



# **EXERCISE PACIFIC WAVE 2018**

## **A Pacific-wide Tsunami Warning and Enhanced Products Exercise**

**1 September–30 November 2018**

**Volume 1**

**Exercise Manual**

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## 1. BACKGROUND

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 earthquake off the coast of Chile, which generated a tsunami killing 2,000 people locally, and hundreds in the far field in Hawaii, Japan, and the Philippines. The main focus of the Group is to facilitate the issuance of timely international alerts, and advocate for comprehensive national programmes in hazard assessment, warning guidance, and preparedness (*ITSU Master Plan*, 2004 [IOC/INF-1124 Rev.]; *Medium-term Strategy: Pacific Tsunami Warning and Mitigation System* (PTWS MTS), 2014–2021 [IOC/2013/TS/108]; *PTWS Implementation Plan 2013*, (evolving document, version 4). In 2005, ITSU was re-established as the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS).

The US Pacific Tsunami Warning Center (PTWC), established in 1965 with the start of the Tsunami Warning System in the Pacific, serves as the lead Tsunami Service Provider (TSP) for the Pacific. Because of the Pacific's large size, several regional Tsunami Service Providers have been, or are being, established in order to improve the timeliness and threat assessment accuracy of especially regional events.

In response to Member State requests for additional regional information, Japan began operation of its Northwest Pacific Tsunami Advisory Center (NWPTAC) in March 2005, and in April 2006 expanded on an interim basis to the South China Sea. The NWPTAC, which serves as the TSP for the Northwest Pacific, provides timely alerts for earthquakes occurring in the Northwest Pacific extending North to South from Russia to the Solomon Islands, and West to East from Thailand to Micronesia. As of February 2018, the NWPTAC has issued the advisories for 232 events in total since it started the service in March 2005.

In 2013, Member States approved the proposal for the South China Sea Tsunami Warning and Mitigation System, and the establishment of the South China Sea Tsunami Advisory Center (SCSTAC) hosted by China. The SCSTAC services countries bordering the South China Sea, Sulu Sea, and Celebes Sea. The SCSTAC began issuing trial products in January 2018.

A Pacific-wide tsunami exercise is an effective tool for evaluating the readiness of PTWS countries and to identify changes that can improve its effectiveness. The international tsunami exercises were first conceived and conducted in 2006 by the ICG/PTWS under the leadership of the PTWS Exercises Task Team with strong contributions from the International Tsunami Information Center (ITIC), PTWC, and Japan Meteorological Agency (JMA). Altogether there have been seven IOC-coordinated international tsunami exercises: Exercise Pacific Wave in 2006 (IOC/INF-1244), 2008 (IOC/2008/TS/82), 2011, (IOC/2011/TS/97 Vol.1 and 2); 2013 (IOC/2013/TS/106 Vol.1 and 2), 2015 (IOC/2015/TS/117 Vol.1 and 2), 2016 (IOC/2015/TS/126 Vol.1 and 2) and 2017 (IOC/2016/TS/131 Vol.1 and 2).

The exercises, using a multitude of Pacific scenarios and accompanied by tsunami message products from the Pacific Tsunami Warning Center, Japan Meteorological Agency's Northwest Pacific Tsunami Advisory Center, the US National Tsunami Warning Center (formerly West Coast and Alaska Tsunami Warning Center), and the South China Sea Tsunami Advisory Centre (SCSTAC) have been used to evaluate the effectiveness of the system and measure the readiness of countries to respond, as national tsunami warning centers and emergency response agencies and the public, to distant and local tsunamis. Exercise Pacific Wave 2011, 2013, and 2015 were additionally used to introduce and obtain feedback, test, and validate the PTWC new enhanced forecast products which became official on 1 October 2014. Exercise Pacific Wave 2016 and 2017 were used to evaluate experimental NWPTAC Enhanced Products and identify necessary modifications before the Enhanced Products are formally adopted. Exercise Pacific Wave 2017 was also used to support the development of the

SCSTAC products. Exercise Pacific Wave 2018 will be used to validate the NWPTAC enhanced products and test the new SCSTAC products.

At its 27<sup>th</sup> session, the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXVII/3), held in Tahiti, France, from 28 to 31 March 2017, approved the conduct of Exercise Pacific Wave 2018 (PacWave18) from September to November 2018.

## **2. EXERCISE PURPOSE**

Exercise Pacific Wave 2018 (PacWave18) intends to support the development of improved tsunami products and procedures, including the Enhanced Products of the Northwest Pacific Tsunami Advisory Center (NWPTAC) of the Japan Meteorological Agency (JMA) and the South China Sea Tsunami Advisory Centre (SCSTAC) of the China State Oceanic Administration (SOA).

The aim of PacWave18 is to test country preparedness arrangements, and operational procedures to respond and recover from a destructive tsunami, especially at the community level.

PacWave18 provides a valuable opportunity for Pacific countries to test the new products (where relevant), review their tsunami response procedures, test internal and external communication systems, and engage with communities through public education activities. Regular exercises are important for maintaining staff readiness in case of a real event. This is especially true for tsunamis, which are infrequent, but when they occur, require a rapid response. Every Pacific country is encouraged to participate.

## **3. EXERCISE OBJECTIVE**

The overall objectives for Exercise Pacific Wave 2018 are to:

- Test communications from the PTWS PTWC, NWPTAC, and SCSTAC Tsunami Service Providers to Member States.
- Test national communication and cooperation, and readiness within the country.
- Test regional communication and cooperation between Member States.
- Test whether the PTWS PTWC, NWPTAC, and/or SCSTAC Tsunami Service Provider products are interpreted by Member States accurately and in a timely manner.
- Validate the format and content of NWPTAC Enhanced Products (*Only applicable to relevant countries*).
- Evaluate the format and content of SCSTAC Enhanced Products (*Only applicable to relevant countries*).

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

## **4. NEW ENHANCED PRODUCTS**

### **4.1 NORTHWEST PACIFIC TSUNAMI ADVISORY CENTER ENHANCED PRODUCTS**

At the 26th session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXVI), held in Honolulu, Hawaii, USA, from 22 to 24 April 2015, Member States agreed that the NWPTAC should proceed with the development

of its enhanced products for the North-West Pacific, with guidance and feedback to be received from the Task Team on Enhanced Products.

The enhanced products consist of an initial text message using information from a pre-established tsunami database, and are followed by text and graphical messages that include results from real-time simulations. The enhanced products include new forecast points, five categories of tsunami amplitude classification and three graphical products. The graphical products are sent solely to Tsunami Warning Focal Points of recipient countries. A draft Users' Guide based on the document *Operational users guide for the Pacific Tsunami Warning and Mitigation System (PTWS)* (IOC/2011/TS/87 Rev. (2nd ed.)), mainly section 6) has been prepared and is available at the PacWave18 website as *Users Guide for the Northwest Pacific Tsunami Advisory Center Enhanced Products for the Pacific Tsunami Warning System*. PacWave16 and PacWave17 were used to support the development of the NWPTAC enhanced products. Exercise Pacific Wave 2018 will be used to validate the new NWPTAC enhanced products.

Through IOC Circular Letter 2702 (IOC/CL-2702) dated 13 December 2017, the Japan Meteorological Agency's NWPTAC commenced issuance of its experimental NWPTAC Enhanced Products on 20 December 2017, in parallel with its existing products. The full changeover date to the new products is expected six months to a year afterward.

