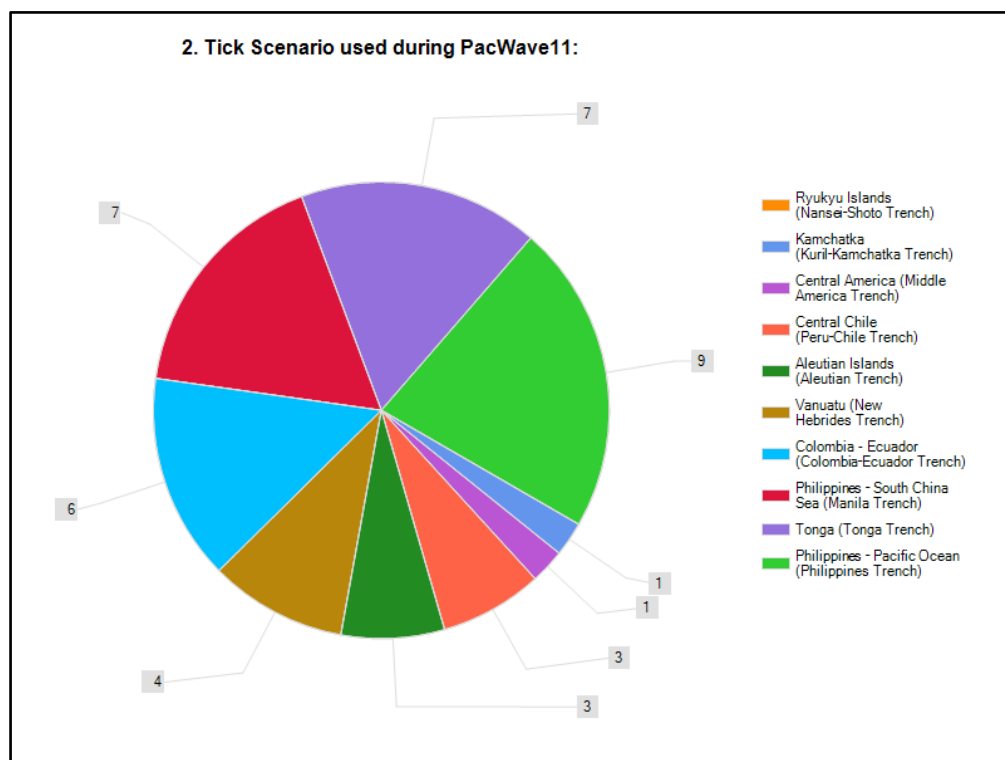


Figure VI-1. Results of the scenarios used during PacWave11

EVALUATION QUESTIONS/STATEMENTS

1A.1. The information issued by your international Tsunami Warning Centre (PTWC, NWPTAC, or WC/ATWC) was according to standard operating procedures.

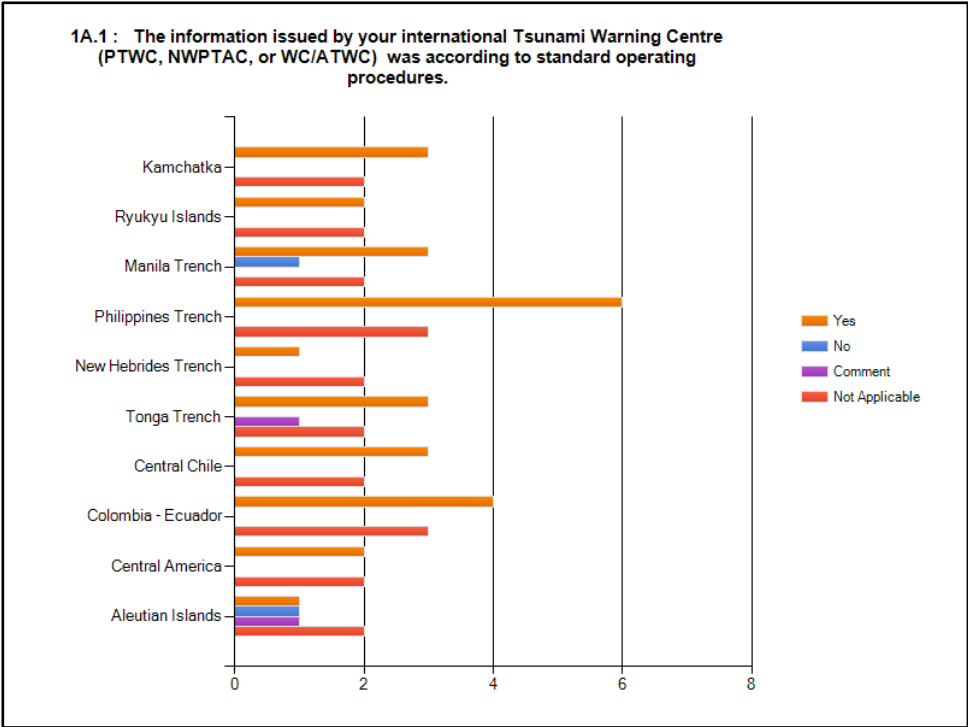


Figure VI-2. Results to Question 1A.1 by scenario

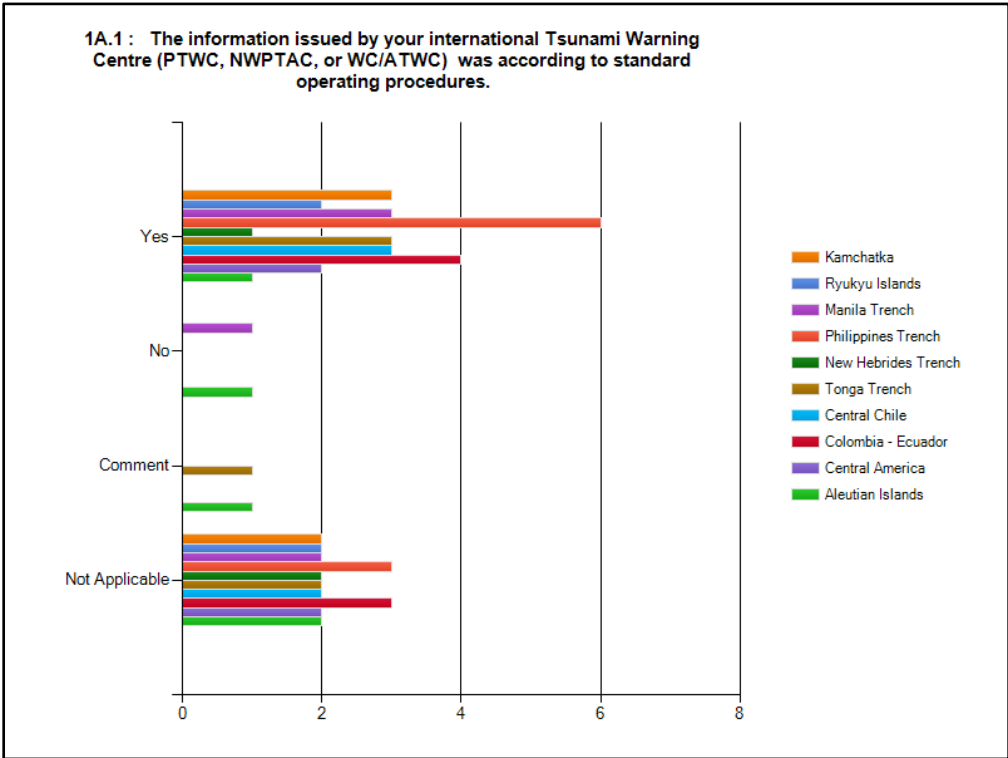


Figure VI-3. Responses to Q 1A.1

1A.2 What time was the initial PTWC, NWPTAC and/or WCATWC Exercise PacWave11 scenario exercise start message issued to the national tsunami warning centres?
Please note the time using 24 hour clock and UTC, e.g., 14:35 UTC.

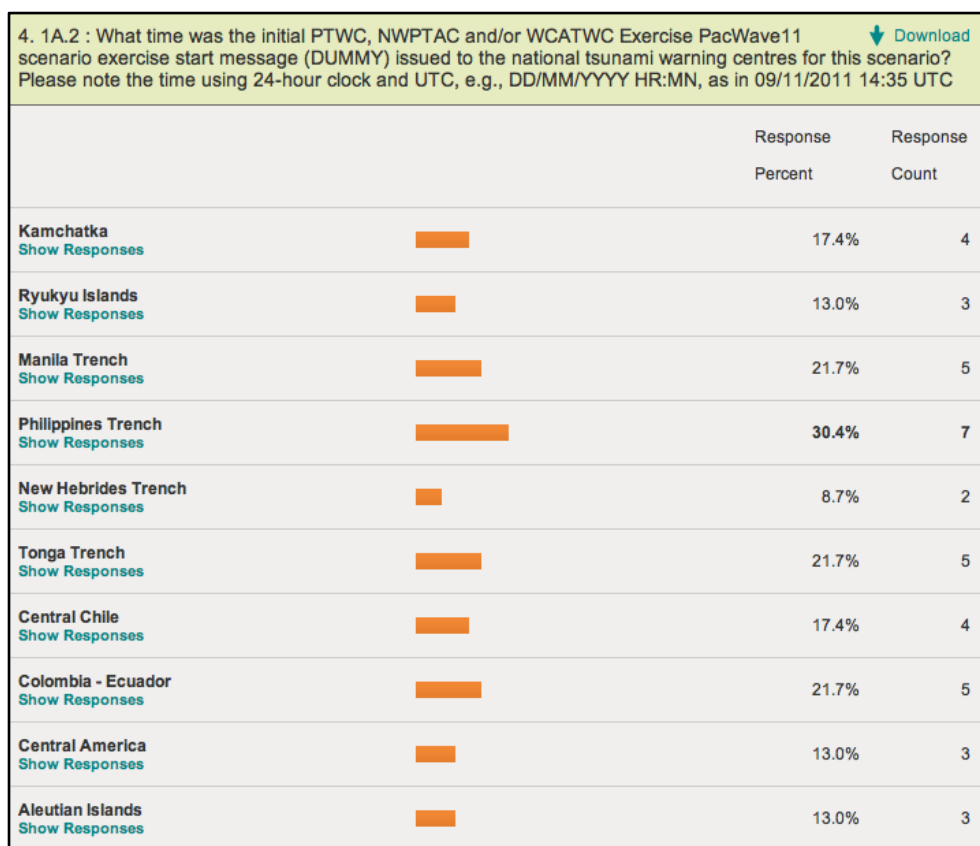


Figure VI-4. Per centage of responses given by the International TWC to Question 1A.2

Scenario	Time of the initial PTWC, NWPTAC and/or WCATWC Execise PacWave11 scenario exercise start message issued to the NTWCs	Number of responses
Kamchatka	09/11/2011 22:08 UTC, and 22:50 UTC	3
Ryukyu Islands	09/11/2011 22:08 UTC and 22:50 UTC	2
Manila Trench	10/11/2011 22:16 UTC and 02:50 UTC	2
Philippines Trench	10/11/2011 00:08 UTC and 00:50 UTC	2
New Hebrides Trench	09/11/2011 22:08 UTC	1
Tonga Trench	09/11/2011 21:08 UTC	1
Central Chile	09/11/2011 13:08 UTC	1
Colombia-Ecuador	09/11/2011 14:08 UTC	1
Central America	09/11/2011 15:08 UTC	1
Aleutian Islands	09/11/2011 18:16 UTC and 18:05 UTC	2

Table VI-1. Summary of time of the initial PTWC, NWPTAC and/or WCATWC Execise PacWave11 scenario exercise start message issued to the NTWCs (Question 1A.2)

Scenario	Time of the initial PTWC, NWPTAC and/or WCATWC Exercise PacWave11 scenario exercise start message issued to the NTWCs
Kamchatka	09/11/2011 22:08 09/11/2011 22:08 UTC 09/11/2011 22:50 UTC 22:08 UTC
Ryukyu Islands	09/11/2011 23.08 09/11/2011 23:08 UTC 09/11/2011 23:50 UTC
Manila Trench	10/11/2011 02:16 UTC 02:10 UTC 10/11/2011 02:50 UTC 02:12 UT We didn't receive any start message as we expected around 02:00 UTC 10/10/2011 00:08 UTC
Philippines Trench	1017 Yap Time 10/11/2011 00.08 10/11/2011 00:08 UTC On 11/10/2011 the initial NWPTAC Exercise PacWave11 scenario exercise start message issued to the Vietnam Earthquake Information and Tsunami Warning Centre at 2:10 UTC 10/11/2011 00:50 UTC 09/11/11 1308z (Received it around 1311z) November 10, 2011, at 11:35am Pohnpei Time
New Hebrides Trench	09/11/2011 22:08 UTC 2208Z 09 NOV 2011
Tonga Trench	09/11/2011 21:08 09/11/2011 21:08 UTC 20.08 UTC Nov 9 2011 2108 UTC 09/11/2011 22:09 UTC (Fiji daylight saving-1 hr ahead)
Central Chile	9/11/2011 13:08 09/11/2011 13:08 UTC 09/11/2011 13:09 UTC At 13:08 UTC
Colombia-Ecuador	09/11/2011 14:08

Scenario	Time of the initial PTWC, NWPTAC and/or WCATWC Exercise PacWave11 scenario exercise start message issued to the NTWCs
	09/11/2011 14:08 UTC 14:05 09/11/11 14:08 UTC 14:08 UTC (ECUADOR SCENARIO)
Central America	09/11/2011 15:08 09/11/2011 15:08 UTC 09/11/2011 15:14
Aleutian Islands	09/11/2011 18:16 UTC 18:18 UTC 09/11/2012 18:05 UTC

Table VI-2. Raw data–Time of the initial PTWC, NWPTAC and/or WCATWC Exercise PacWave11 scenario exercise start message issued to the NTWCs (Question 1A.2)

1A.3 Initial PTWC, NWPTAC and/or WCATWC Exercise Pacific Wave 11 scenario exercise start message was sent to national tsunami warning centres by the following methods. Please tick all methods that apply. Note other methods in Comments section.

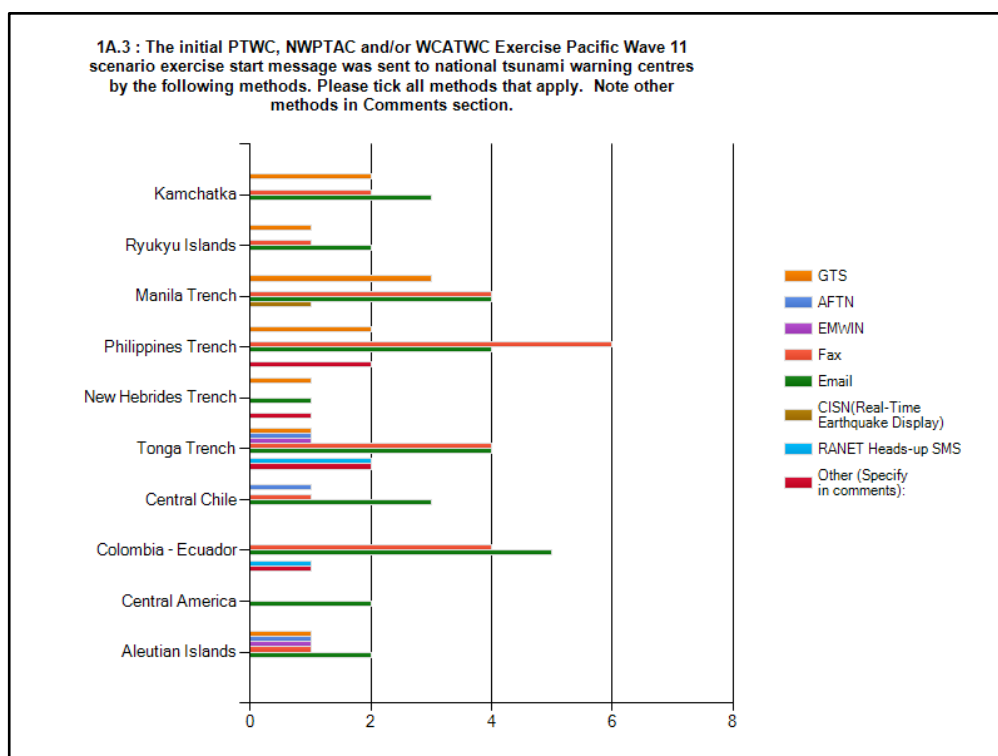


Figure VI-5. Responses to Question 1A.3 by scenario

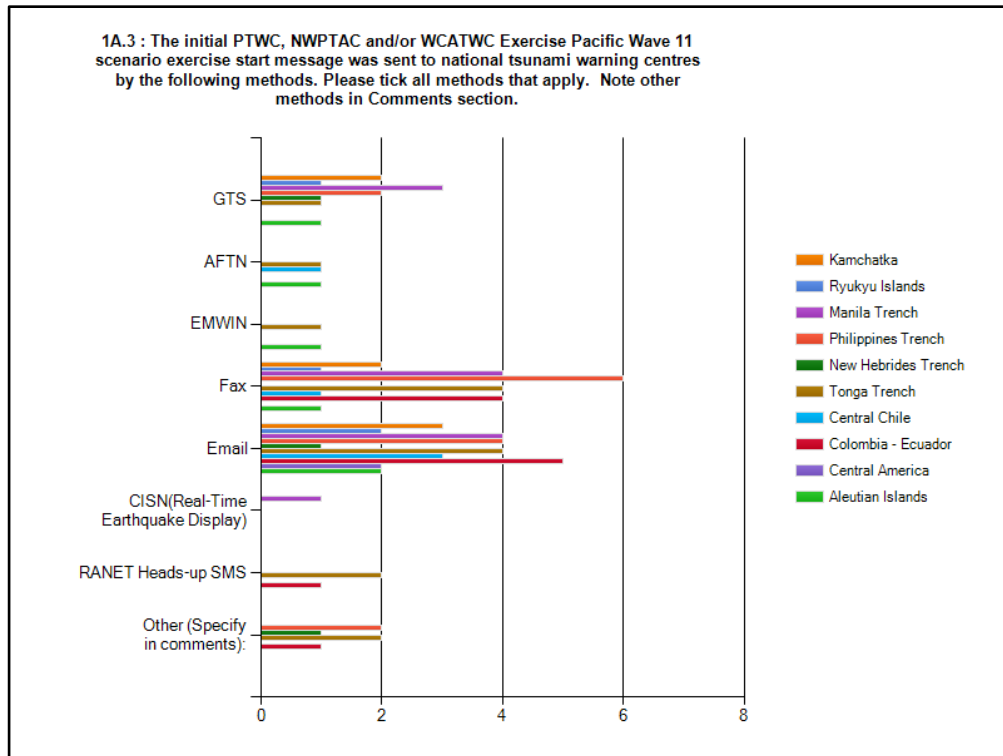


Figure VI-6. Responses to Question 1A.3 by methods

- Was sent to DCO from Yap WSO by fax and verified via phone.
- Note that times in 4 1A.32 are issue times by PTWC.
- Facsimile messages from PTWC never been received at Vietnam Earthquake Information and Tsunami Warning Centre up to now. Maybe it is due to the wrong facsimile number? The Fax number of Vietnam Earthquake Information and Tsunami Warning Centre is (84-4) 37914593. Email address of the TWFP is now changes to phuong.dongdat@gmail.com Please check and update accordingly if needed.
- Fax: 18:18 UTC Email: 18:17 UTC.
- Telephone, Mobiles, RT.
- We didn't receive any start message as we expected around 02:00 UTC. The first received message was Bulletin1 02:10 by email and 02:14 by fax.
- Fax, Correo electrónico.
- Fax/EAS – handheld 2way radio/NOAA weather radio.
- Start messages were received via EMWIN, Fax and then followed by phone calls to make sure the message reached its proper destination.
- Usually msg received via our EMWIN first but during the exercise our EMWIN system is malfunction. Dummy first msg from PTWC all received via internet connection as schedule.

1A.4. Other international TWC evaluation statements. Please summarize the statement and results. (Response count: 5)

- Received email message with in 1 minute.
- We received only bulletin 1, 2 and 3. Bulletin 4 – final didn't.
- Msg only received from PTWC.
- The statement came through fax and disseminated it right-away to the DCO office and other stakeholders.
- The exercises we had for PacWave 06, 08 and 11 are very very good exercise for the people who works in the Weather Services and the Emergency Management Personnel in the States and the National Government to test our Disaster Plans and the SOPs. We have not conducted any Tsunami exercise in our country the last three exercises we had, has improved our capabilities on how to get the message out to the communities in a timely manner.

1B.1 The information issued by your country national Tsunami Warning Focal Point was to standard operating procedures.

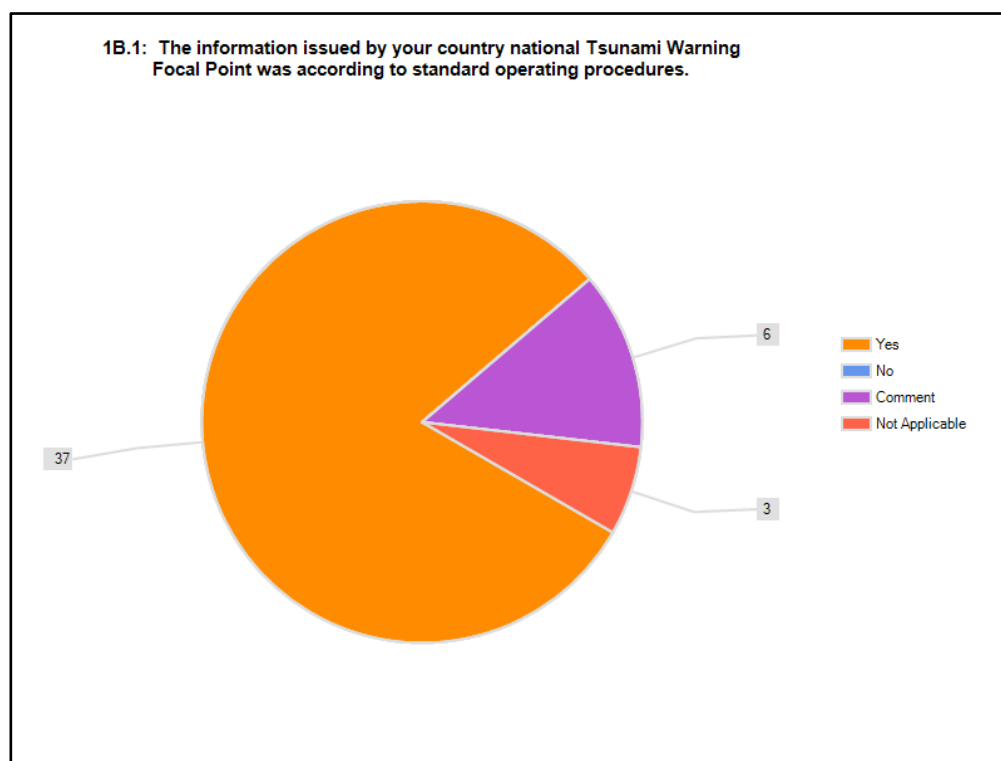


Figure VI-7. Response to Question 1B.1

One of the agencies (Weather Service here in Pohnpei) commented that receiving the bulletin and message is not a problem but getting the bulletin and message to the communities and the states is the problem that they want to improve in the near future by getting the proper communication system that can enable them to reach to the far communities.

- Siguiendo los procedimientos se procedió a emitir Aviso por el sismo y generación de tsunami. Se realizó Informe Especial describiendo las características preliminares del evento e indicando las recomendaciones para ese momento.

- *Following the procedures, Notices for the earthquake and tsunami generation were issued. Special Report was made describing the preliminary characteristics of the event and indicating the recommendations for that moment*
- Se definió que para este ejercicio se evaluaría como medio de notificación únicamente la comunicación vía correo electrónico.
 - *For this exercise, it was determined that only the communication by email would be evaluated as mean of notification. Only a communications test was conducted.*
- Se realizaron coordinaciones con los integrantes del Sistema Nacional de Alerta de Tsunami (Perú): Instituto Nacional de Defensa Civil (INDECI).
 - *Coordination was performed with members of the National Tsunami Warning System (Peru): National Institute of Civil Defense (INDECI).*
- When first received Tsunami, OEEM, Pohnpei & Kosrae State were notified and activated.
- Receiving bulletin and massage from our Weather Service here in Pohnpei is not a problem but getting the bulleting and massage to the communities and the states is the problem that we want to improve in the near future by getting the proper communication system that can enable us to reach to the far communities.
- Yes, this set of questions was only answered by the Ministry of Civil Defence & Emergency Management (MCDEM).
- DO not know because at the moment Fiji's TWFP is the Director MET Office, Nadi. No message received from him during the exercise.

1B.2 The information issued by our national tsunami warning centre was timely

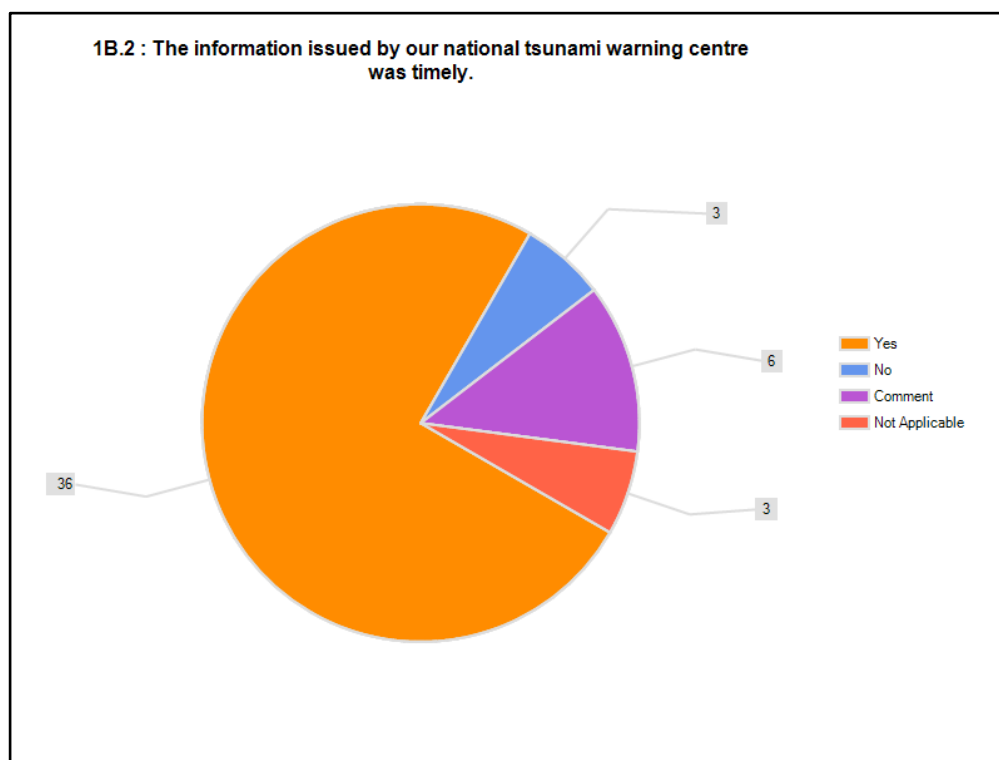


Figure VI-8. Responses to Question 1B.2

Eighty-eight (88%) per cent of respondents indicated the information by their national tsunami warning centre was timely. However, there were a few comments to clarify where this was not the case:

- No se considera oportuna la emisión de los boletines 2, 4 y 5 por parte del centro nacional de alerta contra los tsunamis, ya que al utilizar el modelo de simulación numérica TIME se observó menor tiempo de arribo a las costas nacionales con respecto al reporte del PTWC, el cual fue avalado por el C Dr Modesto Ortiz Figueroa, Investigador Titular del Departamento de Oceanografía Física del CICESE.
 - *The issue of bulletins is not considered timely by the national tsunami warning centre, since by using the numerical simulation model TIME, less arrival time was observed to national coasts with regard to the PTWC report, which was endorsed by Dr Modesto Ortiz Figueroa, Full Researcher of CICESE Physical Oceanography Department.*
- Only a communications test was conducted.
- El Centro Nacional de Alerta emitió su Informe Especial basado en el boletín recibido por el PTWC indicando las recomendaciones adecuadas.
 - *The National Warning Centre issued its Special Report based on the bulletin received by PTWC indicating the proper recommendations.*
- Only the first two bulletins were not ready at the scheduled time (Guatemala).
- It takes about 8 minutes in preparation & dissemination of the warning to NDMO after time warning received via internet.
- About 4–5 minutes late.
- I would suggest that you include the Disaster Managers in your contact list when you send notification of Tsunami warning.
- The issuance of some JATWC products was delayed due to liaison between state-based emergency managers and the National Tsunami Warning Centre taking too long. The SOPs give clear guidance on the expected time frames and responsibilities. This issue will be resolved by more training on Warning Centre staff. Just a delay of within 2 minutes as the national centre trying to generate the own context of its warning templates based from the PTWC information.

1B.3 Information issued by our national public-safety, decision-making and dissemination point was timely.

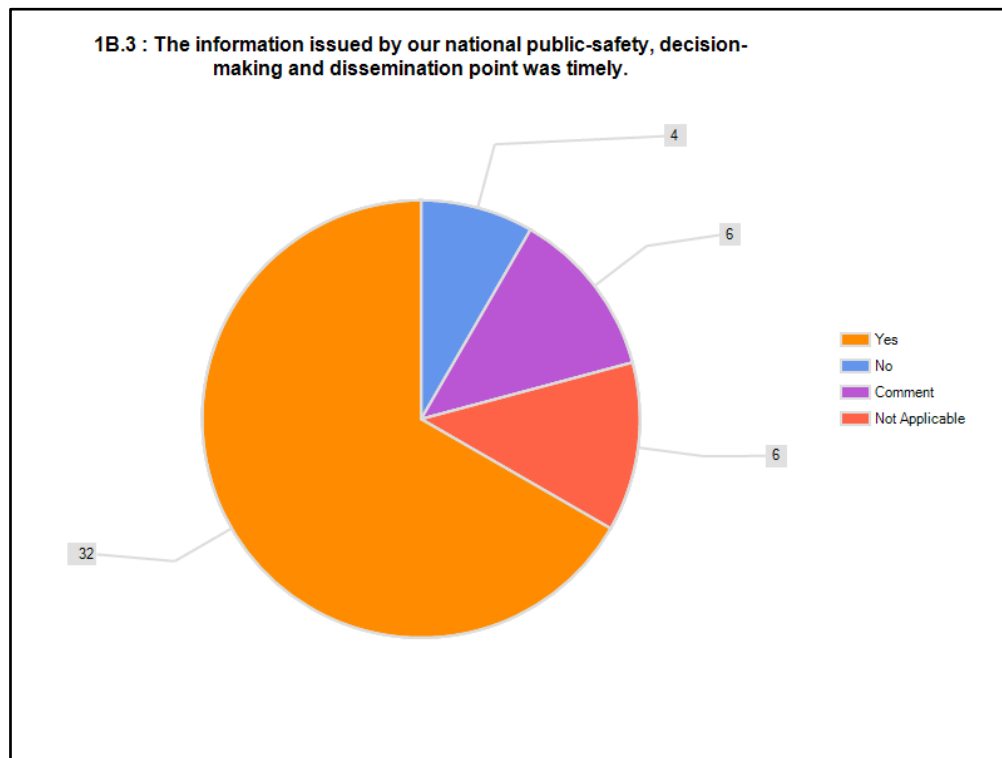


Figure VI-9. Responses to Question 1B.3

Seventy-eight (78%) per cent of respondents indicated yes, the information issued by their national public safety, decision-making and dissemination point was timely. However, one comment is of interest:

One respondent noted that it takes around 30–40minutes for all National Disaster Committee (NDC) to meet up at National Coordination Centre (NCC) for decision making and public safety.

- The exercise focused primarily between the WSO and the NEMCO test existing operating procedures, communications linkage, equipments, and personnel training. Information issued between the WSO and the NEMCO were timely.
- Only a communications test was conducted.
- Se activaron los planes de operaciones de emergencia nacional
 - National emergency operations plans were activated.
- Telephone consultations between the WSO and WSFO Guam were carried prior and after the exercise.
- It takes around 30-40 mins for all National Disaster Committee(NDC) to meet up at National Coordination Centre (NCC) for decision making & public safety.
- Once information received, emergency management were activated.
- We received all notification directly from the Weather Services Office and my Office notify the President and the States Disaster Coordinators and they are responsible to disseminate the information to the people into the communities.

- As soon as the message comes out from the national warning centre, the information is channelled out to all key agencies in an effective, timely approach.

1B.4 Is the national public-safety, decision-making and dissemination point different to the national tsunami warning centre?

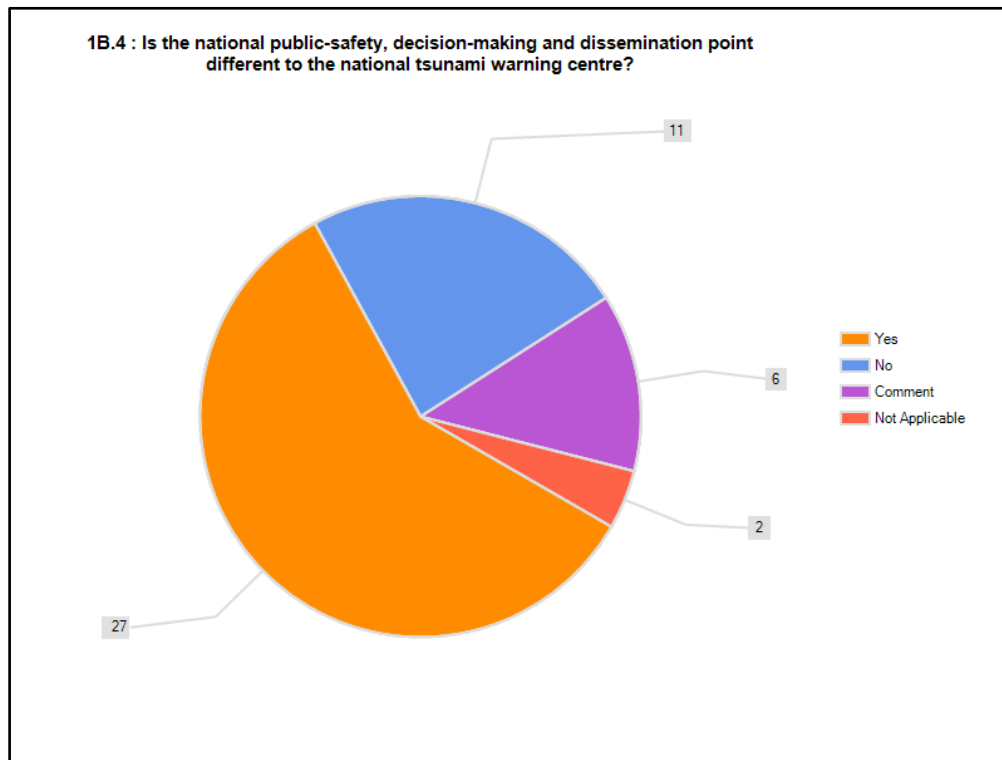


Figure VI-10. Responses to Question 1B.4

Nearly two thirds (66%) of respondents indicated that the national public safety, decision-making and dissemination point is different to the national tsunami warning centre.

- WSO (Weather Service Office) Majuro is the TWFP NEMCO (National Emergency Management Coordination Office) is responsible for public-safety and dissemination point. Some limited decision-making also. NDC (National Disaster Committee) is primarily tasked with the decision-making.
- Panamá no tiene un centro nacional de alerta de tsunamis. Panamá tiene varias instituciones que actúan como punto focal. El instituto de Geociencias está realizando gestiones para proponerse como Centro Nacional de Alerta contra los Tsunamis (NTWC).
 - *Panama does not have a national tsunami warning center. Panama has several focal point Institutions. The Geoscience Institute is making arrangements to promote itself as National Tsunami Warning Center (NTWC).*
- El centro nacional (DHN) es el encargado oficial de emitir la alerta al INDECI, quien cumple el papel de la difusión o diseminación de la alerta.
 - *The national center (DHN) is the official responsible for issuing the Warning to INDECI, that plays the role of disseminating the Warning.*
- El Servicio Oceanográfico es el responsable del Centro Nacional de Tsunamis. Protección Civil es la responsable de la toma de decisiones, la difusión y la seguridad pública.

- *The Oceanographic Service is responsible for the Tsunami National Centre. Civil Protection is responsible for decision-making, dissemination and public-safety.*
- The RMI NDMO runs under the RMI Office of the Chief Secretary.
- The NDC will further analysis the information received from warning centre.
- But decisions were based on the information issued by tsunami warning centre.
- We follow exactly what the information received from the tsunami warning centre.
- NZ MCDEM is the national public-safety, decision-making and dissemination point and the national tsunami warning centre.
- Dependent to the analysis, verification from the national warning centre.

1B.5 Initial PTWC, NWPTAC and/or WCATWC PacWave11 scenario exercise start message was received by our country TWFP.

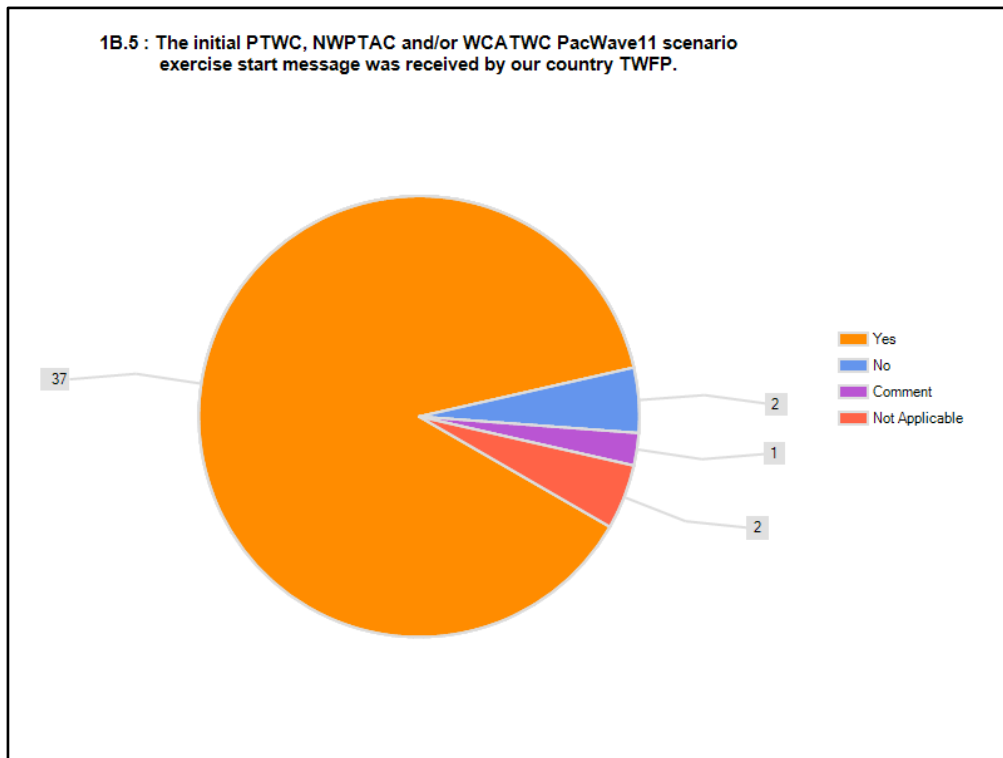


Figure VI-11. Responses to Question 1B.5

Ninety (90%) per cent of respondents indicated that the intial scenario exercise start message was received by the country TWFP.

1B.6 What time was the initial PTWC, NWPTAC and/or WCATWC PacWave11 scenario exercise start message received by your TWFP? Please indicate the time from each international TWC. Please note time using 24 hour clock and UTC, e.g., 14:35 UTC.

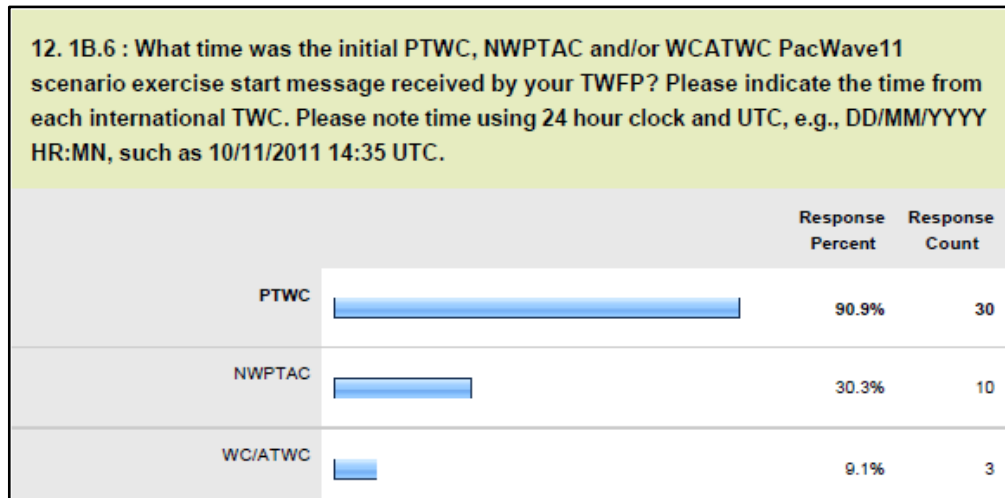


Figure VI-12. Responses to Question 1B.6

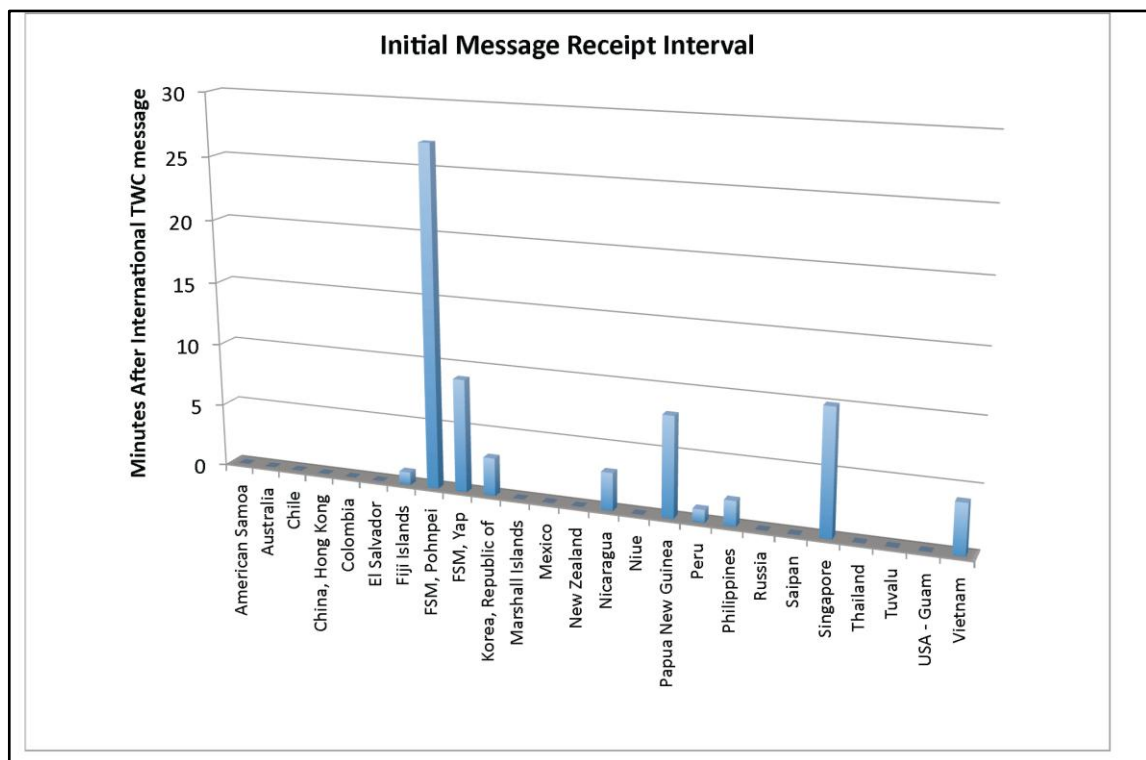


Figure VI-13. Initial Message Receipt Interval

The average time interval of initial message receipt by the TWFP from the international TWC was 2.7 minutes.

Summary of Time Issues

There were a number of apparent problems in the time entry data received. Time was requested by questions 1A.2, 1B.6, 1B.8, 3C.3, 3D.6, and 3E.2. Thirteen entries (countries/agencies) had specific timing issues, whereas 25 entries yielded consistent times.

For instance, many countries (20) entered their 1B.6 time also into 1A.2, indicating confusion. Two countries possibly entered times for a different scenario (Fiji and Solomon Islands). Ten countries entered possibly a causal times (Brunei, China, Cook Islands, Ecuador, Indonesia, Malaysia, Panama, Solomon Islands, Tonga, Vanuatu). Three countries reported times with respect to NWPTAC for a scenario where no 1A.2 time for NWPTAC was given (Guatemala, French Polynesia, Nicaragua). Inconsistent times were reported for one Federated States of Micronesia (FSM) entry (Original data set). No times were reported from Samoa and FSM Chuuk. Additional, it is noted that Saipan, American Samoa, and Guam each give a 3C.3 time [message sent to other agencies] earlier than the corresponding 1B.8 [message sent to primary national agency]. Finally the difficulties for interpreting time were noted by one FSM entry: "Information provided was understood, except some don't understand time between UTC and Local..."

ITWCs	Time of the initial PacWave11 scenario start message received
PTWC	<ul style="list-style-type: none"> • 1017 Yap Time • 21:08 EMAIL, 21:09 EMWIN • 13:30 UTC • 08:10 PST (00:10 UTC) • 09/11/2011 13:08 • 2108UTC • 10/10/2011 00:08 UTC • PTWC - 15:08 UTC • 0210 utc from PTWC • The messages were received within 10 minutes of the initial warning from international tsunami centres • 02:16 UTC • 14:05 • 07:11 local time (02:11 UTC) • 09/11/2011 13:09 UTC • 09/11/11 14:08 UTC • PTWC - 09/11/2011 21:08 • 20.08 UTC 9 Nov 2011 • TWFP received the scenario start message from PTWC @ 00:00 UTC • 02:12 UTC • 14:11 UTC (ECUADOR SCENARIO) • PTWC : 02:16 UTC • 22:08 UTC • 10/10/2012 00:08 UTC

ITWCs	Time of the initial PacWave11 scenario start message received
	<ul style="list-style-type: none"> • 2108 UTC • 0008 UTC • 13:08 UTC • PTWC: 22:00 UTC • 10/10/2011 00:08 • 2208Z 09 NOV 2011 • 10/11/12, 0425Z- POHNPEI, 10/11/12 0454/Z-KOSRAE • 0035 Zulu (Time Pohnpei) • 09/11/2011 22:08 UTC • PTWC bulletin received at 2208 UTC (1109NZDT) • 09/11/2011 22:09 UTC (Received via SMS message personal mobile) • 10/10/2011 0008 UTC
NWPTAC	<ul style="list-style-type: none"> • Only facsimile message from NWPTAC received at NTWC at 2:14 UTC. • The messages were received within 10 minutes of the initial warning from international tsunami centres • 02:16 UTC • 23:08 UTC • NWPTAC @ 00:01 UTC respectively • 14:11 UTC (ECUADOR SCENARIO) • NWPTAC : 02:10 UTC • 14:13 UTC via fax and 14:08:49 via e-mail. • 23:00 UTC • N/A
WCATWC	<ul style="list-style-type: none"> • The messages were received within 10 minutes of the initial warning from International Tsunami Centres • didn't receive • N/A

Table VI-3. Responses to Question 1B.6

1B.7 How did the TWFP receive the international message(s)?
Please indicate for each international TWC if they are different.

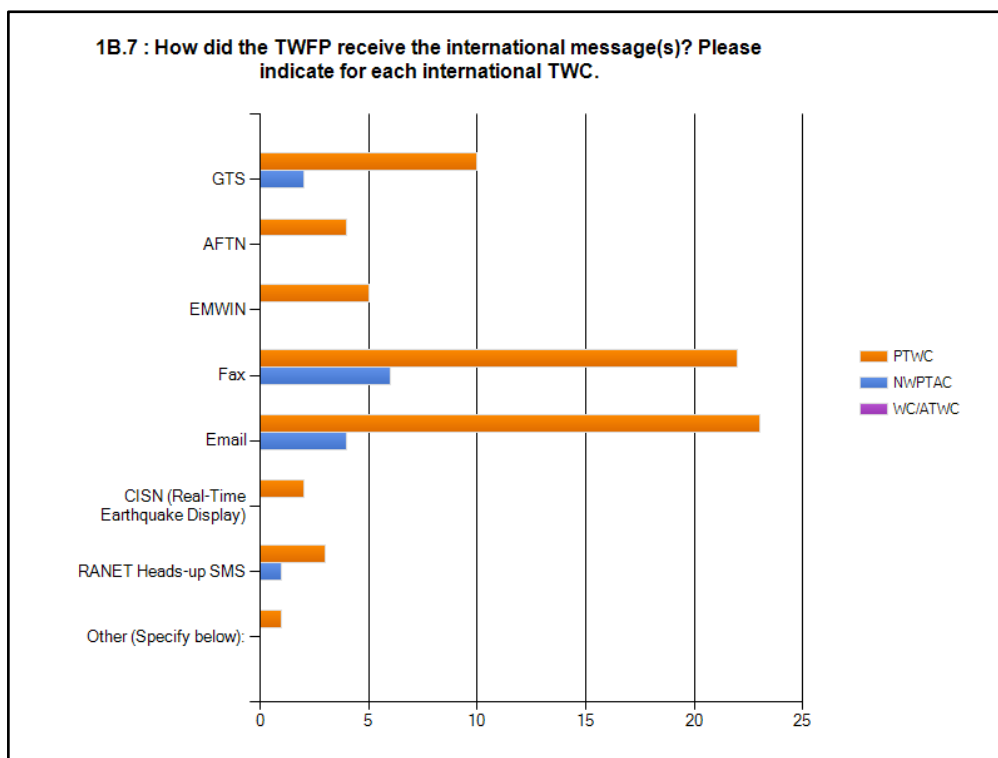


Figure VI-14. Responses to Question 1B.7

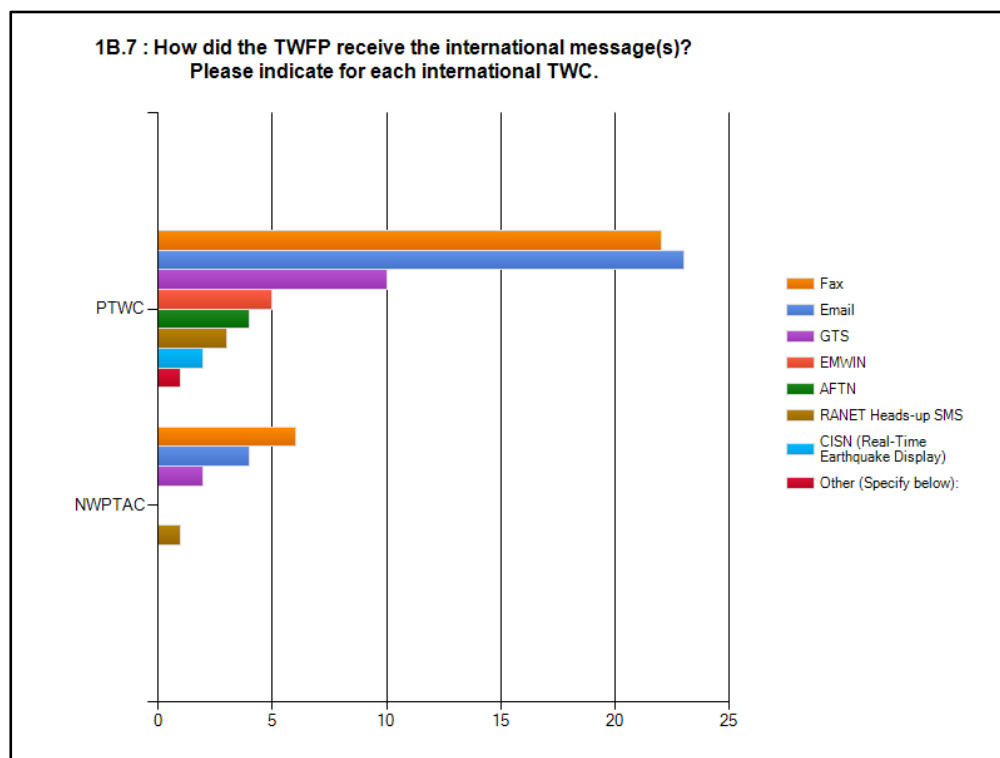


Figure VI-15. Response to to Question 1B.7

Additional methods are listed below:

- Exercise Website. <http://itic.ioc-unesco.org> (now archived to http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1686&Itemid=2331&lang=en)
- Internet with other sites such as the ITIC, PTWC and others.
- Event also presents the opportunity to test the recently fielded Chatty Beetle units (CB) on two outer-islands.
- Fax/2way Radio/NOAA Weather Radios.
- Fax and confirmed by phone to Yap Weather
- Exercise Website. <http://itic.ioc-unesco.org>
- The messages were received within 10 minutes of the initial warning from International Tsunami Centres
- Did not specify who they received message from.
- TWFP received the messages through email and by fax. One of Provincial Disaster Management Office which operated EMWIN system reported receiving test messages as well but for different scenarios and was advised accordingly.
- Fax
- PTWC, NWPTAC? GTS, FAX, E-MAIL
- Rcv'd Tsunami from PTWC by Emwin, Fax and Telephone call from Guam Forecast Office
- (TWFP- NWS/WFO-Guam) In addition–AWIPS

1B.8 If the national public-safety, decision-making and dissemination point is different to the country/national TWFP, what time did the national public-safety, decision-making and dissemination point receive the information? Please indicate the time from each international TWC. Please note the time using 24 hour clock and UTC, e.g., 14:35 UTC.

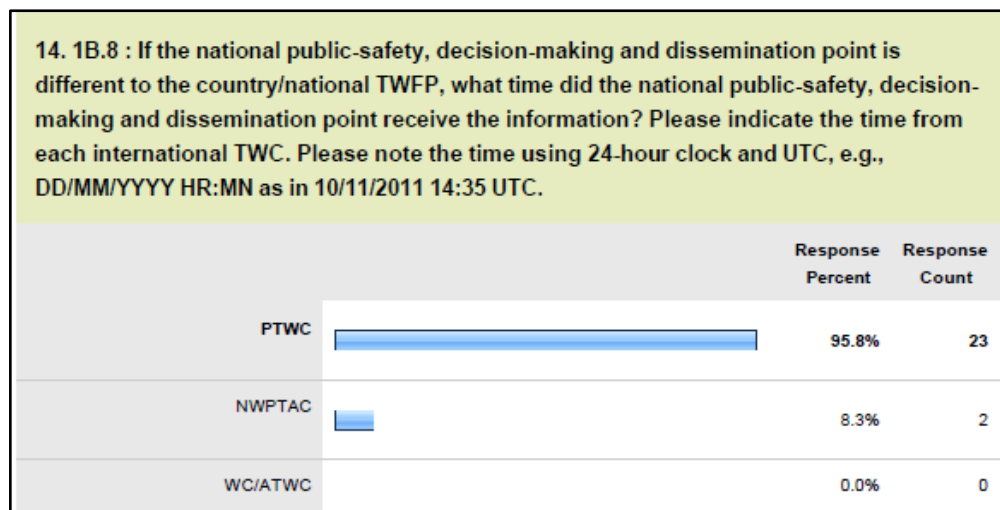


Figure VI-16. Per centages of the responses to Question 1B.8

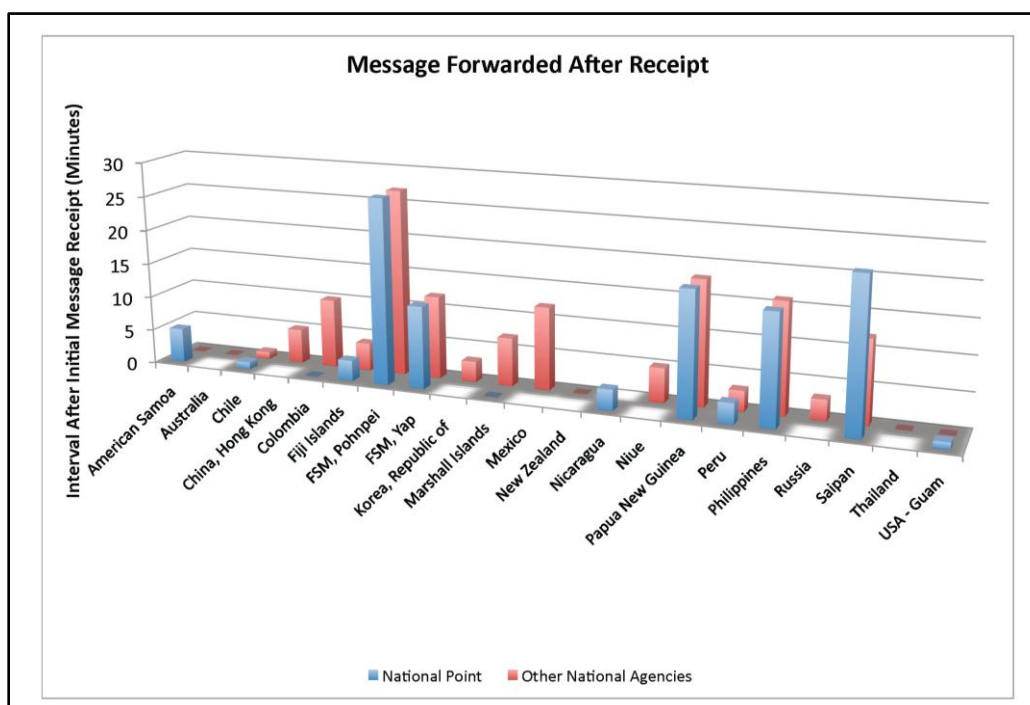


Figure VI-17. Message forwarded after receipt

The average time interval from receipt the initial message at the Tsunami Warning Focal Point to its receipt by the national public-safety, decision-making and dissemination point was 8.5 minutes, and the median time was 3 minutes. This plot also shows the time to forward the message to other national agencies (3C.3).

As with 1B.6 and questions where time was requested, there appeared to be some confusion on what was being asked for resulting in inconsistent answers. As a result, some entries could not be included.

ITWCs	Time when the national public-safety, decision-making and dissemination point received the information
PTWC	<ul style="list-style-type: none"> • 10/10/2011 00:08 UTC. • X 11/11/12 –Bulletin time difference by 3–5 minutes. • 1020 Yap Time. • 21:07 UTC. • The Office of Civil Defense (OCD) received PHIVOLCS Tsunami Bulletin 1 at 00:24 UTC. • Refer to summary of our exercise as we use different time for the exercise in Samoa. • 02:15 UTC. • 14:10 • El Punto nacional de toma de decisiones, difusión y seguridad pública es el SINAPROC??? • 09/11/2011 13:11 UTC • PTWC–El Punto Nacional no recibe información directa del PTWC pues no existe personal adecuado dentro de la SINAPROC??? • PTWC –09/11:2011 21:08 • 20.09 UTC • 1B.8 The message was sent from TWFP @ 00:18 UTC, to the PNG National Disaster Centre (emergency services). • We didn't do this exercise. • 14:11 UTC (ECUADOR SCENARIO). • 2113 UTC • 0030 UTC, some machanical problem (fax machine). • 13:09 UTC • 22:20 UTC • N/A • 0035 Zulu Time (Pohnpei FSM). • N/A–Emergency services receive JATWC warnings. • 09/11/2011 22:11 UTC • 10/10/2011 0009 UTC
NWPTAC	<ul style="list-style-type: none"> • 14:11 UTC (ECUADOR SCENARIO) • 15.08 UTC <p><u>Note:</u> NWPTAC did not particpate in Ecuador scenario</p>
WCATWC	No comments

Table VI-4. Responses to Question 1B.8

1B.9 How did the national public safety decision-making and dissemination point receive the international message(s)? Please indicate for each international TWC if they are different. Please tick all methods that apply:

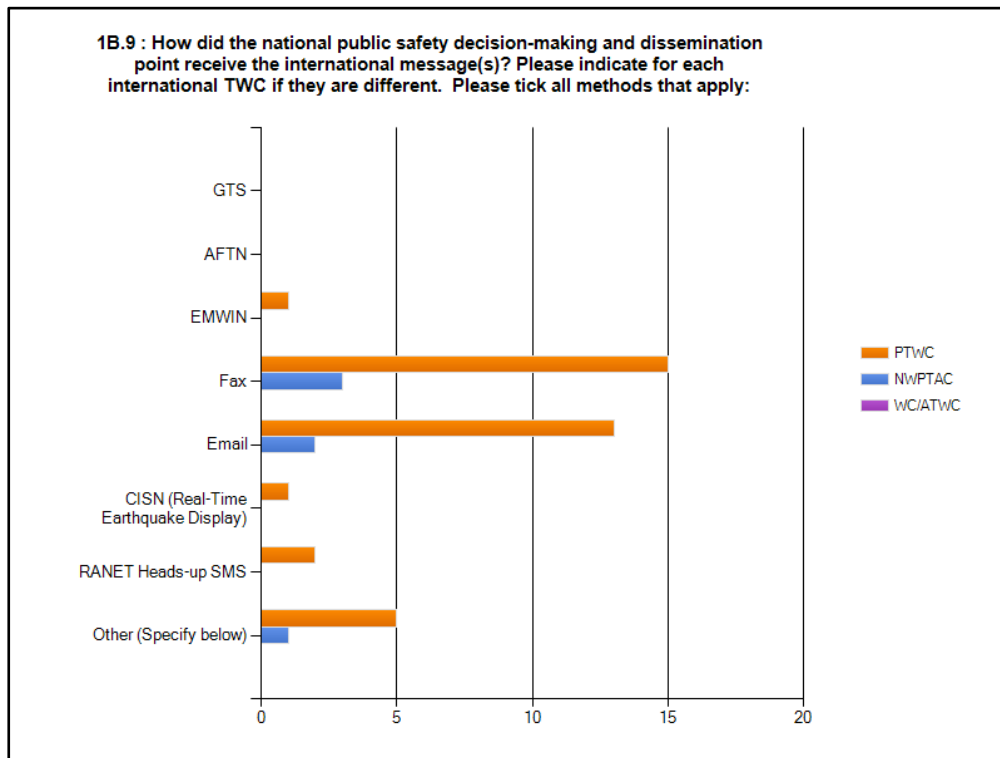


Figure VI-18. Responses to Question 1B.9

Additional methods and comments included:

- The public-safety, decision-making and dissemination point of Hong Kong, China did not receive the international messages. They received the warning messages and other relevant information issued by the local TWC, which has taken into account the information provided in the international messages through our TWFP.
- Teléfono RDSI (Red Digital de Servicio Integrado), Teléfono satelital IRIDIUM, Radio comunicación HF.
 - ISDN (Integrated Service Digital Network) Telephone, IRIDIUM satellite telephone, HF communication radio.
- Local phones and mobiles.
- VHF (radio).

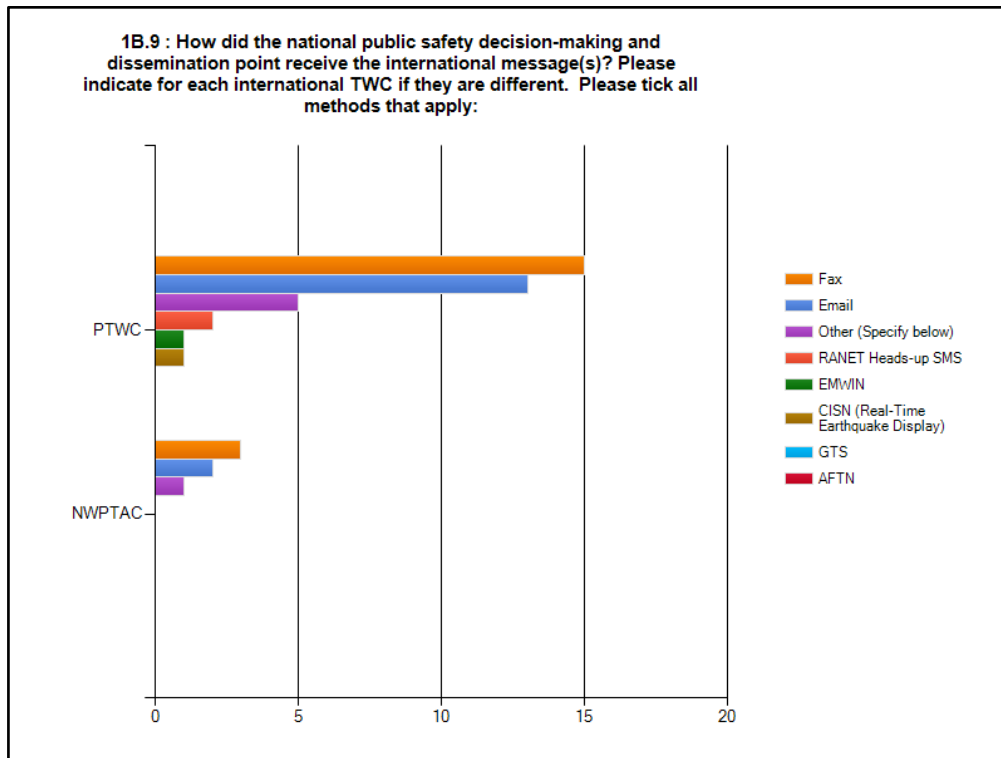


Figure VI-17. Responses to Question 1B.9

Additional methods and comments included:

- The public-safety, decision-making and dissemination point of Hong Kong, China did not receive the international messages. They received the warning messages and other relevant information issued by the local TWC, which has taken into account the information provided in the international messages through our TWFP.
- Teléfono RDSI (Red Digital de Servicio Integrado), Teléfono satelital IRIDIUM, Radio comunicación HF.
 - ISDN (Integrated Service Digital Network) Telephone, IRIDIUM satellite telephone, HF communication radio.
- Local phones and mobiles.
- VHF(radio).
- Telephone, Cellular, and VHF Radio was the primary means of communication.
- 31/5/2012 8:25 AMView Responses.
- The Office of Civil Defense is not a direct recipient of ITWC messages.
- The WSO faxed and emailed the information to NEMCO. Follow-up phone calls were also made by the WSO to confirmed reception of information.
- Ning bo Maritime Bureau.
- 14:11 UTC (ECUADOR NWPTAC:Fax, Correo– PTWC: fax, correo electrónico y vía telefónica –SCENARIO) electrónico y vía telefónica WCATWC:
 - PTWC: Fax, email and–14:11 UTC (ECUADOR SCENARIO) NWPTAC: fax, email and via telephone–via telephone WCATWC:
- INTERNET LINKS.

- VHF (radio), fax, e-mail send from NTWC.
- The WSO received and transmit to EMO via fax and confirmation phone call.
- Message was disseminate via telephones and mobiles to all members gather in NCC for special meeting/decision making.
- Australian state-based emergency services organisations receive warnings via JATWC not PTWC.
- Normally via email, phone and fax but Fiji had a tabletop exercise during the PACWAVE11 Exercise.
- Telephone

1B.10 Were there any problems with the receipt of initial PTWC, NWPTAC and/or WCATWC Exercise PacWave11 scenario exercise start message(s)?

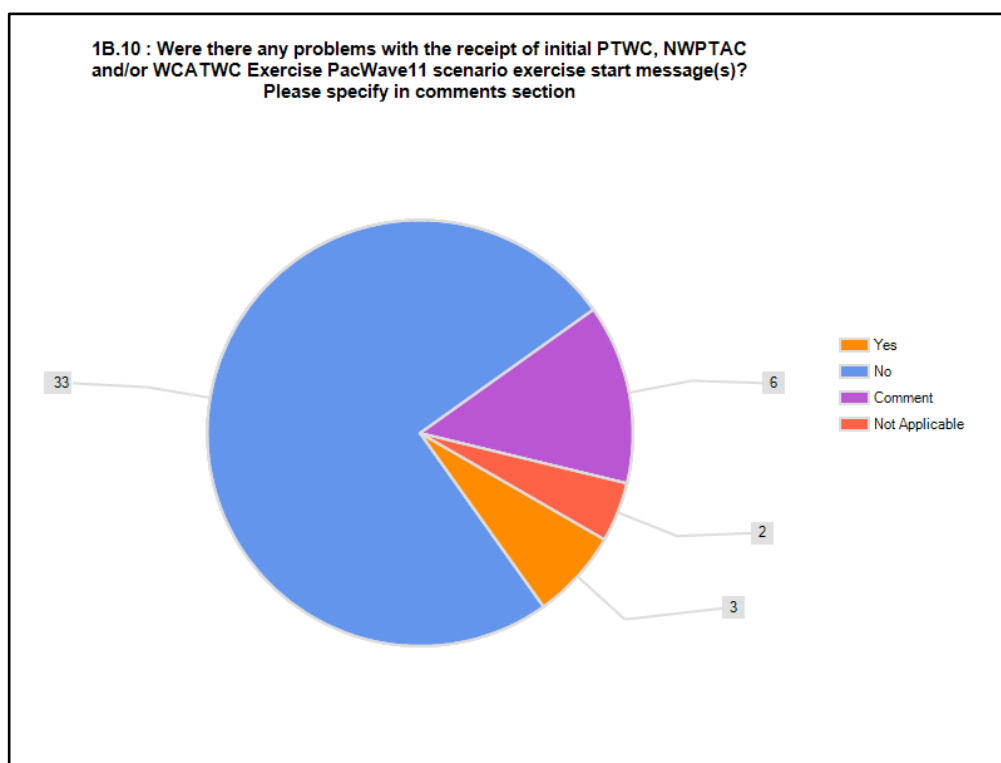


Figure VI-19. Responses to Question 1B.10

Eighty-seven (87%) per cent of respondents had no problems with the receipt of initial exercise start messages.

- WE SEND WARNING ON THE SAME FAX WHICH WE ALSO USE TO RECEIVE AND MIGHT BE THE REASON WHY WE DID NOT RECEIVED ANY FAX FROM PTWC.
- The initial and subsequence messages were received and transmitted to the NEMCO.
- The Samoa scenario is based on PACWAVE11 approved tsunami source. An earthquake with a magnitude of 9 on the Richter scale occurring at the Tongan Trench but the time was changed to 4:00pm on the 9th of November 2011 based on recommendation and changes by the event planning team.

- Para el IGC no hubo problemas la recepcion de los mensajes por fax.
 - There were no problems with the receipt of fax messages for IGC.
- Other than the very minor issue of the first bulletin labeled as? Test?, there were no problems. All bulletins were received in a timely manner.
- NWPTAC start message was received at 23:00 UTC (but was issued at 22:10 UTC).
- Rcv'd by Emwin, Fax & call from Guam Forecast Office
- We have no problem with the messages received.

1B.11 Information provided in the relevant international warning centre messages was understood by the National Tsunami Warning Centre (NTWC)/National Disaster Management Office (NDMO).

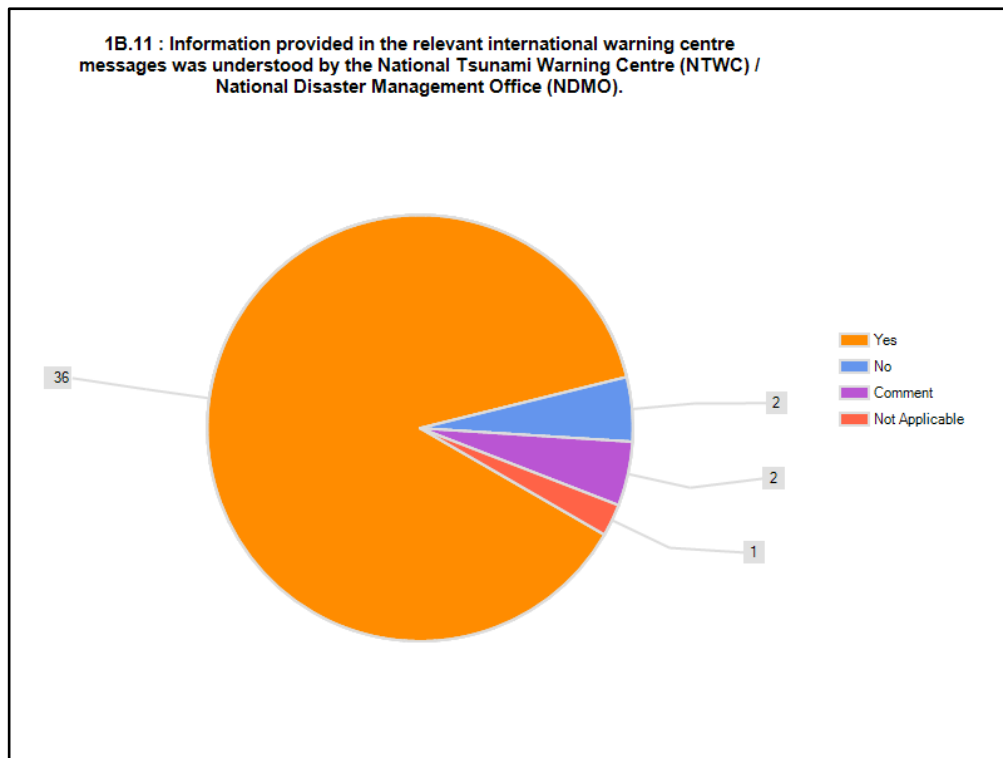


Figure VI-20. Responses to Question 1B.11

Ninety-five (95%) per cent of respondents understood the relevant international warning centre messages.

- In our NTWC we misunderstood that there would be only a bulletin, and we did not understand the paragraph (now so clear) where you refer us to PacWave11 Exercise Manual and to the web site in order to continue with the exercise. This was, we were waiting for the “official bulletin” with the parameters of the earthquake, estimated time of arrivals of the waves, etc.
- JATWC understand PTWC messages, however they are not distributed to emergency services organisations in Australia. Australia has its own tsunami warning system.
- Telephone consultation throughout the event.
- The bulletin text was clear and we have no problem with it.

1B.12 The information provided assisted with decision making, e.g., warning levels, earthquake parameters, estimated arrival times, forecast wave heights, etc.

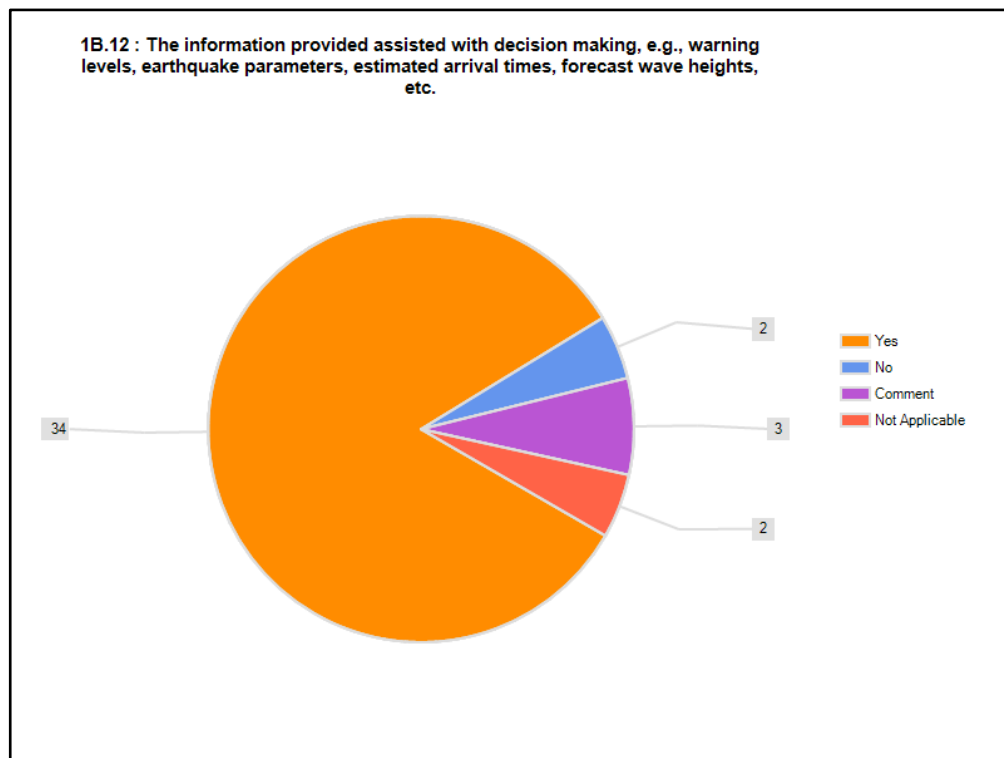


Figure VI-21. Responses to Question 1B.12

Ninety (90%) per cent of respondents indicated the information provided assisted with decision-making (especially the arrival times and wave heights). However one respondent indicated that the scientific terminology was hard to understand.

- Fue de mucha utilidad, sobretodo en los tiempos de arribo y alturas de ola.
 - *It was very useful, mainly in arrival times and wave heights.*
- Yes, definitely with the inclusion of the new tools
- Very helpful to our members of the National Disaster Committee for decision making.

- The warnings contained scientific terminology that was difficult to understand what was being said. Especially in a real-life incident simple and easily understood terminology will be even more critical. Many of the countries that these warnings are going out to do not have English as their first language. English is my first language and I could not understand what you were trying to say in the text of your warnings. I am going to explore whether other products from other sources might be more practical.
- Information provided was understood, except some don't understand time between UTC and Local.
- Very much useful.

1B.13 Information provided was fully utilised by the NTWC/NDMO

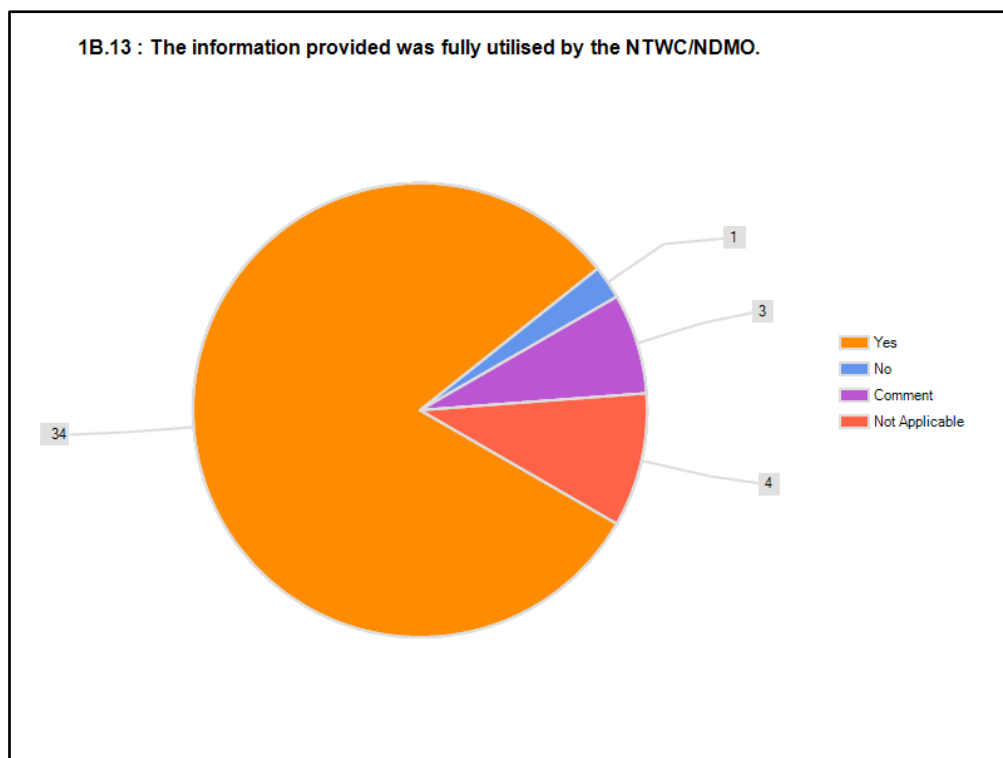


Figure VI-22. Responses to Question 1B.13

Eighty-seven (87%) per cent of respondents indicated that information was fully utilised.

- El Centro de Alerta de Tsunamis utilizó la información proporcionada por el PTWC como guía para elaborar boletines de alertamiento, ya que empleó sus propios modelos para pronosticar los efectos del tsunami de manera local.
 - *The Tsunami Warning Centre used the information provided by the PTWC as guidance to prepare warning bulletins, since it used its own models to forecast locally tsunami effects.*
- Not applicable as a communications test was conducted.
- The WSO put to test the recently installed chatty beetles on two locations in the Marshall Islands, namely Jaluit and Ailanglapalap.
- We utilized our own system without any support from outside.

1B.14 Existing in-country hazard information/local data was utilised

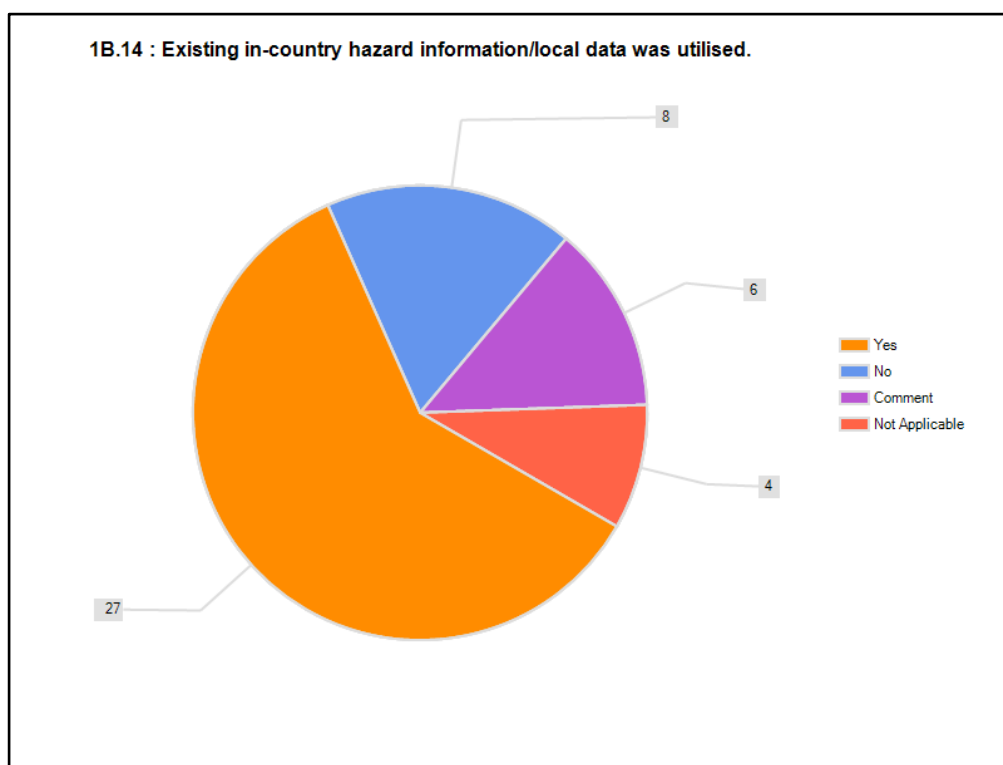


Figure VI-23. Responses to Question 1B.14

Seventy (70%) per cent of respondents indicated existing in-country hazard information was utilised, eg. tide tables and state of the sea, tsunami threat scenarios (with numerical models).

- Not applicable as a communications test was conducted
- Se utilizaron las tablas de mareas y pronósticos del estado del mar a nivel nacional.
 - *Tide tables and state of the sea forecasts were used at national level.*
- Se utilizaron escenarios de amenaza por tsunami que han sido desarrollados con modelación numérica para determinar qué zonas podrían ser inundadas en mayor medida.

- *Tsunami threat scenarios developed with numerical models were used to determine which zones could be inundated to a greater extent.*
- We don't have any tsunami scenarios in Pacific areas.
- Many of the regional Civil Defence Emergency Management Groups have existing hazard information, in addition to information held by GNS Science - this was all used during the exercise.
- GHS/OCD level of participation: EOC Drill, GHS/OCD personnel only.

1B.15 Additional in-country local/regional expert advice was utilised

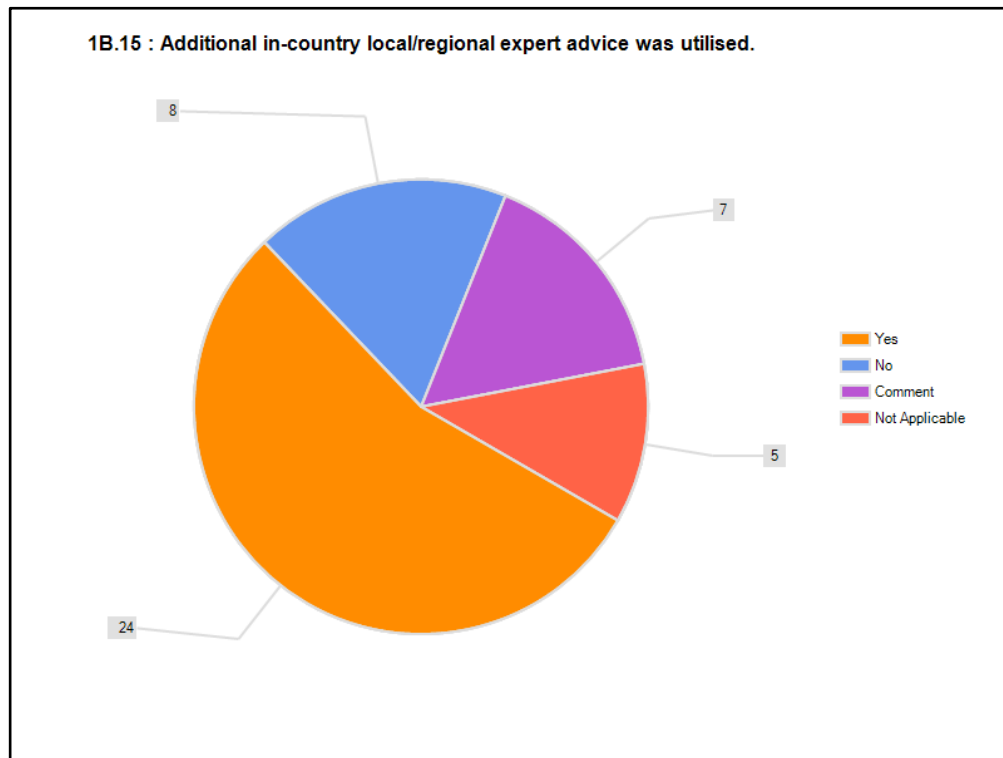


Figure VI-24. Responses to Question 1B.15

Sixty-three (63%) per cent of respondents used additional in-country local/regional expert advice.

- Bureau of Coast and Geodetic Survey (BCGS) of the National Mapping Resource Information Authority (NAMRIA).
- Consultation calls between the WSO and WFO Guam prior, during and after the exercise. WFO Guam's Warning Coordination Meteorologist (WCM) Chip Guard was very available throughout the exercise to assist.
- Not applicable as a communications test was conducted.
- Modelos numéricos, creados en nuestro Centro Nacional de Alerta de Tsunamis y las cartas de inundación por tsunami.
 - *Numerical models created in our National Tsunami Warning Center and tsunami inundation charts.*
- Yes (during the exercise).
- WSFO Guam (WCM Chip Guards).

- NWS WFO
- Worked with WCM Guam and other Micronesian stations.
- We utilized our own system in disseminate the bulletin.
- The Tsunami Experts Panel (GNS Science and other university experts) provided input into the exercise scenario/response.

1B.16 If you answered yes to Q1B.15, what agency or agencies did you consult?
(Response count: 16)

The following people and/or agencies were consulted:

- Niue Met
- Vietnam National Hydro-Meteorological Service.
- NOAA NWS
- Se consultó al Centro de Investigación Científica y de Educación Superior de Ensenada, Baja California (México).
 - *The Ensenada Center for Scientific Research and Higher Education, Baja California, Mexico.*
- Se utilizó información ya procesada que se realio junto al Instituto de Hidráulica Ambiental de Cantabria, España
 - *Information already processed was used that was gathered with the Institute of Environmental Hydraulics of Cantabria, Spain.*
- Instituto de Hidráulica Ambiental de Cantabria (España)
 - *Institute of Environmental Hydraulics of Cantabria, Spain.*
- Bases de datos con información histórica como las bases de la NOAA y HTDB.
 - *Databases with historical information such as NOAA and HTDB databases.*
- New Zealand Ministry of Civil Defence and Emergency Management (MCDEM) – Mr Keith Evans was in Rarotonga for Pacific Wave 11 Exercise. He assisted in the set-up and response to PacWave11.
- Yuzhno-Sakhalinsk Seismological Station.
- NWS.
- Collaboration between NOAA and ASDHS-TEMCO.
- Governor's office Agriculture Department Chuuk Public Utility Corporation Education Department.
- SHOA received the seismic parameters from Chilean seismological service 4 minutes after the earthquake (13:04 UTC).
- Mr Chip Guard, Guam Forecast Office, Hagemeyer Tsunami Center–Dr Laura Kong.
- The Tsunami Experts Panel (GNS Science and other university experts) provided input into the exercise scenario/response.
- Yap DCO, Yap Weather, Guam Weather, National DCO.
- Tonga Acting Chief Seismologist, Geological Department.

- Bureau of Coast and Geodetic Survey (BCGS) of the National Mapping Resource Information Authority (NAMRIA) referred to the Exercise Manual and provided local wave height values from their tide gauge stations in Eastern Philippines.
- Hydrographic Department.
- We use the Tidetools to assess the sea level data change and consult experts from Vietnam National Hydro-Meteorological Service.