#### 4.2 SOUTH CHINA SEA TSUNAMI ADVISORY CENTER ENHANCED PRODUCTS

At the Twenty-seventh session of the ICG/PTWS (ICG/PTWS-XXVII) held in Tahiti, France, from 28 to 31 March 2017, Member States agreed to commence the trial operation of SCSTAC in late 2017, with a specific date to be decided by the Steering Committee of the ICG/PTWS (PTWS SC). The PTWS SC at its virtual meeting on 11 September 2017 accepted the proposal to start the trial issuance of SCSTAC products on 26 January 2018. The Technical Document entitled *Tsunami Advisory Products for the South China Sea Regional Tsunami Warning and Mitigation System* (October 2017) provides information on the SCSTAC products, geographical coverage, bulletins, forecast points and other technical aspects (<http://www.scstac.org>). PacWave17 was used to support the development of the SCSTAC enhanced products. Exercise Pacific Wave 2018 will be used to support the SCSTAC operation and products.

Through IOC Circular Letter 2706 (IOC/CL-2706) dated 5 January 2018, the SCSTAC will commence trial issuance of the SCSTAC Products on 26 January 2018. During the trial, comments or suggestions are welcome on the Technical Document or SCSTAC products through May 2018 for improving the products to be validated in PacWave18.

### 5. EXERCISE DATES

PacWave18 will be held within the period of 1 September to 30 November 2018. PacWave18 will simulate Pacific countries receiving Tsunami Threat messages containing wave amplitude forecasts. Member States may then use the information in their decision making to assess their national threat and to simulate creating and disseminating alerts. Countries are encouraged to engage communities at the local level and it is recommended to be at least a table-top exercise.

All products will be available prior to the exercise dates on the PacWave18 website (<http://www.pacwave.info>). Participating countries may choose to run their exercise at any time between 1 September and 30 November 2018, allowing flexibility to avoid conflict with other important national events.



## 5.1 PROVISIONAL TIMELINE AND MILESTONES

PROVISIONAL TIMELINE	
28 February 2018	Nomination of a National Contact for PacWave18
18 May 2018	Exercise Manual available on <a href="http://www.pacwave.info">www.pacwave.info</a> (including scenarios)
1 June 2018	Exercise Message and products available on <a href="http://www.pacwave.info">www.pacwave.info</a>
1 September – 30 November 2018	Exercise Pacific Wave 2018
21 December 2018	Countries to complete and submit evaluation survey online
ICG/PTWS-XXVIII, 2019	Draft PacWave18 Preliminary Results discussed at the ICG meeting
30 June 2019	Draft PacWave18 Preliminary Report available to Member States
31 August 2019	Final PacWave18 Summary Report uploaded to <a href="http://www.pacwave.info">www.pacwave.info</a>

Table 1. Provisional Timeline and milestones

## 6. EXERCISE SCENARIO

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.

PacWave18 will include multiple scenarios to enable all Member States to select a distant, regional or local event that will impact their country. It is recommended countries choose one scenario to exercise. Scenarios will include past historical events, including the 2009 Tonga Trench (Samoa Islands Region), 2010 Peru-Chile Trench (near the coast of Central Chile), 2011 Japan Trench (near the coast of Honshu), and 2013 South Solomon Trench (Santa Cruz Islands) tsunamis, and hypothesized scenarios for the Manila Trench, South Solomon Trench, and Tonga Trench (see [Annex I](#) for scenario details).

For exercise purposes, the date will be set to 5 November 2018. For historical events, the earthquake origin time will be the actual time it happened, and actual tsunami observations will be reported by the TSPs, and marigrams for stations observing the tsunami will also be available.

Note that a live communication test from the Tsunami Service Providers to Member States will be conducted at 0000 UTC on 5 November 2018.

The exercise will require the evaluation of PTWC and, as applicable, the NWPTAC and/or the SCSTAC enhanced products, issuance of appropriate country specific alerts by National Tsunami Warning Centres, and decision-making, including steps taken just prior to public notification. Member States are encouraged to engage with communities at the local level as part of the exercise.

Member States are also encouraged to engage in communication and coordination activities, such as through a joint exercise, with nearby jurisdictions and countries in the region. Examples might be the sharing of data, information, parameters, and/or analysis, and decision-making conference calls, and/or coordination of alert levels along borders.

## **7. TSUNAMI SERVICE PROVIDER COMMUNICATIONS TEST**

To test communications from the Tsunami Service Providers to each Member State, one live message will be issued for PacWave18. The live test will occur at 0000 UTC on 5 November 2018. Member States should note when and how they receive the live communications test message and report back through the Post-Exercise Evaluation Survey.

## **8. TYPE OF EXERCISE**

It is recommended that, if possible, Exercise Pacific Wave 2018 be carried out as a functional exercise with community engagement, or at a minimum, be carried out in a Table Top format (also referred to as a 'discussion exercise', or 'DISCEX').

Exercise Pacific Wave 2018 could be carried out in a drill format within communities or as a functional exercise. In a drill exercise, staff physically handle equipment or perform a specific procedure. The exercise usually has a time frame element and is used to test the procedures. An example of a drill exercise may involve activating an emergency operations centre or using alternative communications (such as radios).

A functional exercise may also 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. 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. Functional exercises normally involve multi-agency participation (real or simulated) and this type of exercise is used to practice multiple emergency functions, e.g. direction and control, resource management and communications. An example of a functional exercise is a multiple agency response to a tsunami threat, where evaluation of a coastal area is required. Messages and injects are provided by exercise control and are handled by participants in the way described in appropriate plans and procedures. Outcomes are generated that would be expected in a real situation.

Finally, functional exercises that include the practice evacuation of communities, or sectors of a community such as a school or other important facilities, are encouraged where possible. A school evacuation would test the procedures for receiving the warning and subsequent evacuation order, and the evacuation of school staff and school children to a designated tsunami safe area.

In a Table Top exercise, participants are presented with a situation or problem that they are required to discuss and for which they have to formulate the appropriate response or solution. Normally, the exercise requires no simulation other than the scenario and/or prewritten exercise injects. An exercise controller 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 the key stakeholders, such as the National Tsunami Warning Centre and the National Disaster Management Office in one country, and/or

National Tsunami Warning Centres from neighboring countries, discussing their response to a tsunami threat in a particular area, where the only inputs are the tsunami products from the relevant Tsunami Service Providers.

## **9. FURTHER GUIDANCE**

### **9.1 PLANS AND PROCEDURES FOR TSUNAMI WARNING AND EMERGENCY MANAGEMENT GUIDELINE**

The IOC Manual and Guides entitled *Plans and procedures for tsunami warning and emergency management* (IOC/2017/MG/76 Rev.) has been developed to provide guidance for countries in strengthening tsunami warning and emergency response through the development of Plans and Standard Operating Procedures for their warning and emergency management authorities. National authorities should have aligned and robust tsunami warning and response plans and procedures to ensure timely, actionable warnings and effective response by coastal communities.

The guideline is a product of collaboration between the four Intergovernmental Coordination Groups (ICGs) through the Working Group on Tsunamis and Other Hazards related to Sea-Level Warning and Mitigation Systems (TOWS-WG), and is a reference point for global consistency with regard to planning for and responding to tsunamis.