1B.17 Other country evaluation statements. Please summarize the statement and results. (Response count: 6)

- Se presentó un problema entre el nivel de NTWC hacia la NDMO. Los mensajes enviados vía correo electrónico no fueron recibidos en la NDMO porque, a pesar de la coordinación del día anterior, los medios de comunicación entre ambas instituciones no eran correctos, el mismo que fue resuelto luego de confirmación de direcciones correctas con directivos del NDMO, esto tuvo un retraso de aproximadamente 10 minutos, tiempo perdido muy valioso, tomando en consideración el escenario propuesto para el ejercicio. Se consultó bibliografía desarrollada por el INOCAR que junto a la proporcionada por los coordinadores internacionales permitieron mejorar la evaluación local de alturas y tiempos estimados, elaborando localmente un mapa para manejo de información.
 - *Between levels NTWC towards the NDMO a problem appeared. Messages sent by email were not received by the NDMO, because, despite coordination the day before, means of communication between both institutions were not correct. This was solved after the right addresses were confirmed with NDMO staff members, with approximately 10 minutes delay, losing very valuable time, considering the scenario suggested for the exercise. It was consulted bibliography developed by INOCAR that along with the one provided by international coordinators, allowed the improvement of local heights and estimated time assessment, preparing at local level a map for information management.*
- At first our organisation was not sure if this was in fact the start of the exercise or some initial network test that we were not aware of. We use the term 'EXERCISE' leading into PacWave11 and when it (PacWave11) starts the term 'TEST' is used in the simulated bulletins. Our response was put on hold until we confirmed with the Exercise Director that this was in fact the start of PacWave11. A very valid comment - this was clarified with Laura after PacWave11. The term TEST is and will continue to be used in PTWC exercises. The phrase Exercise, Exercise, Exercise is used in the Cook Islands in any national or large scale simulated exercise message and in future Pac Wave Exercises, this phrase will be added to the simulated bulletin by the first receiver before the simulated message is further disseminated. The Exercise, Exercise, Exercise standard will be maintained in the Cook Islands. THIS IS A TEST MESSAGE. Exercise, Exercise, Exercise AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS ORIGIN TIME - 2000Z 09 NOV 2011 COORDINATES - 23.6 SOUTH 175.5 WEST DEPTH - 20 KM LOCATION - TONGA ISLANDS REGION MAGNITUDE - 9.0
- In PNG, the national public-safety, decision-making and dissemination point is different to the country/national TWFP. What time did the national public-safety, decision-making and dissemination point receive the information. Please indicate the time from each international TWC. Please note the time using 24 hour clock and UTC, e.g., 14:35 UTC.
- Basic text products did not include "forecast wave heights" and the experimental products had no "arrival times".

- Decision making from Emergency Management depend on advise from WSO Pohnpei, Guam Forecast Office, Tsunami Warning Center.

2A.1 The information contained in the experimental products is understandable

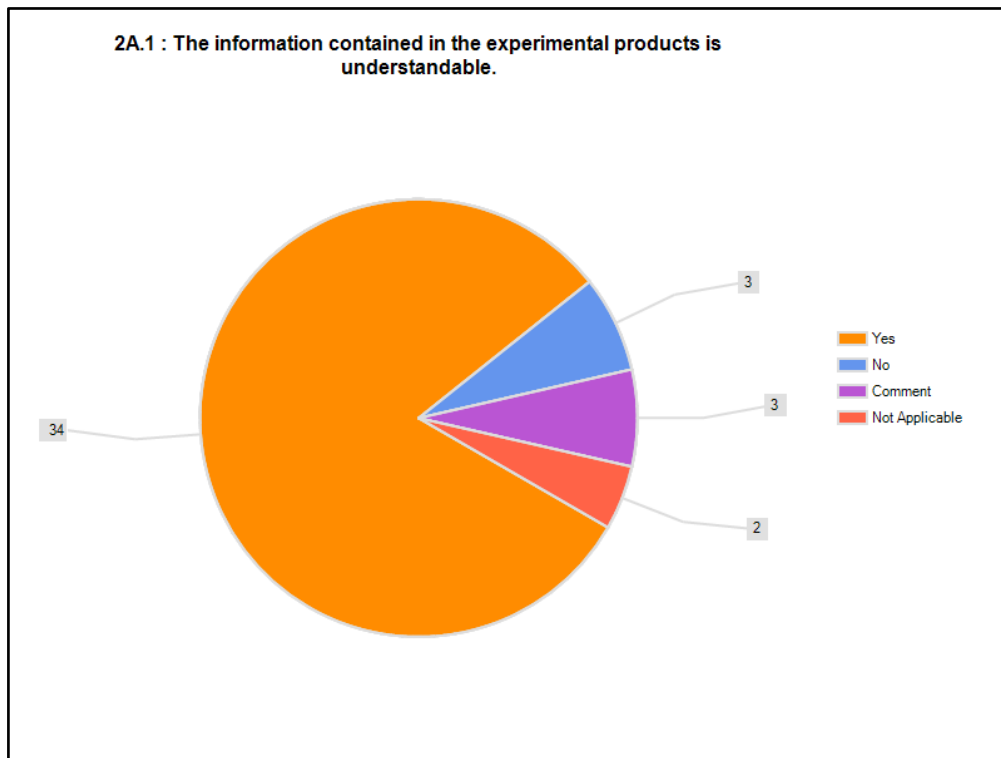


Figure VI-25. Responses to Question 2A.1

Eighty-seven (87%) per cent of respondents indicated that the information contained in the experimental products is understandable. Some comments indicate that clarification may be required:

- Very understandable however some clarification is needed to support the forecast level of threat issued for the Cook Islands in the image product above. Is this based on historical data or has some modeling analysis been carried out on the Cook Islands and if so which islands as we have low lying atolls and volcanic structures. Could some clarification be given here please as to how this data came about to determine the given level in this imagery? The imagery is great and also knowing how this was developed would assist our decision makers when planning for each island in the Cooks.
- La información contenida en los productos experimentales ha resultado muy comprensible, puede ser comprendida por personas ajenas al tema.
 - Information contained in experimental products has proven to be very understandable. People not involved with the subject can understand it.*
- En todo caso el mapa de amenaza de tsunami es más útil para pronósticos de tsunami, sin embargo el mapa de energía de tsunami es también de gran utilidad para nuestro centro de alerta.
 - In any case the tsunami threat map is more useful for tsunami forecasts; however the tsunami energy map is also very useful for our warning centre.*
- The Text Message is very clear and have no comment

- These questions were discussed between MCDEM and GNS Science. Together, we feel this information is very understandable and has come a long way since the early prototypes.

2A.A Information contained in the experimental products helps with your decision-making.

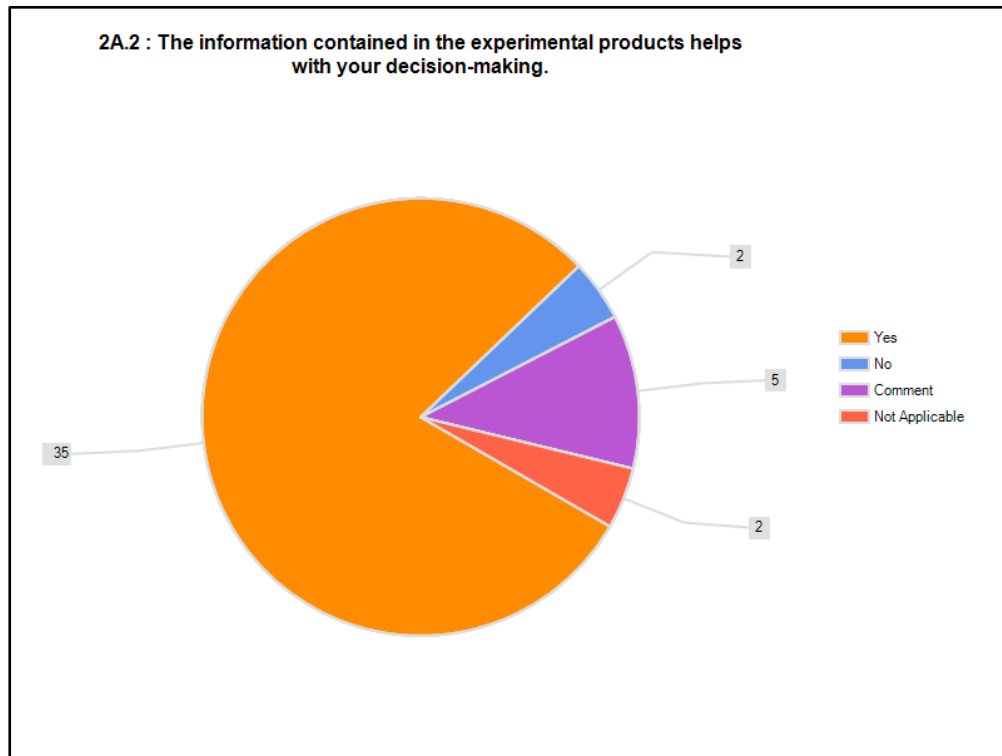


Figure VI-26. Responses to Question 2A.2

The information contained in the experimental products helped the vast majority of respondents (90%) with their decision making. However, there are two comments of note:

- Australia has its own national tsunami warning system (JATWC). The inclusion of Australian forecast regions in PTWC messages could cause a potential conflict with Australian organisation and the Australian public if the level of warnings in PTWC and JATWC products for Australian regions is different.
- It is not clear how to apply mean, median and maximum height information with respect to warnings. There was no arrival time information. Training needed!
- The PTWC Experimental New Products Guide was very helpful. The guidance was well written and very much assisted in performing the exercise.
- Rotundamente sí, ya que permite tener una visión general previa de los acontecimientos que generalmente no varían drásticamente.
 - *Absolutely yes, since it helps having a previous general overview of events, that usually do not vary drastically.*
- Principalmente la relativa a pronóstico de altura de olas en sitios cercanos a la costa.
 - *Mainly that related to wave height forecast in places near the coast*
- Sakhalin TWC issues Regional Tsunami Warning based on Yuzhno-Sakhalinsk Seismological Station's information.

- Good for confirmation of decision making.

2A.3 What features of the experimental products are most useful?
(Response count: 34)

The most useful features of the experimental products were:

- Threat level map.
- Wave heights.
- Arrival/travel times.
- Forecast amplitude.
- Meaning of experimental products unclear.
- Graphical products.
- Correction of Magnitude, estimate of times and estimate of Tsunami wave heights is essential to indicate the hazard it can produce.
- Pictures of area threaten by tsunami at each countries.
- Niue didn't use PTWC experimental products.
- The most useful features of the experimental products are standard text products, graphical products and threat map.
- Another product utilised was the Coastal forecast map and its travel times prediction.
- Las alturas de olas y tiempos de arribo pronosticados como parte de los productos experimentales fueron consideradas como las características más útiles.
 - *Wave heights and arrival times forecasted as part of the experimental products were considered as the most useful characteristics*
- Sí son de utilidad, ya que la paleta de colores permite identificar las áreas con mayores alturas de ola.
 - *They are useful because the color palette allows the identification of areas with larger wave heights.*
- Quantitative products and threat levels.
- The energy map and the threat map were easily understood and useful.
- Forecast maximum tsunami amplitudes at the coast.
- Tsunami height estimations.
- Estimated arrival times and forecast wave heights.
- Los tiempos de arribo y las alturas de ola en la costa, del mapa de amenaza por tsunami.
 - *Arrival times and wave heights in the coast, of the tsunami threat map.*
- Pronóstico de altura de olas en diferentes sitios cercanos a la costa
 - *Wave height forecast in different places near the coast*
- La información sobre alturas de ola.
 - *The information about wave heights.*
- The Fingers of God image showing direction of forecasted amplitude. The message illustrated by this imagery is what we found as most useful of the new products.

When the coordinates of each island (Cook Is) are quickly plotted onto the imagery, their forecasted level of threat is clearly identified. This can be used to prioritize the list of Pa Enua (Outer Islands) that are contacted during the event. The risk is clearly identified. Helps in forward planning for decision makers.

- Energy distribution maps, comprehensive table of threat levels.
- Colour coded threat levels.
- Threat map, and travel time.
- The forecasts on the predicted tsunami wave amplitude and tsunami threat level are useful for decision making.
- Forecast maximum tsunami amplitudes at the coast.
- CONRED: WE REGRET NOT GETTING THE INFORMATION LINKS IN ORDER TO DO THE FOLLOW-UP AND USE THEM; TSUNAMI TIMING WAS USEFUL TO CONRED.
- INSIVUMEH: Hazard Map, graphics products, points in google earth.
- Table of arrival times, primary text product.
- Estimated Tsunami waves arrival times for the islands.
- Arrival Times/Significant Heights.
- The most useful product is the wave forecast and the travel time map.
- Wave heights.
- Tsunami height estimation.
- Coastal Tsunami threat map and wave travel time.
- Forecast time of arrival.
- Time & Location of Tsunami, Time of arrival.
- The content or feature of the messages are useful.
- Threat level and coastal zones (although we have our own NZ version).
- The predicted wave amplitudes which we do not normally have before really assist.
- Maximum Values and threat indicators.

2A.4 What if any, features need to be changed? (Response count: 21)

- The RIFT Model forecast applies the Green's Law and it noted in the guide to be not suitable for region with shallow water and/or small islands. Better model?
- It is desirable to have the Tsunami Energy Forecast Map zoomed to cover the South China Sea only under the Manila Trench scenario. There should be more categories at the high end of the scale for predicted tsunami wave amplitude in this map.
- Sugiero que la clasificación de los niveles de amenaza pueda ser revisada.
 - I suggest that threat level classification should be reviewed.
- Se podrían emitir pronósticos de altura de ola para sitios más cercanos geográficamente a la costa de los países.
 - Wave height forecast could be issued for places closer geographically to countries' coast.
- No recommendations to change but some clarification on the data used to generate "threat level forecast" images. This will ensure our decision makers are fully aware of the background for this forecast when making operational decisions for all our Pa Enua (Outer Island) communities.
- Need to expose localized tsunami prone areas
- It will be good to add the parallels and meridians, to identify the locations affected by different wave heights by latitude and longitude.
- Scientific terminology needs to be eliminated.
- Please remove Australian forecast regions from PTWC products to remove potential conflict with JATWC products.
- We would see the colours needing minor amendment. We would expect to see red as the highest wave height instead of pink.
- Need to add arrival times.
- Meaning of experimental products unclear.
- All features are important for warnings. Inverse Tsunami travel time is given in hours only, I suggest number of hours and right timing of tsunami passes should be along with it. Example 10 hours: and time is 10:30z because we also pass through date line and different latitude and longitude with different timing zones.
- Most of the products are well explanatory.
- So far so good.

2A.5 What if any new features should be added in the experimental products? (Response count: 17)

- Se sugiere además realizar ligeros cambios en cuanto a los umbrales que se han tomado como referencia, con la información obtenida en los diferentes países de afectación.
 - Also slight changes are suggested regarding thresholds that have been taken as reference, with the information obtained in different affected countries
- Información sobre alturas de olas históricas, si las hay disponibles.
 - Information about historical waves, if available.

- Consider adding a grid over the image. The effect of the secondary waves that might affect the islands at a later time. If possible add Tsunami inundation model/s using the seismic area source, if from Kermadec – send through a model using that particular source and magnitude.
- It is desirable to have time series of sea level at selected tide gauge stations.
- CONRED: TSUNAMI WAVE HEIGHT AND POSSIBLE RUNUP
- Localizing wave heights across the Samoan shores
- It will be good to add the parallels and meridians, to identify the locations affected by different wave heights by latitude and longitude.
- From our science colleagues who do the assessments on our behalf: Would be nice to have an error factor on the data. Doesn't need to be on the plot which could complicate the display but some explanatory notes for our scientific advisors would be very useful. We would need authentication of the models used. Are the travel times lines based on the model? And if modelled, what is the amplitude threshold? (vs TTT travel times). Need to know the source.
- Arrival times
- Meaning of experimental products unclear
- So far, I believe information is sufficient. Existing Sea level gauges and buoys must be included. Not for agencies to put their own.
- So far so good.

2A.6 Other country evaluation statements. Please summarize the statement and results. (Response count: 2)

- The PACWAVE11 exercise is very useful for countries in Pacific Rim. Each country can evaluate Tsunami threat and tsunami risk are in their own countries and can have important information for decision making and follow their SOP.
- The recommendation from the other state stakeholders is that we should have this an annual exercise.

2A.7 Additional Comments: (Response count: 4)

- Emails that sent to each country would refer to website's URL that IOC want to show products.
- We need to improve our communication system so message can reach to all the communities in a timely fashion.
- A very important issue is that PTWC messages contain forecasts for Australian regions. Australia has it own, very capable, tsunami warning system. The inclusion of Australian forecast regions in PTWC messages could cause a potential conflict with Australian organisation and the Australian public if the levels of warnings in PTWC and JATWC products for Australian regions are different. Please remove Australian forecast regions from PTWC products.
- A bit worried in the case when the real wave amplitudes far exceeds the predicted one. Need to be sure on the quality of bathymetry and topography data used which plays a critical role with such forecast models.

2B.1 Staging: Should forecast threat levels be included in the initial first product, knowing that forecasts are likely to change over the first hour as later-arriving seismic data and sea level data are received and analysed?

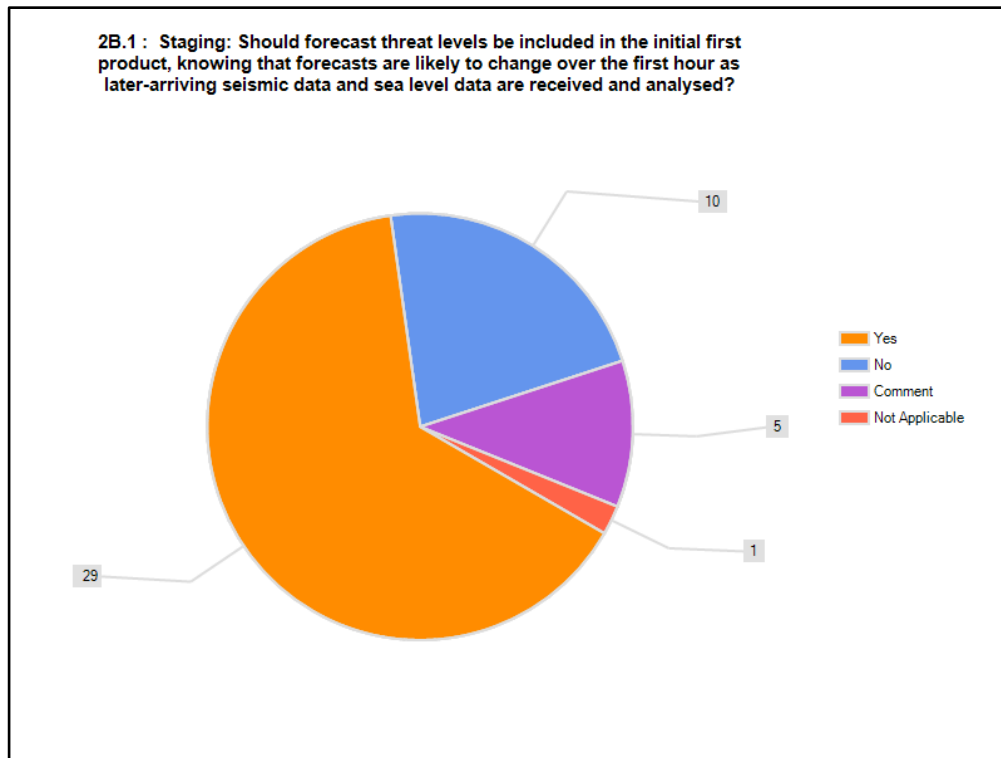


Figure VI-27. Responses to Question 2B.1

Seventy-three (73%) per cent of respondents indicated that forecast threat levels should be included in the initial first product:

- Sí, debe ser incluido a pesar de que pueden cambiar en una hora los pronósticos, el tener una referencia es de suma importancia cuando se tiene que tomar decisiones, pueden ayudar al tomador de decisiones.
 - *Yes, it should be included despite the fact that forecasts can change in one hour. Having a reference is of high importance when decisions have to be made. They can help the decision maker.*
- Deberían emitirse pronósticos sobre nivel de amenaza para los países que se encuentran cercanos al epicentro del sismo quienes son los que deben tomar decisiones de manera inmediata.
 - *Threat level forecast should be issued to countries closer to the epicenter of the earthquake which have to make immediate decisions.*
- Should be but depends on each country distant from source, if it only few km away then it worthwhile. Or else, include in later product after analysis properly if it is a regional source.
- Countries within 3 hours of ETA should have all threat level forecast information immediately.
- The majority of participating agencies want forecast threat levels included in the initial first product as they felt it important to at least get some idea of size etc.
- Yes but warning centers should be careful in the dissemination of the initial information as the first bulletin is the most remembered message (similar to the 3 m

tsunami warning during the 11 March 2011 Tohoku event) and the content should clearly indicate that such information is preliminary.

- Should be separated.
- Whatever necessary data to include in the first product would be useful to us in case there is a question from our decision makers.
- The responsibility of the staff of the National Tsunami Centre to explain and relay the information on to why such changes are expected.
- For planning purposes.

2B.2 Staging: Should forecast threat levels be given only for coasts within 6 hours of the estimated tsunami arrival time in initial products, knowing that initial forecasts will be based only upon the seismic parameters?

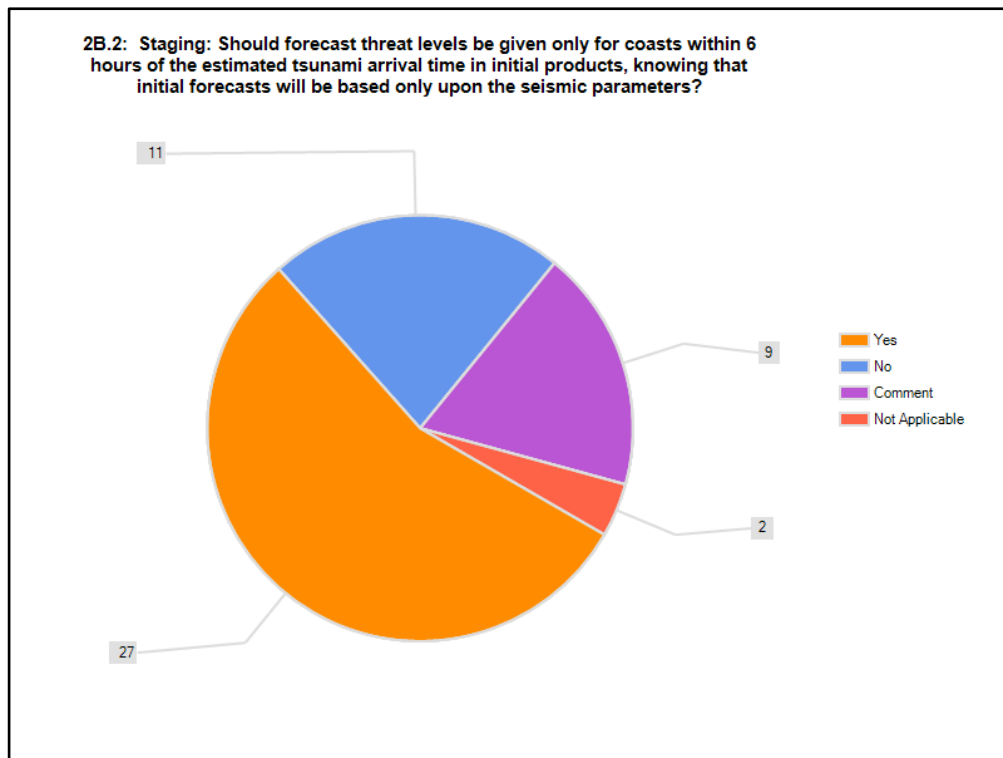


Figure VI-28. Responses to Question 2B.2

Two thirds (67%) of respondents would like to see forecast threat levels given only for coasts within 6 hours of the estimated tsunami arrival time in initial products:

- More lead time beyond 6 hours would be relevant and useful for planning purposes.
- It is desirable to have forecast threat levels for all coasts included in the initial first product, regardless of the tsunami arrival time.
- Sí, debe entregarse aunque de manera preliminar, para el técnico es una herramienta de suma utilidad que le permitirá al tomador de decisiones mejorar su tiempo de respuesta.
 - *Yes, they should be given preliminarily, for the technical expert is an extremely useful tool that will enable the decision maker to improve his time of response.*

- Deberían emitirse pronósticos sobre nivel de amenaza para los países que se encuentran cercanos al epicentro del sismo quienes son los que deben tomar decisiones de manera inmediata.
 - *Threat level forecast should be issued to countries closer to the epicenter of the earthquake who have to make immediate decisions.*
- No – The Cook Islands first responders would appreciate as much information up front. We are fully aware that the situation will be reassessed within the hour. We have many scattered communities and information is vital in the very early stages to assist us with decision making for every single one of our Pa Enua (Outer Island) communities.
- It is desirable to have forecast threat levels for all coasts included in the initial first product, regardless of the tsunami arrival time.
- Same as commented above, 2B.1, depending on the source and distance from individual threat to a country.
- I am assuming that within 1 hour of the event you will be able to bring fine tuning calculations into the forecasts to make them more accurate.
- Opinion was divided in this question. At the national level MCDEM would say yes, however, at the regional level the majority of participating agencies said no.
- I GUESS THIS IS NOT APPLICABLE FOR SMALL ISLANDS LIKE TONGA.
- Yes. Decisions are better when forecast information is enhanced by observation near the tsunami source.
- Forecasting threat level would be created in time steps and disseminate to risk regions if considering that tsunami will potentially effect to any countries.

2B.3 Format: Does the primary text product contain the right information?
If not, please specify what additional information is wanted. Consider
information on the earthquake and the tsunami, and whether the evaluation
description is adequate.

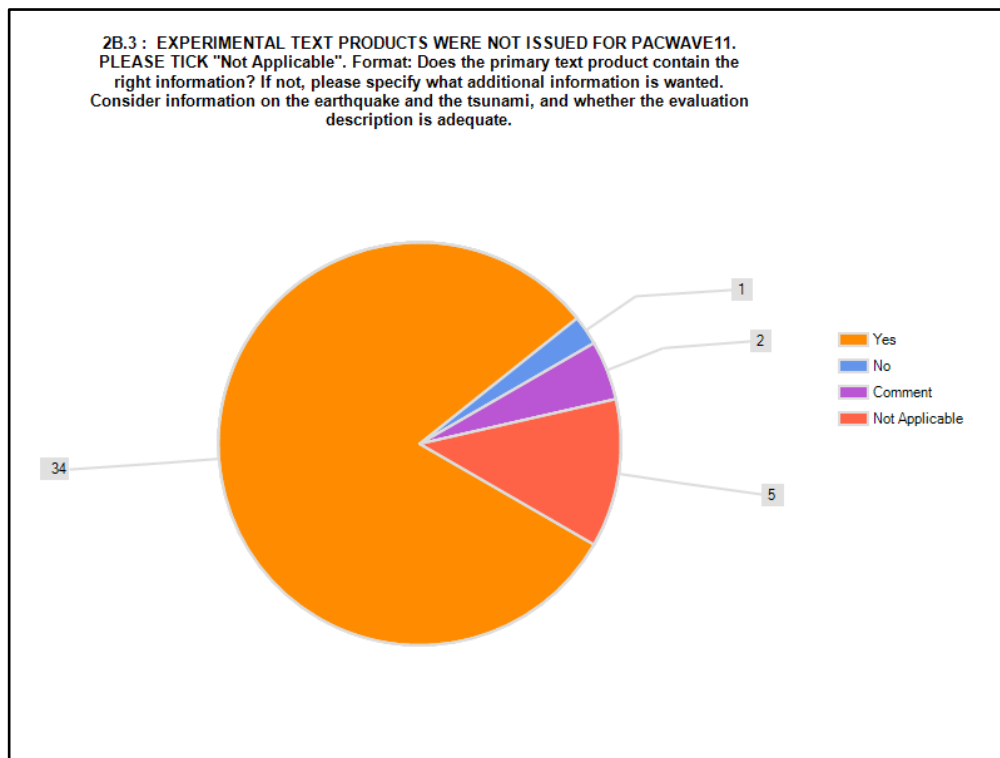


Figure VI-29. Responses to Question 2B.3

Text products were not available during the exercise. However, nearly all (85%) ticked "YES", suggesting they did not understand the question.

- Sí, tiene información adecuada, pero esta puede ser mayormente descrita para mejorar la evaluación.
 - *Yes, it has appropriate information, but this can be especially described to improve the assessment.*
- Add arrival times to text product.
- Ministry of Health: The information within the national warning messages (ie. Internally within NZ) have enough information• Wellington: Yes but again in the context of 2B.1 and ensuring that modelling does not through out vast differences in forecasts. Also needs to be alphabetically sorted. • West Coast: Initial info is good however should not just keep sending same info over and over again as frequently. New info should be highlighted. Reduce the amount of info EOC staff have to churn through.

2B.4 Format: Does the proposed suite of products—primary text product, energy map, threat map, table of threat levels, table of arrival times—provide all the necessary information? Please note on comment page.

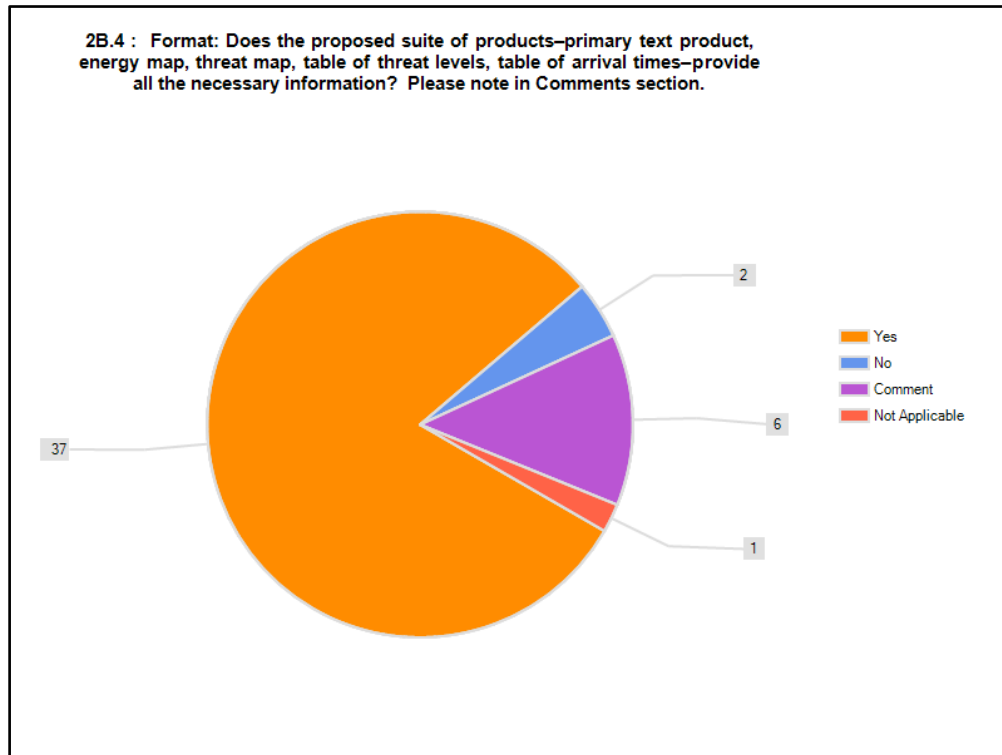


Figure VI-30. Responses to Question 2B.4

Ninety-three (93%) per cent of respondents indicated the proposed suite of products provides all the necessary information.

- Instead of median, min, max & num. Considering using time of first arrival, time when marine threshold exceeded, time of max amplitude (and max amplitude) and time when marine threshold reached after max amplitude.
- Product was sufficient as our experience and capacity is still growing.
- All provided information mention above is necessary.
- Information is useful for planning and assessment of impact.
- Sí, prácticamente los productos propuestos permiten obtener la información mas útil y necesaria de una manera muy rápida, claro que el análisis deberá ser complementado con información local y con la experiencia de la parte técnica local, la cual es muy importante.
 - *Yes, suggested products practically help obtain the most useful and necessary information in a very fast way, evidently the analysis will have to be completed with local information and with the experience of the local technical side, which is very important.*
- Incluir información sectorizada para los países que pueden ser afectados en el menor tiempo de arribo del tsunami.
 - *To include zoned information for countries that can be affected in the shortest tsunami arrival time*

- Add island locations (dots) on the threat map. The most useful product was the wave height forecasts.
- Ministry of Health: The map with the coloured lines indicating the expected wave height gives a good visual representation of the possible impact. Wellington: Yes they do, but need to ensure consistent and easy to understand messages given by the colours from amplitude, threat level and NZ threat level and evacuation zones. Currently too much room for error as some conflict between the aforementioned and again if used in the public domain, causes confusion.
- Table of Arrival Times were not included and arrival graphic was not sufficiently precise.

2B.5 Content: Are there other information or products that should be included in the suite of products? Consider earthquake and tsunami information, and/or threat assessment products. Please note on comment page.

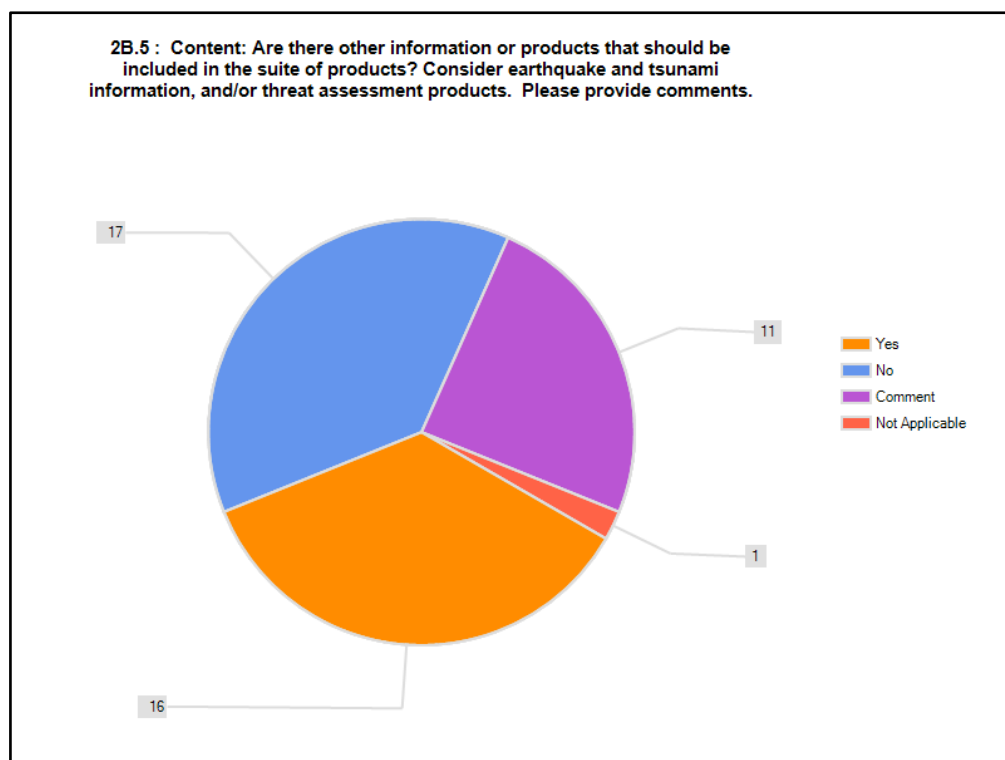


Figure VI-31. Responses to Question 2B.5

Other information or products that respondents would like to see provided are noted below:

- Graphical illustration of sea level data anomalies and inundation areas.
- Time series of sea level at selected tide stations.
- Seismic moment and focal mechanism.
- Historical event information.
- Wave height of the initial wave in the bulletin.
- Number of tsunamis and wave time.
- Real time information on tide gages via VSAT.
- Forecast based on the Dart's measurements (in real time).

- Seismic information such as the nature of the fault, type of movement; how the model is generated. Assumptions on focal mechanisms and fault extensions (the source) eg. Moment tensor solutions.
- Product was sufficient as our experience and capacity is still growing.
- Information on coastal population at risk might also be useful for NTCs and NDMOs.
- Sea level data from tide gauge stations and from buoy would be reported in near real time after generation of tsunami.
- Is it possible to include in the suite of products graphical illustration of sea level data anomalies and inundation areas?
- It is desirable to have time series of sea level at selected tide stations.
- Seismic moment and focal mechanism.
- Información de eventos históricos
 - *Historical event information*
- Yes - Is it possible to also include the wave height of the initial wave in the bulletin?
- It is desirable to have time series of sea level at selected tide stations.
- CONRED: IF POSSIBLE, TO HAVE NUMBER OF TSUNAMIS AND WAVE TIME FOR THE TSUNAMIS TAKING PLACE, ALSO SPECIFIC TRAVELS TIMES.
- INSIVUMEH: It is an urgent need to have real time information on tide gauges via VSAT.
- Forecast based on the Dart's measurements (in real time).
- From our science colleagues who do the assessments on our behalf: Interested in seismic information such as the nature of the fault, type of movement; how the model is generated. Assumptions on focal mechanisms and fault extensions (the source) eg. Moment tensor solutions. Our experts' panel would generally seek out more information both in the user guide and on the day.
- Products issued for Guam- Will inundation information be based on high-resolution bathymetry or acquired from Green's Law?

2B.6 Content: Are the proposed forecast zones appropriate?
If not, please suggest better zonations.

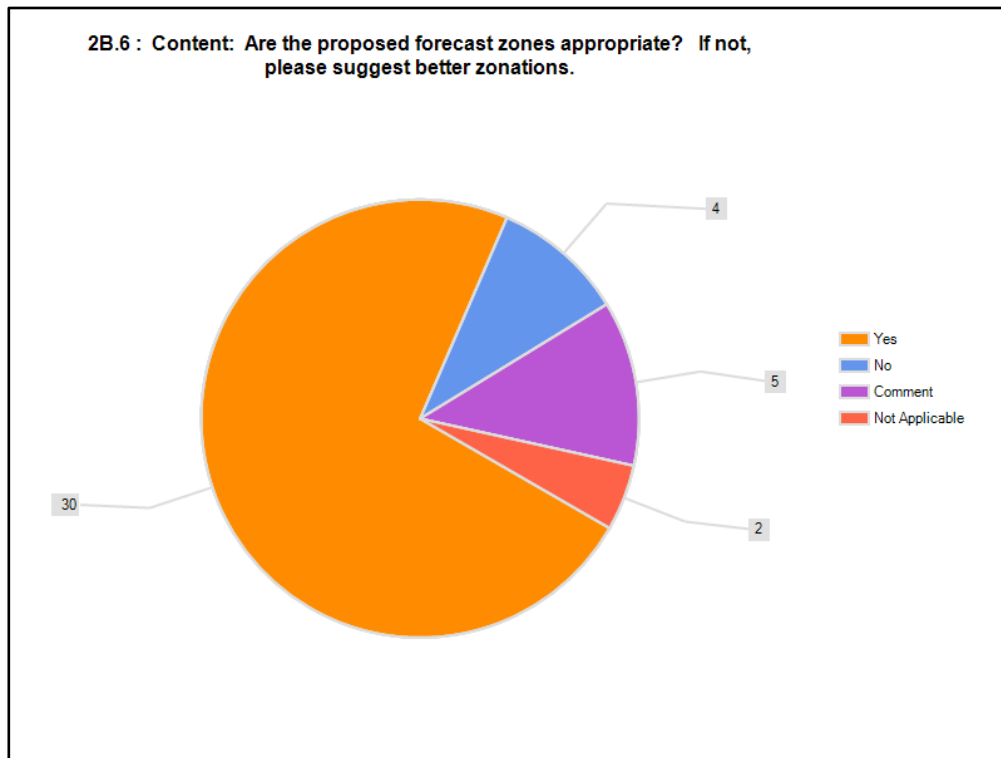


Figure VI-32. Responses to Question 2B.6

Seventy-nine (79%) per cent of respondents indicated that the proposed forecast zones are appropriate:

- Please remove Australian forecast zones.
- Could stand for further discussion. We could provide our coastal zones, but may not help at all of the Pacific scale. May be better as it is or perhaps middle horizontal split of the South Island of New Zealand perhaps?
- Geography needs to be darker. It is not clear where squares are located.
- There is a marked difference from previous threat classification (watch, warning) where Philippine local threat levels were initially based but can be matched accordingly.
- Status quo – what we have now is sufficient.
- Emergency Management suggest Local time, sometimes confuse on UTC time.

2B.7 Content: Are the proposed forecast levels:
0–0.3m, 0.3–1m, 1–3m, >3m adequate?

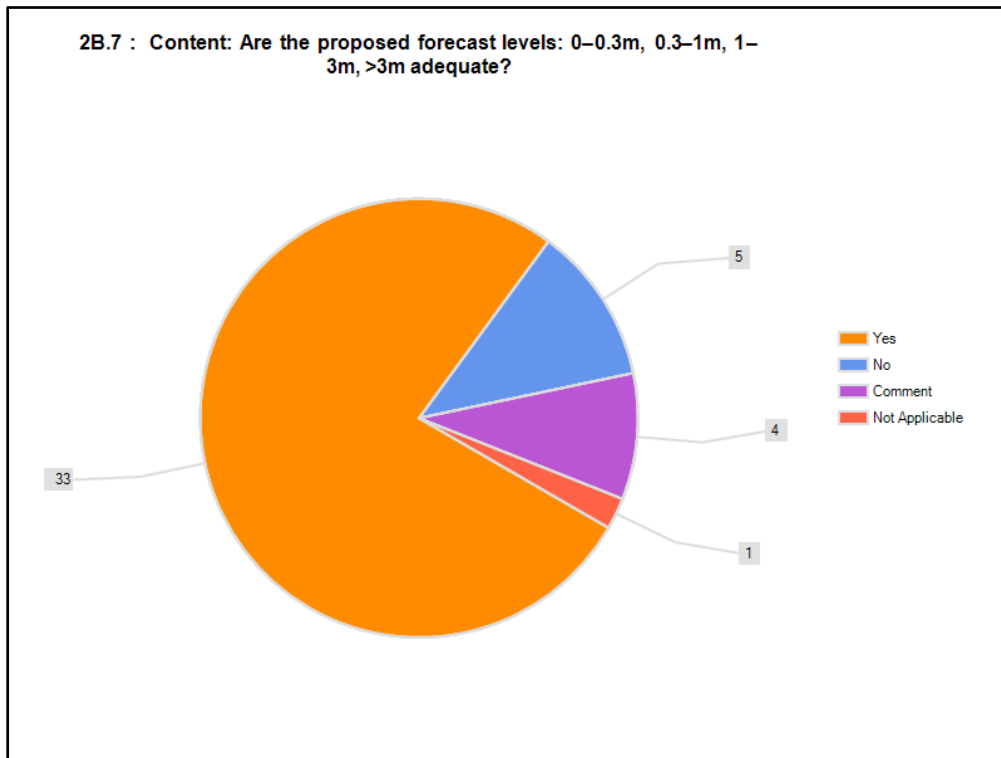


Figure VI-33. Responses to Question 2B.7

Eighty-five (85%) per cent of respondents indicated that the proposed forecast levels are adequate.

- Waves above 10 metres should also be included as a forecast level.
- There should be more levels for large wave heights for extreme tsunamis.
- Status quo. What we have now is sufficient.
- Only three levels required.

2B.8 Content: Should there be a 5th level to describe for extreme tsunamis (e.g., 2004 Sumatra or 2011 Tohoku)? If yes, please specify the forecast level.

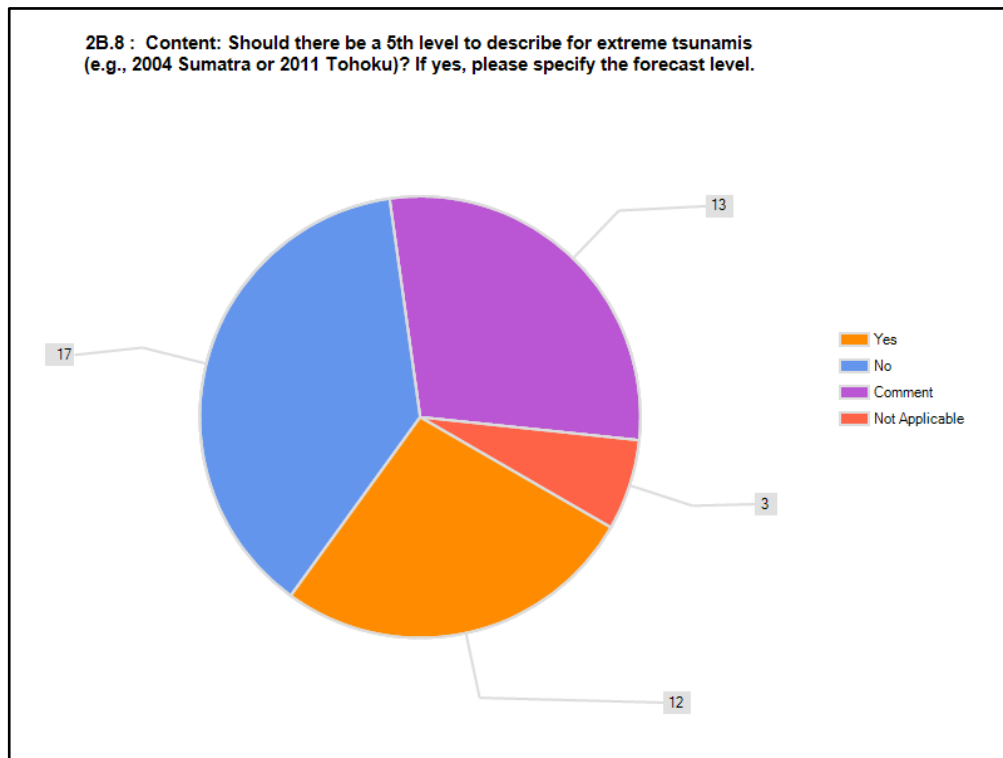


Figure VI-34. Responses to Question 2B.8

Nearly half of respondents (46%) indicated a 5th level to describe extreme tsunami is not required. However, 32% do want another level.