The content is based largely on training materials developed by the ICG/PTWS and the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS) and their respective Tsunami Information Centres, in particular the UNESCO-IOC-NOAA International Tsunami Information Centre (ITIC), based in Hawaii, USA, and was developed through training workshops conducted in countries of the Indian Ocean, Southeast Asia and South China Sea Region during 2008 to 2010, as part of the project entitled “*Strengthening Tsunami Warning and Emergency Responses: Training Workshops on the Development of Standard Operating Procedures for Indian Ocean and Southeast Asian Countries*”. It includes contributions from international experts in the fields of tsunami science, early warning and mitigation, disaster management and community awareness.

### **9.2 HOW TO PLAN, CONDUCT AND EVALUATE TSUNAMI EXERCISES GUIDELINE**

The IOC Manual and Guides *How to plan, conduct and evaluate UNESCO/IOC tsunami wave exercises* (IOC/2011/MG/58 Rev, English, Spanish) has been developed to aid countries in planning, conducting, and evaluating a tsunami exercise at a national and/or provincial level.

This guideline contains information on how to plan, conduct and evaluate tsunami wave exercises. It has been designed for use by IOC Member States who will participate in these exercises and has been divided into four easy stages to provide a range of practical advice and templates for in-country exercise developers to analyse the need for an exercise at the country, provincial or local level, design the exercise, conduct the exercise, and evaluate the exercise. A number of case studies have also been included to provide examples of various in-country tsunami exercises. The case study examples are not necessarily based on tsunami wave exercise scenarios, but they provide an insight into the planning and execution of national level tsunami exercises.

Both documents are also available at the PacWave18 website (<http://www.pacwave.info>).

### 9.3 INTERNATIONAL DAY FOR DISASTER REDUCTION AND WORLD TSUNAMI AWARENESS DAY

It will be useful to link your exercise, and especially any community activities with either the International Day for Disaster Reduction on 13 October 2018, or the World Tsunami Awareness Day on 5 November 2018. Note that a live communication test from the Tsunami Service Providers to Member States will be conducted at 0000 UTC on 5 November 2018.

## 10. ASSUMPTIONS

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

## 11. EXERCISE PARTICIPATION

All Pacific countries are strongly encouraged to participate in the exercise. However, it is up to each country to decide what level of governmental participation they will undertake. At a minimum, to meet the objectives of PacWave18, it is recommended that the National Tsunami Warning Centre and the National Disaster Management Office participate.

Each country's lead agency and its PacWave18 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, including any regional or joint exercises.
- **During the exercise:**
  - Participating in the live communication test between the Tsunami Service Providers and Member States at 0000 UTC on 5 November 2018.
  - Responding as necessary to fulfil their all-of-government and national, provincial and/or local arrangement obligations.
  - Responding as necessary to fulfil regional commitments.
- **After the exercise:**
  - Encouraging the conduct of debriefs and evaluations by in-country agencies, and/or country-country evaluation.
  - Completing the PacWave18 Exercise Evaluation Form based on in-country feedback.

## 12. EXERCISE DOCUMENTATION

Exercise Pacific Wave 2018 planning, conduct, and evaluation should take into account the following documents:

- IOC Circular Letter, 2709: Pacific Tsunami Warning and Mitigation System (PTWS) Exercise Pacific Wave 2018 (PacWave18), during the period 1st September to 30 November 2018, issued 22 January 2018 ([CL-2709](#))
- Exercise Pacific Wave 2018, A Pacific-wide Tsunami Warning and Enhanced Products Exercise, 1 September–30 November 2018. Exercise Manual, Volume 1, IOC Technical Series No 139. UNESCO/IOC 2018 (English)

- User's guide for the Pacific Tsunami Warning Center: enhanced products for the Pacific Tsunami Warning System. IOC Technical Series No 105, Revised edition. UNESCO/IOC 2014 (English; Spanish) ([IOC/2013/TS/105 REV.3](#))
- Users Guide for the Northwest Pacific Tsunami Advisory Center Enhanced Products for the Pacific Tsunami Warning System. (English, draft December 2017)
- Tsunami Advisory Products for the South China Sea Regional Tsunami Warning and Mitigation System, Technical Document, October 2017
- Operational Users Guide for the Pacific Tsunami Warning and Mitigation System (PTWS), ([IOC/2011/TS/87rev](#)), rev August 2011 (English)

Resources on the development of tsunami Standard Operating Procedures, and the planning, conduct, and evaluation of exercises include the following:

- Plans and procedures for tsunami warning and emergency management. Paris, Intergovernmental Oceanographic Commission of UNESCO 2017. 72 pp. (IOC Manuals and Guides No. 76); English WC. ([IOC/2017/MG/76 REV](#))
- How to plan, conduct and evaluate UNESCO/IOC tsunami wave exercises, IOC Manuals and Guides No 58, 2013 (English, Spanish) ([IOC/2012/MG/58 REV](#))

All information related to Exercise Pacific Wave 2018 is available at the exercise website: <http://www.pacwave.info>

### 13. EXERCISE PRODUCTS

Countries may commence their PacWave18 exercise using the messages from the relevant Tsunami Service Provider (PTWC, NWPTAC and/or SCSTAC). All messages for each scenario are provided in the Master Schedule of Events List (MSEL, [Annex II](#)). Participating countries should select a relevant scenario and the most convenient date and time to conduct the Exercise within the 1 September–30 November 2018 time-period. For exercise purposes, the date noted in the MSEL is set to 5 November 2018.

Note that there will be **NO LIVE SCENARIO** dummy kick-off messages from the Tsunami Service Providers. Instead, there will be **ONE LIVE COMMUNICATION TEST** from the Tsunami Service Providers to Member States that will occur at 0000 UTC on 5 November 2018. Participating Member States should note the date, time, and method of receipt of the live communication test and report the finding in their Post-Exercise Evaluation Survey.

Participating Member States may amend the exercise messages to suit their own timetable. The earthquake origin default date and time of the messages can be adjusted to coincide with your selected Exercise local date and time. Each Member State 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. Subsequent message issuance date and times, and earthquake and tsunami arrival times should then also be adjusted accordingly.

All PTWC, NWPTAC, and SCSTAC products will be provided online at the PacWave18 website in advance to help countries plan and prepare. It is recommended to download from the PacWave18 website, the PTWC, NWPTAC, and SCSTAC products and messages for the appropriate scenario prior to the day of the exercise.

All documentation and correspondence relating to this exercise is to be clearly identified as **PacWave18** and **for exercise purposes only**.

#### 14. EXERCISE DELIVERY/FORMAT

All messages and message issue times for the different scenarios (**Annex I**) are listed in the Master Schedule of Events List (MSEL, **Annex II**).

Distribution of the series of Tsunami Service Provider products for each scenario within each country (available beforehand on the exercise website) is the responsibility of each country.

Each PacWave18 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.

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

#### 15. MASTER SCHEDULE OF EVENTS LIST (MSEL) – EXERCISE SCRIPT

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

The International Master Schedule of Events List (MSEL) giving the timeline for issuance of the Tsunami Service Provider products, and the product types are given in **Annex II**.

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

#### 16. POST-EXERCISE EVALUATION

All exercises should have a learning focus. Learning is maximised when there is a continuous process of review to draw out the lessons identified. Review is the process of evaluating and validating the exercise. The exercise should also test an agency's Standard Operating Procedures (SOPs).

A review should evaluate the effectiveness of arrangements in place and identify if there are any corrective actions and gaps to fill. The hot and cold debriefs are then used to complete the Exercise Pacific Wave 2018 post-exercise evaluation form.

**All participating countries are asked to provide feedback through the PacWave18 Evaluation Form (**Annex III**) by 21 December 2018.** It is requested that each country compile evaluations from its jurisdictions and/or agencies, and submit only **ONE (1) PacWave18 evaluation per country**. Forms should be submitted online by visiting [https://www.surveymonkey.com/s/pacwave18\\_eval](https://www.surveymonkey.com/s/pacwave18_eval). This feedback will greatly assist in the evaluation of Exercise Pacific Wave 2018 and the finalisation of the NWPTAC and SCSTAC Enhanced Products.

##### 16.1 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 organizational 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 PacWave18 is expected to conduct its own debriefs after the exercise. This may take the form of a hot debrief (or hotwash) on the day of the exercise, with each participating agency conducting its own cold (formal) debrief within the week(s) following the exercise.

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

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

A useful guide to debriefing is the one used by New Zealand Ministry of Civil Defence & Emergency Management (ISBN 0-478-25467-9). It can be found at:  
<https://www.civildefence.govt.nz/assets/Uploads/publications/is-06-05-organisational-debriefing.pdf>

## 16.2 EXERCISE VALIDATION

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

## 16.3 EVALUATION CRITERIA

There will be two types of evaluation criteria. The first type will be international criteria based on the overall exercise objectives ([Section 3](#)). The key PacWave18 objectives are provided in [Annex III](#). The second type will be criteria to be determined by each individual country to measure its own objectives.

In compiling the Exercise Pacific Wave 2018 Summary Report, the Exercise Task Team will require ONE (overall) evaluation form per participating country.

## 16.4 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.

## 16.5 EVALUATION TOOLS

The goal of exercise evaluation is to validate strengths and identify opportunities for improvement within the participating organizations. 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 organizations. At the international level, this would involve the ICG/PTWS as the Intergovernmental Coordinating Group supporting effective tsunami warning and decision making.

Evaluation of an exercise should focus on the adequacy of plans, policies, procedures, assessment capabilities, communication, resources and inter-agency/inter-jurisdictional relationships that support effective tsunami warning and decision-making at all levels of government. Participants that choose to include additional objectives, for example by exercising public warning and/or response plans, can expand the evaluation form accordingly. The evaluation of such additional objectives will be for the use of the particular participating agency only, and is not required for the PTWS Exercise Pacific Wave 2018 Summary Report.

The evaluation tool aims to inform and facilitate individual participant country evaluations as well as the Exercise Pacific Wave 2018 Summary Report.

All participating countries are asked to complete the official PacWave18 Exercise Evaluation Form (**Annex III**) by **21 December 2018**. Forms should be submitted online by visiting [https://www.surveymonkey.com/s/pacwave18\\_eval](https://www.surveymonkey.com/s/pacwave18_eval).

## 16.6 EXERCISE PACIFIC WAVE 2018 SUMMARY REPORT

The Exercise Task Team will compile the Exercise Pacific Wave 2018 Summary Report based on the official Exercise Evaluation Forms received. The report will include the following:

- Exercise description
- Post-Exercise Evaluation Summary and Findings
- Identification of Best Practices or Strengths
- Identification of Areas for Improvement
- Recommendations on Plans of Action for Improvement

## 17. OBSERVERS

Exercise Pacific Wave 2018 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 to observe the exercise is the responsibility of each participating country.

## 18. REAL EVENTS DURING EXERCISE PLAY

In the case of a real event occurring during the exercise, PTWC, JMA/NWPTAC and SCSTAC 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 Statement will not disrupt the exercise.

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

## 19. 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.

## **20. MEDIA ARRANGEMENTS**

The UNESCO Division of Public Information / Sector for External Relations and Public Information will issue an international Media Advisory one week before the development of the Exercise Pacific Wave 2018 providing details of the exercise. ICG/PTWS Member States should consider issuing at least one press release 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.

**Annex IV** 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 PacWave18 website (<http://www.pacwave.info>).

ANNEX I  
**SCENARIOS**

EARTHQUAKE LOCATION	PAST EVENT	ORIGIN TIME (UTC)	LATITUDE (POSITIVE= NORTH)	LONGITUDE (POSITIVE = EAST)	DEPTH (KM)	MAGNITUDE
Tonga Trench (Samoa Islands Region) 29 September 2009	*	1748:10	-15.489	-172.095	18	8.1
Peru-Chile Trench (Near Coast of Central Chile) 27 February 2010	*	0634:11	-36.122	-72.898	23	8.8
Japan Trench (Near Coast of Honshu, Japan) 11 March 2011	*	0546:24	38.297	142.373	29	9.1
South Solomon Trench, (Santa Cruz Islands, Solomon Islands) 6 February 2013	*	0112:25	-10.799	165.114	24	8.0
South Solomon Trench (Santa Cruz Islands, Solomon Islands)		0112:25	-10.799	165.114	24	9.0
Manila Trench		0100:00	14.4	119.5	30	8.8
Tonga Trench		0200:00	-20.0	-173.4	20	9.0

Table 1. Scenarios

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\*Actual historical event

ANNEX II

INTERNATIONAL MASTER SCHEDULE OF EVENTS LIST

Scenario	2009 Tonga Trench (M 8.1)		2010 Peru Chile (M 8.8)		2011 Japan Trench (M 9.1)				2013 South Solomon Trench (M 8.0) and (M 9.0) <i>Note: -/TS indicates M9.0 only products</i>				Manila Trench (M 8.8)						Tonga Trench (M 9.0)	
Centre	PTWC		PTWC		PTWC		NWPT AC		PTWC		NWPTAC		PTWC		NWPT AC		SCSTA C		PTWC	
Date & Time (UTC)	#	TY P	#	TY P	#	TY P	#	TY P	#	TYP 8.0/9. 0	#	TYP	#	TY P	#	TY P	#	TY P	#	TY P
05 Nov 0000																				
0010																				
0100													Quake							
0107													01	TI						
0110																01	T F R			
0112													Quake							
0118									01	TI/TI										
0120															01	T I				
0125											01	TI/TI								
0135													02	T F R			02	T F H		
0142									02	TFR/T FR										
0150															02	T F R				
0200									03	TS/TF P			03	T F P			03	T S	Quake	
0202											02	TFR/T FR								
0206																			01	TI
0230													04	T F H					02	T F R
0300									04	TS/TS	03	TS/TS	05	T S	03	T S	04	T S	03	T F P
0400									05	TS/TS	04	TS/TS	06	T S			05	T S	04	T S
0500									06	TS/TS			07	T S	04	T S	06	T S	05	T S
0546					Quake															
0552					01	TI														
0600									07	TS/TS	05	TS/TS	08	T S	05	T S	07	T S	06	T S
0601							01	TI												
0616					02	T F R														
0630					03	T F P														
0634			Quake																	
0636							02	T F R												
0640			01	TI																
0700			02	T F R	04	T S	03	T S	08	TS/TS	06	TS/TS	09	T S					07	T S
0730			03	T F P																
0800			04	TS	05	T S	04	T S	09	TS/TS			10	T S	06	T S	08	T S	08	T S
0900			05	TS	06	T S			10	TS/TS	07	-/TS	11	T S	07	T S			09	T S