- It would be useful to have the 5th level information for comparison and for media queries.
- 3–5m and >5m. Even better if 5–7m and >7m are included, especially for a scenario of magnitude 9.0 earthquake which can generate tsunamis of greater than 10 m at the coast.
- Extreme tsunami > 10 m.
- En caso la magnitud sea mayor a 8.8
 - In case the magnitude is higher than 8.8
- Un tsunami de 3 metros de altura se considera destructivo y existen recomendaciones para este tipo de eventos, por lo tanto si un tsunami tiene una altura superior a 3 metros se deben seguir las mismas recomendaciones.
 - *A 3 meters high tsunami is considered destructive and there are recommendations for this type of events, therefore if a tsunami is 3 meters higher the same recommendations should be followed.*
- El nivel 4 ya es motivo para medidas extremas. Además, olas aún mayores probablemente solo ocurran a distancias locales (y antes de emitir el segundo boletín) y en direcciones de máxima radiación de energía.
 - *Level 4 is already a reason for taking extreme measures. In addition, probably even greater waves occur at local distances (and before issuing the second bulleting) and in directions of maximum energy radiation.*

- Extreme Tsunami should be included for the area in the test when tsunami generated closes the specific area.
- Yes, if that information exists. We use 3–5m, 5–8m and 8+m. Some of the participating agencies suggest 5th level to indicate greater than 5 to 10 metres. Consider adding forecast level 3 to 6 metres. Such megathrust event should be cautious of its imminent danger and should be tagged as extreme land threat as 5th level.
- It should reflect the historical magnitudes mentioned e.g. 3-4, >5.
- I suggest all tsunamis are very dangerous and all must be treated as extreme tsunamis. It all depends on the threat level.
- Based on observed effects of the 11 March 2010 Tohoku event, waves greater than 10 m (extreme land threat) may be capable of overtopping seawalls and protective structures and toppling RC buildings.
- Unsure.
- Significant Events Causing casualties.
- Status quo – what we have now is sufficient
- Would this be necessary for the Pacific Islands?

2B.9 Other Country evaluation statements.

Please summarize the statement and results. (Response count: 2)

- (1) Review times if not correct (2) Review threat levels (3) Do not issue threat levels in the first hour for distant tsunamis except for local tsunamis where timing is very important. (4) On the inverse tsunami travel time map include both hours and Zulu time together to avoid time change zones.

2B.10 Additional Comments

(Response count: 4)

- South China Sea region is seemed to be safe if earthquake generated tsunami in Pacific Rim.
- The predicted wave amplitude and forecast threat for the 1st. issue is less than MMD pre-generated scenario. The 3rd issue, about 0345UTC provide better predicted amplitude and forecast threat but by then it will be too late to issue warning for Sabah. Using MMD pre-generated scenario, we were able to provide warning to Sabah immediately after the earthquake.
- Providing statistical values like median, mean, max, standard deviation and number of points doesn't necessarily provide the kind of information that emergency response agencies want. What the need is information to base decisions on such as: When are the first waves going to arrive When will the waves first start to endanger the community When will the largest waves arrive and how big will it be When will the effects recede so they can start sending in equipment.

3A.1 The NTWC/NDMO has an activation and response process (standard operating procedures) in place for the receipt of tsunami warnings.

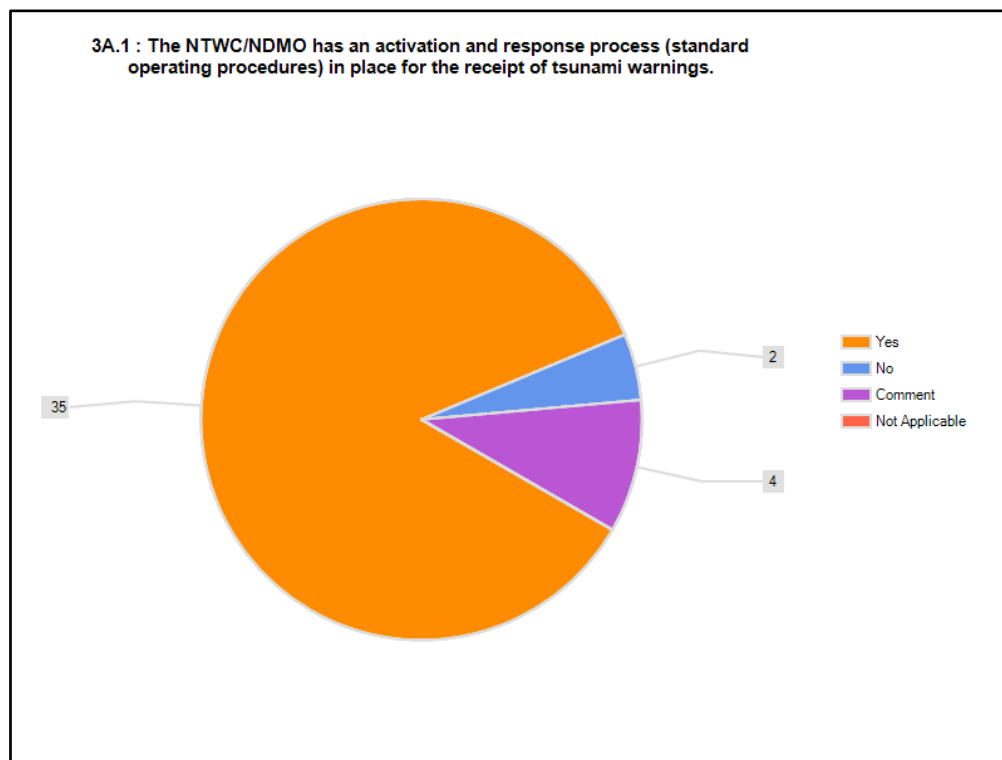


Figure VI-35. Responses to Question 3A.1

Ninety (90%) per cent of NTWC/NDMO's have standard operating procedures for the receipt of tsunami warnings (even if some are in draft form).

- Actualmente el NTWC ha desarrollado sus procedimientos, los que actualmente están siendo revisados luego de la ocurrencia de los últimos eventos. Hasta el momento se están desarrollando procesos de respuesta y activación que involucren tanto el NTWC y la NDMO.
 - *At present NTWC has developed its procedures, which are currently being reviewed after the latest event occurrences. Until now response and activation processes are being developed involving both NTWC and NDMO.*
- La NDMO cuenta con procedimientos de respuesta y activación generales para cualquier amenaza y no específicos para tsunamis
 - NDMO has general response and activation procedures for any threat and not specific for tsunamis.
- Arrangements in place – draft SOP prepared.
- INSIVUMEH: We are aware that the information proceeding from the PTWC must be evaluated by a scientific staff in our country to avoid false alarm and misunderstandings.
- Still in draft form.
- We don't have a response process on tsunami. There is a draft response process. We used the typhoon management response process SOPs to activate all emergencies partners.

3A.2 The NTWC/NDMO knows its specific response role in the event of a tsunami

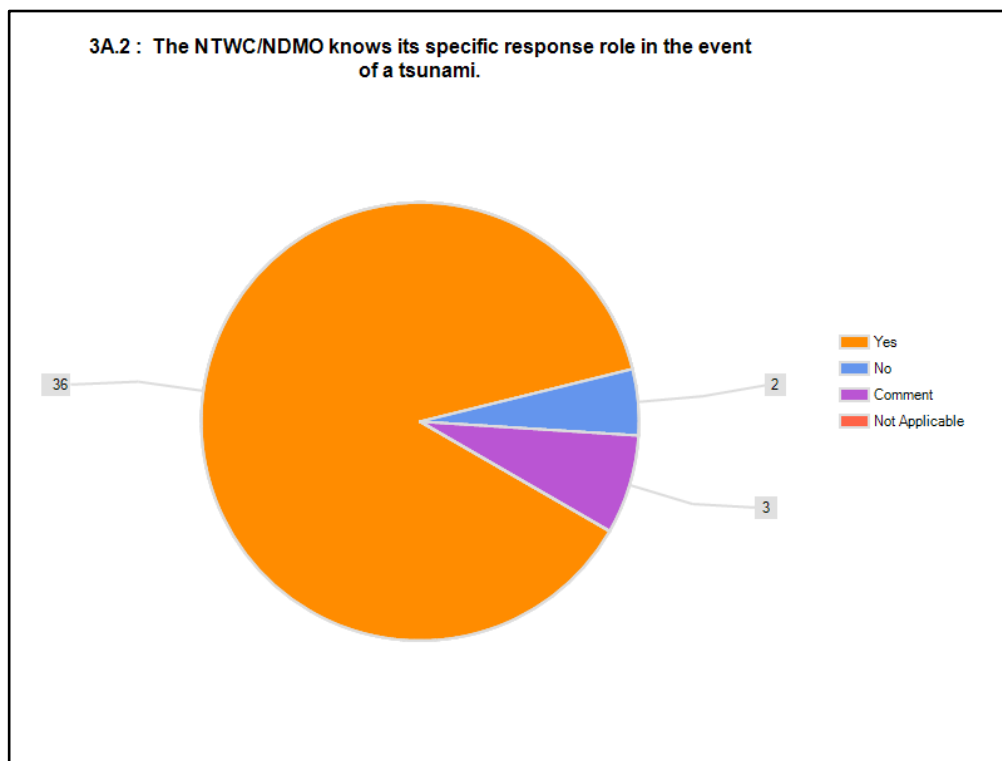


Figure VI-36. Responses to Question 3A.2

Ninety-two (92%) per cent of respondents know their specific response role in the event of a tsunami.

- El NTWC conoce muy bien sus funciones, sin embargo la NDMO en el país tiene inherencia a nivel de Ministerio, y ha sido creado a partir del 2010, teniendo aún por realizar algunos procesos en los que están los que se articulan con el NTWC.
 - *NTWC know its functions very well, however the NDMO in the country has influence at Ministry level, and has been created since 2010, having some processes yet to be done among which are those that articulate with the NTWC.*
- La NDMO cuenta con procedimientos de respuesta y activación generales para cualquier amenaza y no específicos para tsunamis.
 - *NDMO has general response and activation procedures for any threat and not specific for tsunamis.*
- The tsunami directive exists where the role of each is exposed. The tsunami support plan is now underway.
- Other agencies are still in the learning process to familiarize themselves with newly adopted system.
- Major responsibility to effectively coordinate with all response agencies upon receipt of the message from national warning centre.

3A.3 The NTWC/NDMO has, prior to the exercise, engaged in tsunami response planning

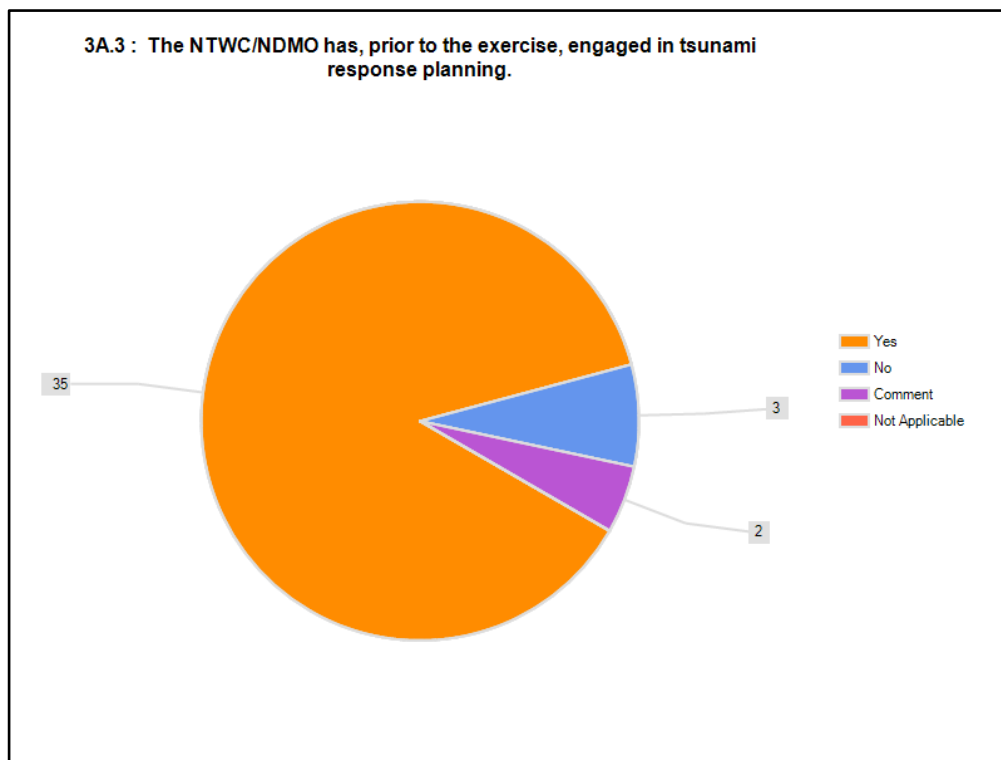


Figure VI-37. Responses to Question 3A.3

Ninety per cent (90%) of respondents engaged in tsunami response planning prior to the exercise.

- El NTWC y la NDMO desarrollaron planes de respuesta de tsunami, antes del inicio del PacWave11, sin embargo no se pudieron evaluar de manera conjunta.
 - *NTWC and NDMO developed tsunami response plans before the beginning of PacWave11, however they could not be jointly assessed.*
- Existe el Plan Nacional de Alerta de Tsunami, bajo los protocolos de actuación establecidos por el Sistema Nacional de Detección de Alerta de Tsunamis.
 - *The National Tsunami Warning System exists under action protocols established by the National Tsunami Warning/Detection System.*
- Our office and the National Weather Services and the State DMOs have engaged in tsunami response planning in previous Tsunamis.

3A.4 The NTWC/NDMO has undertaken activity to increase its capacity and capability to support a national tsunami response (for example, training, exercise, etc)–
Note activities in Comment section.

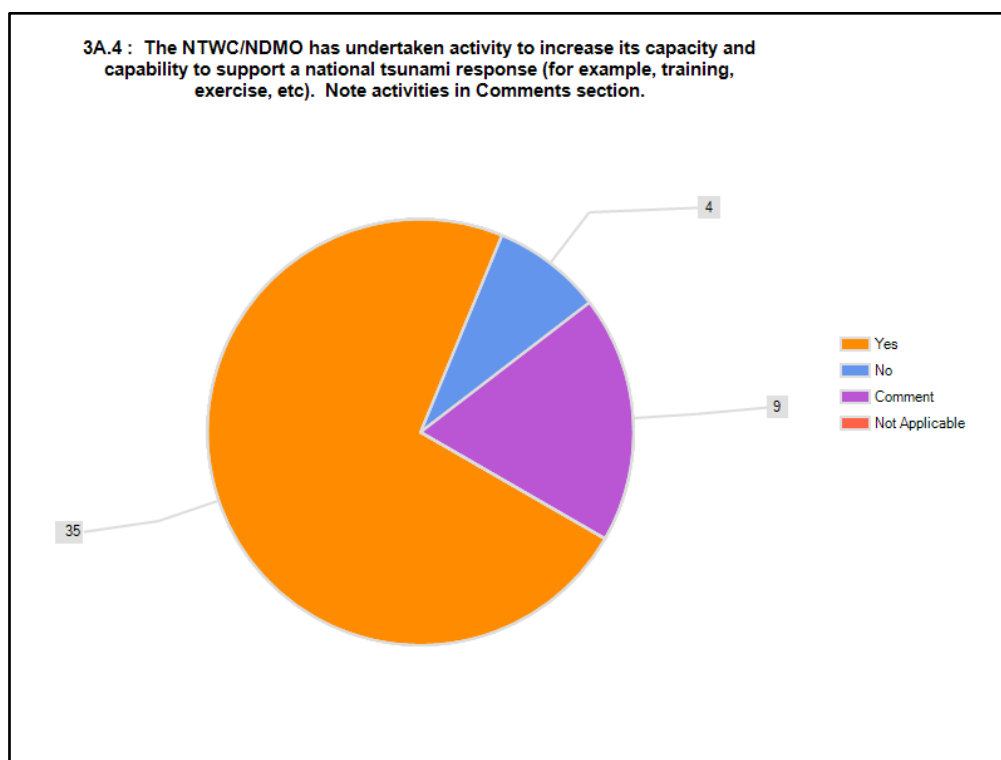


Figure VI-38. Responses to Question 3A.4

Ninety (90%) per cent of NTWC/NDMOs undertook activity to increase their capacity and capability to support a national tsunami response. These included:

- Tsunami awareness week, trial evacuation of Primary school week before PacWave exercise and again carried out in real time during the event.
- The NTWC has undertaken annually training of watch standers. A group of scientists at NTWC is taking part in the research projects at national and regional levels on tsunami hazards assessment.
- El NTWC y la NDMO han llevado a cabo actividades para aumentar su capacidad y habilidad para apoyar una respuesta nacional en caso de tsunami, sin embargo aún no se ha concretado la realización de ejercicios, pues en la actualidad se está trabajando en los protocolos de comunicación a nivel nacional, se está trabajando en la creación de un Comité que fortalezca las actividades que realizan las entidades que trabajan en la temática, pero sobre todo que están inmersas en el sistema nacional.
 - *NTWC and NDMO have carried out activities to increase their capacity and ability to support a national response in case of tsunami, however the conduction of the exercise has not yet materialized, since at present they are working in communication protocols at national level; they are working in the creation of a Committee that would strengthen the activities entities working in the subject carry out, but above all that are immersed in the national system.*
- Se trabaja en el desarrollo de un Sistema Nacional de Alerta de Tsunamis, el cual considera recursos humanos, materiales y financieros para su operación, además de entrenamiento y ejercicios.

- *Work being done in the development of a National Tsunami Warning System, which considers human, material and financial resources for its operation, in addition to training and exercise.*
- In order to increase TWC's capacity, tsunami evacuation activity was taken.
- El NTWC y la NDMO realizan anualmente un simulacro de alerta de tsunami en Tumaco en la Costa Pacífica. Así como participan en un proyecto de fortalecimiento de los sistemas de alerta temprana junto a las demás organizaciones que forman parte del Sistema Nacional.
 - *NTWC and NDMO annually conduct a tsunami warning drill in Tumaco in the Pacific Coast. As well as participate in an early warning system Strengthening project along with other organizations that are part of the National System.*
- Durante el año se han llevado a cabo 3 simulacros de tsunami a nivel nacional (diurno y nocturno) y a nivel interno 2 veces por semana mediante pruebas de comunicación con los integrantes del sistema.
 - *During the year 3 tsunami drills have taken place at national level (daylight and night) and 2 times per week at an internal level through communication testing with members of the system.*
- Se ha participado únicamente en los ejercicios internacionales en los años 2006 y 2008.
 - *Participation in international exercises only in 2006 and 2008*
- Yes. Tsunami evacuation signs are put around the island of Rarotonga to indicate to the public of the evacuation route when a tsunami threatens. All communities in the Cook Islands now either have a double sided/ single sided or manual operated warning siren. Carrel & Carrel – Manual operated siren – ideal for communities with a limited supply of electrical power and great as a back up when electricity fails. Tsunami inundation modeling (ComMIT) – will soon be introduced into national to community planning. Currently proposing for ComMIT training to be done in the Cook Islands of which Pa Enua participants will be included. The inclusion of better bathymetry and topographic data will make this more effective.
- The NTWC/NDMO has conducted tsunami evacuation drills from time to time.
- Regional (local) tsunami exercises with NDMO, trainings with NDMO and tsunami experts and staff.
- Daily tsunami exercises (NTWC), monthly tsunami exercises with regional evacuation (NDMO and NTWC). Constant training (NTWC and NDMO).
- The activities include the PTWS ITIC training in Vanuatu in August 2011.
- An activity in need to undertake to improve our national tsunami response.
- For the safety of the people, need more exercise, or training on tsunami and what to take in order to save the life of the people.
- Most of the State and National Disaster Management Coordinators have participated in tsunami trainings.
- Participation in previous IOWAVE, PacWave and National tsunami exercises.
- Tsunami drills for schools conducted every year. Collaborative tsunami awareness approach to rural vulnerable communities, schools etc.
- Annual all hazards conferences.

- There were seminars, workshops to educate local staffs to know what to do when tsunami occur, and improveand installed some broascastng devices in risk regions.
- Se está trabajando en la localización automatic.
 - *Works is being done in automatic location.*

3A.5 The NTWC/NDMO has an appropriate management structure identified and documented to support tsunami response.

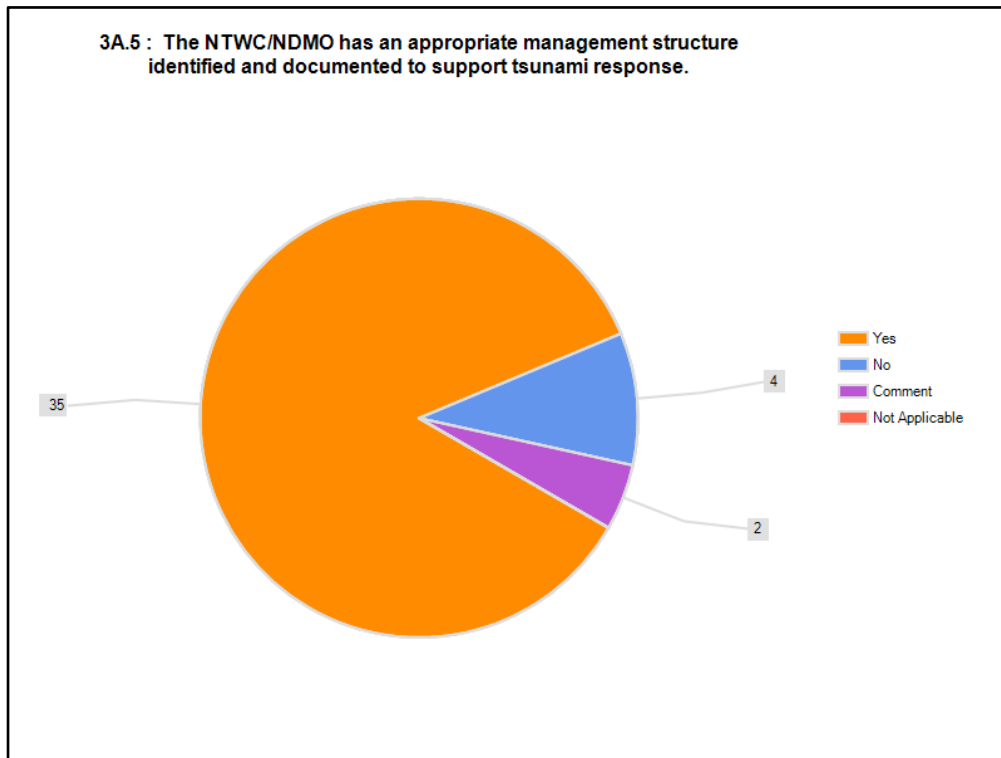


Figure VI-39. Responses to Question 3A.5

Ninety (90%) per cent of respondents had an appropriate management structure identified and documented to support tsunami response.

- Tsunami Section now in the Niue National Disaster Plan which directs the structure of warnings to be issued and by whom.
- El NTWC cuenta con infraestructura adecuada para realizar procesos de identificación y documentación como parte del apoyo a la respuesta ante un evento de tsunami, sin embargo ésta debe ser fortalecida, mientras que la NDMO, por el hecho de haber sido constituido hace apenas 2 años, está llevando a cabo proyectos que conllevan a una adecuada infraestructura para respuesta ante un evento de tsunami, sin embargo ha desarrollado un gran proyecto para fortalecer la respuesta multiamenaza conocido como ECU911.
 - *NTWC has an appropriate infrastructure to conduct identification and documentation processes as part of supporting the response to a tsunami event; however this has to be strengthened, while the NDMO – because it was set up only 2 years ago- is making projects that involve an appropriate infrastructure for the response to a tsunami event. However it has developed a great project to strengthen the multi-hazard response known as ECU911.*
- We don't have the disaster plans for tsunami so we need to have the plan in order to have a structure t support our tsunami response effort.

- The provision of the National Tsunami Response Plan ready to be submitted through cabinet.

3A.6 The NTWC/NDMO has a tsunami mass coastal evacuation plan

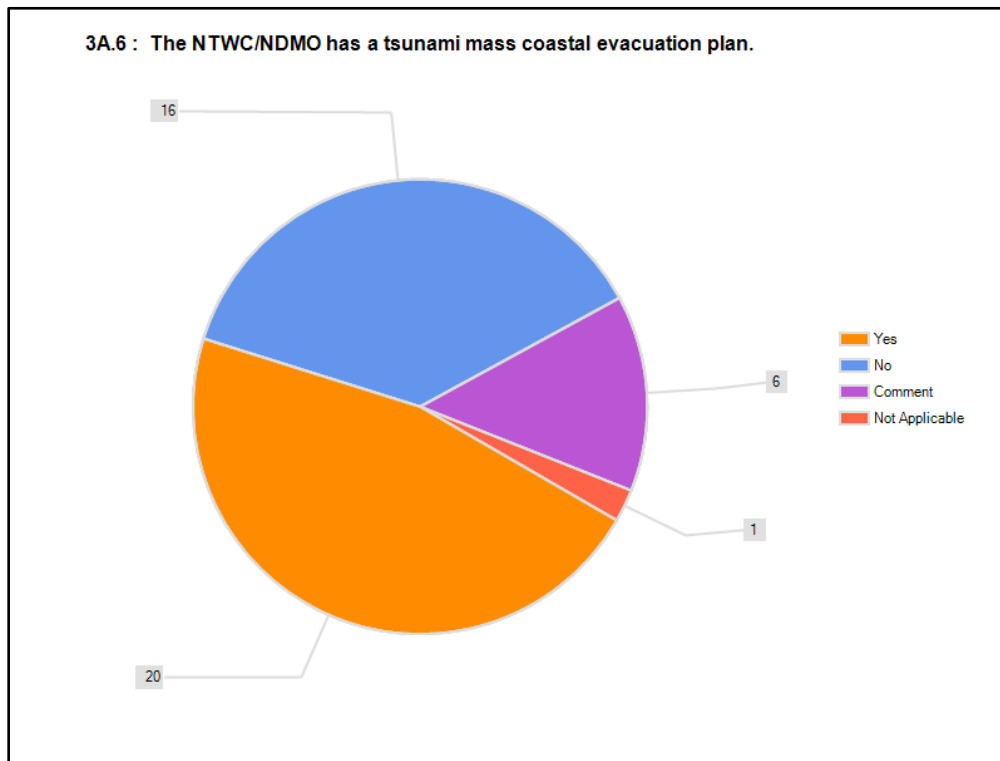


Figure VI-40. Responses to Question 3A.6

Just over half (53%) of the respondents have a mass coastal evacuation plan.

- Only some models of tsunami response have been developed for some coastal cities within research projects. No mass coastal evacuation plan developed for the whole coastal zone of Vietnam.
- Cada gobierno estatal (provincial) que forma parte del país está en proceso de elaboración de sus propios planes de evacuación de población costera ante la ocurrencia de un tsunami, en coordinación con el gobierno federal.
 - *Each state (provincial) government in the country and in coordination with the federal government is in the process of making its own evacuation plans for people living in coastal areas facing the occurrence of a tsunami.*
- El NTWC y la NDMO no cuentan con un plan de evacuación masiva para los habitantes de zonas costeras ante la ocurrencia de un tsunami, esto se pudo apreciar con la respuesta frente al tsunami de Japón de 2011, en el que se evacuó a toda la población costera, creando un caos al momento de la evacuación por falta de planificación.
 - *NTWC and NDMO do not have a mass evacuation plan for the population of coastal zones in the event of a tsunami. This could be observed with the response to the tsunami of Japan 2011, where all the coastal population was evacuated, creating chaos at the moment of the evacuation due to lack of planning.*

- Existen para las poblaciones mayores en la costa y especialmente, más expuestas al fenómeno.
 - *They exist for older coastal population and especially, more exposed to the phenomenon.*
- Now there only few areas that have an evacuation plan. But we educate to some coastal community in self evacuation.
- Yet tsunami plan still in draft form and need more improvement in pinpoint/planning evacuation safe sites when comes to as a real evacuation plan.
- Evacuations were done during Tsunami's but there are no evacuation plans set.
- None of the State in the FSM has any coastal evacuation plan.
- MCDEM does not have a tsunami mass coastal evacuation plan. However, the regional and local authorities have evacuation plans and as a result of a late 2010 tsunami exercise, it was recommended we look at developing a mass national evacuation plan.
- But only for urban Suva Area. Mostly other areas within the Fiji Group not yet to be implemented with evacuation map and plan.

3A.7 Other country evaluation statements.
Please summarize the statement and results.
 (Response count: 1)

- Drill for tsunami evacuation in full scale will operate every year.

3B.1 Arrangements to assemble the in-country disaster management group relevant to decision-making on tsunami warning and response were in place **before** the exercise.

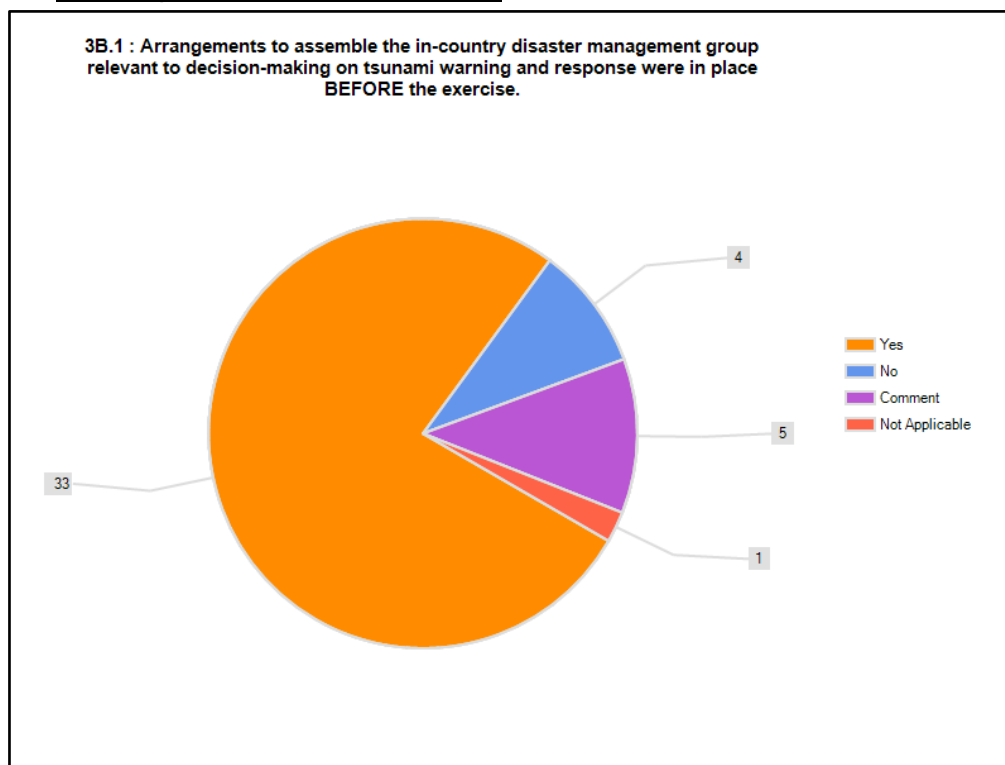


Figure VI-41. Responses to Question 3B.1

Eighty-three (83%) per cent of respondents had arrangements to assemble the in-country disaster management group relevant to decision-making on tsunami warning and response in place before the exercise.

- Annual Tsunami Drill in full scale was integrately operated with several agencies concerned this year (2012).
- Las disposiciones dadas al grupo nacional encargado de la gestión de los efectos de los desastres relacionada con la toma de decisiones sobre la alerta y respuesta ante los tsunamis fueron implementadas, pero no en su totalidad antes del ejercicio.
 - *Provisions given to the national group in charge of disaster related to decision-making on tsunami warning and response effect management were implemented before the exercise, but not in tis entirely.*
- French Polynesia is NOT concerned by LOCAL/REGIONAL source tsunami
- Se realizaron 2 reuniones de coordinación antes del PacWave11.
 - *2 coordination meetings were held before PacWave11.*
- CONRED: We did not assemble the decision making group because it was not in the scope of the tabletop exercise.
- WSO, notified OEEM, DCO's Pohnpei & Kosrae State of such exercise before the exercise.
- There was no arrangement in country prior to the exercise
- The majority of participating agencies indicated that they have arrangements in place before an event or exercise.

3B-2 A country tsunami emergency response plan (standard operating procedures) for regional/local tsunamis exists.

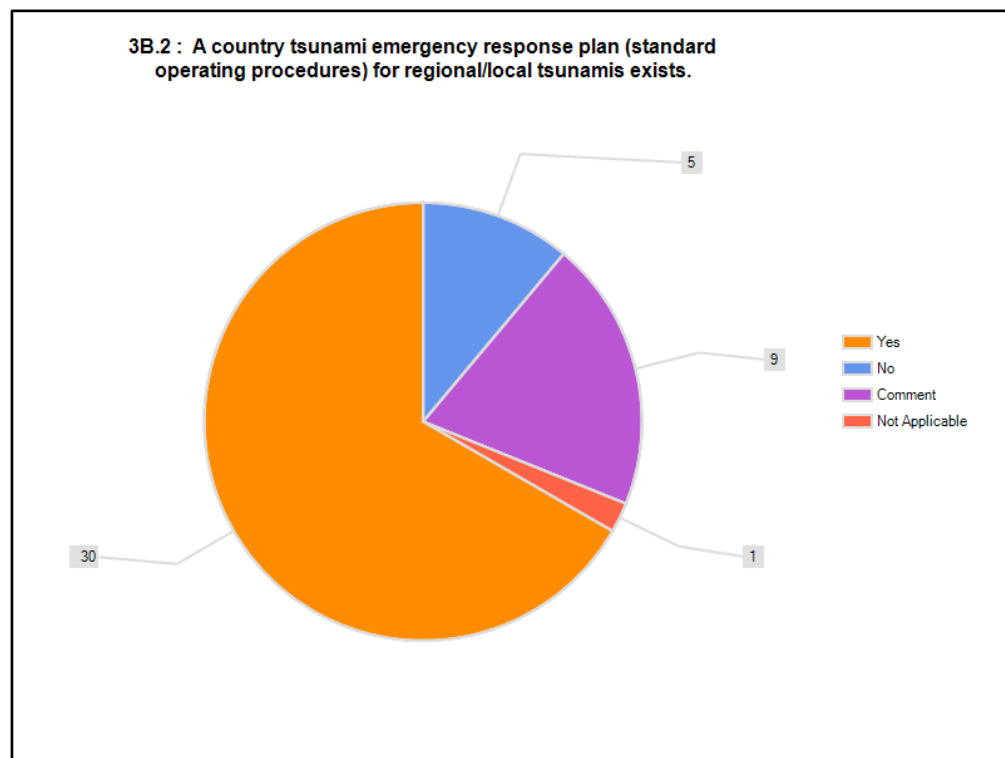


Figure VI-42. Responses to Question 3B.2

Seventy-five (75%) per cent of respondents have a country tsunami response plan (SOPs) for regional/local tsunami. This ranged from regional or local plans to national plans. Some indicated that whilst they don't have plans in place they do have some arrangements.

- Se encuentra en desarrollo un Sistema Nacional de Alerta de Tsunamis, el cual considera recursos humanos, materiales y financieros para su operación, además de entrenamiento y ejercicios.
 - *A National Tsunami Warning System is being developed, which considers human, material and financial resources for its operation, in addition to training and exercises.*
- No existe aún un plan nacional de respuesta de emergencia con procedimientos normalizados de operaciones, sin embargo se están coordinando acciones y tareas que se encaminan a lograr este plan nacional.
 - *A national emergency response plan with standard operation procedures does not exist, however actions and tasks focused on achieving this national plan are coordinated.*
- French Polynesia is NOT concerned by LOCAL/REGIONAL source tsunami.
- El NTWC sí cuenta con planes de respuesta, la NDMO cuenta con procedimientos de respuesta y activación generales para cualquier amenaza pero no específicas para tsunamis.
 - *NTWC does have response plans, NDMO has general response and activation for any threat and not specific for tsunamis.*
- Existe el Plan Nacional de Alerta de Tsunami, bajo los protocolos de actuación establecidos por el Sistema Nacional de Detección de Alerta de Tsunamis.
 - *The National Tsunami Warning System exists under action protocols established by the National Tsunami Warning/Detection System.*
- Arrangements in place, no formal SOP yet.
- In Draft and await cabinet approval.
- OEEM National government, DCO's Pohnpei & Kosrae States have such plan.
- No Response plan for Tsunami.
- There is a national plan. Some regions are conducting work in this area, however, the majority of participating regions do not have regional/local tsunami SOPs.
- Only for local.

3B.3 Public education materials were developed and disseminated prior to the exercise

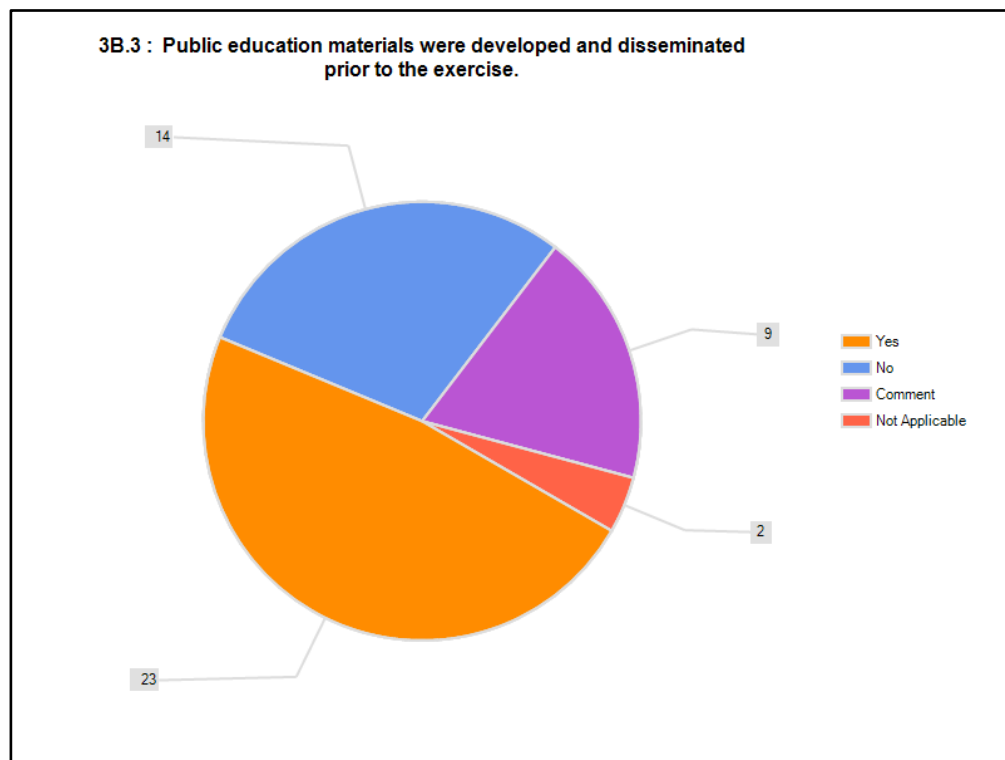


Figure VI-43. Responses to Question 3B.3

Just over half (58%) of respondents have developed and disseminated public education materials prior to the exercise. Since some countries did not involve the public in the exercise (communication or table top), no public education or outreach was needed. However, most countries mentioned having awareness materials.

- Outreach made by the visitings by the WFO Guam WCM and the WSO to schools, communities and local and national government.
- A communications test was to be conducted and hence there was no need for public education materials to be developed prior to the exercise. However, public material for emergency preparedness is available on the NDMO website.
- Solamente, se distribuyó material educativo a directivos de la NDMO con el propósito que éste fuera distribuido a la comunidad, sin embargo no fue considerado de esta manera.
 - *Only, education material was distributed to NDMO staff members with the purpose they be distributed to the community, however it was not consider this way.*
- French Polynesia is NOT concerned by LOCAL/REGIONAL source tsunami.
- En este caso el PacWave11 no implicó movilización de la población.
 - *In this case PacWave11 did not involve public mobilization.*
- A las instituciones participantes del ejercicio se les distribuyó un manual para participar en el ejercicio. Se han difundido materiales educativos sobre el tema de tsunamis en la costa Pacífica a la comunidad sobre el ejercicio de comunicaciones.
 - *A manual to participate in the exercise was distributed to institutions participating in the exercise. Education material on the subject of tsunami has*

been disseminated in the Pacific coast to the community but specific on communication exercise.

- Yes – the awareness program is continuous in schools/communities and work places and was in place well before the recent exercise. Awareness of PacWave11 was also in the media in the weeks leading up to the event and on the day of the exercise.
- To Emergency Management Offices.
- We had some community education with the type of hazards.
- Public not involved in this exercise.
- The majority of participating agencies had public education materials that were disseminated prior to the exercise. Some have materials currently being developed.
- Since it is only a tabletop exercise with the exclusion of the public participation.
- Tsunami materials i.e. Posters, community educational awareness and prior advocacy have been conducted with participating Provinces. However, with regard to the PacWave11 awareness/promotion, we decided to conduct it 2 weeks before the exercise.

3B.4 Regional/local tsunami exercises are routinely conducted in-country.
Note last exercise in Comments section.

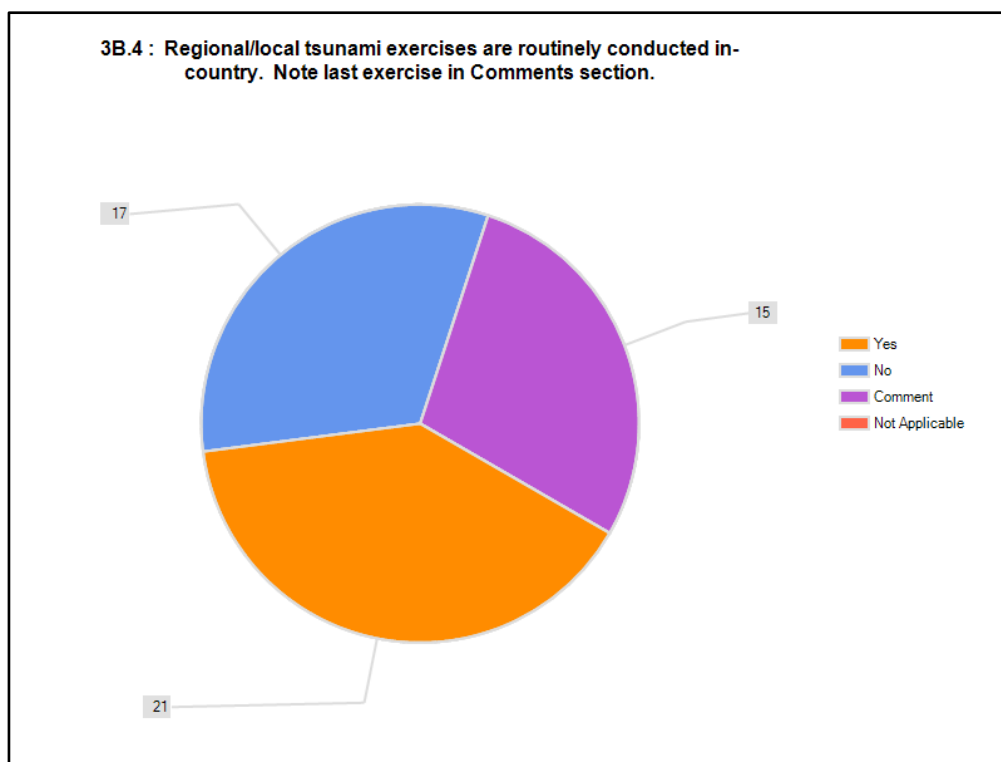


Figure VI-44. Responses to Question 3B.4

Only half (54%) of respondents indicated that regional/local tsunami exercises are routinely conducted in-country. A number of countries specifically mentioned the previous Pacific Wave international exercises Comments are noted below:

- The last tsunami exercise conducted was in 2010 as part of the continuing development of the Standard Operating Procedures for Tsunami Monitoring, Warning and Mitigation.
- 10–11 May 2012.
- Exercise have begun recently the focus being on the evacuation of the Primary school which is currently an at risk location in the event of a tsunami.
- The last drill on Tsunami Response, Search and Rescue (ST-11) was conducted in Da Nang city (Central Vietnam) on 18 October 2011.
- Yes, in 2007, 2008, now we have changed our focus to conduct exercises focusing on village settings, schools etc. and the hazards and scenarios used varies. Before PacWave11, we conducted a mass casualty exercise in May 2010 using a tsunami scenario to test response of health emergency services to mass casualty resulting from a tsunami event from local source.
- More refined evacuation maps will be developed.
- We participated in the Pacific-wide tsunami exercises organized by PTWS.
- Normalmente se realizan ejercicios regionales, al menos dos por mes.
 - *Normally, regional exercises are conducted at least twice a month.*
- French Polynesia is NOT concerned by LOCAL/REGIONAL source tsunami.
- 2011 Safe Korea Exercise (4 May 2011).
- Se realizó un ejercicio de Sismo y Tsunami una semana antes del PacWave11 a nivel institucional.
 - *An Earthquake and Tsunami exercise was carried out a week before PacWave11 at institutional level.*
- El último ejercicio realizado fue el Pacwave08.
 - *The last exercise conducted was PacWave08.*
- En Marzo del 2011 se participó en el ejercicio de Comunicaciones Caribe Wave 11 y el 7 de octubre de 2010 se realizó el III Simulacro de evacuación por Tsunami en Tumaco.
 - *In March 2012, participation in the Caribbean Wave 11 Communication exercise and on October 7, 2012 the III Tsunami evacuation Drill in Tumaco took place.*
- Yes. Japanese earthquake in March 2011. Schools also run regular tsunami evacuation exercises. This is a part of their annual plan.
- Tsunami drills were previously conducted for various places in the country and the last drill was on 12 Oct 2011 at Kota Kuala Muda. There are general earthquake and tsunami subjects in secondary level education. Presently, tsunami evacuation maps, routes and evacuation signs are not available to the communities.
- We participated in the Pacific-wide tsunami exercises organized by PTWS.
- 2011/09/27.