Scenario	2009 Tonga Trench (M 8.1)		2010 Peru Chile (M 8.8)		2011 Japan Trench (M 9.1)				2013 South Solomon Trench (M 8.0) and (M 9.0) <i>Note: -/TS indicates M9.0 only products</i>				Manila Trench (M 8.8)						Tonga Trench (M 9.0)	
Centre	PTWC		PTWC		PTWC		NWPT AC		PTWC		NWPTAC		PTWC		NWPT AC		SCSTAC		PTWC	
1000			06	TS	07	TS	05	TS	11	TL/TS			12	TS			09	TS	10	TS
1100			07	TS	08	TS	06	TS	12	-/TS			13	TS	08	TS			11	TS
1200			08	TS	09	TS			13	-/TS	08	-/TS	14	TS	09	TS	10	TS	12	TS
1300			09	TS	10	TS	07	TS	14	-/TS			15	TS					13	TS
1400			10	TS	11	TS	08	TS	15	-/TS			16	TS	10	TS	11	TS	14	TS
1500			11	TS	12	TS			16	-/TS	09	-/TS	17	TS	11	TS			15	TS
1600			12	TS	13	TS	09	TS	17	-/TS			18	TS			12	TS	16	TS
1700			13	TS	14	TS	10	TS	18	-/TS			19	TL	12	TS	13	TL	17	TS
1748	Quake																			
1752	01	TI																		
1800			14	TS	15	TS			19	-/TS	10	-/TS							18	TS
1815	02	TFR																		
1840	03	TFP																		
1900	04	TS	15	TS	16	TS			20	-/TL									19	TL
2000	05	TS	16	TS	17	TS														
2100	06	TS	17	TS	18	TS	11	TS												
2200	07	TS	18	TS	19	TS	12	TS												
2300	08	TS	19	TS	20	TS														
6 Nov 0000	09	TS	20	TS	21	TS														
0100	10	TS	21	TS	22	TS														
0200	11	TS	22	TS	23	TS														
0300	12	TS	23	TS	24	TS														
0400	13	TS	24	TS	25	TS														
0500	14	TS	25	TS	26	TL														
0600	15	TL	26	TL																

Table 2. International Master Schedule of Events List

Message Types:

- TI = PTWC/NWPTAC Initial Text Message
- TFR = PTWC/NWPTAC/SCSTAC text Message with a Forecast for the Region near the Earthquake
- TFP = PTWC Products with a Pacific-wide Forecast
- TFH = PTWC Products with a Forecast for Shallow Marginal Seas (High-Resolution Forecast Model Run)
- TS = PTWC/NWPTAC/SCSTAC Text Message with Tsunami Observations
- TL = PTWC/SCSTAC Last Message for this Event

Note 1) A live communication test from the Tsunami Service Providers to Member States will be conducted at 0000 UTC on 5 November 2018.

Note 2) Participating countries may shift the schedule to adapt it to their own timetable.

### ANNEX III

#### POST-EXERCISE EVALUATION

Exercise evaluation forms are to be completed by each participating agency and forwarded to the country Exercise Pacific Wave 2018 National Contact, or the country Tsunami National Contact (TNC). **The PacWave18 National Contact will compile the country Evaluation Form and complete and submit this online no later than 21 December 2018.**

Note: **Only ONE (1) on-line evaluation form is to be completed per country.** The PacWave18 National Contact, TNC, or Tsunami Warning Focal Point (TWFP) should compile sub-jurisdiction evaluations into one country evaluation to submit.

The PacWave18 Evaluation Form can be found at:

[https://www.surveymonkey.com/s/pacwave18\\_eval](https://www.surveymonkey.com/s/pacwave18_eval)

Alternatively, the country evaluation forms can be submitted by email to the Exercise Pacific Wave 2018 Task Team Chairs:

- Laura Kong (email: [laura.kong@noaa.gov](mailto:laura.kong@noaa.gov), or
- Jo Guard (email: [jo.guard@dpmc.govt.nz](mailto:jo.guard@dpmc.govt.nz))

EXERCISE PACIFIC WAVE 2018 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 <b>end</b> of each section. However, do NOT change the reference numbers to the questions.
2	Each participating Agency/Country	Print this form and mark your evaluation answers on it.
3	Each participating Agency/Country	<ul style="list-style-type: none"> <li>Answer each statement with either Y (Yes), N (No).</li> <li>Comments should be used to explain/expand upon your Yes or No answer</li> <li>Write your comments on the page following the evaluation questions. Note the question number in the left column and write your comments alongside.</li> </ul>
4	Each participating Agency/Country	Send completed agency evaluation form to country PacWave18 National Contact so he/she can compile to complete Country PacWave18 Evaluation Form (this URL).
5	PacWave18 National Contact	<p>PacWave18 National Contact should complete and submit the PacWave18 Evaluation Form by <b>21 December 2018</b>. (<a href="https://www.surveymonkey.com/s/pacwave18_eval">https://www.surveymonkey.com/s/pacwave18_eval</a>). If there are problems or questions, please contact the PacWave18 Task Team co-Chairs:</p> <p>Laura Kong, <a href="mailto:laura.kong@noaa.gov">laura.kong@noaa.gov</a>; or</p> <p>Jo Guard, <a href="mailto:jo.guard@dpmc.govt.nz">jo.guard@dpmc.govt.nz</a></p>

Exercise Pacific Wave 2018 Evaluation Form			
Contact Details			
Agency:		Country:	
Contact Name:		Contact Position:	
Contact Phone:		Contact Mobile:	
Contact E-Mail:			

Country Exercise Scenario	
Scenario Used:	Tick Scenario used during PacWave18: <input type="radio"/> 2009 Tonga Trench (M 8.1)

Country Exercise Scenario	
	<input type="radio"/> 2010 Peru-Chile Trench (M 8.8) <input type="radio"/> 2011 Japan Trench (M 9.1) <input type="radio"/> 2013 South Solomon Trench (M 8.0) <input type="radio"/> Manila Trench (M 8.8) <input type="radio"/> South Solomon Trench (M 9.0) <input type="radio"/> Tonga Trench (M 9.0)

Country Exercise Scenario	
<b>Reason Scenario Chosen:</b>	<b>Tick the primary reason:</b> <input type="radio"/> Exercise Local Tsunami – rapid response <input type="radio"/> Exercise Distant Tsunami – long response <input type="radio"/> Exercise Destructive Tsunami <input type="radio"/> Exercise Non-Destructive Tsunami <input type="radio"/> Exercise Real Event <input type="radio"/> Other (please specify)
<b>OBJECTIVE 1</b> <i>Test communications from the PTWC, NWPTAC, and/or SCSTAC Tsunami Service Providers to Member States/Countries.</i>	

		Yes	No	Comment	Not applicable
<b>Ref No</b>	<b>Evaluation Statements/Questions</b>				
1.1	Did your country Tsunami Warning Focal Point receive the PTWS, NWPTAC, and/or SCSTAC information/threat message?	Y	N	C	NA
1.2	If yes, please state which Tsunami Service Provider you received the information/threat message from: <ul style="list-style-type: none"> <li>PTWC</li> <li>NWPTAC</li> <li>SCSTAC</li> </ul>	Y	N	C	NA
1.3	If you received an information/threat message, when did you receive the message(s)? <ul style="list-style-type: none"> <li>PTWC</li> </ul>	Please state the time in UTC:			



		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements/Questions				
	<ul style="list-style-type: none"> <li>NWPTAC</li> <li>SCSTAC</li> </ul>				
1.4	How did you receive the message(s)? <ul style="list-style-type: none"> <li>GTS</li> <li>AFTN</li> <li>EMWIN</li> <li>Fax</li> <li>Email</li> <li>CISN (Real-Time Earthquake Display)</li> <li>Other (Please specify):</li> </ul>	Please tick methods			

Ref No	Objective 1 Comments <i>(Insert extra rows as required)</i>

## OBJECTIVE 2

To test ***national*** communication and cooperation, and readiness within the country.

### → Objective 2a

To test ***national*** communication and cooperation within the country

		Yes	No	Comment	Not applicable				
Ref No	Evaluation Statements/Questions								
2.1	<p>The warning was disseminated to:</p> <ul style="list-style-type: none"> <li>• Emergency services</li> <li>• Other national government agencies</li> <li>• Science agencies/universities involved in assessment</li> <li>• Local government: provincial/regional level</li> <li>• Local government: city/district level.</li> <li>• Public</li> </ul> <p>Please list number of destinations in Comments</p>		Y		N		C		NA
2.2	<p>What time was warning sent to the agency or agencies or Public listed in Q2.1? Please note the date and time using 24-hour clock and UTC, e.g., 5 Nov, 14:35 UTC.</p>	Insert time in UTC							
2.3	<p>How did you send the warning to emergency, national, science, and local government agencies in Q2.1? Tick all that apply.</p> <ul style="list-style-type: none"> <li>• Landline Telephone</li> <li>• Satellite Telephone</li> <li>• Cell or Mobile Phone</li> <li>• Fax</li> <li>• Email</li> <li>• SMS</li> <li>• Radio (UHF, VHF, Amateur)</li> <li>• Chatty Beetle</li> <li>• TV</li> <li>• Website</li> <li>• Twitter</li> </ul>		Y		N		C		NA

## OBJECTIVE 2

To test ***national*** communication and cooperation, and readiness within the country.

### → Objective 2a

To test ***national*** communication and cooperation within the country

		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements/Questions				
	<ul style="list-style-type: none"><li>Facebook</li><li>RSS</li><li>Other (Please specify)</li></ul>				
2.4	<p>How did you send the warning to the Public? Tick all that apply.</p> <ul style="list-style-type: none"><li>Landline Telephone</li><li>Satellite Telephone</li><li>Cell or Mobile Phone</li><li>Fax</li><li>Email</li><li>SMS</li><li>Radio (UHF, VHF, Amateur)</li><li>Chatty Beetle</li><li>TV</li><li>Website</li><li>Twitter</li><li>Facebook</li><li>RSS</li><li>Sirens</li><li>Public Announcement Systems (voice speakers)</li><li>Emergency cell / mobile phone broadcast</li><li>Police</li><li>Door-to-door announcements</li><li>Electronic billboards</li><li>Other (Please specify)</li></ul>	Y	N	C	NA

## OBJECTIVE 2

To test **national** communication and cooperation, and readiness within the country.

### → Objective 2a

To test **national** communication and cooperation within the country

		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements/Questions				
2.5	Based on feedback from agencies, were the communication methods timely and appropriate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	NA
2.6	Based on feedback from agencies, were the message(s) disseminated from the NTWC/NDMO accurate and clear?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	NA
2.7	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"/>	NA
2.8	If you answered yes to Q2.7, what was the nature of the communication <b>between the national disaster management organisation</b> (or equivalent) with the <b>national tsunami warning centre</b> throughout the event?	Note answer in the comment box			

Ref No	Objective 2a Comments (insert extra rows as required)

### → Objective 2b

To test **national** readiness within the country.

		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements/Questions				
2.9	The NTWC/NDMO has an activation and response process (standard operating procedures) in place for the receipt of tsunami warnings.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	NA
2.10	The NTWC/NDMO knows its specific response role in the event of a tsunami.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	NA

➔ **Objective 2b**

To test ***national readiness*** within the country.

		Yes	No	Comment	Not applicable				
Ref No	Evaluation Statements/Questions								
2.11	The NTWC/NDMO has, prior to the exercise, engaged in tsunami response planning.		Y		N		C		NA
2.12	The NTWC/NDMO has undertaken activities to increase its capacity and capability to support a national tsunami response (for example, training, exercise, etc.) – List activities in Comments.		Y		N		C		NA
2.13	The NTWC/NDMO has an appropriate management structure identified and documented to support tsunami response.		Y		N		C		NA
2.14	The NTWC/NDMO has a national tsunami mass coastal evacuation plan.		Y		N		C		NA
2.15	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
2.16	A country tsunami emergency response plan (standard operating procedures) for tsunamis exists. Tick all that apply <ul style="list-style-type: none"><li>Local (less than 1 hour arrival time)</li><li>Regional (1-3 hours arrival time)</li><li>Distant (greater than 3 hours)</li></ul>		Y		N		C		NA
2.17	The response plan includes processes to issue Safe-to-Return (All-Clear) notices		Y		N		C		NA
2.18	Tsunami exercises are routinely conducted in-country. Please list last exercise, and type of exercise scenario (local, regional, distant) in Comments.		Y		N		C		NA
2.19	Tsunami-related public education and awareness materials have been developed and disseminated		Y		N		C		NA
2.20	Tsunami-related curriculum programmes are in place for all levels (pre, primary, secondary, post-secondary) of education. If No, please list which levels have programmes in Comments.		Y		N		C		NA
2.21	All tsunami-vulnerable communities have tsunami evacuation maps, signage, and		Y		N		C		NA

➔ **Objective 2b**

To test ***national readiness*** within the country.

Ref No	Evaluation Statements/Questions	Yes	No	Comment	Not applicable	
	assembly points for evacuation? If No, please list number of communities with maps and signage, gaps, and future plans to fill gaps in Comments.					
2.22	What type of exercise did you conduct? <ul style="list-style-type: none"> <li>• Orientation</li> <li>• Drill</li> <li>• Tabletop</li> <li>• Functional</li> <li>• Full Scale</li> <li>• Other (Please specify)</li> </ul>		Y	N	C	NA
2.23	Did you conduct community evacuation? If Yes, what type? <ul style="list-style-type: none"> <li>• Schools</li> <li>• Businesses</li> <li>• Community</li> <li>• Other (Please specify)</li> </ul>		Y	N	C	NA
2.24	If you answered yes to Q2.23, approximately how many people were evacuated in total?	Insert total				

Ref No	Objective 2b Comments <i>(insert extra rows as required)</i>

### OBJECTIVE 3

To test **regional** communication and cooperation.