- Local Tsunami drills are routinely scheduled, exercised, and evaluated as part of ASDHS-TEMCO's ongoing Community Outreach Program.
- Need more drill and exercise for CNMI.
- Tarapacá regional tsunami exercise.
- Only during PacWave11 exercise.
- We have not done any local tsunami exercise in the FSM.
- Last national exercise in Jun 2009, but Australia uses international exercises such as IOWAVE and PacWave to test national readiness.
- A national tsunami exercise (Exercise Tangaroa) was conducted in October 2010. All civil defence groups in New Zealand participated. There have been a number of real events that have occurred in the last five years which have also served as good practice.
- Exercise Marianas Rumble- September 2011.

3B.5 Tsunami-related curriculum programmes are in place for all levels of education. Note which levels in Comments section.

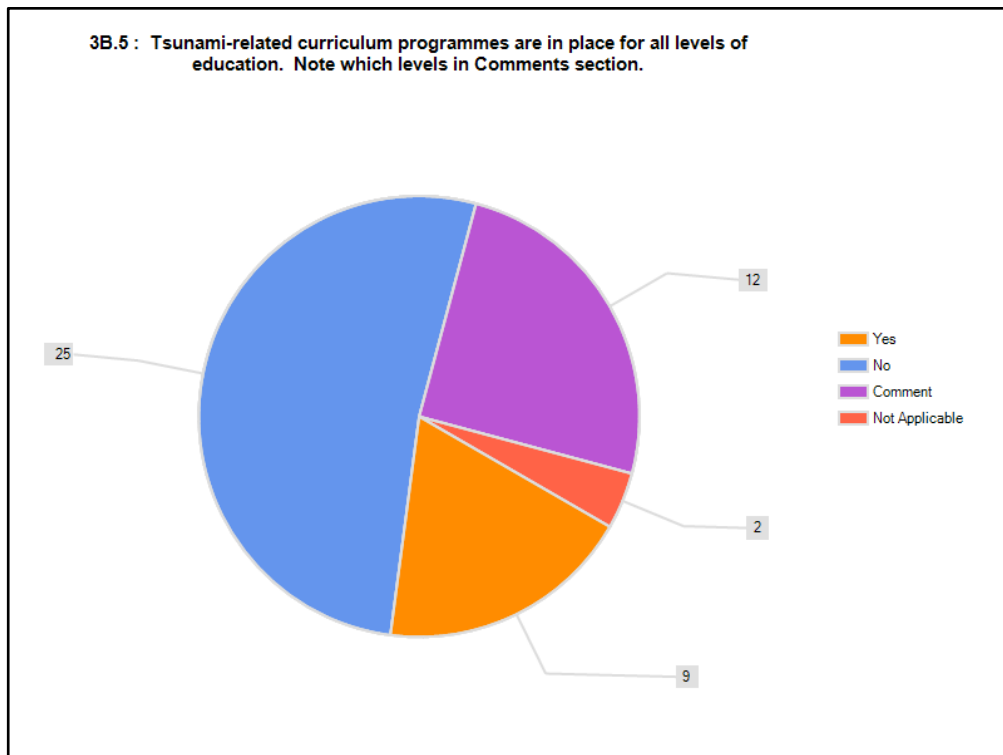


Figure VI-45. Responses to Question 3B.5

The nearly (66%) of respondents do not have tsunami-related school curriculum programmes in place for all levels of education. New Zealand gave examples of its general hazards curricula, which has a number of components, each of which can be used independently or in conjunction with each other. Several countries indicated the need for evacuation planning by schools in tsunami hazard zones..

- Not to my knowledge, although I understand Education were seeking resources for this to be in place – Niue.

- Tsunami-related curriculum programmes are not in place for any level of education in Vietnam.
- Levels of Education includes: Early Childhood, Primary and Secondary School levels.
- More refined evacuation maps will be developed.
- Actualmente, se está llevando a cabo este proyecto con el apoyo del PNUD.
 - *At present this project is being carried out with the support of UNDP.*
- No se ha logrado que la temática de tsunamis constituya parte de programas curriculares nacionales.
 - *Failure to include the tsunami subject matter as part of national curriculum programs.*
- French Polynesia is NOT concerned by LOCAL/REGIONAL source tsunami.
- Evacuation routes and plans for schools. Promotion of programmes in schools on tsunamis as well as videos of real events in the past on local television.
- Educational levels starting from Early Child Education to College Level Educations.
- Tsunami information material in the SHOA web site for all education levels.
- Primary & Secondary Schools curriculum.
- A program is in place to educate 8th graders in all applicable forms of disaster risk, including tsunami in Pohnpei. I do not know about the other states of FSM.
- With the support from the USAID, we are in the initial stage in working with the State Dept. of Education to include a curriculum on all hazards.
- This item is being actively and continuously reviewed at the national level between JATWC and state-based emergency services.
- Generic hazards (including tsunami) are covered in the New Zealand curriculum though a programme called 'What's the Plan Stan'. This covers primary and intermediate school children aged 5–12 years. The resource has a number of components, each of which can be used independently or in conjunction with each other. These include:
 - A guide for teachers, including unit plans and activities
 - A CD–Rom for teachers and students, including stories, interactive games, research material, tips for teachers and resources that can be cut and pasted into unit plans. The CD-Rom can also be run off the school intranet.
 - A website - www.whatstheplanstan.govt.nz The guide includes: unit plans, activities and ideas to increase students' confidence in emergency planning and practice.
 - Fact sheets about different types of disasters.
 - Simulation and practice activities that involve the school and community agencies.
 - Information about the roles of principals, Boards of Trustees and the community agencies.
 - Templates for the activities and suggested resources including books and websites.

- The Ministry of Health takes an all hazards approach toward the coordination of the health and disability sector in an emergency rather than specific tsunami education.
- Tsunami-related topics are part of discussions on disaster preparedness and mitigation in the elementary and high-school curriculum.
- People, mass media, volunteers, official staffs in local and center (primary schools, high school, graduate and higher).
- Not to my knowledge, although I understand Education were seeking resources for this to be in place (Tasi can you comment)

3B.6 Communities have tsunami evacuation maps, routes, evacuation signs and assembly points for evacuation areas? Please note any gaps and future plans to fill gaps.

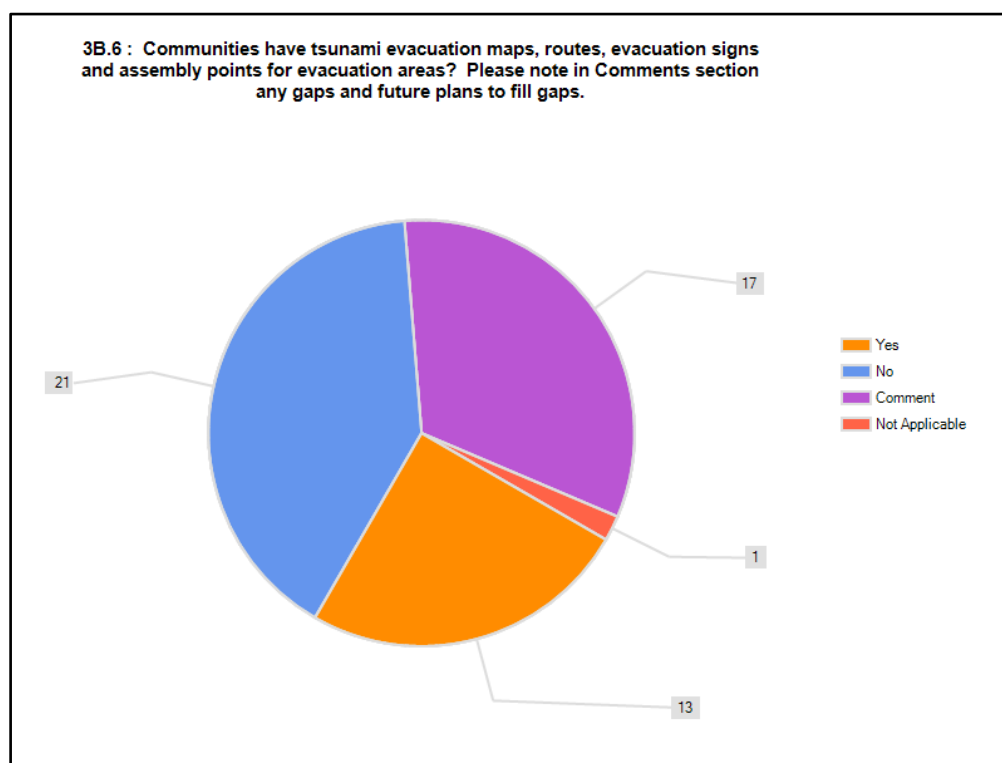


Figure VI-46. Responses to Question 3B.6

Over half (55%) of respondents do not have tsunami evacuation maps, routes, evacuation signs and assembly points for evacuation areas. Where these do not exist, some agencies are progressing. One country noted that during the real event, there were traffic jams and people did not follow what they practiced in exercises, so follow-up needed to look at routes and signage.

- Not all communities have this information, we need to increase our capacity through exercises, to involve the community and update these maps.
- Tsunami inundation maps and guidelines for development of tsunami evacuation plans have been developed and are provided to the local government. Evacuation plans and maps for pilot coastal villages were prepared and community drills were conducted to test these plans. Local programmes are currently being prepared to assist coastal villages in the preparation of their tsunami evacuation plans.

- In real situation some people donot follow the practiced drill, traffic jam are problems, routes' sign are not located in the right places etc. There will be workshops to raise the gap and to find solutions.
- No current evacuation maps though this is going to form part of the MCDEM funding available to Niue to allow us to progress this.
- There are still no tsunami evacuation maps, routes, evacuation signs and assembly points for evacuation areas at community level in Vietnam. Nationwide Projects on community-based tsunami response should be conducted in the future to fill this gap.
- Se encuentra en desarrollo un Sistema Nacional de Alerta de Tsunamis, el cual considera recursos humanos, materiales y financieros para su operación, además de entrenamiento y ejercicios.
 - *A National Tsunami Warning System is being developed, which considers human, material and financial resources for its operation, in addition to training and exercises.*
- At the moment, we have signage, evacuation maps for 8 villages and will be looking at adding more villages once funding is available to put up the rest in the country.
- More refined evacuation maps will be developed.
- The last exercise conducted was a table-top exercise for Exercise IOWave 2011 which was conducted in October 2011.
- Inundation maps are under preparation.
- No en su mayoría, actualmente se está migrando de formato papel a formato digital, algunas cartas que se elaboraron con metodología empírica (fórmula de Yamaguchi). Se ha planificado el desarrollar cartas para todo el litoral ecuatoriano partiendo de la modelización.
 - *Not for the majority, currently a migration from paper to digital format is being done to some charts made with empirical method (Yamaguchi method). The development of charts has been planned for the entire Ecuadorian littoral starting from modeling.*
- Some exercises have been conducted several times in several communes and islands. The evacuation zones are determined, but presently there are no evacuations signs.
- Actualmente contamos con 80 mapas de inundación por tsunami para las principales comunidades costeras que representan el 60%. Actualmente, nuestra deficiencia es llegar a concretar este proyecto en un 100%.
 - *Currently we have 80 tsunami inundation maps for main coastal communities representing the 60%. At present our gap is to make this project a reality in a 100%.*
- Disponibles en la población de Tumaco en la Costa Pacífica.
 - *Available for the people of Tumaco in the Pacific Coast.*
- Routes are identified but need some Evacuation Centre's in high elevated areas. Evacuation areas are mainly cleared fields.
- En algunas zonas costeras hay señales de evacuación.
 - *In some coastal areas there are evacuation signs.*
- Inundation maps are under preparation.

- Only two places have evacuation signs (Paramushir Island, Nevel'sk region). We are considering creating more tsunami evacuation maps, routes, evacuation signs and assembly points for evacuation areas in 2012 (on Iturup and Kunashir Islands and Kholmsk, Aniva and Korsakov regions (all on Sakhalin region)). There is an assembly point for evacuation areas on Kunashir Island.
- Parts of the Island have evacuation maps, routes, evacuation signs and assembly areas. ASDHS-TEMCO and its Tsunami Readiness Program are currently in the process to complete the entire island.
- CNMI Tsunami inundation and evacuation modeling map are in process by PMEL.
- SHOA is transferring the methodology to the Universities for making inundations maps.
- The Tsunami warning system for Vanuatu is a project that will begin in 2012 to include tsunami signs, tsunami awareness material. The tsunami information is still to be more emphasizing in school curriculum.
- FSM has a whole should prepare one, and should be use by all states.
- We are still in the planning stage and the States will be the one responsible to designate their own routes and evacuation signs in the respective states.
- This item is being actively and continuously reviewed at the national level between JATWC and state-based emergency services.
- The majority of participating agencies indicated that they do have community tsunami evacuation maps, routes, evacuation signs and assembly points or this work is underway. However, some coastal communities have well developed evacuation routes. Some have none.
- Still trying our best to cover the whole Fiji Group with outreach tsunami awareness campaign. Normally we strictly emphasize the communities to make their own evacuation plan and map as they know the geological background and the various high grounds better than we do.
- Inundation maps are complete, evacuation maps being developed.

3B.7 Other country evaluation statements. Please summarize the statement and results (Response count: 2)

- This exercise helps the team to identify the needs that need to be addressed properly for a proper tsunami warning system.

3C.1 The response activation process was followed when the initial PTWC, NWPATC and/or WCATWC Exercise PacWave11 scenario exercise start message was received.

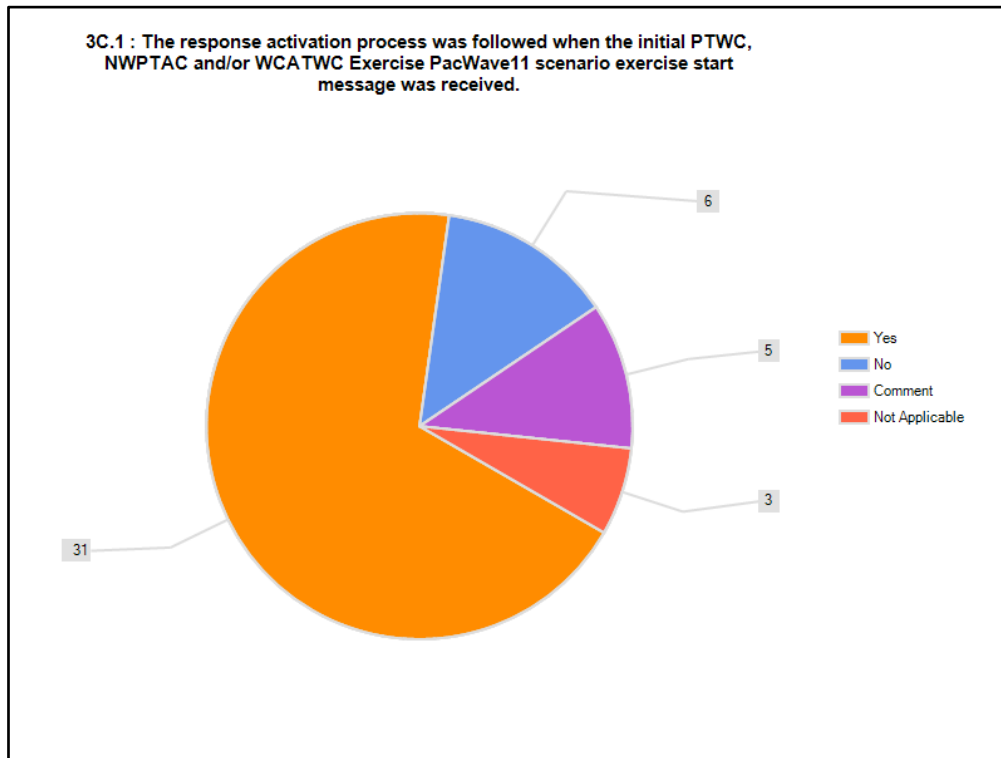


Figure VI-47. Responses to Question 3C.1

Eighty (80%) per cent of respondents followed their response activation processes when the initial exercise start message was received.

- We started five minutes past the hour of occurrence of the earthquake.
- Not applicable as a communications test was conducted.
- CONRED: UNFORTUNATELY THE EXCERCISE INFORMATIONS CAME IN WITH SOME DELAY.
- INSIVUMEH: The start message was sent to the Emergency service agency at 15:08 GMT.
- The exercise was started by the simulated perception of the earthquake and the following intensity report from NDMO.
- WSO, Pohnpei notified OEEM, Pohnpei & Kosrae States.
- JATWC messages used.
- Given the limited timeframe exist for the whole of Fiji Group to evacuate.

3B.2 The warning was disseminated to:

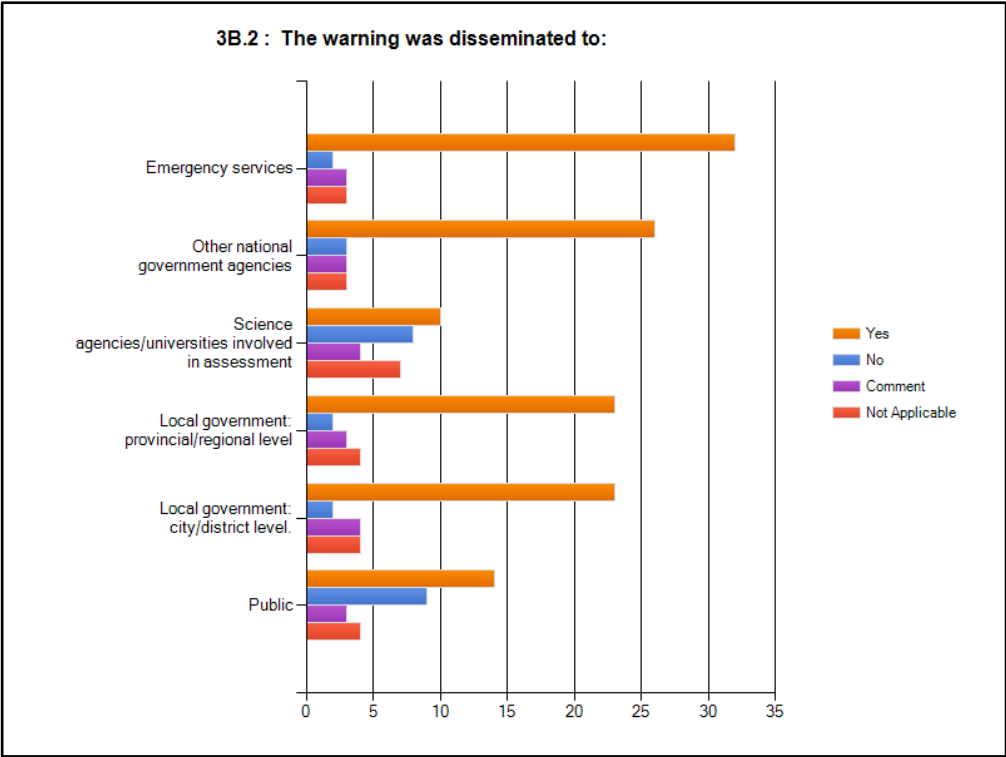


Figure VI-48. Responses to Question 3B.2

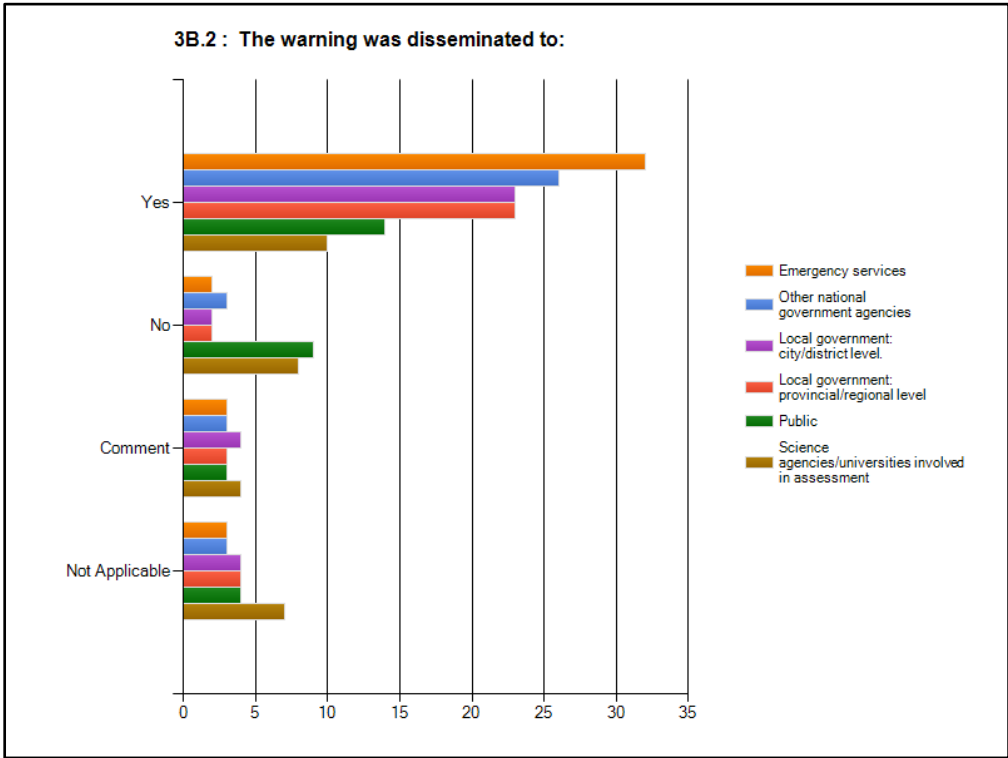


Figure VI-49. Responses to Question 3B.2

- There are not many Scientific and Universities in the Solomon Islands and we have not invited those exist to participate in the exercise.
- Warning message did not sent to other agencies in case of Thai Meteorological Department received email from PTWC due to TMD is not the focal point but for the real situation TMD has SOP to disseminate all information of earthquake and tsunami to users and public.
- The exercise gave the opportunity to tests two recently fielded Chatty Beetle terminal units on two of the outer-islands (Jaluit and Ailinglaplap Atolls). These are units are in operation at the Synoptic Weather Station and manned by the weather observers on these islands.
- Not applicable as a communications test was conducted.
- French Polynesia is NOT concerned by LOCAL/REGIONAL source tsunami.
- Yes to all accept Science /universities involved in assessments as we do not have this luxury. Although exercise participation was voluntary many agencies participated either through small scale operational or table-top exercise. All first responders at national level participated fully.
- Local government thru the Chatty Beetle units in the outer-islands.
- At Pohnpei State we used the exercise to test the accuracy and timeliness of our emergency contact procedures. I cannot speak for the National Government or the other states. Most of these questions are directed at the national level and not applicable to us at the state level.
- When received Tsunami Warning, statement was prepared and announce on the local radio for public awareness.
- When we disseminated the messages, we clearly inform them that it was an exercise to test how fast we can send the messages to every key people in the government and the public.
- Please note this is for JATWC messages used. The local government and the public were not involved.
- Only key agencies at National level.

3C.3 What time was the initial PTWC, NWPATC and/or WCATWC Exercise PacWave11 scenario exercise start message sent to the agency or agencies listed in Q3.C2? Please note the time using 24 hour clock and UTC, e.g., 14:35 UTC.

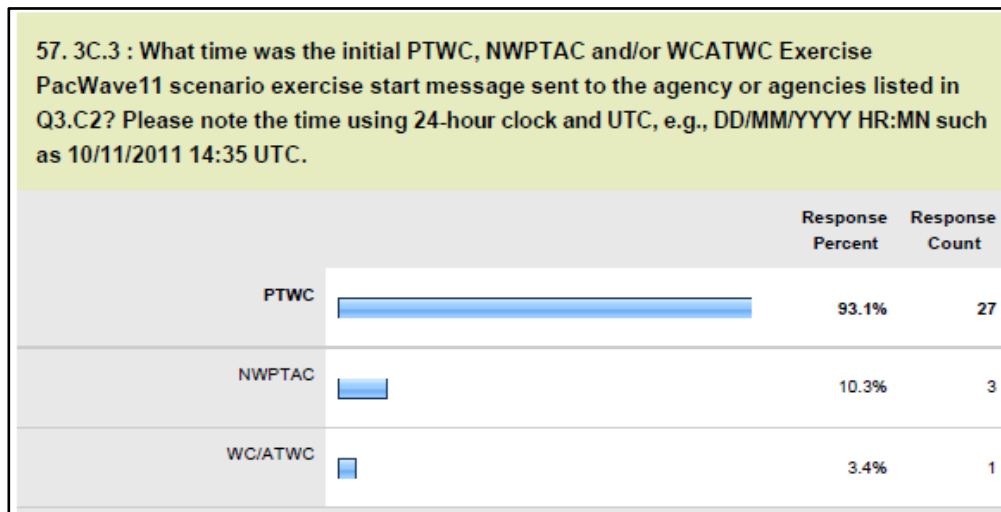


Figure VI-50. Per centages of responses to Question 3C.3

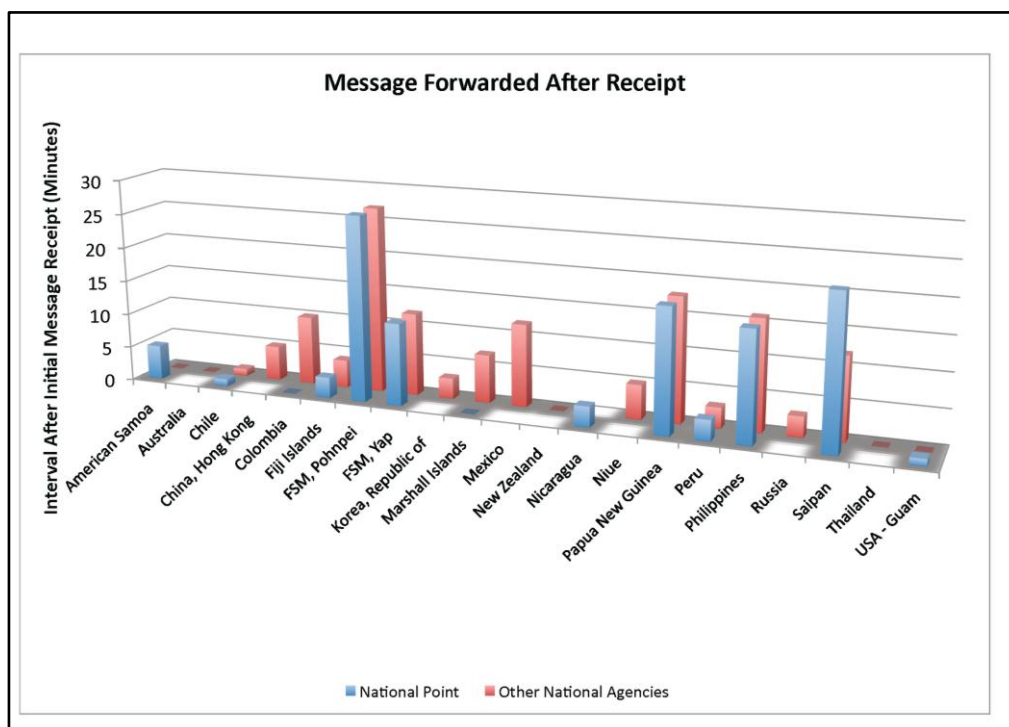


Figure VI-51. Message forwarded after receipt (in minutes)

The average time interval from receiving the initial message to sending national agencies was 6.9 minutes, and the median time was 5 minutes. This the same plot as shown for 1B.8

As with 1B.6 and questions where time was requested, there appeared to be some confusion on what was being asked for resulting in inconsistent answers. As a result, some entries could not be included.

TWCs	Time when initial PTWC, NWPATC and/or WCATWC Exercise PacWave11 scenario exercise start message was sent to the agency or agencies listed in Q3.C2. (24 hour clock and UTC)
PTWC	<ul style="list-style-type: none"> • Comments Governor 1020 Yap Time; 3 minutes after 1st initial start message Emergency Services 1036 Yap Time; 19 minutes after 1st initial start message National Government 1040 Yap Time; 23 minutes after 1st initial start message Public via Government Media 1056 Yap Time; 39 minutes after 1st initial start message • 21:06 UTC EMAIL, FAX AND SMS • The Office of Civil Defense (OCD) received PHIVOLCS Tsunami Bulletin 1 at 0024UTC • 09/11/11 13:08 UTC • 2113 UTC • 10/10/2011 00:15 • PTWC–15:20 UTC • Emergency services at 02:15 UTC • Science agencies/universities involved in assessment at 02:17 UTC • Local government: provincial/regional level at 02:15 UTC • Local government: city/district level at 02:16 UTC • Public at 02:18 UTC • The initial PTWC, NWPATC and/or WCATWC Exercise PacWave11 scenario exercise start message was not sent to the agencies. The first earthquake report based on the start message was sent to the agencies at 02:15 UTC. • 14:25 • 10/11/2011 13:11 UTC • PTWC–EI PTWC no lo envió a ninguno de estos organismos • PTWC–PTWC did not send it to any of these agencies • PTWC–09/11/2011 21:18 • 20.10 UTC (initial) and by 20.25 UTC–all participating agencies were receiving and disseminating bulletins as per their SOP. Some agencies received the bulletins and called an in-house meeting to discuss their actions and responsibilities as a single agency (table-top). Other participating agencies exercised communications through to full evacuation (Operational). Non participating agencies received bulletins and acknowledged receipt of bulletin with

TWCs	Time when initial PTWC, NWPATC and/or WCATWC Exercise PacWave11 scenario exercise start message was sent to the agency or agencies listed in Q3.C2. (24 hour clock and UTC)
	<p>the Exercise Management Team.</p> <ul style="list-style-type: none"> • Exercise start message sent to PNG Emergency Services at 00:18 UTC • 02:12 UTC • De manera automática por correo electrónico y por fax • We will automatically e-mail and fax • 0215 UTC • The initial PTWC, NWPATC and/or WCATWC Exercise PacWave11 scenario exercise start message was not sent to the agencies. The first earthquake report based on the start message was sent to the agencies at 02:15 UTC. • 10/10/2012 00:08 UTC • 2108 UTC • 0020 UTC • 13:09 UTC • 22:00 • 10/10/2011 00:15utc • 09/11/11 1308z • 0035 Zulu Time (Pohnpei FSM) • 09/11/2011 22:08UTC • 2208UTC (1108 NZDT) • 09/11/2011 22:12 UTC • 10/10/2011 0008 UTC
NWPTAC	<ul style="list-style-type: none"> • Within 30 minutes after the initial NWPATC Exercise PacWave11 scenario exercise start message was received at the NTWC. • 23:08 UTC • N/A
WCATWC	<ul style="list-style-type: none"> • N/A

Table VI-5. Responses to Question 3C.3

3C.4 How did you send the initial PTWC, NWPTAC and/or WCATWC Exercise PacWave11 scenario exercise start message to the agency or agencies listed in Q3.C2? Note methods in the Comments section. (Response count: 33)

The initial exercise start message to the agencies listed in Q3.C2 was sent via:

- Email.
- Fax.
- Satellite phone.
- HF radio and 2way radio.
- SMS.
- Phone Call.
- DisasterLan.
- Via phone & VHF radio.
- EMAIL, FAX, SMS WEBSITE.
- The exercise messages were sent by fax email and SMS.
- PTWC – Automatically by email and Fax.
- ALL VIA EMAIL AND FOLLOW UP BY TELEPHONE CALL.
- From the NTWC, Exercise PacWave11 scenario exercise start message was sent via Fax.
- NEMCO received information via fax, email and telephone. Two outer-islands communities warning focal points received via Chatty Beetle terminal units.
- Correo electrónico.
 - Email
- Send the initial PTWC Exercise PacWave11 scenario exercise start message by fax.
- The local message on the start of exercise was sent by Government Bulletin Board System, fax and email.
- Vía fax, e-mail, teléfono.
- Fax.
- Correo electrónico FAX Teléfono RDSI Teléfono Satelital Radio HF.
 - E-mail, FAX, Telephone, ISDN Satellite Telephone, HF Radio.
- PTWC did not send it to any of these agencies.
- Email and fax. Messages were confirmed with each agency using the same methods.
- Email, phone call, radio, TV station and text message prompt. When the response executives (decision makers) decided from the information received that an evacuation of the coast was required – all sirens on Rarotonga were sounded. This activated the evacuation process discussions for those doing a table-top exercise and an actual evacuation for those participating to this extent (operational). The Exercise management team (EMT) was aware before the exercise of the type of exercise each participating agency will conduct during Pac Wave 2011.
- E-mail, Fax.

- Via Fax.
- PTWC.
- SMS and Fax.
- The local message on the start of exercise was sent by Government Bulletin Board System, fax and email.
- CONRED: EMMAIL. PHONE, FAX.
- INSIVUMEH: With bulletins, where it was informed about the parameters of the earthquake, the estimated heights of the waves and their arrival time to the coasts of Guatemala. CONRED: EMMAIL. PHONE, FAX.
- The initial message (PTWC, NWPTAC) was not sent to any of agencies because RTWC sent its own tsunami warning message by GTS, phone (commercial and dedicated lines), fax, e-mail.
- Fax, telephone and chatty beetles units.
- EAS (Media) broadcast / Telephone / NOAA Weather Radio /2-Way Radio.
- THRU EMAIL, FAX AND PHONE CALLS (land lines, radio and cell phones).
- Radio (VHF), e-mail, fax.
- By fax.
- Fax telephones and cellphones if needed.
- By Fax, Delivery by Police officers, email and follow up on Telephone.
- By Fax, email and telephone.
- PTWC message not distributed.
- Sent via the National Warning System (email).
- Microphones since it is a tabletop exercise.
- Disaster LAN.

3C.5 The method of communication from our public-safety, national decision-making and dissemination point to us was sufficient (timely, clear, accurate) to support decision-making.

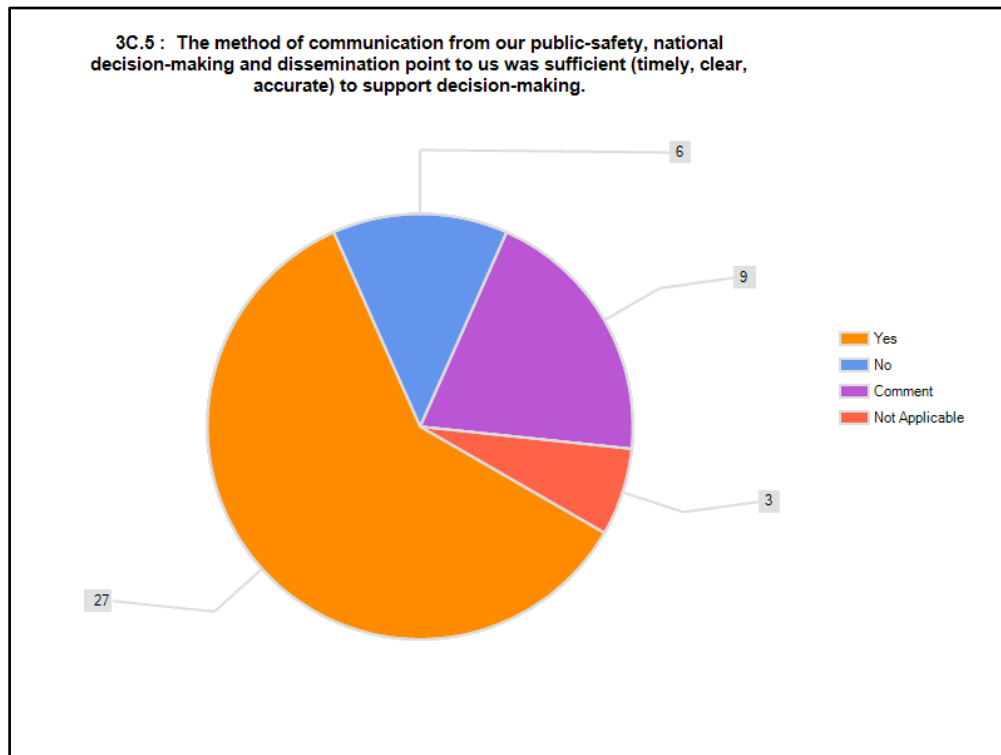


Figure VI-52. Responses to Question 3C.5

Seventy-three (73%) per cent of respondents indicated that the method of communication from their public-safety, national decision-making and dissemination point was sufficient to support decision-making.

- The tsunami exercise did not involve the participation of the public.
- Still slow via Fax.
- It only took 2 minutes.
- Not applicable as a communications test was conducted.
- El Centro Nacional de atención de emergencias no se activó de manera oportuna a pesar de que el Centro Nacional de alerta de tsunami le informó de manera inmediata.
 - *The National Emergency Care Center was not timely activated even though the National Tsunami Warning Center immediately informed.*
- Yes, the sirens are the fastest mode of warning message dissemination we currently have. Prior to the sounding of sirens as information was being assessed information was disseminated via emails/ phone call and text messaging. When the evacuation order was issued by the response executives the sirens were sounded and the email/ phone call and text messaging continued with the addition of door to door knocking and Police officers stationed on the streets to guide people and traffic inland and maintain order as per our sop.
- National SOP on tsunami not yet formulated.

- INSIVUMEH: Especially at the beginning of the Exercise due to the initial confusion about whether we would receive the bulletins from the PTWC. We think is convenient to have another messages way in case of communication failures.
- As mentioned earlier, the warning was riddled with scientific terminology that only confused us as to the level of threat for us.
- Always Fax or call PTWC of Tsunami received.
- When we first sent the first and second messages, we managed to get them out intime but as more messages, came throught our communication system got delay because of so many interruption coming in from outside.
- However, the issuance of some JATWC products was delayed.
- The majority of participating agencies indicated that the method of communication from MCDEM worked well. One agency commented that communication of raw data is quick enough in parallel to what is received directly from PTWC – however national scientific advice is very slow and can't be relied on in regional or local events.

3C.6 The method of communication between our public safety national decision making and dissemination point and individual response agencies and provinces/local jurisdictions was sufficient to support national information requirements and decision-making.

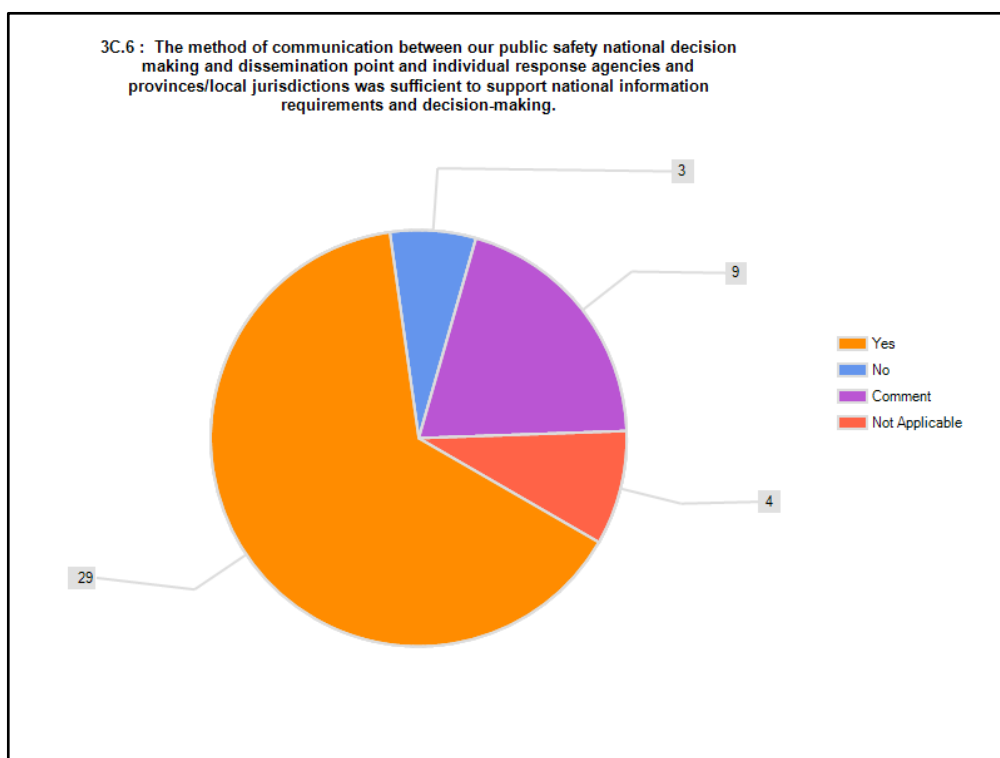


Figure VI-53. Responses to Question 3C.6

Eighty-one (81%) per cent of respondents indicated that the method of communication between the public safety national decision making and dissemination point and individual response agencies/provincial and local jurisdictions was sufficient to support national information requirements and decision-making.

- Please read comment 3C.8.
- Recently our upgraded system allows sending SMSs to the coastal provinces People Committees.
- It only took 2 minutes.
- Not applicable as a communications test was conducted.
- Debido a que el Centro Nacional de atención de emergencias no se activó de manera oportuna, la comunicación con los gobiernos locales se retrasó.
 - *Since the National Emergency Care Center was not timely activated, communication with local governments delayed.*
- Yes, there were small delays in some areas and these are been addressed internally.
- Only by Fax & Telephone.
- All agencies except one indicated that the method of communication between MCDEM and regional partners was sufficient to support national information requirements and decision making.
- Yes because of an effective coordination in a timely driven manner.

3C.7 Did a management group responsible for decision-making on tsunami warning and response assemble during the exercise?

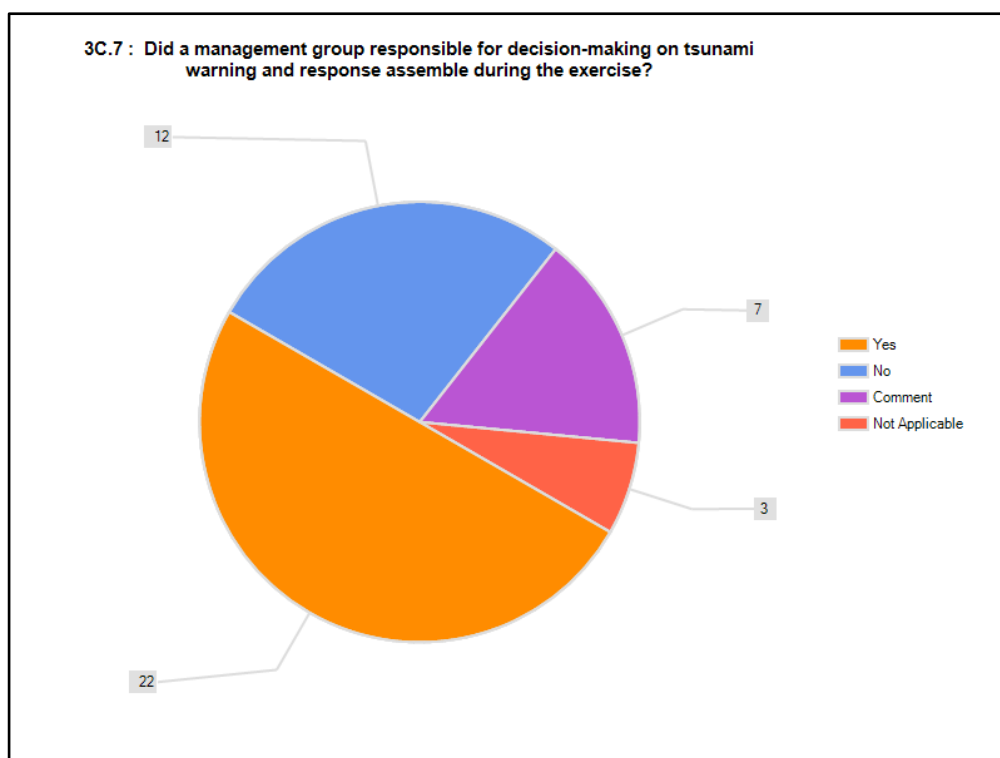


Figure VI-54. Responses to Question 3C.7

Sixty-one (61%) per cent of respondents assembled a management group responsible for decision-making on tsunami warning and response during the exercise.

- Please read comment 3C.8
- The chairman of the National Disaster Committee (NDC) was took part in the exercise at the NEMCO level.
- Not applicable as a communications test was conducted.
- Se reunieron en las oficinas del Centro Nacional de Atención de emergencias (Protección Civil), representantes de diversas instituciones tomadoras de decisiones incluyendo especialistas del Centro Nacional de Alerta de Tsunamis.
 - *They assembled at the National Emergency Care Centre (Civil Protection) representatives of several decision-making institutions including specialists from the National Tsunami Warning Centre.*
- Yes, the response executives were contacted as per our sop and they met to discuss the threat using all data received.
- Management did not assemble, but EOC simulated its activation going through its call lists and advisement of supporting Agencies.
- Inundation maps are nearly complete from PMEL.
- We did not at the state level, we were not testing to that point, I do not know what was being done at the national level.
- OEEM, Pohnpei & Kosrae DCO's.
- Most agencies assembled a management group.
- Yes. The members under the NEOC.

3C.8 If you answered yes to Q 3C.7 (above), how many minutes/hours did it take for your management group to assemble after receiving the initial Exercise PacWave11 exercise start message? (Response count: 22)

For those agencies that did assemble a management group it took between two minutes and 60 minutes to assemble the group. It should be noted, however, that for a local tsunami, there may not be enough time for this group to meet and make decisions before the first tsunami wave arrives, and therefore, decision-making must be streamlined and authority delegated to warning or emergency operation center duty staff.

- It takes around 25 – 30 minutes.
- Since the Philippines used a local tsunami scenario where tsunami waves are expected to arrive early, there was no time to convene management during the first few hours and initial decisions were based on written SOPs and tsunami expert judgement.
- Approximately less than 30 minutes depend on situation.
- Throughout the exercise period.
- En diferentes zonas se reunieron autoridades de los 3 niveles de gobierno el día del ejercicio en diferentes horarios ya establecidos con anterioridad.
 - *Authorities of 3 levels of government assembled in different zones the day of the exercise at different times previously established*
- About 5 minutes.

- The management group assembled instantly.
- 10 minutes.
- Aproximadamente, una hora.
 - *One hour approximately*
- Entre 2 y 10 minutos.
 - *Between 2 and 10 minutes.*
- 30 minutes after the start of the exercise.
- Management group assembled for the start of exercise.
- Al momento de recibir el correo electrónico.
 - *At the moment the email was received.*
- The management group assembled instantly.
- CONRED: It was assembled before the initial NTWC message was received. We gathered before because the NTWC msg was NEVER RECEIVED, and checked the PTWC WEB PAGE for updated references.
- 3 minutes.
- 00:15 minutes to gather the NDMO.
- It would take between 20 minutes to an hour.
- In less than 5 minutes.
- One hour. The warning has been disseminated to the NDMO only. The agencies involve in this exercise are the Vanuatu Meteorology and Geohazards department as the warning centre and the NDMO. Being in the same building facilitates the fastness of the meeting for everyone. Yet being a local tsunami scenario is a big challenge in terms of rapidity to meet, to decide and to respond. This shows some gaps in the level of preparedness for both agencies, the NDMO and the VMGD that requires mending. Both agencies need to familiarise themselves with the procedures in times of emergency, prepare all contacts to call or email in such time and display in the operation centre.
- 5 to 10 minutes.
- The management groups assembled within 5–30 minutes depending on the organisation.
- Since it was a tabletop Exercise, it took within 1–5 minutes for them to assemble.
- <1hour.

3C.9 If you answered yes to Q 3C.7 (above), was this timely to facilitate good decision-making?

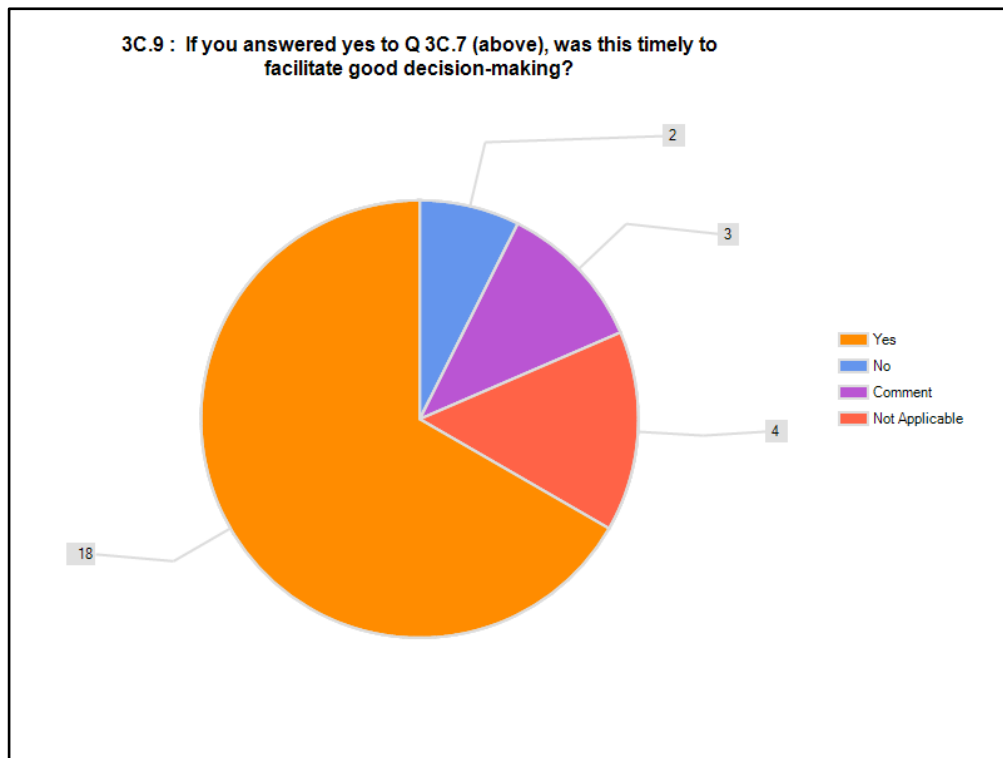


Figure VI-55. Responses to Question 3C.9

Seventy-five (75%) per cent of respondents indicated this was timely to facilitate good decision-making.

- Please read comment 3C.8
- Se tardó aproximadamente una hora, lo cual para un evento regional es demasiado tiempo.
 - *It took about one hour, too much time for a regional event.*
- Yes, all data received at that point is made available to them. They either request for more information or seek the advice of those that are familiar with the characteristics of the threat.
- Immediately.
- It would be for the Search & Rescue phase.
- All participating agencies indicated yes this was timely.
- Plenty time available.
- Fue de inmediato.
 - *Immediately.*

3C.10 Other Country evaluation statements. Please summarize the statement and results. (Response count: 3)

- Ref No. 3C.5 – Our Telekom Company Ltd. Dissemination of the warnings using SMS was clear and accurate, however, the problem is mainly of with the timing in receiving of the warnings by the public. This is because the new network system used by Our Telekom has difficulty with the traffic. As such, some people receive the SMS first and others receive the SMS very late. Ref No. 3C.5–Solomon Islands Broadcasting Corporation (SIBC) The disseminations of the warnings using the National AM Broadcaster (SIBC) was timely, clear and accurate, however, the problem that was encounter is that not many people wake-up in the night as well as not many people are turning on their radios during night time.
- Answers to 3C.3• Emergency services–22:11 UTC • Other national government agencies–22:11 UTC • Science agencies/universities involved in assessment–22:12 UTC • Local government: provincial/regional level–22:12 UTC • Local government: city/district level–22:12 UTC • Public–22:11-22:17 UTC.
- The warning has been disseminated to the NDMO only. The agencies involve in this exercise are the Vanuatu Meteorology and Geohazards department as the warning centre and the NDMO.

3D.1 Did the national disaster management organisation (or equivalent) maintain communication with the National Tsunami Warning Centre throughout the event?

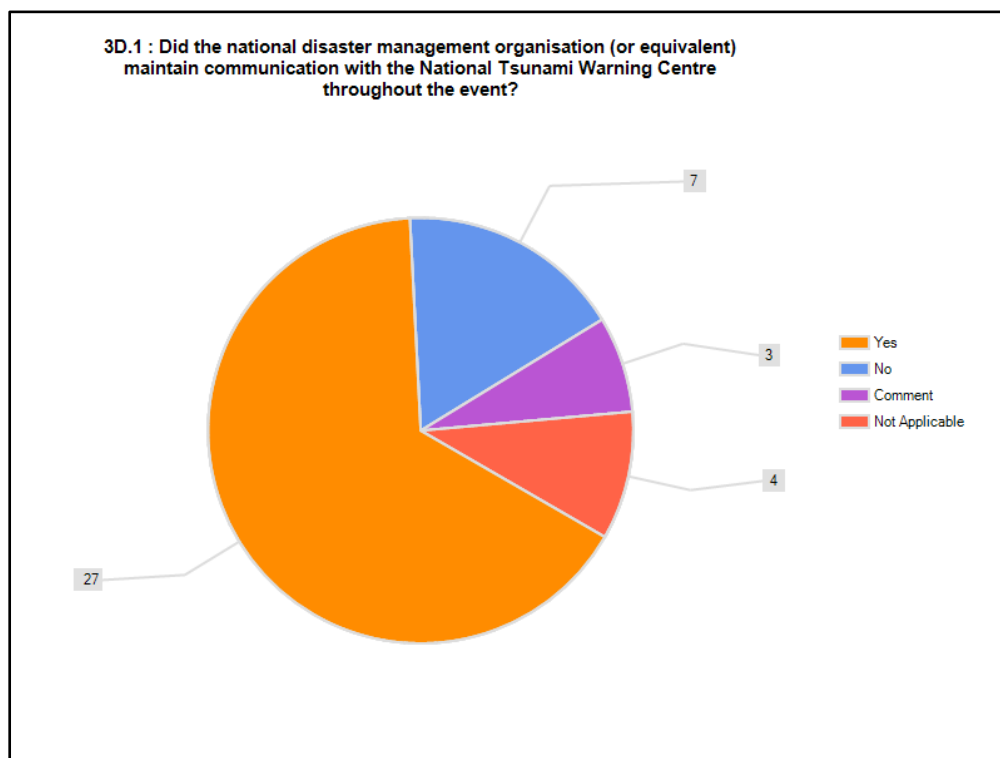


Figure VI-56. Responses to Question 3D.1

Seventy-one (71%) per cent of the national disaster management organisations maintained communication with their tsunami warning centre.

- NDWC, TMD provided information and warning messages to DDPM via channels (fax, sms, hotline).
- Not applicable as a communications test was conducted.
- Se mantuvo comunicación vía fax, correo electrónico y teléfono.
 - *Communication was maintained by fax, email and telephone.*
- Yes. The Cook Islands Meteorological Services (CIMS) been the focal point for information received from PTWC maintained contact with the National Emergency Operations Centre (NEOC) all throughout the exercise. The director of CIMS is also a member of the core decision making team.
- INSIVUMEH: Our National Tsunami Warning Centre (INSIVUMEH) sent bulletins via fax and email to the National Disaster Management Organisation (CONRED), but there was not any response in return; this is, there was communication but only in one way. However, in the past, in real events, we have had high level communication which has avoided misunderstandings and false alarms.
- National disaster management depend on WSO, Pohnpei for communication with National Tsunami Warning Centre.
- Definitely yes. For them to be updated with the information provided as per bulletin received from PTWC.

3D.2 If you answered yes to Q3D.1, what was the nature of the communication between the national disaster management organisation (or equivalent) with the national tsunami warning centre throughout the event? (Response count: 23)

The nature of the communication was predominantly via:

- Phone.
- Email.
- HF radio.
- ACKNOWLEDGING THE RECEIPT OF THE EACH BULLETIN.
- The Communications between the two was excellent as they are all located within the National Emergency Operations Centre (NEOC).
- The Office of Civil Defense provided hourly Situation Reports (SitReps) consolidated from Situation Reports from Regional OCD offices. These reports are also available at their website.
- Fax, sms, hotline.
- PHONE EMAIL Contact regarding updating what Police were doing/achieving in terms of the evacuation of the Niue Primary School.
- Correo electrónico y teléfono.
 - *Email and telephone.*
- DMO officers maintained contact throughout the exercise via text via email and telephone calls requesting updates.
- Possible Tsunami threat level and the scope of its influence.

- Government Bulletin Board System, telephone, email, fax.
- Accuracy and rapidity.
- Teléfono RDSI Radio HF.
 - *ISDN Telephone, HF Radio.*
- Fue una comunicación constante y fluida
 - *Constant and fluent communication.*
- Se mantuvo permanente comunicación vía teléfono y correo electrónico, sobre el desarrollo del ejercicio.
 - *Permanent communication was maintained by telephone and email, about the development of the exercise.*
- At first by telephone call to advise that a PTWC bulletin has been issued then in person at the NEOC. He maintained contact with his office (CIMS) and kept NEOC and decision makers updated.
- Frequent telephone contact (land line and mobile), e-mail.
- By radio.
- Government Bulletin Board System, telephone, email, fax.
- CONRED: STRICTLY REFERRED TO THE EVENT, THROUGH BULLETINS.
- Phone (commercial and dedicated lines), by Telegraph Agency.
- To maintain and receive updates as the exercise was on going.
- Thru website.
- Through radio (VHF), satellite phones and satellite internet.
- Telephone was the main means of communication between the 2 agencies during the exercise.
- To make sure, area still in warning effect and when initial time of wave arrival pass but not threat to specific area. When to cancel warning etc.
- Direct phone contact and secured web pages.
- Smooth, well linked and understandable at both ends.
- Via radio.

3D.3 Did the national disaster management organisation (or equivalent) maintain communication with local/regional disaster management organisations (or equivalent)?

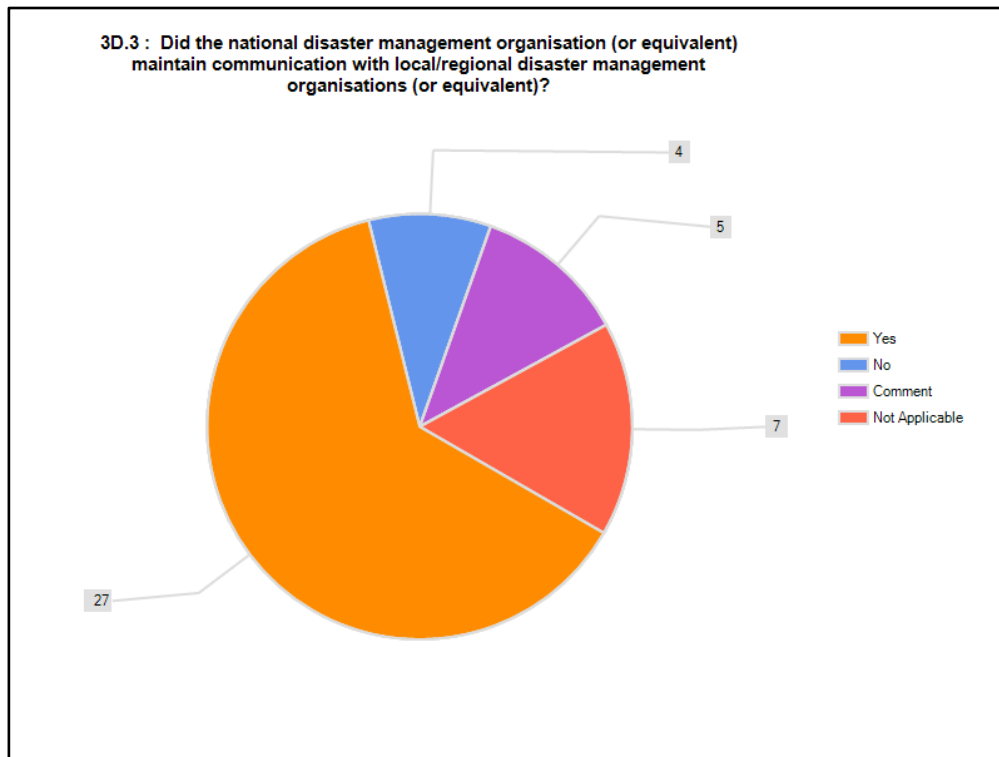


Figure VI-57. Responses to Question 3D.3

Seventy-one (71%) per cent of national disaster management organisations maintained communication with local/regional disaster management organisations.

- Not applicable as a communications test was conducted.
- Teléfono RDSI Radio HF.
 - *ISDN Telephone, HF Radio.*
- Local organisations such as the community siren management teams and participating Ministries were contacted and kept updated throughout the exercise. EMT chose to not have regional partners involved in the exercise but rather focus on communications with our communities on Rarotonga and the Outer Islands (Pa Enua). Police Emergency Operations Centre was activated and exercised their role of message dissemination during Pac Wave 2011.
- But was in contact with WFO Guam's WCM Guard.
- Telephone consultation between the WSO, EMO and WSFO Guam.
- All participating agencies at the regional level agreed that communication was maintained throughout the exercise.
- Guam State and Local Government are the same.

3D.4 If you answered yes to Q3D.3, what was the nature of the communication between the national disaster management organisation (or equivalent) with local/regional disaster management organisations (or equivalent)? (Response count: 24)

The nature of communication was predominantly to:

- Acknowledge receipt of messages.
- Verify the timely receipt of warning bulletins.
- Inform on actions to be taken at local level.
- Updated via phone at beginning and end of the exercise.
- Basically to maintain contact and monitor the activation of respective Provincial Disaster Management Arrangements and early warning and response systems, including the Provincial and Community Tsunami Response Plans.
- The Office of Civil Defense provided tsunami bulletins and updates from PHIVOLCS to their Regional OCD offices to be disseminated to appropriate local government.
- Fax, telephone, radio communication.
- Primarily to acknowledge reception of messages.
- Correo electrónico con el objetivo de verificar la oportuna recepción de los boletines de alertamiento, acciones de protección para la población y afectaciones a la misma.
 - *Email with the purpose to verify the timely receipt of warning bulletins, protection actions for the population and what affects them.*
- Possible inundation area and the evacuation route.
- Government Bulletin Board System, telephone, email, fax.
- Accuracy and rapidity.
- La comunicación se basó en el envío y recepción del mensaje con los parámetros del evento. En cuanto a la activación de los planes de emergencia se utilizó Radio HF a los representantes de las organizaciones locales y regionales.
 - *Communication was based on sending and receiving the message with the event parameters. As to emergency plan activation, HF Radio was used with representatives from local and regional organizations.*
- Se mantuvo comunicación por escrito y por teléfono para informar sobre las acciones a tomar a nivel local.
 - *Written and telephone communication was maintained to inform on actions to be taken at local level.*
- La Dirección General de Gestión del Riesgo emitió 3 boletines informativos a los cuerpos locales de atención de emergencias, así como activó el sistema de alerta nacional en las poblaciones de la Costa Pacífica.
 - *The Risk Management General Directorate issued 3 informative bulletins to local bodies of emergency care, as well as activated the national warning system in the Pacific Coast population.*
- All fine.
- Telephone and HF radio contact.
- Via radio.

- Government Bulletin Board System, telephone, email, fax.
- CONRED: SITE WARNINGS, SURF HEIGHT AND TRAVEL TIMES.
- Phone, mobile phone, e-mail, fax.
- Which suitable scenarios to use.
- To maintain coordination and communication.
- Website.
- Radio (VHF) and satellite phone.
- Telephone communication.
- To make sure evacuation are Okay with no more risks to our area.
- To ensure they received the message and to ask on how the exercise was carried out in the communities.
- Via situation reports and holding statements.
- Hourly/ updated warning messages including evaluation and teleconferences.
- This exercise targets mostly at national level. Will move further down in years to come.
- Via radio.

3D.5 Were any areas evacuated?

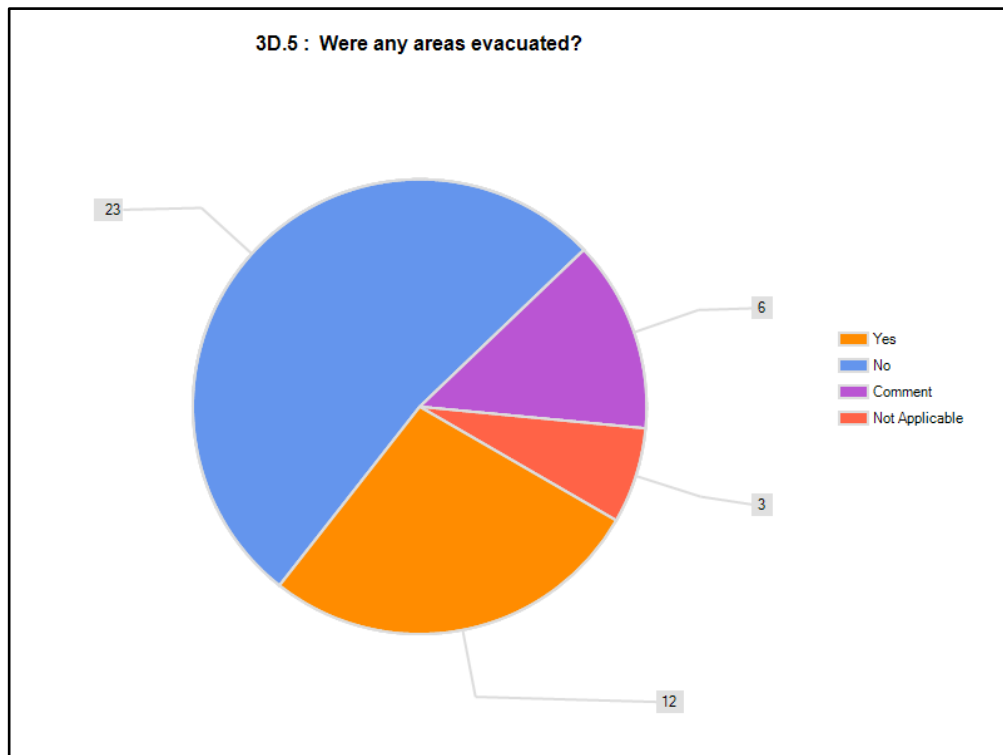


Figure VI-58. Responses to Question 3D.5

Nearly a third (32%) of respondents evacuated communities as part of the exercise.

- Not applicable as a communications test was conducted.
- French Polynesia is NOT concerned by LOCAL/REGIONAL source tsunami.
- Yes—many schools exercised their tsunami evacuation plans. All did very well—(Approximate numbers on the day of the exercise).
- The exercise was conducted primarily to test the RMI current and existing communication apertures and emergency procedures. Part of the exercise involved testing the Chatty Beetles fielded in two outer-islands.
- Two agencies evacuated communities.
- Exercise only restricted at national level.

3D.6 If you answered yes to Q3D.5, please specify the following:
The area(s) evacuated (name of the town or community), the time they were
evacuated (use 24-hour clock in UTC time), estimated number of people evacuated.
(Response count: 9)

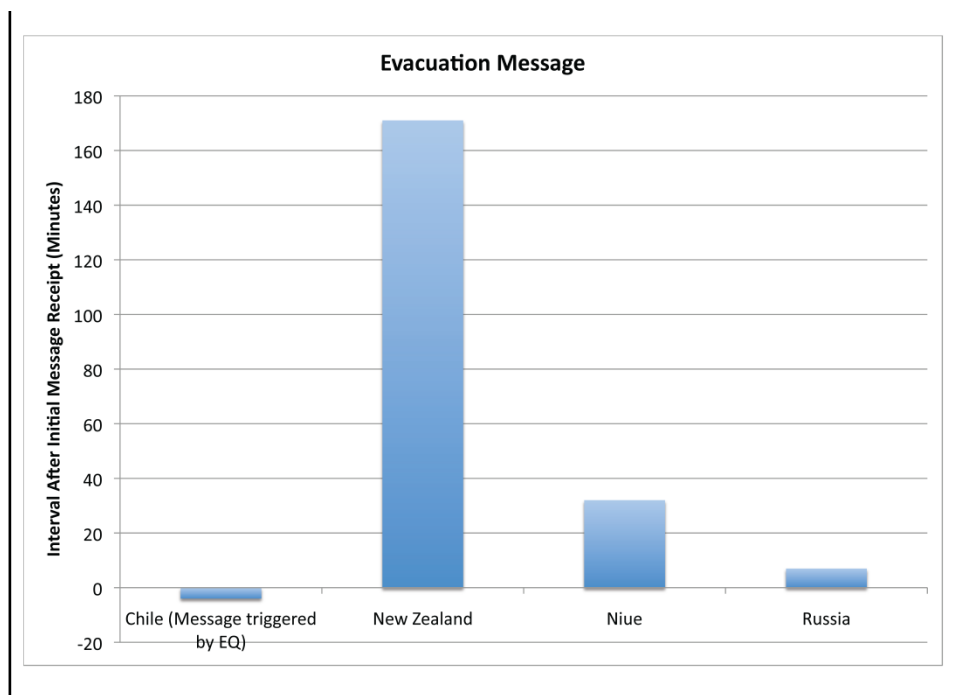


Figure VI-59. Interval after initial message receipt (minutes)

The average announcement time for evacuation, relative to initial message, was 58 minutes.

There were few values reported for evacuation announcement times.

The negative times reported for Chile are due to initial evacuation and public announcement based on "seismic parameters from Chilean seismological service", which occurred prior to receipt of PTWC message.

The following outlines the details of the evacuations performed:

- Honiara City: National Referral Hospital, Isabel Province: Buala Village, Malaita Province: Lilisiana Village, Central Province: Olevuga and Bokolonga.

- Niue Primary School, Alofi 2140 UTC.
- Arorangi School, Arorangi (150) 2. Rutaki school, Arorangi (60) 3. Avatea school, Nikao (300) Nikao school, Nikao (150) 5. Apii Te Uki Ou (150) 6. Papaaroa Adventist School (130) 7. Nukutere College (300) 8. Titikaveka College (300). Other schools and many private and government organisations discussed their agency evacuation processes. Tsunami evacuation drills is common practice in schools now. Many schools had just completed their tsunami drill exercise in the months before PacWave11.
- Yuzhno-Kuril'sk (Kunashir Isl.); 22:15? 22:40 UTC; 35 people.
- 2 Elementary Schools, 1 High School, 1 Private Company were monitored and assessed. Villages, other Schools, Government Agencies, and other private companies participated on their and reported their outcomes to ASDHS-TEMCO.
- 600 people in the city of Iquique started the evacuation at 13:04.
- Harbour site and all coastal areas.
- In the Wellington Region: Lower Hutt suburbs, Eastbourne, Seaview, Gracefield, Petone, 15,000 people evacuated, time evacuated 1412 hours. In the Gisborne region: Coastal areas at the top of East Cape, 1400 hours NZDT, 250 people.
- All low-lying areas in southern villages, Agana and Tumon, Guam.

3D.7 Were tsunami **inundation** maps available for evacuated areas?

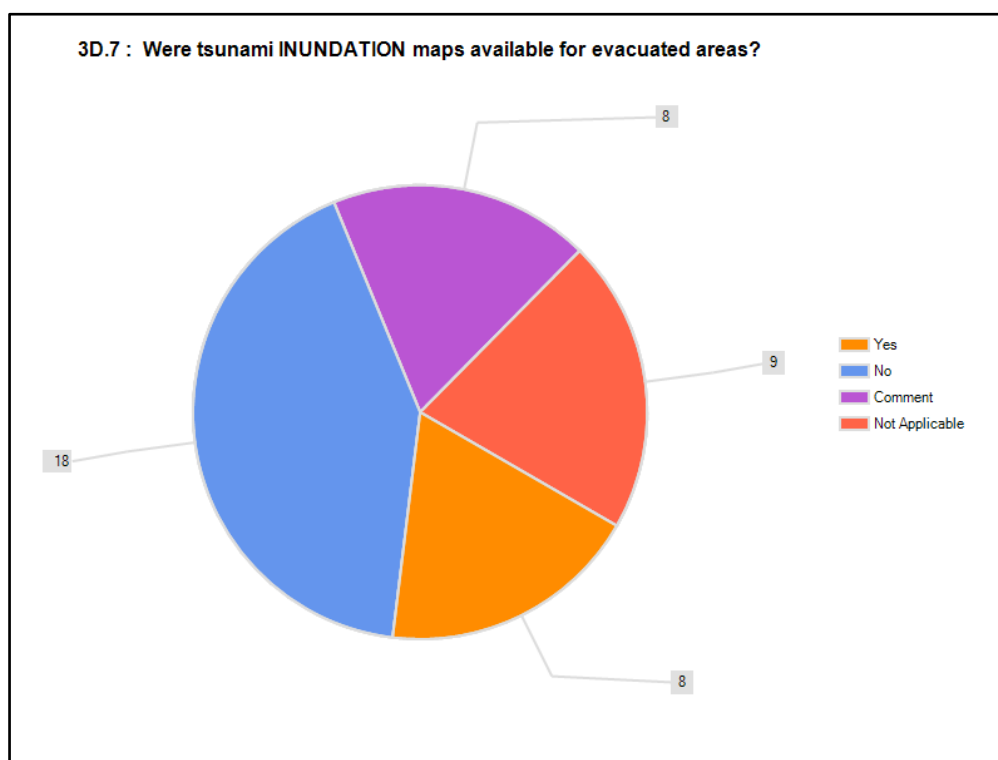


Figure VI-60. Responses to Question 3D.7

Half (50%) of respondents indicated they did not have inundation maps available for evacuated areas.

- All the Provincial Disaster Offices were being issued with the Local Threat Map for the Solomon Islands, extracted by using the MOST Software that was developed for the Solomon Islands by the Australian Bureau of Meteorology.
- Only few tsunami inundation maps available for evacuated areas in a database of pre-calculated tsunami scenarios, which consists of 25 scenarios.
- Not applicable as a communications test was conducted.
- Inundation maps are under preparation.
- Hay mapas de inundación por tsunami para toda la costa de El Salvador aunque ninguna ciudad se evacuó.
 - *There are tsunami inundation maps for all the coast of El Salvador even when no city was evacuated.*
- No – refer to comment in 3D.9
- Inundation maps are under preparation.
- Inundation maps are nearly complete from PMEL.
- Maps were available for decision makers only.

3D.8 Were tsunami **evacuation** maps available for evacuated areas?

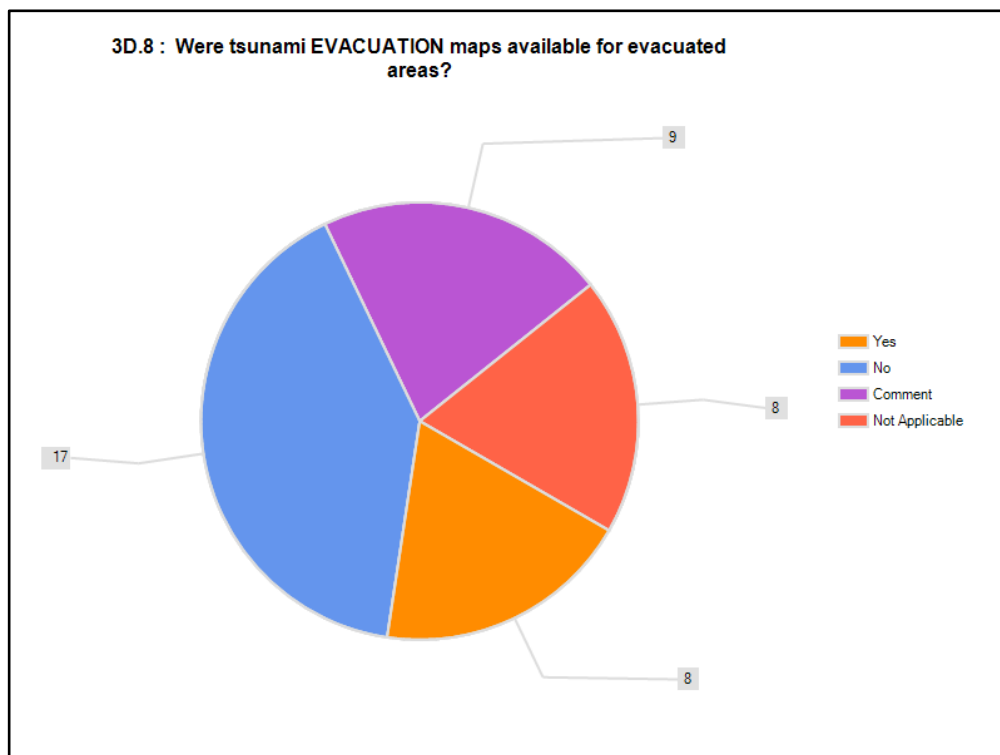


Figure VI-61. Responses to Question 3D.8

Nearly half (47%) of the respondents do not have evacuation maps for evacuated areas.

- Each of the participating villages over the past 2.5 years with the support of the NDMO has developed their own village response plans which include their safe areas, evacuation routes and evacuation sites. As such, this is entirely up to each of the participating villages.
- Some tsunami evacuation maps developed for coastal cities of Central Vietnam (eg. Nha Trang and Da Nang, but within framework of research projects only.
- Not applicable as a communications test was conducted.
- Participating agencies have their own evacuation maps in their plan and used these routes to time their evacuation during the exercise.
- Evacuation was based on individual evacuation plan for each area, which includes routes of evacuation, evacuation zones and assembly points.
- Draft evacuation maps were available for decision makers only.

3D.9 Did your tsunami warning centre use any numerical model tsunami scenarios during the exercise (e.g., Deep-ocean propagation and/or coastal inundation models?)

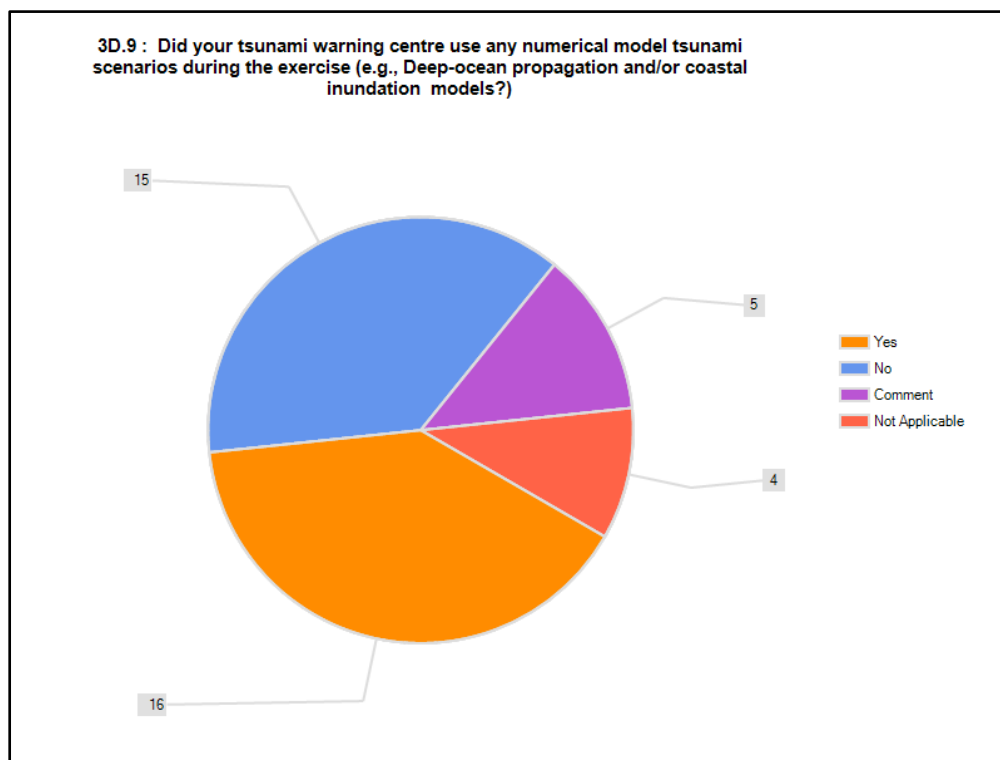


Figure VI-62. Responses to Question 3D.9

About half (44%) of the tsunami warning centres used numerical model tsunami scenarios during the exercise. These included:

- MOST
- COMCOT
- COMMIT

- At present the National tsunami warning centre uses a database of 25 scenarios, developed by using MOST numerical model. We are in the process of enlarging the number of scenarios using COMCOT and TUNAMI models in the near future.
- Not applicable as a communications test was conducted.
- Se utilizaron varios modelos numéricos: COMCOT y COMMIT.
 - *Several numerical models were used; COMCOT and COMMIT.*
- At the time of the exercise, software programs were not available at the national level. Now the ComMIT program is available for use. There is still need for better bathymetry and topography data that inundation maps can be produced. Low-lying area and other basic topographic maps for each Island are available.
- Arrival times, max run-ups only.
- Deep Ocean MOST propagation with threat level validated against previous observed effects of previous tsunami.
- Pre-calculated models were used (the same as we would do in a real event).
- Currently no such tsunami modelling in place locally.

3D.10 How did your country assess the tsunami threat during the exercise?

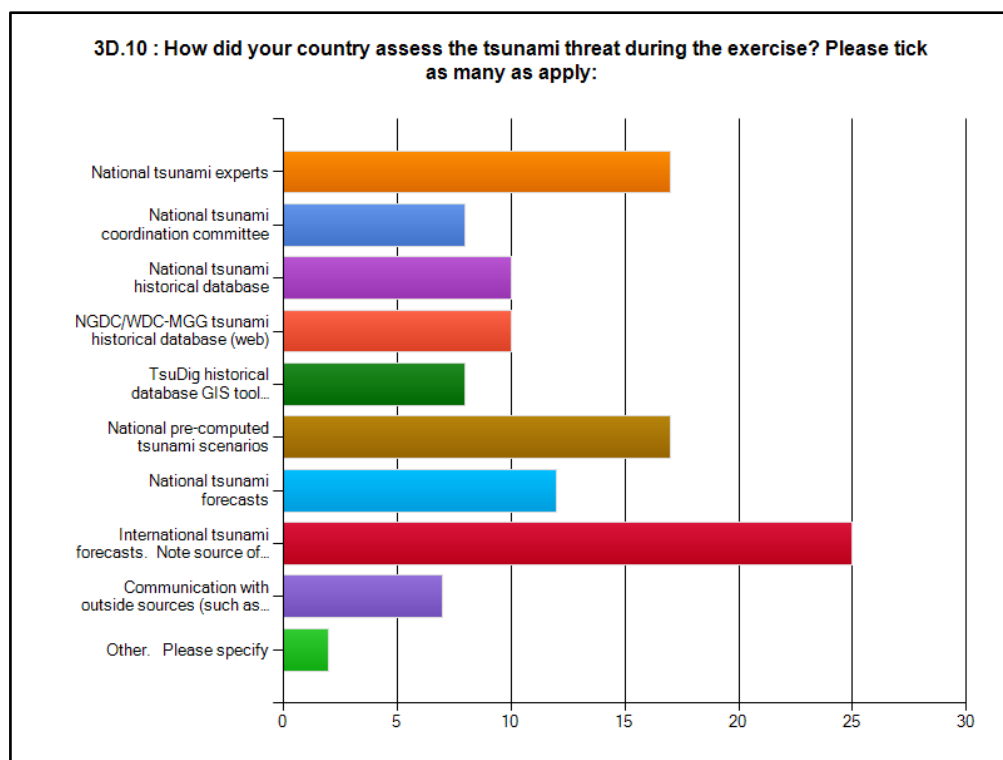


Figure VI-63. Responses to Question 3D.10

- Representatives from YAP weather, YAP DCO, guam weather via phone, guam coast guard via phone, national DCO via phone.
- We receive tsunami forecasts from NWPTAC and PTWC.
- WFO Guam.
- Not applicable as a communications test was conducted.
- PTWC, NWPTAC.

- Pronósticos disponibles de PTWC. Datos mareográficos históricos.
 - *Forecasts available to PTWC. Historical tide gauge data.*
- ¿Expertos nacionales sobre tsunamis, Comité nacional de coordinación ante tsunamis?, base de datos nacional e histórica de tsunamis?, base de datos históricos sobre los tsunamis del NGDC/WDC-MGG (web)?, herramienta SIG de base de datos histórica TsuDig (no conectada al NGDC/ITIC)?, pronósticos internacionales sobre tsunamis. Indicar la fuente de los pronósticos (PTWC, NWPTAC, WCATWC)?, medios de comunicación: Televisivo, periódicos, radiales.
 - *The data sent through from PTWC was assessed through the following means; National tsunami coordination committee National tsunami historical database TsuDig historical database GIS tool (NGDC/ITIC offline) International tsunami forecasts. Communication with outside sources.*
- The model provided from PTWC underestimated the tsunami threat and is too late for early warning.
- PTWC, NWPTAC.
- CONRED: Media and Government Agencies involved.
- WFO Guam.
- National tsunami historical database and International tsunami forecasts (PTWC).
- The international Tsunami forecast from PTWC.
- WSFO Guam.
- There was no threat during the exercise.
- Regional Hazard Analysts.
- As support to pre-designed forecast were used products issued by the PTWC.
- International tsunami forecasts: PTWC.
- News media: Television, newspapers, radios.

3D.11 Other country evaluation statements. Please summarize the statement and results. (Response count: 3)

- We had the UNESCO Disaster Rep with us Mr Rajendra Prasad who acted as an observer and evaluator during the exercise.
- El ejercicio no se pudo concretar en un simulacro porque, a pesar de los tiempos establecidos para su organización, las autoridades de riesgo, prefirieron mantener la fecha del ejercicio como incógnita con el propósito de evaluar su capacidad de respuesta a todo nivel de organización (es decir, provincial y local). Sin embargo, los Comités Operativos de Emergencia se reunieron en cada una de las localidades con la finalidad de evaluar capacidades de respuesta, conocimiento y toma de decisiones de autoridades competentes. Estos comités no son específicamente para tsunamis, pero su activación fue de gran interés.
 - *The exercise was unable to materialize in a drill, because despite the times set for its organization, risk authorities, preferred to maintain the date of the exercise as unknown in order to evaluate its response capacity at any organization level (that is, provincial and local). However the Emergency Operational Committee met in each one of the locations with the purpose to evaluate response capacities, knowledge and decision making of competent*

authorities. These committees are not specifically for tsunamis, but its activation was of great interest.

3E.1 Was a tsunami warning and/or information issued to the public?

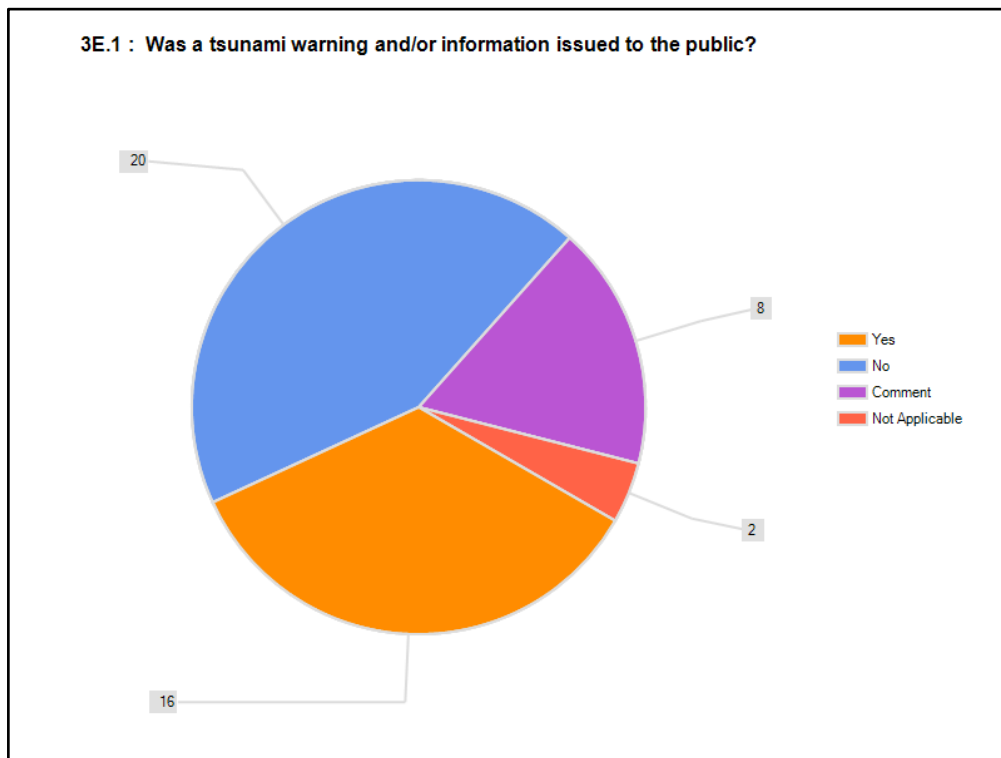


Figure VI-64. Responses to Question 3E.1

Less than half (43%) of the respondents issued a tsunami warning and/or information to the public.

- There a total of 7 National Tsunami Warnings (using the current SI National Tsunami Warning Template) being issued by the National Emergency Operations Centre (NEOC) including a Cancellation.
- No, because tsunami threat for Thailand region in this exercise.
- Not applicable as a communications test was conducted.
- The tsunami warning/information was issued to the simulated public in the exercise.
- Se consideró que no era conveniente alertar a la población.
 - *Warning the population was not considered to be convenient.*
- The exercise was developed for institutions that are part of the National Tsunami Warning System only.
- The tsunami warning/information was issued to the simulated public in the exercise.
- INSIVUMEH: There was no tsunami warning nor information issued to the public because the tabletop level we used in this Exercise.
- The exercise was conducted primarily to test the RMI current and existing communication apertures and emergency procedures. Part of the exercise involved testing the Chatty Beetles fielded in two outer-islands.

- The warning was not issued out due to EOC drill on but ready to issue if needed thru EAS and police sirens.
- Telephone and Memo was circulated to all the Departments in at the National Government for each bulletin and everyone is pretty much aware with the exercise.
- Three agencies indicated they issued warnings to the public. The majority of participating agencies did not.
- Does not involve the public at present.

3E.2 If you answered yes to Q3E.1 note: Type of information that was released to the public (nop action, prepare, evacuate), whom it was issued by, and, the time it was issued (use 24 hour clock in UTC time, e.g., DD/MM/YYYY HR:MN such as 10/11/2011 14:35 UTC). (Response count: 14)

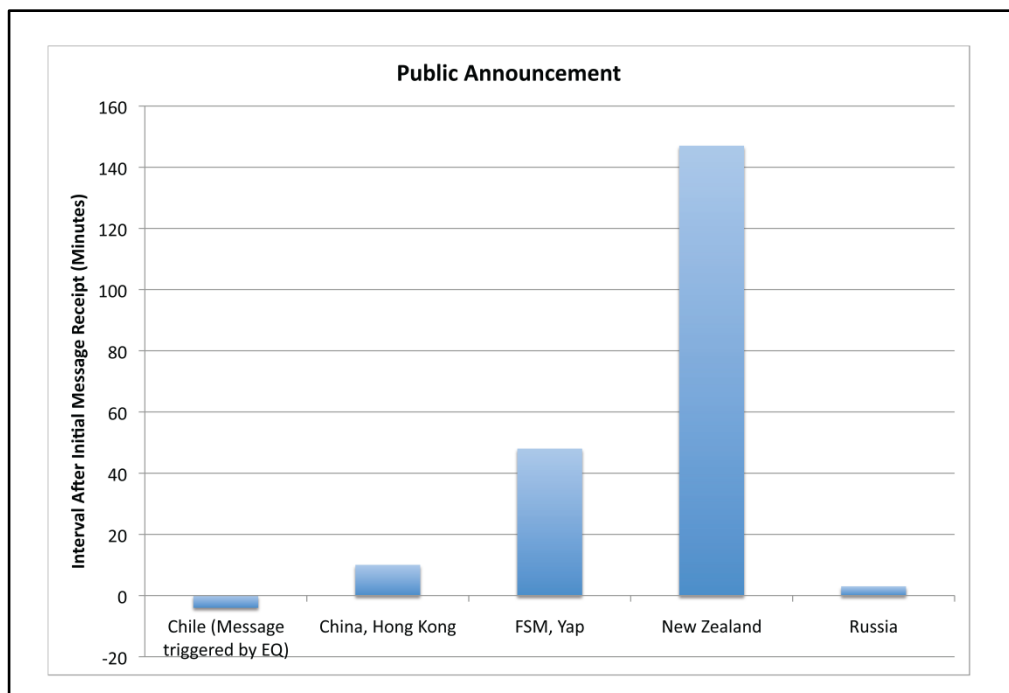


Figure VI-65. Interval after initial message receipt (in minutes)

The average time to issue the Public announcement was 41 minutes.