		Yes	No	Comment	Not applicable				
Ref No	Evaluation Statements/Questions								
3.1	Did your country engage in communication and cooperation with other countries in the region for PacWave18? If yes, please list countries in Comments		Y		N		C		NA
3.2	What types of cooperation were conducted? <ul style="list-style-type: none"><li>• Data sharing (seismic, sea level, etc.)</li><li>• Event information sharing</li><li>• Alert coordination (levels, dissemination)</li><li>• Joint PacWave18 exercise</li><li>• Other (Please specify)</li></ul>		Y		N		C		NA
3.3	Did the National Tsunami Warning Center communicate with other countries during the event? If Yes, please list countries		Y		N		C		NA
3.4	Did the National Disaster Management Agency communicate with other countries during the event? If Yes, please list countries		Y		N		C		NA
3.5	Was national information shared with other countries during the event? If Yes, please list		Y		N		C		NA
3.6	What type of national information did you share? Tick all that apply. <ul style="list-style-type: none"><li>• Seismic phase arrival times</li><li>• Earthquake hypocentre and/or magnitude</li><li>• Tsunami Alert Level (such as Warning, Cancellation, etc.)</li><li>• Tsunami Forecast</li><li>• Tsunami Observations</li><li>• Tsunami Evacuation</li></ul>								

### OBJECTIVE 3

To test **regional** communication and cooperation.

		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements/Questions				
	<ul style="list-style-type: none"> <li>Tsunami Impact</li> <li>Other (Please specify)</li> </ul>				
3.7	How did you communicate the information? <ul style="list-style-type: none"> <li>Radio (UHF, VHF, Amateur)</li> <li>Landline Telephone</li> <li>Satellite Telephone</li> <li>Cell or Mobile Phone</li> <li>Fax</li> <li>Email</li> <li>SMS</li> <li>Chatty Beetle</li> <li>Other (Please specify)</li> </ul>				
Ref No	Objective 3 Comments (insert extra rows as required)				

### OBJECTIVE 4

Test whether the PTWS PTWC/NWPTAC/SCSTAC Tsunami Service Provider (TSP) products are interpreted by Member States accurately and in a timely manner.

		Yes	No	Comment	Not applicable	
Ref No	Evaluation Statements/Questions					
4.1	Information provided by the relevant Tsunami Service Provider (TSP) products was understood by the National Tsunami Warning Centre (NTWC)/National Disaster Management Office (NDMO).		Y	N	C	NA



#### OBJECTIVE 4

*Test whether the PTWS PTWC/NWPTAC/SCSTAC Tsunami Service Provider (TSP) products are interpreted by Member States accurately and in a timely manner.*

		Yes	No	Comment	Not applicable				
Ref No	Evaluation Statements/Questions								
4.2	How did your country assess the tsunami threat during the exercise?  Please tick as many as apply: <ul style="list-style-type: none"><li>National tsunami experts</li><li>National tsunami coordination committee</li><li>National tsunami historical database</li><li>NCEI/WDS tsunami historical database (web)</li><li>TsuDig historical database GIS tool (NCEI/ITIC offline)</li><li>TsuCAT Tsunami Coastal Assessment Tool – pre-computed tsunami scenarios from NOAA Propagation Database (PMEL/ITIC offline)</li><li>National pre-computed tsunami scenarios</li><li>National tsunami forecasts</li><li>Tsunami Service Provider forecasts. List source of forecasts (PTWC, NWPTAC, SCSTAC, US NTWC) in Comments.</li><li>Communication with outside sources (such as ITIC, media, other) (Please specify)</li></ul>		Y		N		C		NA
4.3	The information provided assisted with decision making, e.g., warning levels, earthquake parameters, estimated arrival times, forecast wave heights, etc.		Y		N		C		NA
4.4	The information issued by our country national Tsunami Warning Focal Point was according to standard operating procedures.		Y		N		C		NA
4.5	Do you require additional training on the use of the TSP products for national threat level decision-making. Tick TSP training requested <ul style="list-style-type: none"><li>PTWC products</li><li>NWPTAC products</li></ul>		Y		N		C		NA

#### OBJECTIVE 4

*Test whether the PTWS PTWC/NWPTAC/SCSTAC Tsunami Service Provider (TSP) products are interpreted by Member States accurately and in a timely manner.*

		Yes	No	Comment	Not applicable
Ref No	Evaluation Statements/Questions				
	<ul style="list-style-type: none"> <li>SCSTAC products</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Ref No	Objective 4 Comments <i>(insert extra rows as required)</i>

#### OBJECTIVE 5

*Validate the format and content of the Northwest Pacific Tsunami Advisory Center (NWPTAC) Enhanced Products (if applicable for your country).*

		Yes	No	Comment	Not applicable				
Ref No	Evaluation Statements/Questions								
5.1	Information provided in the Northwest Pacific Tsunami Advisory Center (NWPTAC) messages was understood by and useful to the National Tsunami Warning Centre (NTWC)/National Disaster Management Office (NDMO)		Y		N		C		NA
5.2	Threat information in NWPTAC products was understood and useful. Please comment as necessary. <ul style="list-style-type: none"><li>Text products</li><li>Graphical products</li></ul>		Y		N		C		NA
5.3	Components of the NWPTAC product suite were understood and useful. Please comment as necessary on product clarity or confusion.		Y		N		C		NA
5.4	The information provided assisted with decision making, e.g. warning levels, earthquake parameters, estimated arrival times, forecast wave heights, etc.		Y		N		C		NA

Ref No	Objective 5 Comments <i>(insert extra rows as required)</i>

## OBJECTIVE 6

*Evaluate the format and content of the South China Sea Tsunami Advisory Centre (SCSTAC) Enhanced Products (if applicable for your country).*

		Yes	No	Comment	Not applicable	
Ref No	Evaluation Statements/Questions					
6.1	Information provided in the South China Sea Tsunami Advisory Centre (SCSTAC) messages was understood by and useful to the National Tsunami Warning Centre (NTWC)/National Disaster Management Office (NDMO)		Y	N	C	NA
6.2	Threat information in SCSTAC products was understood and useful. Please comment as necessary. <ul style="list-style-type: none"><li>Text products</li><li>Graphical products</li></ul>		Y	N	C	NA
6.3	Components of the SCSTAC product suite were understood and useful. Please comment as necessary on product clarity or confusion.		Y	N	C	NA
6.4	The information provided assisted with decision making, e.g. warning levels, earthquake parameters, estimated arrival times, forecast wave heights, etc.		Y	N	C	NA

Ref No	Objective 6 Comments <i>(insert extra rows as required)</i>

## GENERAL EXERCISE OBSERVATIONS

Provide feedback on the planning and conduct of PacWave18

Please also provide information on your country's exercise.