There were few values reported for public announcement times. The negative times reported for Chile are due to initial evacuation and public announcement based on "seismic parameters from Chilean seismological service", which occurred prior to receipt of PTWC message.

- Bulletin notifying public of exercise via radio announcement & police announcement door to door by Government Media & DCO through Public Safety issued at 1056 Yap Time; 39 minutes after 1st initial start message.
- National Tsunami Warnings was complemented by the NEOC Tsunami Safety Messages (using the current SI Tsunami Safety Message Template) which stated what people should do before, during and after the tsunami waves arrives.
- TMD will issue earthquake informatio and follow situation, NDWC will issue watching and evacuation.

- Fax.
- The warning was not broadcast, so as not to cause undue panic. Parents were informed that there would be a mock evac of Niue Primary School.
- During the exercise, a warning was issued to members of the public involved in this exercise. For Samoa, the exercise was focussed only on 8 pilot sites to test their evacuation plans and routes.
- Evacuation, local government, 02:55 UTC.
- The first tsunami warning was issued by Hong Kong Observatory at 02:20 UTC with advisory messages on precautionary actions.
- The full bulletin was released to the media after the word “Test” was replaced with the phrase Exercise, Exercise, Exercise. In an actual event, the national controller will go over the air and advise the public on what they should do (Chilean earthquake). In the exercise this was not done as radio announcers only mentioned that exercise bulletin no# 1, 2 or 3 had been issued but the contents not read out. The announcer then reminds the public of the exercise taking place. Note: It is within our planning to quickly convert the contents of a typical bulletin into the Maori language and have both versions available to the public. This was a recommendation forwarded to the EMT by the media.
- Tipo de información que se emitió a la población (Simulacro): ¿Quién emitió el mensaje a la población?, hora en que se emitió este mensaje (Formato de 14:08 UTC(ECUADOR SCENARIO)).
 - *Type of information that was released to the public (Drill): Whom it was issued by?, the time it was issued (14:08 UTC Format (ECUADOR SCENARIO)).*
- The Warning was issued to the National Security Council and the local agencies via SMS and Fax.
- The first tsunami warning was issued by Hong Kong Observatory at 02:20 UTC with advisory messages on precautionary actions.
- The type of information that was released to the public – evacuate. It was issued by the Emergency services. The time it was issued – 22:11 UTC.
- Tsunami Warning Test, no action.
- Evacuation, NDMO, 3 minutes after the earthquake (13:04 UTC).
- The type of information was released to the public by Radio and it was issued by Emergency Task force committee.
- Telephone and Memo was issued to all the Department right after we issued the first message to the FSM President.
- The West Coast region released within 60 minutes to start preparing for evacuations. Issued by 3 EOCs on specifics on where to go to, and group telling to follow instructions of local civil defence and emergency services. The Southland region tested their Public Information Management teams function in the EOC only. No public announcements were made. Preparatory comments were made about staying away from the coast and to listen for updates. The first message was available for release at 0035 UTC. In the Wellington region public information was released to the local participants e.g. to schools and local organisations through ReadyNet text system. In other areas information was collated and authorised but stopped from release as exercise control. Generally public information is prepared by PIM in consultation with Planning and Intelligence and authorised by Controller. The type of action was either ‘Prepare’ or ‘Evacuate’.

3E.3 If you answered yes to Q3E.1, how was the warning/information communicated with the public?

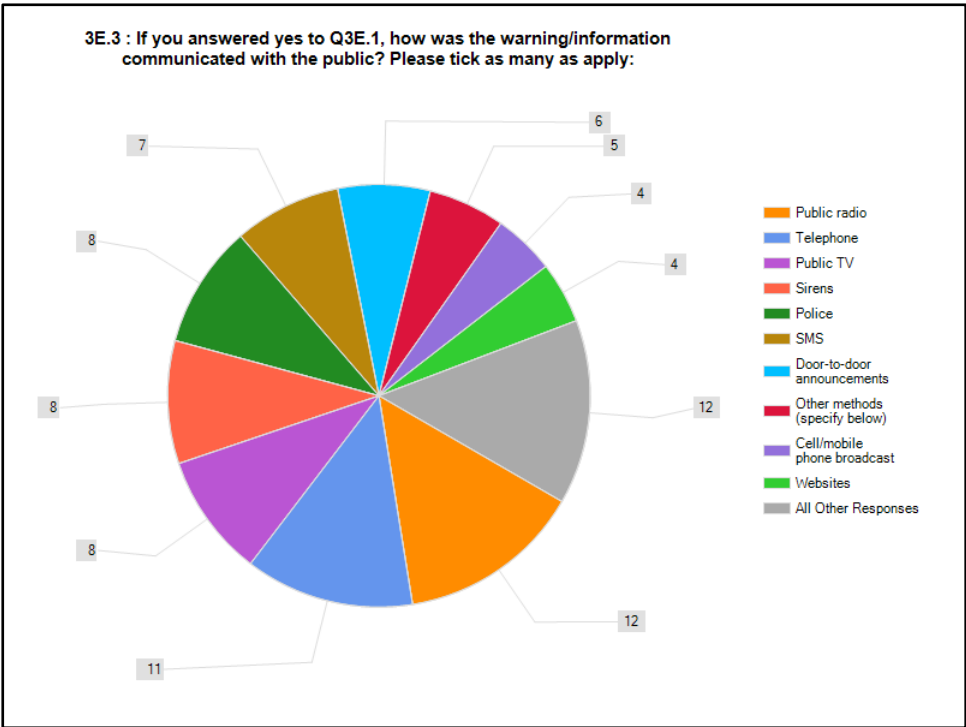


Figure VI-66. Responses to Question 3E.3

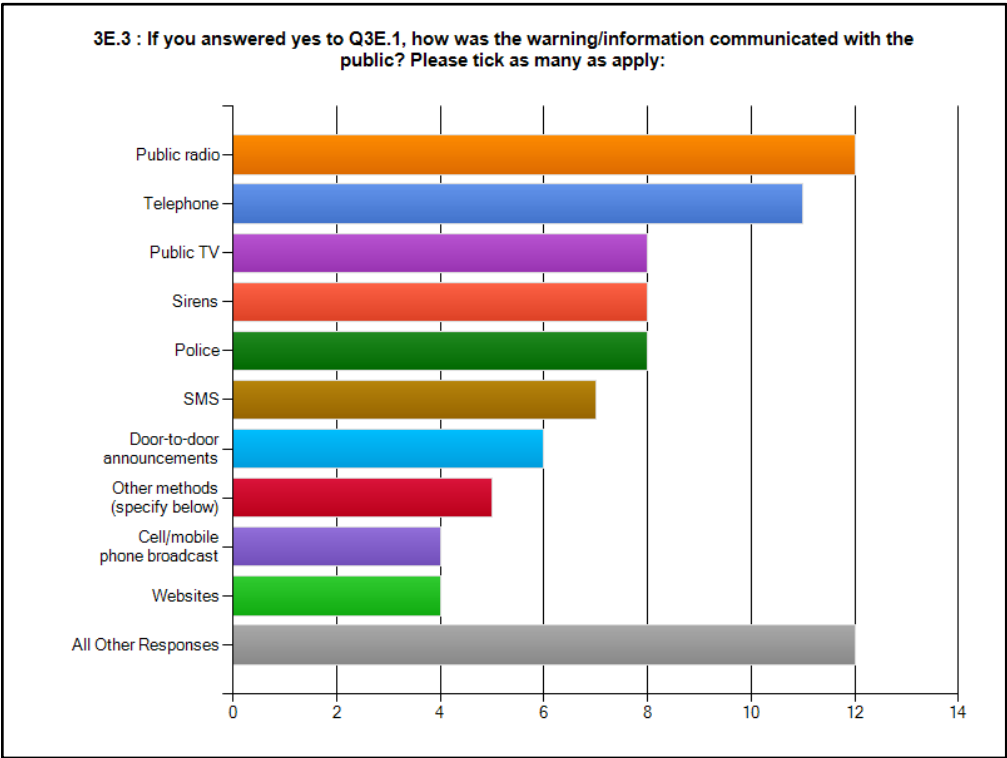


Figure VI-67. Responses to Question 3E.3

- Fax.
- It was disseminated through SMS to the villages? Representatives and the Disaster Advisory Committee via email and SMS.
- Telephone: Exercise, Exercise, Exercise? Tsunami bulletin issued? report to, immediately Cell/ Mobile phone: Exercise, Exercise, Exercise, tsunami bulletin issued, report to, immediately Radio: (Announcer on air) Exercise, Exercise, Exercise - The first Pacific Wave 2011 bulletin has been issued to this radio station. Those not aware there is an exercise? SMS: (Message) - Exercise X 3, tsunami bulletin issued, report to, immediately Email: (Full bulletin) - Exercise, Exercise, Exercise? Police (face to face on street), a tsunami exercise has started, do not panic if/ when the sirens sound, although it is an exercise - treat it real?). Door to door announcements: (Message), As above, Sirens: (continuous sounding)
- Por medio de comunicado de Prensa.
 - *Through Press release.*
- The tsunami sirens were activated at Kudat and Labuan.
- Loudspeakers.
- Warning sirens, radio and public broadcast, and NOAA weather radio.
- We first called the Department and follow by a short memo describing the purpose of the exercise.

3E.4 Other country evaluation statements. Please summarize the statement and results. (Response count: 4)

- La organización local, sugirió no realizar una evacuación de la población como parte del simulacro porque se consideró que la población aún no está preparada.
 - *The local organization, suggested not conducting public evacuation as part of the drill because the population was not considered to be ready.*
- French Polynesia is NOT concerned by LOCAL/REGIONAL source tsunami.
- Note from TT Chair - this set of questions was not completed. Jo G.

3F.1 The public were officially notified prior to the scenario wave arrival time

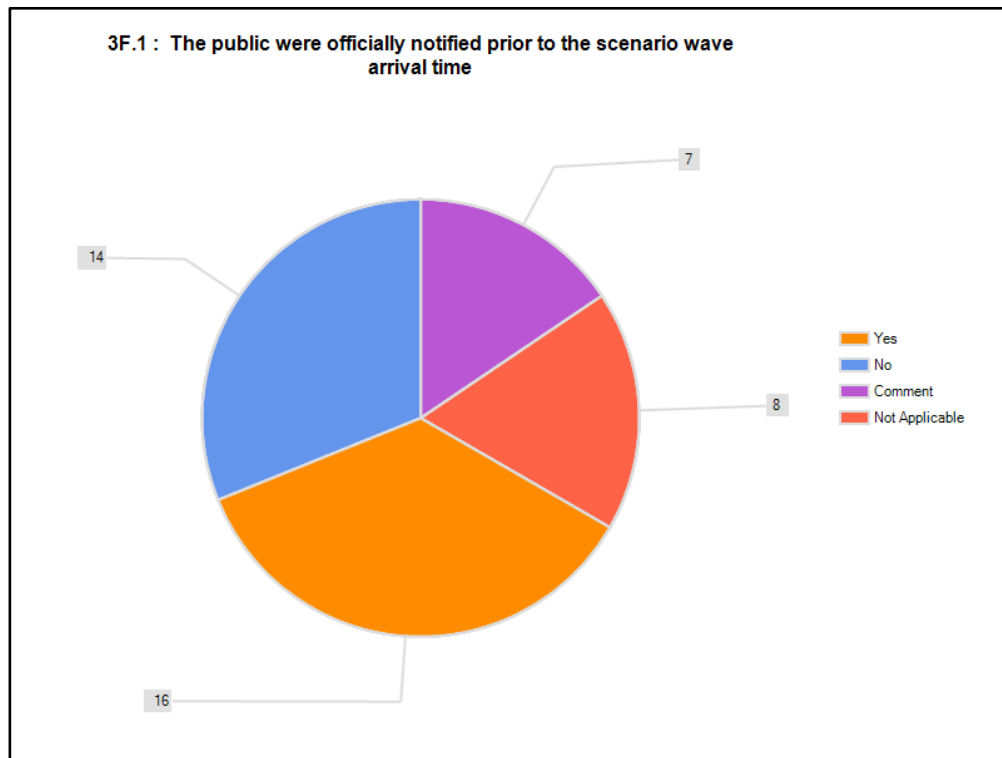


Figure VI-68. Responses to Question 3F.1

The majority (58%) of respondents did not alert the public in this exercise.

- That exercise will be conducted to improve disaster preparedness and effective response for tsunamis.
- Not applicable as a communications test was conducted.
- The tsunami warning/information was issued to the simulated public in the exercise.
- La Dirección General de Gestión de Riesgo activo a los organismos locales y departamentales de emergencia a las 09/11/2011 22:18 UTC.
 - *The Risk Management General Directorate activated local and departmental emergency agencies to 09/11/2011 22:18 UTC.*
- Exercise coverage/ awareness were also on TV and print media in the days leading up to the exercise. Many people were aware that an exercise would take place. The actual starting time was the only information not issued to the public.
- The tsunami warning/information was issued to the simulated public in the exercise.
- The television shooting group was in Sakhalin TWC at period of the Exercise. The report and preliminary results were shown in local TV-channel and the Russian channel.
- The exercise was conducted primarily to test the RMI current and existing communication apertures and emergency procedures. Part of the exercise involved testing the Chatty Beetles fielded in two outer-islands.
- Taking into consideration that it may create a panic with no prior notice
- This exercise was done as a table top exercise between NDMO and the Warning center (VMGD).

- Most agencies did not officially notify the public. However, in the Wellington Region the public were notified where it was within the scope of the exercise to do this. In Southland there was no dissemination of public messages however, the messages were ready for release prior to the wave arrival.

3F.2 Other country evaluation statements. Please summarize the statement and results. (Response count: 2)

- French Polynesia is NOT concerned by LOCAL/REGIONAL source tsunami.

4.1 The Agency has a better understanding of the goals, responsibilities and roles in civil defence emergencies.

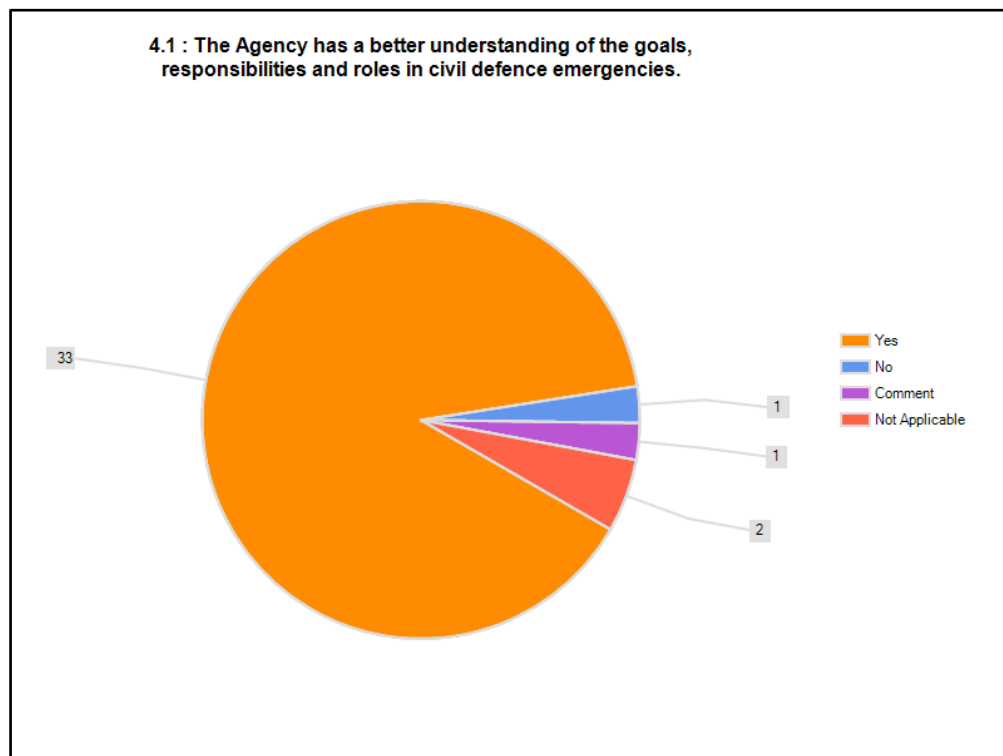


Figure VI-69. Responses to Question 4.1

Eighty-nine (89%) per cent of respondents now have a better understanding of the goals, responsibilities and roles in civil defence emergencies.

4.2 Gaps in capability and capacity have been identified

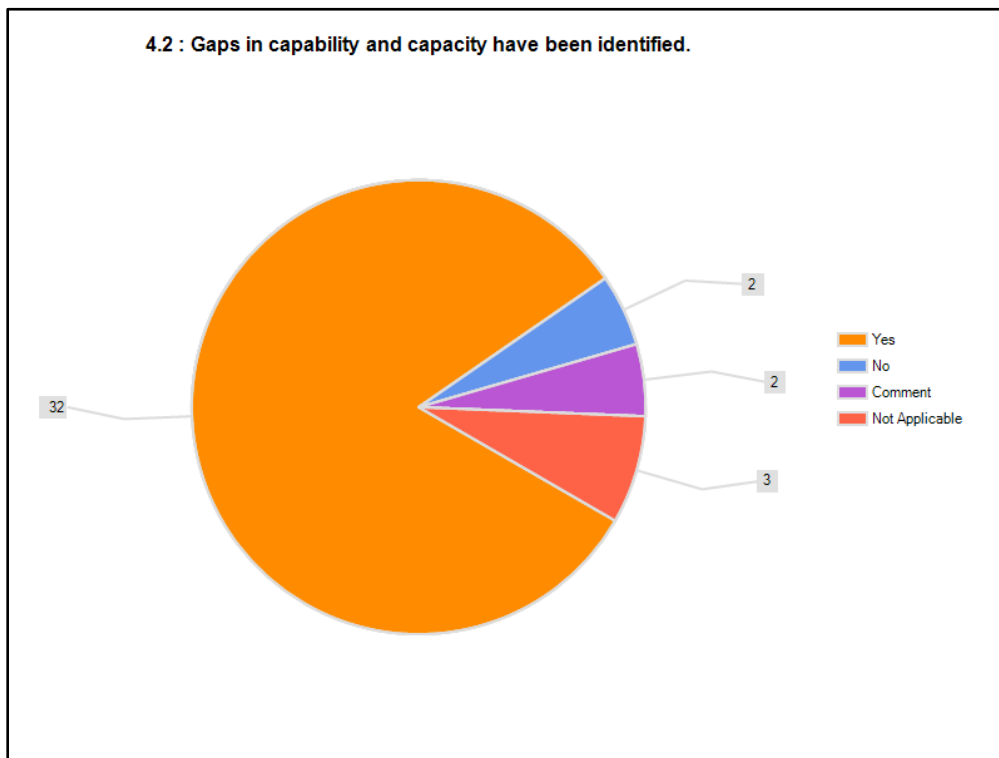


Figure VI-70. Responses to Question 4.2

84% of respondents identified gaps in capability and capacity during the exercise.

- Contacts lists updated.
- Se ha identificado particularmente la deficiencia del Centro de Atención de Emergencias al no poseer procedimiento de actuación ante tsunamis.
 - *Particularly the Gap of the Emergency Care Centre has been identified for not having tsunami action procedures.*
- We lack the capability and the capacity.
- Public information statements have been clarified.

4.3 The Agency enhanced its external relationships and identified its interdependencies as a result of the exercise.

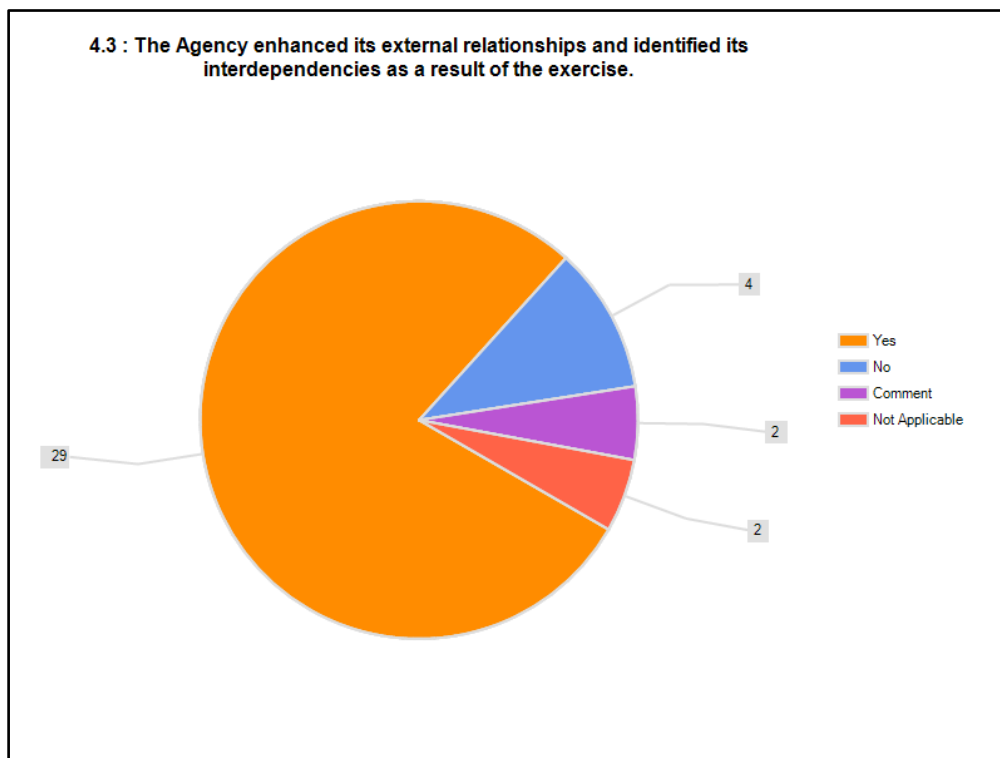


Figure VI-71. Responses to Question 4.3

- None.

4.4 Overall, the exercise planning, conduct, format and style were satisfactory

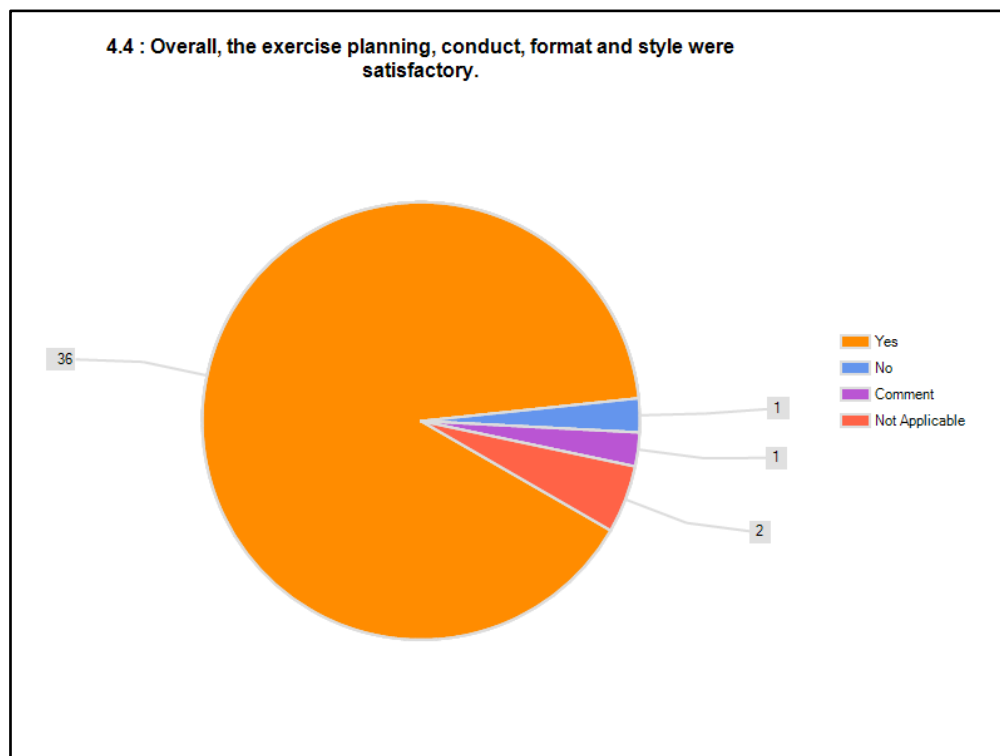


Figure VI-72. Responses to Question 4.4

Ninety-two (92%) per cent of respondents indicated the exercise planning, conduct, format and style were satisfactory.

- We are taking steps to improve our attention to this phenomena due it is not frequently but at the same time dangerous.
- Exercise materials could have been provided on website earlier. Experimental text products did not include arrival times.

4.5 Exercise planning at the **international level** went well

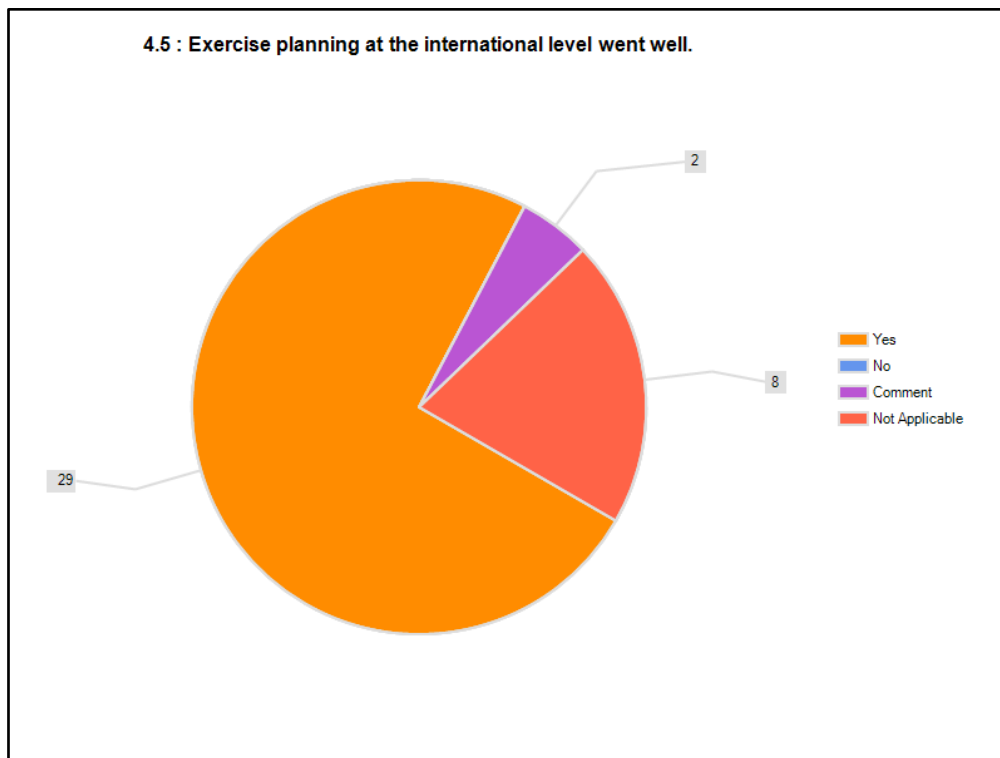


Figure VI-73. Responses to Question 4.5

The majority of respondents indicated that exercise planning at the international level went well.

- As co-chair of the Exercise Task Team I found the exercise to be enjoyable and educational to prepare. Laura and her team were great to work with and we were able to put something together in a reasonable timeframe mostly through email correspondence. My week spent in Hawaii developing the framework for the exercise was invaluable and the face-to-face discussions and planning should not be underestimated in future exercises.

4.6 Exercise planning at the **national level** went well

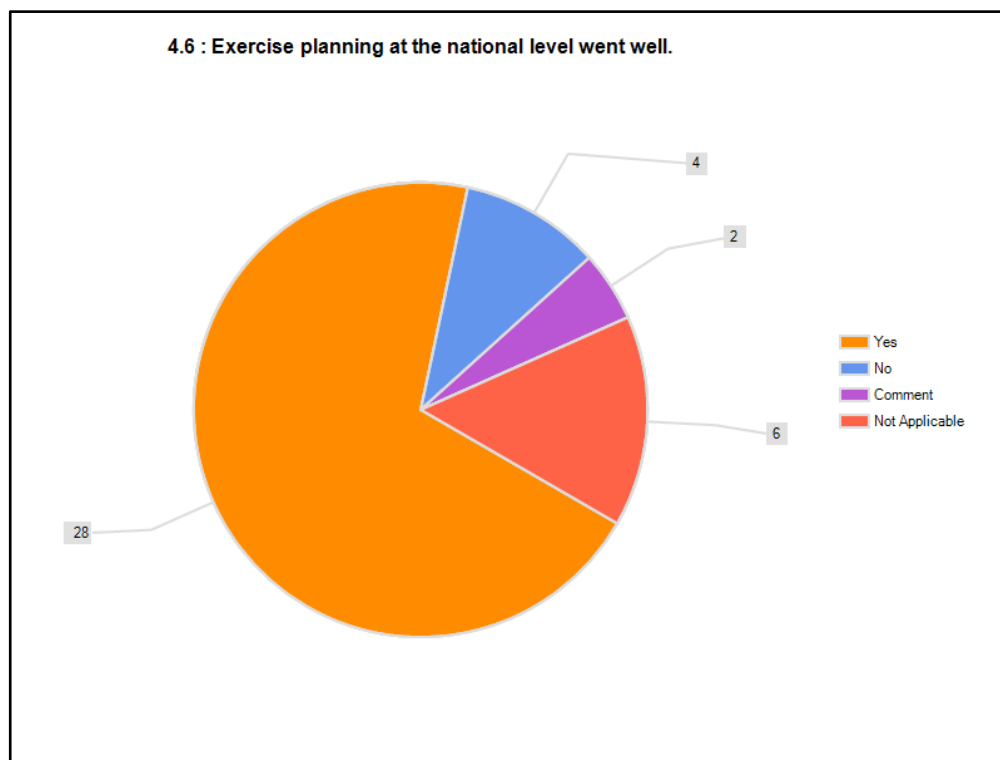


Figure VI-74. Responses to Question 4.6

Seventy-four (74%) per cent of respondents agreed the planning at the national level went well. There were no negative comments made.

- A coordinating instruction and web updates were provided to key people in advance of the exercise and regional MCDEM staff were briefed and available to answer any questions on the exercise.

4.7 Exercise planning at the provincial/local level went well

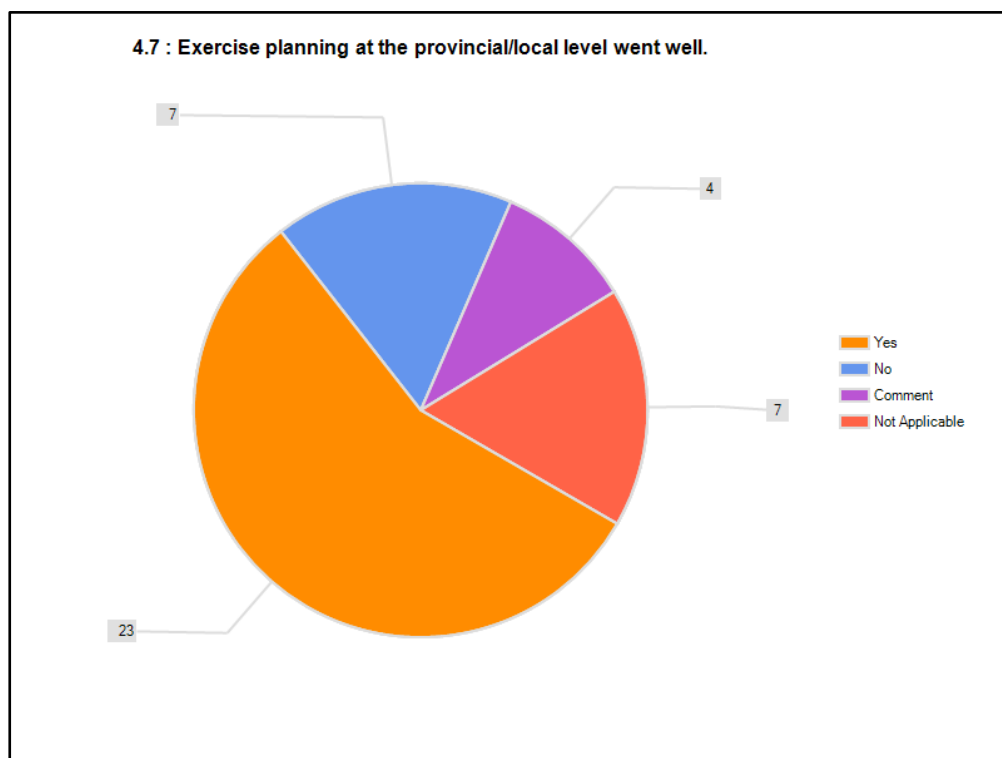


Figure VI-75. Responses to Question 4.7

Sixty-one (61%) per cent of respondents indicated that planning at the provincial/local level went well. However, some commented that there could have had more participation from local governments.

- Se podría haber tenido mayor participación de los gobiernos locales, los cuales no pudieron intervenir de manera activa debido a que se encontraban de emergencia por las lluvias que ocurrían en el país en esa época.
 - *This could have had more participation from local governments, which were not able to actively intervene since they were in emergency for the rainfall in the country at that time.*
- We believe that the local level needs more exercise as well.
- All participating agencies indicated that planning went well at the local level.

4.8 The PacWave11 exercise website pages were useful

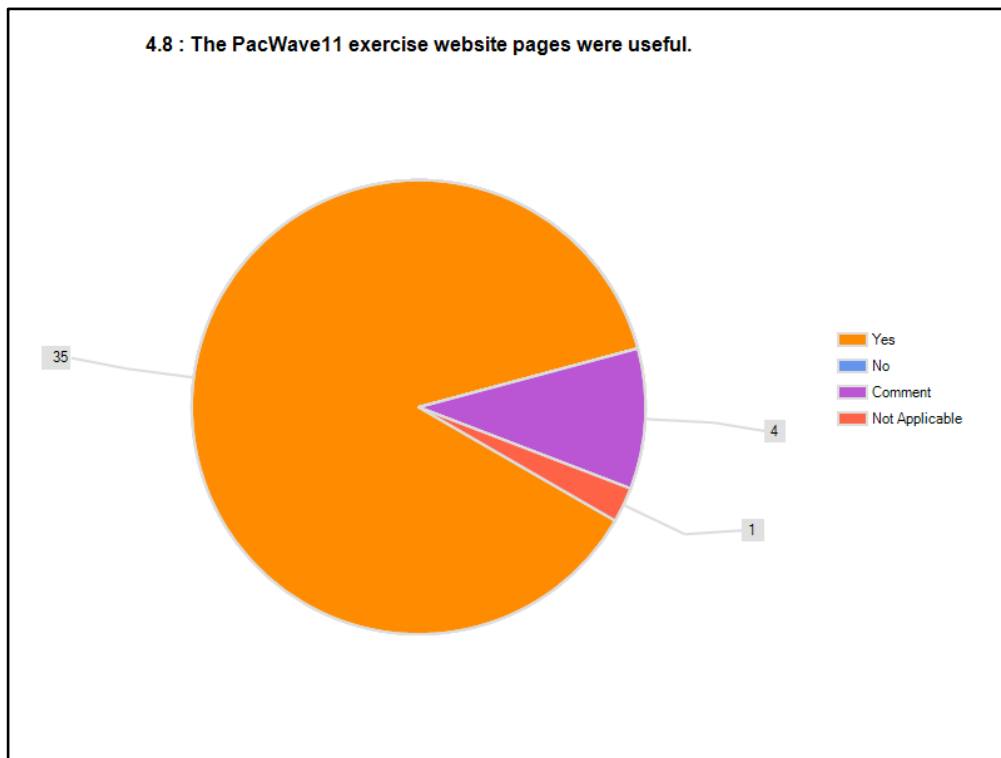


Figure VI-76. Responses to Question 4.8

Ninety-two (92%) per cent of respondents indicated the exercise website pages were useful.

- Fue de mucha utilidad tener los documentos, manuales y escenarios sísmicos, así como los diferentes tipos de boletines para cada region.
 - *It was very useful having documents, manuals and seismic scenarios as well as different bulletin types for each region.*
- I know the website pages are useful for the exercise but I did not have enough time to read everything.
- The PacWave exercise website was useful for the national exercise coordinator and some to some participating agencies. Other agencies indicated this was not applicable to them as they were likely using materials provided from the national exercise coordinator.

4.9 The PacWave11 exercise website pages were updated in a timely manner

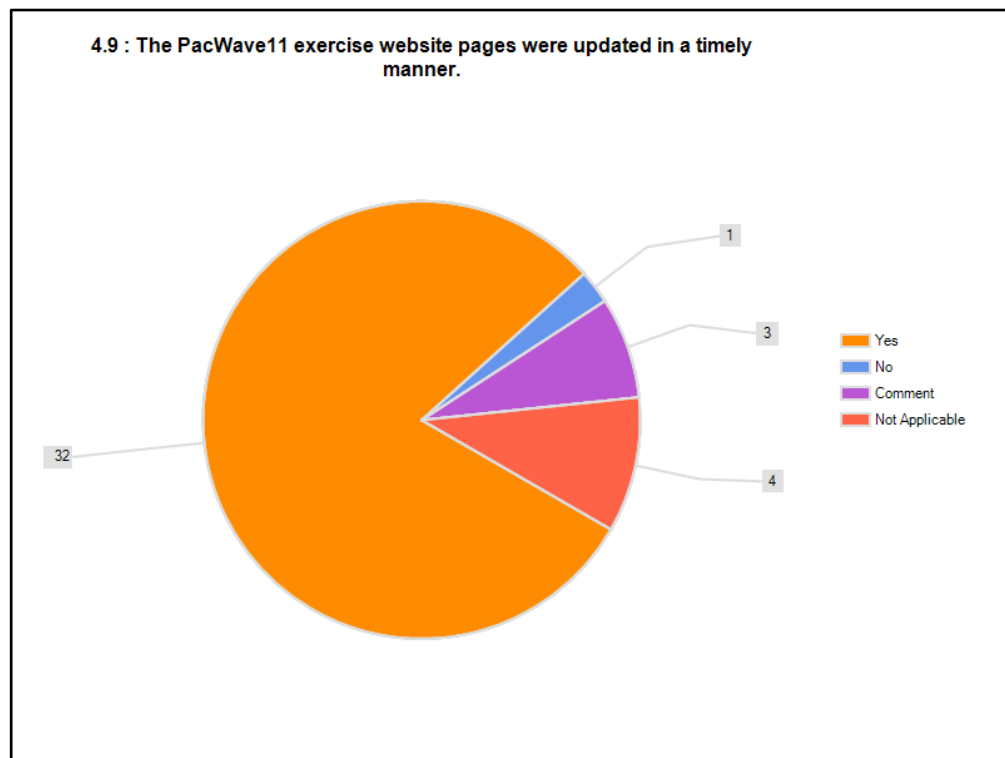


Figure VI-77. Responses to Question 4.9

Eighty-four (84%) per cent of respondents agreed that the website was updated in a timely manner.

- No se Aplica.
 - N/A
- I did not know that it was updated.
- From the international/national perspective, some of the material could have been placed up sooner to help coordinate at the national level; eg. the scenario detail. The national exercise coordinator found this to be a bit rushed at the end!

4.10 This evaluation form was easy to use

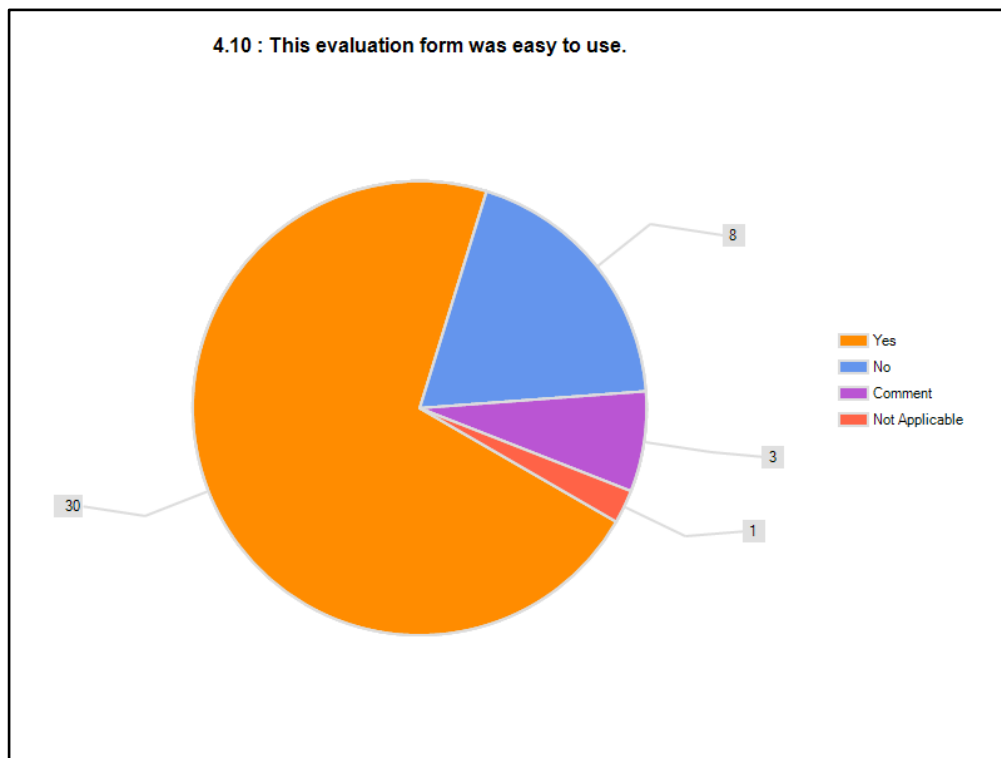


Figure VI-78. Responses to Question 4.10

Seventy-nine (79%) per cent of respondents indicated that the evaluation form was easy to use, however, several commented that the form was too long (contained too many questions).

- It was OK.
- The word doc format was uneditable thus check marks were difficult to insert onto form.
- This evaluation is was too long and I can't believe I am still giving you my time.
- 90 plus questions is a bit much though.
- There was a bit of a split in responses to this question. Some found the form easy to use, aside from formatting of rows and columns etc. Where it says 'all agencies' some of the content was not relevant to some agencies and it took some time to digest what was being asked. Due to the wide audience using the form in New Zealand there were a number of questions that were not relevant to some. There was not time for the national Exercise Coordinator to tailor the forms more accordingly.

4.11 PacWave11 Exercise Manual provided an appropriate level of detail.

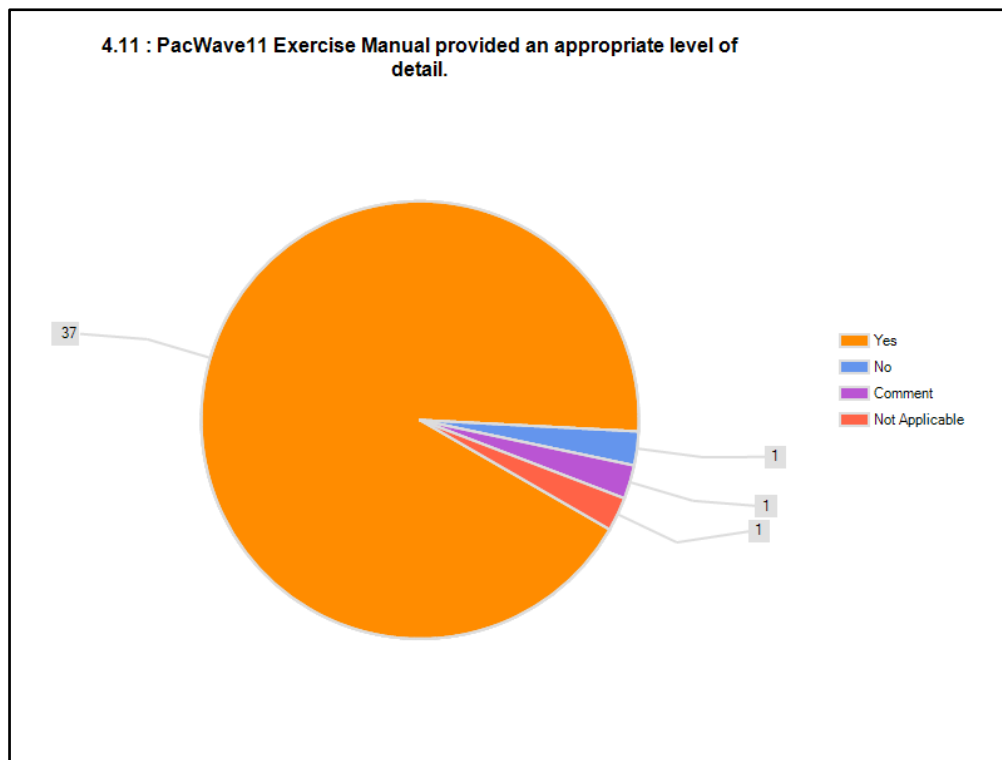


Figure VI-79. Responses to Question 4.11

Ninety-seven (97%) per cent of respondents indicated that there was an appropriate level of detail in the exercise manual.

- Aclaró de manera detallada cómo se desarrollaría el ejercicio.
 - *It clarified how the exercise would be developed in detail.*
- All agencies felt there was an appropriate level of detail.

4.12 The How to Plan, Conduct, and Evaluate Tsunami Exercises guideline was useful

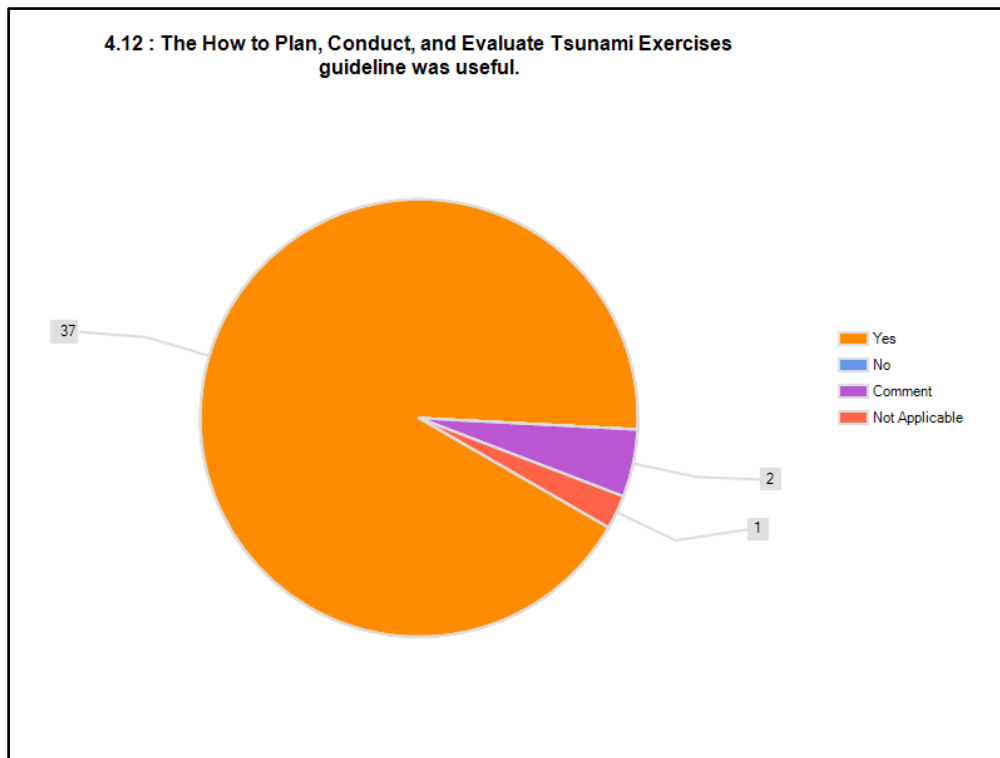


Figure VI-80. Responses to Question 4.12

Ninety-seven (97%) per cent respondents indicated that the guideline *How to Plan, Conduct, and Evaluate Tsunami Wave Exercises* was useful.

- Yes, good reference guide.
- Very Good!
- Several agencies used the guideline and found it useful. A number of agencies did not use it, instead using national level documentation provided by the Exercise Coordinator.

4.13 Exercise Planning: Please provide a general statement about WHAT WENT WELL. (Response count: 29)

Overall, respondents indicated that the following areas went well:

- The flow of information, and cooperation between agencies went well.
- The early announcement of the exercise allowed sufficient time for preparation.
- Exercise materials such as the manual and guideline assisted with planning. Having these available on the website was very useful.
- The PTWC experimental products were very helpful for the systematic decision making process.
- The choice of scenarios was good.

Country comments:

- First responders were given explicit instructions both verbally and thru their SOP's.
- COUPLE OF MEETINGS WITH STAKEHOLDERS WERE CONDUCTED BEFORE THE EXERCISE.
- Packaged exercise materials were accessible well ahead of time.
- Message, information were received rapidly.
- The messages received by Niue Met were passed on quickly and they had process in place to ensure they were received by the other agencies. The focus for the individual government departments was of course different, ie Police/Telecom/Niue Met and BCN (Broadcasting) all had differing roles to play and from what I saw these roles were carried out efficiently.
- The international organization of the exercise went very well (information, communication, documentation etc.)
- Es el primer simulacro de alerta de tsunamis del presente siglo en México. Se determinó que el inicio de las comunicaciones interinstitucionales para casos de alerta de tsunamis será desde el CAT. Se estableció un procedimiento provisional de alerta de tsunamis en tanto entra en operación el CAT.
 - *It is the first tsunami warning drill of this century in Mexico. The beginning of inter-agency communication for Tsunami Warning cases was determined to be from the TWC. A tsunami warning provisional procedure was established while the TWC is put into operation.*
- No comment as a only communications test was conducted.
- The early announcement of the exercise allowed sufficient time for preparation of a detailed local exercise master scenario and involvement of more exercise players.
- En general, el ejercicio permitió a instituciones de gestión de riesgo y puntos focales coordinar acciones para el desarrollo del mismo y sobre todo permitió ver las necesidades organizacionales.
 - *Overall, the exercise enabled risk management institutions and focal points to coordinate actions for its development and above all allowed organization needs to be seeing.*
- The PTWC experimental products were very helpful for the systematic decision making process.
- La reuniones de coordinación con los integrantes del SNAT para los preparativos del PacWave11.
 - *Coordination meetings with SNAT members for the preparation of PacWave11.*
- El Centro Nacional de Alerta de Tsunamis se preparó adecuadamente para llevar a cabo el ejercicio y desarrolló material de apoyo (manuales) para capacitar al Centro Nacional de Atención de Emergencias en lo relativo al ejercicio.
 - *The National Tsunami Warning Centre was properly prepared to conduct the exercise and developed supporting material (manuals) to train the National Emergency Care Centre concerning the exercise.*
- Planear el ejercicio seleccionando un escenario que por sus características fue un reto en cuanto a la evaluación de las capacidades del sistema nacional y los tiempos de respuesta.

- *Planning the exercise selecting a scenario which for its characteristics became a challenge as to the evaluation of the national system capacities and response times.*
- Exercise Pacific Wave 2011, was a great opportunity to bring together and exercise our national resources from technologies to human resources and that we did. 1. The new experimental products we found very useful in many ways at various levels. It is a great set of tools and also very practical and easy to interpret. 2. The experiences learned from this exercise will contribute to how we manage coming events. 3. In the Cook Islands there are many internal yet minor areas we will continue to improve on as we move towards been effective and efficient in how we manage tsunami events. 4. Please provide information for request made in 2A.1 and feedback on recommendations in 2A.5 5. We will continue to seek out opportunities to learn more about this threat that continues to surprise the most prepared and tsunami knowledgeable communities. 6. Acknowledge the support of Mr. Keith Evans from the New Zealand Ministry of Civil Defence and Emergency Management (MCDEM) 7. On behalf of the Cook Islands Exercise Management Team – we thank all the organizers of this event and look forward to the next exercise. Pac Wave 2011 – Exercise Management Team – Cook Islands.
- Cooperation between TWFP (PMGO) and the National Emergency Services (PNGNDC).
- Both Meteorological Service and Natural Disaster Management Centre eager to participate Pacific Wave 11 and decided to select orientation level.
- La preparación del CODE para recibir y transmitir el aviso.
 - *CODE preparation to receive and issue the notice.*
- Received all PTWS Operational Users Guide and Exercise Pacific Wave 11, Exercise Manual from the PTWC well in advance for use in the planning by the NTWC.
- The early announcement of the exercise allowed sufficient time for preparation of a detailed local exercise master scenario and involvement of more exercise players.
- CONRED: Having had such a time short notice, we were able to manage the basics of action protocols, and resources inventory in case of a TSUNAMI.
- INSIVUMEH: Internally we prepared and organized well about the role of each and how we would respond.
- Choice of the scenarios for each country. Testing new experimental products (text product, energy and threat maps). Sakhalin TWC received all training materials before Exercise Pacific Wave 11. It was enough time to plan and prepare at the local level. All information related to Exercise Pacific Wave 11 was available at the exercise website. Sakhalin TWC had possibility to consult with ITIC about Exercise Pacific Wave 11 before the drill.
- The testing of the Chatty Beetles was good and are now in full operation. Plans to procure and install more in the remote outer-islands.
- Working hand in hand with NOAA in planning, sharing, and making sure the products in question for this exercise were understood by all agencies involved.
- Time of receiving the Warning, Disseminate warning to OEEM or the other stake holders and warn the public what elevation safe to go, runaway from the coastal area etc. To know how to explain to people so they won't get panic.

- Every key personnel in the disaster management in the National Government, State and Local jurisdiction were involved in the exercise and they understand their important role in trying to get the word out on a timely fashion.
- At the national level, things were fairly smooth as we have a set structure for exercise planning in New Zealand. Some regions participation in the exercise was fairly modest. However, generally information sharing went well in the lead-up to the exercise. This was a good exercise to help build relationships. New Zealand provided appropriate levels of engagement options which enabled realistic planning to whatever level people decided to play.
- The coordination and timely response of all agencies involved went on well during the exercise. They understood the messages that were delivered in our own national context derived from what PTWC provided.

4.14 Exercise Planning: Please provide a general statement about WHAT DID NOT GO WELL. (Response count: 23)

Overall, respondents indicated that the following areas did not go well:

- Evacuation routes were found to be difficult for some people in the community.
- The PTWC exercise start mechanism was not clear.
- Not all stakeholders took part in the exercise.
- Risk management institutions did not relate each other as expected.
- Meeting were cancelled and rescheduled causing delay and last minute decisions.
- Some countries have difficulties in reaching out to the remote islands. Their communication systems were not turned on and they had no means to get reach them in a timely manner.
- Some agencies lacked preparation from the exercise.

Country comments were:

- A few responders do not have updated SOP's hence confusion.
- ONE OF THE MAJOR SMS PROVIDERS SYSTEM FAILED TO PROVIDE THE SMS MESSAGE.
- There was no sufficient time to explain the new tsunami forecast products to staff members and field offices.
- Due to Thailand is located at both side of Pacific and Indian Ocean then it looks duplicate work for exercises and sometimes make staff concerned confuse.
- Speaking only from Police position in terms of our role in evacuating the primary school. The planned route from the school up a bush track of about 1.5km to the Hospital grounds can be susceptible to rain which is what we encountered on the day of the exercise. For the younger preschool children this will be an arduous trip and Police were quick to respond to the fact that many of the younger pupils would need an initial transport in the Police vehicles up the first part of the route until flat ground was reached. It is patently obvious that in the event of a short timeframe tsunami warning the whole of the Police service will be required to assist in this evacuation. It will therefore be incumbent on BCN to ensure as much information is broadcast to other members of the public so they can ensure their own safety.

- The national organization of the exercise did not go well (response, awareness, action, etc.)
- Analizar adecuadamente la información disponible por parte del PTWC para los escenarios del ejercicio. No quedó claro el mecanismo de inicio del ejercicio por parte del PTWC. No se estableció que el área responsable de Protección Civil (Manejo de Emergencias) debería emitir recomendaciones a la población y autoridades Estatales y Municipales e instrucciones a las Dependencias Federales.
 - *Properly analyze the PTWC information available for exercise scenarios. The PTWC exercise start mechanism was not clear. It was not established that The Civil Protection (emergency management) responsible area should issue recommendations to the public and State and Municipal authorities as well as instructions to Federal agencies.*
- No comment as a only communications test was conducted.
- Not all stakeholders in the emergency response plan took part in the exercise so that some of the response actions have to be simulated.
- A pesar de las coordinaciones, las instituciones de la gestión de riesgo no se relacionaron como se hubiera esperado. No hubo retroalimentación hacia el Punto Focal.
 - *Despite of coordination, risk management institutions did not relate each other as expected. No feedback towards the Focal Point.*
- En este punto y debido a las reuniones de coordinación no se tuvo contratiempo en la ejecución del PacWave11.
 - *At this point and thanks to coordination meetings there was no setback in conducting Pacwave11.*
- Fue difícil la incorporación del Centro Nacional de Atención de Emergencias a la planificación del ejercicio debido a que el país se encontraba en una época crítica debido a las lluvias.
 - *It was difficult to incorporate the National Emergency Care Centre to the exercise planning since the country was in a critical period because of rainfalls.*
- Lack of clarity in terms of what actions to be taken to accomplish the primary objective of the exercise.
- Las reuniones no fueron realizadas con el tiempo suficiente para el esclarecimiento del ejercicio.
 - *Meetings were not carried out with enough time to clarify the exercise.*
- Not all stakeholders in the emergency response plan took part in the exercise so that some of the response actions have to be simulated.
- CONRED: Again we regret the lack of proper communications and information flow between all the involved in this activity, basically lack of proper EARLY COORDINATION from the Tsunami Focal Point.
- INSIVUMEH: Having reached the point of exercise without having fully understood how it would operate. And the lack of much earlier communication with the national organization of risk management for better planning of the exercise.
- Meeting times where some were cancelled and rescheduled causing delay and last minute decisions.

- Identifying communications capabilities and weaknesses. Participation of all stakeholders was not in place.
- The participation from a reduced quantity of evacuated people.
- The exercise was supposed to be testing the operations and the level of response of the various stakeholders. Unfortunately the type of exercise had to be changed to a table top exercise for only 2 agencies.
- Receiving Warning in UTC and Local time people needs to learn the differences. Wait for the cancellation warning (don't make up your own idea to leave the evacuation site).
- Some of the States DMO have difficulties in reaching out to the remote islands. Their communication syteem were not turn on and they have no means to get to them on a timely manner.
- Unfortunately the Rena (ship running aground) incident took resources away from preparing a slightly more interactive exercise for some regions so they either had to withdraw from the exercise or down-play their involvement.
- Lack of preparation for some agencies which were not notified earlier in advance which leads to the laxity on the focus to the main goal of the exercise. Need to coordinate at national level more effectively.
- Due to multiple events and weekly exercises held by different government agencies, participation in Pacific Wave was downgraded to an EOC Drill for GHS/OCD staff only; Emergency Support Function Coordinators did not participate.

4.15 Exercise Planning: Please provide a general statement about WHAT COULD BE IMPROVED. (Response count: 26)

Overall, respondents indicated that the following could be improved:

- Some agencies indicated that communication in a live situation can be troublesome and therefore a clear understanding of each department's roles is even more important. Public education is also important in terms of the public knowing exactly what to do and where to go in the event of a tsunami threat.
- Some contacts need to be updated.
- Awareness and training is required.
- Some encouragement is required to convince all stakeholders to take part in exercises. Greater involvement at Provincial /Local level is required.
- National SOPs are required.
- Interagency communication needs to be improved.
- More outreach programs on tsunami awareness should be enforced and enhanced.
- Further exercises are required to keep testing capabilities
- Regional leadership could be improved.

Country comments:

- To complete drafting and adoption of the all hazard State Disaster & Emergency Response Plan including the enabling legislation.
- Internally, there was short notice; pre-activity preparation and post-activity evaluation did not include other local agencies that participated.

- Communication in a live situation is always going to be troublesome between the various departments. Therefore a clear understanding of each department's roles is even more important. Public education is also important in terms of the public knowing exactly what to do and where to go in the event of a tsunami threat to the island.
- The contact points coordinates (persons, email address) must be improved to avoid the loss of information from forecast sources. In Vietnam, the Hydro-meteorological Service works separately from the Institute of Geophysics. While IGP is the only body responsible for earthquake and tsunami warning in Vietnam, we think the TNC and the TWFP must be from the IGP. The TNC and TWFP list must be updated on time. At present the out of date list of TNC and TWFP is still being used for communication, and that should make complication and loss of information from overseas sources to Vietnam. The TNC and TWFP must have background of geophysics and seismology to deal with all earthquakes and tsunamis issues.
- Implementar estrategias de sensibilización y capacitación con las autoridades locales sobre la importancia de participar en ejercicios de notificación y comunicaciones en el marco del Sistema Nacional de Alerta de Tsunamis. Considerar la realización de ejercicios de notificación y comunicaciones en el programa anual de trabajo del Sistema Nacional de Alerta de Tsunamis. Promover y consolidar la participación en ejercicios y simulacros de Dependencias e Instituciones de la Administración Pública Federal en el Sistema Nacional de Alerta de Tsunamis. Establecer procedimientos y mecanismos de notificación redundantes con las autoridades locales.
 - *To develop awareness and training strategies with local authorities, regarding the importance of participating in notification and communication exercises related to the National Tsunami Warning System. To consider the implementation of notification and communication exercises in the annual working program of the System. To promote and consolidate the participation in exercises and drills of the Agencies and Institutions of the Federal Public Administration in the National Tsunami Warning System. To establish procedures and redundant notification mechanisms with local authorities.*
- Timely deliverance of notes so that every member of the team is on the same bar. There were a few new members of the team that were not as well versed with planning or understood fully their role in the planning process of the exercise
- No comment as only communications test was conducted.
- To encourage all stakeholders (e.g. transport and container terminal operators) in the emergency response plan to take part in the exercise.
- Lo mencionado en el punto anterior, puede ser mejorado, con reuniones futuras de mayor frecuencia que permitan discutir temas de interés institucionales y que aterricen en la problemática de una buena gestión del riesgo de tsunamis.
 - *The above can be improved with more frequent meetings in the future that allow discussing topics of institutional concern and that land on the problem of a good tsunami risk management.*
- We hope to receive exercise start messages of PTWC through e-mail.
- Contar con documentación general de los ejercicios internacionales anteriores que nos muestren las lecciones aprendidas.
 - *To have general documentation of previous international exercises showing lessons learned.*

- Se puede mejorar la participación interinstitucional en el ejercicio para la obtención de mejores resultados y aprendizaje de todos los involucrados. Trabajar de cerca con los gobiernos locales e instruirlos para que tengan una participación más activa en estos ejercicios y podamos en un futuro involucrar simulacros de evacuación en algunas poblaciones.
 - *Inter-agency participation in the exercise can be improved to achieve better results and learning for all those involved. To work close to local governments and to instruct them so they have a more active participation in these exercises to be able to include in the future evacuation drills in some populations.*
- Disponibilidad de información nacional disponible.
 - *Availability of national information at a hand.*
- Greater involvement at Provincial /Local level.
- National SOP on tsunami has to be put in place.
- Se debe considerar aspectos logísticos en este tipo de ejercicios para hacerlo más real. Se deben considerar los plazos de tiempo para mejorar aspectos en los territorios.
 - *Logistic aspects in this type of exercise to make it look more real should be considered. Period of time for improving aspects in the territories should be considered.*
- To encourage all stakeholders (e.g. transport and container terminal operators) in the emergency response plan to take part in the exercise.
- CONRED: NO DOUBT! It is a MUST. Besides, evacuation and flooding maps should be elaborated according to technical parameters, also better seismic references.
- INSIVUMEH: We need to improve interagency communication, the preparation and sources of communication.
- Having more agencies involvement in planning.
- More outreach programs on tsunami awareness should be enforced and enhanced. Collaboration and participations of all stakeholders.
- A) The levels of graduation for the wave heights in Chile. B) The boundaries of the tsunami affected areas.
- The next exercises must include other stakeholders to test the response of the respective agencies.
- Learn about Time, UTC and Local Time, to understand where the Wave will coming from, the time it will arrive, understand what plate are we in etc.
- We need to have more exercise to keep testing our capabilities on how fast we can get the message out to the people.
- Regional leadership could be improved as well as the willingness of Local Authorities to buy into? regional leadership?
- Coordination and proper planning at national level should be improved.
- Advanced planning, multi-agency participation, full participation in pre-exercise brief or workshop on experimental products.

4.16 Exercise Conduct: Please provide a general statement about WHAT WENT WELL. (Response count: 28)

Overall, respondents indicated that the following went well:

- Agencies indicated that international organisation of the exercise went very well (information, communication, documentation etc.)
- Response actions were carried out efficiently according to the emergency response plans.
- Communications among players were effective.
- Tsunami warnings were issued quickly.
- Operational and communication procedures were tested and went well.
- The experimental products were useful.

Country comments:

- Communication to the first responders went smoothly as preconditions were known.
- ON THE LOCAL LEVEL, WE CONDUCTED TWO SCENARIOS-VANUATU AND TONGA. WE MANAGED TO COMPLETE BOTH OF THEM SATISFACTORILY AND WE UNDERSTAND IT WAS NOT AN IDEAL THING TO DO. HOWEVER OUR ABILITY TO COMMUNICATE WITH OTHERS WENT WELL.
- There was enough elbow room to design injects according to local situation; participating agencies improvised acceptable injects; periodic exercise create opportunity to review and improve on SOP.
- The detail information of Pacific side exercise went very well especially the new products of dissemination.
- As above.
- The international organization of the exercise went very well (information, communication, documentation etc.)
- A partir del Tercer Boletín se utilizaron datos del modelo que utilizará el Centro de Alerta de Tsunamis (CAT). Los protocolos de notificación y comunicaciones son adecuados. El 90% de los Boletines se realizaron y remitieron en tiempo.
 - *From the Third Bulletin was used data of the model to be used by the Tsunami Warning Centre (TWC). Notification and communication protocols are appropriate. 90% of Bulletins were made and issued on time.*
- The following are some of the things that we saw went well for the exercise at the national level: • All agencies receive the SMS messages from the mobile service providers but at different times. This would mainly due to difference in time setup in mobile telephones of approved recipients at the response agency level. • Some of the response agencies who did conduct table top exercises to test their response agency plans found weaknesses in their plans have made changes based on the lessons learned from this exercise such as Samoa Ports Authority, NHS, Bluesky, BOC Gases, Red Cross Society, MWTI and others to name a few. • Relocation of key response agencies further inland including MCIT's radio station 2AP. This is in line with Government's plan for to relocate this facility further inland. • At the village level, signages were found helpful in directing emergency evacuation to evacuation sites. • The same villages that were tested through this exercise were also affected during

the 2009 tsunami and this exercise has again raised their level of awareness of what to do during similar event.

- No comment as a only communications test was conducted.
- Responsive actions were carried out efficiently according to the emergency response plan. Communications among players were effective.
- En cada una de las instituciones queda la satisfacción de haber realizado buenas coordinaciones que permitieron que el personal que estuvo manejando el ejercicio respondiera de la mejor manera y sobre todo con el criterio técnico apropiado.
 - *In each one of the institutions there is the satisfaction of having made good coordination, making it possible for the personnel managing the exercise to answer the best way, and above all with the appropriate technical criteria.*
- The tsunami warning for Exercise Pacific Wave 11 was issued quickly.
- Las pruebas de comunicación entre los organismos integrantes de nuestro Sistema Nacional de Alerta de Tsunami (SNAT) mediante el Teléfono RDSI, Correo electrónico, FAX, Teléfono Satelital y Radio HF. - La emisión de la alerta a nivel de las autoridades de Defensa Civil para su difusión a los gobiernos regionales y distritales.
 - *Communication tests between agencies members of our National Tsunami Warning System (SNAT) through ISDN Telephone, E-mail, Fax, Satellite Telephone and HF Radio. Issuing the Alert at Civil Defense authority level for its dissemination to regional and district governments.*
- Se pudieron poner a prueba los procedimientos de operación y comunicación del centro nacional de alerta de tsunamis los cuales cumplieron satisfactoriamente. El apoyo de los productos experimentales del PTWC fue esencial para que los productos emitidos por el Centro Nacional de Alerta de Tsunamis fueran de calidad y oportunos para los tomadores de decisiones.
 - *Operational and communication procedures of the national tsunami warning center were tested and went well. The support of PTWC experimental products was essential for the good quality of products issued by the National Tsunami Warning and timely for people responsible for decision-making.*
- El ejercicio cumplió su objetivo de permitir que las instituciones ejercitaran sus protocolos de comunicación y procedimientos de respuesta. Además, permitió identificar potenciales debilidades dentro del protocolo nacional.
 - *The exercise fulfilled its objective to enable institutions to exercise their communication protocols and response procedures. In addition, it allowed identifying potential weaknesses within the national protocol.*
- Communication, cooperation between TWFP (PMGO) and National Emergency Services (PNGNDC).
- Timely dissemination of tsunami warning from the PTWC.
- The beginning of the Exercise went well as the bulletins from PTWC and JMA was received in good time and the NTWC disseminated the information to the National Security Council.
- Responsive actions were carried out efficiently according to the emergency response plan. Communications among players were effective.
- CONRED: The inner COORDINATION and support was obvious and well done.

- INSIVUMEH: The realization of our mistakes and failures, which need to be improved.
- Exercise was carried out satisfactorily at all levels. There was no significant remarks and lacks during the Exercise Pacific Wave 11.
- Exercise went well. From NOAA receiving the warning, activation of sirens and EAS, evacuation of assigned schools and private company to when the All Clear was given. As rain kept falling, all who were assigned to participate kept with the exercise until it was over.
- Warning messages sent by PTWC were received on a timely fashion Receipts of bulletins were on a timely fashion.
- A) The test of all NTWC emergency equipment (generators, satellite systems, radios, etc). B) The fluency and velocity of the evaluation and tsunami messages dissemination.
- The participants who were nominated by the responsible agencies to participate in the exercise were present and well organised. The operation centre used have some basic tools available to be used during the exercise such as telephone line through which the warning have been mainly sent from the warning centre.
- Delivering, or disseminate warning in time for people to prepare.
- Every key player actually tests their capabilities in reaching out to the communities in a ample time after receiving the texts.
- Of the elements tested across the country, most regions were pleased with how things went. Information sharing seemed to work well, the establishment of Emergency Operations Centres also worked well. • The ease with which partners were engaged and systems would have been put in place was commented on. • The exercise provided the Health Sector with an opportunity to test its alerting system via Health EMIS (E-Sponder). It also enabled the District Health Boards to trial receiving information directly from the National Warning System.
- Each agency understands their various tasks to play and where to coordinate to interms of informations. We manage to find some rooms of improvements after the exercise which we have pointed and discussed during our debrief.
- Emergency Operations Center Drill was organized and well attended by staff and and management. Materials were made available to all participants and were visible on multiple screens. GHS/OCD employees utilized SOPs and checklists specific to tsunami hazard and maintained chronological log of events. Newly appointed Homeland Security Advisor was able to observe EOC operations.
- La activación del sistema hasta el nivel ejecutivo.
 - *System activation up to the executive level.*

4.17 Exercise Conduct: Please provide a general statement about WHAT DID NOT GO WELL. (Response count: 23)

Overall, respondents indicated that the following did not go well:

- In some cases, the national organisation of the exercise did not go well (response, awariness, action, etc.)
- There were delays in receiving the PTWC bulletins due to details not being updated)
- There were some delays in getting information disseminated (for a variety of reasons)

- There was some lack of preparation and coordination.
- Some materials were not easily understood. Some aspects of the experimental products were not clear.

Country comments:

- Need improvements in issuing instructions and update reporting from the responders. It would have been a disastrous event if it had been held at night.
- ON THE LOCAL LEVEL THE CURRENT COMMUNICATION SETTING AND STAFF CAPACITY PER SHIFT AT MET OFFICE WOULD NOT BE ABLE TO BEAR THE LOAD NECESSARY FOR A SMOOTH COMMUNICATION/ RELAY OF TSUNAMI WARNINGS TO THE PEOPLE OF TONGA. FOUR STAFF AT MET OFFICE WERE CONDUCTING THE EXERCISE AND ALL WERE FULLY LOADED FOR THE WHOLE DURATION OF THE EXERCISE.
- Internally, some offices waited for cues when and how to participate and hence, missed out on the activity.
- The national organization of the exercise did not go well (response, awareness, action, etc.)
- Primer Boletín con atraso de 32 minutos, ya que PTWC lo envió al Punto Focal Nacional que es el Centro Nacional de Comunicaciones (CENACOM) de la Secretaría de Gobernación y no a SEMAR. Dificultad en el envío y recepción en las direcciones de email de los correos institucionales (@segob.mx, @semar.gob.mx, @cenapred.unam.mx, etc.). Correos electrónicos y números telefónicos no actualizados. Las coordenadas que utilizó el PTWC en los Boletines no son las que se utilizan convencionalmente (14.8N; 267.5E, debiendo ser 14.8N, 92.5W) por lo que se hicieron adecuaciones y por consiguiente pérdida de tiempo. No especificar claramente las zonas horarias en los Boletines. Los gráficos utilizados en los anexos no estaban explícitos. No incluir en el Boletín el Mapa de la República Mexicana en donde se muestran las alturas esperadas de la onda de tsunami. De las 11 Unidades Estatales de Protección Civil (UEPC) convocadas, se registró la participación de 6; de las 43 Unidades Municipales de Protección Civil (UMPC) convocadas, se registró la participación de 9; la Dirección General de Marina Mercante participó a lo largo del ejercicio. En el caso del envío de los boletines 2, 4 y 5, entre el CENACOM y las UEPC y UMPC, existió un retraso de 32, 29 y 25 minutos, respectivamente.
 - *First Bulletin was 32 minutes late, because the PTWC sent it to a national Focal Point that is the National Communication Centre (CENACOM) of the Government Secretary and not to SEMAR. Difficulties in sending and receiving from the email addresses of institutional mails (@segob.mx, @semar.gob.mx, @cenapred.unam.mx, etc.). Emails and phone numbers not updated. Coordinates used by PTWC in bulletins are not those conventionally used (14.8N; 267.5E, which should be 14.8N, 92.5W) reason why adjustments had to be made and therefore loss of time. Not clear specification about time zones in bulletins. Graphs used in annexes were not explicit. Maps of the Mexican Republic where expected tsunami wave heights are shown were not included in bulletins. Of 11 State Units of Civil Protection (UEPC) summoned, the participation of 6 was recorded; Of 43 Municipal Units of Civil Protection (UMPC) summoned the participation of 9 was recorded; the General Directorate of Merchant Marine, participated throughout the exercise. In the case of sending bulletins 2, 4 and 5, between CENACOM and UEPC and UMPC, there was a 32, 29 and 25 minutes delay, respectively.*

- The national tsunami warning centre identified the following to improve its performance its responsibilities as the national warning centre: .1 Another means of communication to receive the Pacific Tsunami Warning Centre bulletins such as the WMO Global Telecommunication System (GTS); .2 A special area for media briefing to avoid congestion in the operations area of the national warning centre. .3 At the current location of the national tsunami warning centre, this place would be inundated if it's a real earthquake with a magnitude of 9 on the Richter scale. .4 There is a need to automate a number of procedures and direct dissemination of warning SMS to the public instead of going through the mobile service providers as this take up time or the contact people at the mobile service providers might not be answering their telephones or not in country. .5 Need dedicated operations area for seismic operations during real events as it always gets in the way while weather section staff are trying to meet the timeline for weather bulletins and their observations. Most of the agencies have identified weaknesses with their preparedness such as back up supplies especially for the hospitals and gas companies. It was also raised by NHS that another evacuation site needs to be identified as the original evacuation site (Logoipulotu College compound) is now closed. Need the updated list of village representatives on a regular basis as it was found that some of the numbers do not exist anymore. The reliance of some of the villages on warning signals such as church bells activated in neighbouring villages is not reliable such as the case at Mutiatele and Malaela. The use of the same short code used by mobile service providers for their promotions to send the warning messages is not appropriate as a number of people thought that they was just promotion messages and not a warning. It was recommended to have one emergency short code for the mobile services to send the warning SMSs.
- No comment as only communications test was conducted.
- There were a few discrepancies and unfulfilled expectations in cooperative actions (e.g. search and rescue) among response organizations.
- Las comunicaciones interinstitucionales aún necesitan ser mejoradas, pues los mensajes enviados entre instituciones no llegaron a tiempo.
 - *Inter-institutional communications need yet to be improved, since messages sent between institutions did not arrive on time.*
- No contar en nuestro sistema de alerta con un mensaje automático de cancelación de la alerta a los diferentes integrantes del SNAT.
 - *Not having in our warning system an automatic warning cancellation message for different members of SNAT.*
- Durante la realización del ejercicio hubo participación de medios de comunicación que intentaron involucrarse en el desarrollo del mismo y retrasaron de alguna manera el trabajo de los técnicos que procesaban la información, redactaban informes y emitían recomendaciones. El Centro Nacional de Emergencias no tuvo la participación debida dentro del ejercicio pues se encontraban activados en ese momento debido a las lluvias que afectaban al país en esa época. El Centro Nacional de Emergencias no se activó de manera rápida luego de que el Centro Nacional de Alerta de Tsunamis emitió el Aviso por la ocurrencia del sismo.
 - *During the exercise news media participated and tried to become involved in the development of the exercise which somehow delayed the work of technical experts processing the information, they drew up reports and issued recommendations. The National Emergency Centre did not have due participation in the exercise at that moment since they were active for the rainfalls affecting the country at that time. The National Emergency Centre was*

not activated quickly enough after the National Tsunami Warning Centre issued the Notice about the earthquake event

- Jugar con tiempo real y efectivo, crear condiciones de redundancia para transmitir el aviso.
 - *To play with real and effective time; to create redundancy conditions to issue the notice.*
- The response by the community at Labuan was poor due to the rain during the time of the drill.
- There were a few discrepancies and unfulfilled expectations in cooperative actions (e.g. search and rescue) among response organizations.
- CONRED. Definitely the lack of proper timing in information exchange since the beginning.
- INSIVUMEH: The confusion and delay in delivering the first bulletin at the beginning of the exercise.
- NWPTAC start message was received at 23:00 UTC (but was issued at 22:10 UTC).
- A few sirens did not sound, some schools who voluntarily participated reported NOAA radios not working, the National testing of the EAS which caused a little public confusion that morning. All of these did not go wells were worked on and corrected.
- Slow delivery of warnings to Disaster Office Delivery of bulletins was slow.
- The phone numbers of provincial offices and rural community leaders were not ready at that time. The seismic information bulletin has to be prepared to meet time for dissemination to stakeholders. The respond to this type of local scenario did not show any urgency.
- The communication system in other states is bad and need to be improved.
- Some issuance of some JATWC products was delayed due to NTWC Disaster Manager taking too long to liaise with state-based emergency managers.
- One region advised it took far too long in some cases to set up systems and processes at a local level and without inundation maps and information tended to fly blind for some time. Another region noted that there was some non-participation of all members of its area. Exercises like these provide a window of opportunity to work together and develop trust.
- Lack of preparation and coordination was a major issue raised and observed.
- Some materials were not easily understood. Personnel in the Joint Information Center were not fully engaged due to real-life events.

4.18 Exercise Conduct: Please provide a general statement about WHAT COULD BE IMPROVED. (Response count: 26)

Overall, respondents indicated that the following could be improved:

- Some agencies indicated they need to establish redundant notification procedures and mechanisms with local authorities.
- Reviews of standard operating procedures and the establishment of a threshold guide are required.
- Communications can be improved.

- Involvement of all stakeholders in the exercise to improve coordination.
- The new products could have been loaded on the website sooner. Further exercises will enhance preparedness.

Country comments:

- Better and improved early warning systems not in existence as only shortwave radios, radio broadcast and police are available. Residents of the outlying islands are most venerable.
- A SYSTEM WHEREBY SMS, FAX AND EMAIL CAN BE TRANSMITTED SIMPLY BY PRESSING OF A BUTTON.
- Internally, perhaps put in writing general guidelines and agreements how each office or station can participate.
- None.
- The communication between NTWC of Vietnam and the neighbouring countries, particularly the Philippines could be included in the exercise.
- Establecer procedimientos y mecanismos de notificación redundantes con las autoridades locales.
 - *Establish redundant notification procedures and mechanisms with local authorities.*
- In light of the strengths and weaknesses identified during the exercise, the following recommendations are made where some of these recommendations are already in the implementation phase. • To put in place one emergency short code to use by the mobile service providers to send the warning SMS to approved recipients at the villages and national level. This code is now being approved by the Office of the Regulator and the DMO is working with Bluesky, Digicel and Lesa's Telephone's services to connect this number. • The national tsunami warning system and plan is now being reviewed to incorporate lessons learned from this exercise and the tsunami of September 2009. The review will include the development of a threshold table to guide the type of warning to issue, and this prompt a review of the standard operation procedure within the national tsunami warning centre as well as the response agency and community response contain within the national tsunami hazard plan 2008. • Arrangements will be made with PTWC and WMO to include Samoa in the list of countries to receive PTWC bulletins through the GTS. • The new national seismic data centre and seismic network will improve some of the issues raised by the national tsunami warning centre such as the media briefing area, timeliness of data analysis given the increase in number of seismic stations, and dedicated area for the seismic operations to avoid interrupting weather section's work. • The response agencies plans of the agencies that have identified weaknesses in their respective plans have been amended however only one (Samoa Ports Authority) have submitted their amended plan.
- No comment as only communications test was conducted.
- There could be more in-depth discussions on cooperative response among organizations in the contingency planning.
- Tomando en consideración lo antes expuesto, se considera que las comunicaciones a nivel local deben ser fortalecidas, con el propósito de establecer líneas alternas y reduntes de comunicación.

- *Taking into account the above, it is considered that local level communication should be strengthened, in order to establish alternate and redundant lines of communication.*
- Continuar con la política de información mediante los diferentes sistemas de comunicación ya que tendrá un efecto redundante para la comunidad en general, así como continuar con los Ejercicios Internacionales. - Mejorar e implementar en futuros ejercicios internacionales el mensaje de cancelación.
 - *To continue with policy information through different communication systems, since it will have a redundant effect for the community in general, as well as to continue with the International Exercises. –To improve and implement the cancellation message in future international exercises.*
- Reducir el tiempo en que el Centro Nacional de Emergencias se activa ante estas emergencias tomando en consideración que pueden haber más de una emergencia afectando al país a la vez.
 - *Reduce the time for the National Emergency Centre activation facing these emergencies. Taking into consideration that there can be more than one emergency affecting the country at the same time.*
- Diversificar los canales de comunicación y establecer estrategias para mejorar la capacidad de evaluación y alerta para eventos locales. Involucrar a otros actores como por ejemplo, medios de comunicación.
 - *Diversify communication channels and establish strategies to enhance the evaluation capacity and warning for local events. Involve other players such as, news media.*
- Communication between National Emergency Services and Provincial / Local offices. Also for greater involvement at Provincial / Local and Ward level.
- Jugar previamente con los comités en el territorio para hacerlo mas participativo y en algunos casos demostrativo, considerando los aspectos logísticos.
 - *Previously play with committees in the territory for more participation and in some cases demonstrative, considering logistic aspects.*
- There could be more in-depth discussions on cooperative response among organizations in the contingency planning.
- CONRED: Same as in the planning part, this should be reviewed as soon as possible, and as priority next exercise TO HAVE THE EARLIEST INFORMATION FOR BETTER MANAGEMENT OF ANY REAL EVENT.
- INSIVUMEH: Have information from the tide gages, perhaps via satellite.
- Providing ALL participants with evacuation maps, routes, and assembly areas. Continuity of awareness and preparedness for Tsunami.
- Products could have been loaded on the website sooner. A workshop would have been helpful, but overall, it was a good exercise.
- All stakeholders should collaborate and join this type of drill/exercise to test country's readiness for tsunami. (More collaborations among stakeholders) Delivery of bulletins, collaboration and cooperation of all concern, communications to the islands.
- Continue to improve the SOP's (NTWC and NDMO).
- The seismic information template must be prepared in advance for each province. The contact list for telephone numbers and email addresses to be prepared for each province and area councils. The telephone numbers of the warning centre and the

emergency management or the National disaster operation centre has to be communicated to the rural communities, the provinces and the area councils. The telephone line has to be minded. The advisory 2 and 3 should not be called advisory but warning, because there is prove that the tsunami has generated.

- Time frame, Where to run, what plate we are in, where shall we run for life.
- Need more excercise and exercise.
- Event though the expectations, timelines and authourity of the relationship between NTWC are clearly defined in the SOPs, there's nothing like a real time tsunami exercise, review and the resulting training that will improve the system.
- Some regions commented that they need inundation maps completed for all low-lying communities in the region. There is also a need to have all staff familiar with the use and operation of all communication systems and to exercise on a more regular basis.
 - One region commented that they need greater buy-in from some organisations responsible for vulnerable communities (work in progress).
- Here locally, agencies need to collaborate and coordinate with each other under the leading arm of the NDMO officials.
- Joint Information Center products such as press releases and holding statements. Operational period objectives should have been identified, regardless of limited play.

ANNEX VII

REPORT PREPARATION

FINAL REPORT

The planning, conduct, and evaluation of Exercise Pacific Wave 11 was coordinated by the PTWS Exercise Pacific Wave 11 Task Team (TT). The Exercise Pacific Wave 11 Summary Report and ANNEX V were compiled by Jo Guard, Dr Laura Kong, Brian Yanagi, and Dr Rhett Butler (PacWave11 consultant). Translation of ANNEX V evaluation from Spanish to English was provided by the Hydrographic and Oceanographic Service of the Navy of Chile (SHOA).

Task Team Members:

- Ms Jo Guard, New Zealand, Ministry of Civil Defence and Emergency Management (MCDEM), Task Team Co-Chair.
- Dr Laura Kong, United States of America, International Tsunami Information Center (ITIC), Director, Task Team Co-Chair.
- Mr David Coetzee, New Zealand, Ministry of Civil Defence and Emergency Management (MCDEM), PTWS Working Group 3 Chair.
- Dr Ken Gledhill, New Zealand, Institute of Geological and Nuclear Sciences (IGNS), PTWS Chair, SW Pacific Seismic Data Sharing Task Team Chair.
- Mr Takeshi Koizumi, Japan Meteorological Agency (JMA), Senior Coordinator for International Earthquake and Tsunami Information, PTWS Vice-Chair.
- Lt Willington Renteria, Ecuador, Instituto Oceanográfico de la Armada (INOCAR) Southeast Pacific WG Chair, 2011–2012.
- Mr Brian Yanagi, United States of America, International Tsunami Information Center (ITIC).

ANNEX VIII

LIST OF ACRONYMS

AFTN	Aeronautical Fixed Telecommunication Network
ASDHS	American Samoa Department of Homeland Security
BCGS	Bureau of Coast and Geodetic Survey
BMKG	Meteorology Climatology and Geophysics Agency
BPS	Bureau of Public Safety
CICESE	Centro de Investigación Científica y de Educación Superior de Ensenada de México
CONRED	Coordinadora para la reducción de Desastres en Guatemala
CPPS	Permanent Commission for the South Pacific
DCO	Disasters Control Office
DHN	Diretoria de Hidrografia e Navegaçaa (Brazil)
DISCEX	Discussion exercise
DOE	Department of Education
EMWIN	Emergency Managers Weather Information Network ,
EPW06	Exercise Pacific Wave 06
EPW08	Exercise Pacific Wave 08
GTS	Global Telecommunication System
ICG	International Coordination Group
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
INDECI	Instituto Nacional de Defensa Civil
INOCAR	Instituto Oceanográfico de la Armada de Ecuador
INSIVUMEH	Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología de Guatemala
IOC	Intergovernmental Oceanographic Commission

IOWAVE	Exercise Indian Ocean Wave
ITIC	International Tsunami Information Centre
ITP-HAWAII	ITIC Training Programme
JATWC	Joint Australian Tsunami Warning Centre
JMA	Japan Meteorological Agency's
KMA	Korea Meteorological Administration
MCDEM	Ministry of Civil Defence & Emergency Management of New Zealand
MSEL	International Master Schedule of Events List
NAMRIA	The National Mapping Resource and Information Authority
NCC	National Coordination Centre
NDC	National Disaster Committee
NDMO	National Disaster Management Organizations
NEC	National Emergency Centre
NEMA	National Emergency Management Agency
NEMCO	National Emergency Management Coordination Office
NEMO	National Emergency Management Organisation
NOAA	National Oceanic and Atmospheric Administration of United States of America
NTWC	National Tsunami Warning Centre
NWPTAC	Northwest Pacific Tsunami Advisory Center
NWS	National Weather Service of United States of America
PTWC	Pacific Tsunami Warning Center
PTWS	Pacific Tsunami Warning and Mitigation System
RANET	Response and Assistance Network
SHOA	Hydrographic and Oceanographic Service of the Navy of Chile
SINAPRET	Sistema Nacional de Prevención, Atención y Mitigación de Desastres de Nicaragua.
SINAPROC	Sistema Nacional dde Portección Civil de Panamá
SOP	Standard Operating Procedures

SOPAC	Pacific Islands Applied Geoscience Commission
TEMCO	Territorial Emergency Management Coordinating Office of American Samoa
TRR	Telecom Regulator of Vanuatu
TT	Task Team
TWFP	Tsunami Warning Focal Point
UNESCO	United Nations Educational, Scientific and Cultural Organization
VHF	Very High Frequency
VMGD	Vanuatu Meteorology and Geohazards Department
VSAT	very small aperture terminal
WCATWC	West Coast and Alaska Tsunami Warning Center
WCM	Warning Coordination Meteorologist
WG	Working Group
WSFO	Weather Service Forecast Office of United States of America
WSO	Weather Services Office