- Include electronic links to Media Coverage in Comments section.
- Send summaries, photos and videos directly to the PTWS Technical Secretary (Bernardo Aliaga, [b.aliaga@unesco.org](mailto:b.aliaga@unesco.org)) and PacWave18 Chairs (Laura Kong, [laura.kong@noaa.gov](mailto:laura.kong@noaa.gov), Jo Guard, [jo.guard@dpmc.govt.nz](mailto:jo.guard@dpmc.govt.nz))

Evaluation Statements / Questions. Indicate Yes or No	Yes	No
<b>Overall assessment</b>		
Country stakeholder agencies have a better understanding of the goals, responsibilities and roles in tsunami emergencies.		
Gaps in capability and capacity have been identified.		
Community have a better understanding of their tsunami risk and are better prepared for tsunami events.		
News media participated and covered the exercise (Please provide electronic links if applicable in Comments).		
How many people do you estimate participated in the exercise within your country/territory? Include both government and non-government agencies and public, if applicable	Estimated number	
<b>Exercise planning (please make comments on the following page to all of the statements below)</b>		
Overall, the exercise planning, conduct, format and style were satisfactory.		
Exercise planning at the international level went well.		
Exercise planning at the national level went well.		
Exercise planning at the provincial/local level went well.		
The PacWave18 exercise website pages were useful.		
This evaluation form was easy to use.		
PacWave18 Exercise Manual provided an appropriate level of detail.		
IOC Manual & Guides 76: Plans and Procedures for Tsunami Warning and Emergency Management was useful.		
IOC Manual & Guides 58: How to Plan, Conduct, and Evaluate IOC Tsunami Wave Exercises was useful.		

**Please provide a general statement on your Exercise Pacific Wave 2018 experience.**

**Exercise Planning**

Please provide a general statement about <b>what went well</b> .
<i>Insert comments</i>

Please provide a general statement about <b>what did not go well</b> .
<i>Insert comments</i>

Please provide a general statement about <b>what could be improved</b> .
<i>Insert comments</i>

**Exercise Conduct**

Please provide a general statement about <b>what went well</b> .
<i>Insert comments</i>

Please provide a general statement about <b>what did not go well</b> .
<i>Insert comments</i>

Please provide a general statement about <b>what could be improved</b> .
<i>Insert comments</i>

**Exercise Debrief or Evaluation**

Please provide a general statement about <b>what went well</b> .
<i>Insert comments</i>

Please provide a general statement about <b>what did not go well</b> .
<i>Insert comments</i>

Please provide a general statement about <b>what could be improved</b> .
<i>Insert comments</i>

## ANNEX IV

### SAMPLE PRESS RELEASE

#### TEMPLATE FOR NEWS RELEASE

#### USE AGENCY MASTHEAD

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

**FOR IMMEDIATE RELEASE**  
(insert date)

#### **EIGHTH PACIFIC TSUNAMI DRILL SET FOR SEPTEMBER TO NOVEMBER 2018**

(Insert country name) will join over [insert number] countries around the Pacific Rim as a participant in a mock tsunami scenario during September to November 2018. The purpose of this Pacific-wide exercise is to exercise country tsunami decision-making procedures and communication systems and processes. It will also provide an opportunity for those countries that receive products from the Northwest Pacific Tsunami Advisory Center (NWPTAC) in Japan and the South China Sea Tsunami Advisory Center (SCSTAC) in China to assess new experimental enhanced forecast products, including tsunami wave forecasts that enable each country to better assess its own tsunami threat. Additionally, the Pacific will conduct a live communication test from its Tsunami Service Providers (PTWC, NWPTAC, SCSTAC) to countries on 5 November 2018, World Tsunami Awareness Day.

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

The exercise, titled Exercise Pacific Wave 2018 (PacWave18), will simulate Pacific countries being put into a Tsunami Warning situation requiring government decision-making (and community action [insert what is to be done in your country]). It is the eighth such exercise with the first having been carried out in May 2006, and subsequent exercises held in October 2008, November 2011, May 2013, February 2015, February 2016 and February 2017.

Participating countries will select from seven different Pacific scenarios based on real events and conduct at least a Tabletop Exercise within the period of September to November. Destructive Pacific-wide tsunamis will be simulated through tsunami information messages from the Pacific Tsunami Warning Center in Hawaii, NWPTAC in Japan, and the SCSTAC in China, and then reviewed by focal points designated by each country that are responsible for their country’s tsunami response.

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

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

On the Web:

Exercise Pacific Wave 2018 information site: <http://www.pacwave.info>

Media Resources:

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

Pacific Tsunami Warning and Mitigation System:

[http://www.ioc-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://www.tsunami.gov>

Northwest Pacific Tsunami Advisory Center:

<http://www.data.jma.go.jp/svd/eqev/data/nwptac/index.html>

US National Tsunami Warning Center: <http://www.tsunami.gov>

South China Sea Tsunami Advisory Center: <http://www.scstac.org>

[Insert country URLs]



## ANNEX V

### LIST OF ACRONYMS

<b>CL</b>	Circular letter
<b>DISCEX</b>	Discussion Exercise' or Tabletop Exercise
<b>ICG</b>	Intergovernmental Coordination Groups
<b>ICG/IOTWMS</b>	Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System
<b>ICG/ITSU</b>	International Coordination Group for the Tsunami Warning System in the Pacific
<b>ICG/PTWS</b>	Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (formerly ITSU)
<b>IOC</b>	Intergovernmental Oceanographic Commission (of UNESCO)
<b>ITIC</b>	International Tsunami Information Center (UNESCO/IOC–NOAA)
<b>JMA</b>	Japan Meteorological Agency
<b>MSEL</b>	Master Schedule of Events List
<b>MTS</b>	Medium-term strategy:
<b>NDMO</b>	National Disaster Management Office
<b>NOAA</b>	National Oceanic & Atmospheric Administration (USA)
<b>NTWC</b>	National Tsunami Warning Centre
<b>NWPTA</b>	Northwest Pacific Tsunami Advisory
<b>NWPTAC</b>	Northwest Pacific Tsunami Advisory Center (Japan)
<b>PTWC</b>	Pacific Tsunami Warning Center (USA)
<b>SCSTAC</b>	South China Sea Tsunami Advisory Center (China)
<b>SOA</b>	China State Oceanic Administration
<b>SOP</b>	Standard Operating Procedures
<b>TOWS-WG</b>	Working Group on Tsunamis and Other Hazards related to Sea-Level Warning and Mitigation Systems
<b>TT</b>	Task Team
<b>TNC</b>	Tsunami National Contact
<b>TWFP</b>	Tsunami Warning Focal Point
<b>UNESCO</b>	United Nations Educational, Scientific & Cultural Organization
<b>US NTWC</b>	US National Tsunami Warning Center (USA)
<b>WG</b>	Working Group

# IOC Technical Series

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

(continued)

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 Bathymographs Using a Temperature-Error-Free Method (Application to Sippican/TSK T-7, T-6 and T-4 XBTS. 1994	E only
43	IGOSS Plan and Implementation Programme 1996-2003. 1996	E, F, S, R
44	Design and Implementation of some Harmful Algal Monitoring Systems. 1996	E only
45	Use of Standards and Reference Materials in the Measurement of Chlorinated Hydrocarbon Residues. 1996	E only
46	Equatorial Segment of the Mid-Atlantic Ridge. 1996	E only
47	Peace in the Oceans: Ocean Governance and the Agenda for Peace; the Proceedings of <i>Pacem in Maribus</i> XXIII, Costa Rica, 1995. 1997	E only
48	Neotectonics and fluid flow through seafloor sediments in the Eastern Mediterranean and Black Seas - Parts I and II. 1997	E only
49	Global Temperature Salinity Profile Programme: Overview and Future. 1998	E only
50	Global Sea-Level Observing System (GLOSS) Implementation Plan-1997. 1997	E only
51	L'état actuel de l'exploitation des pêcheries maritimes au Cameroun et leur gestion intégrée dans la sous-région du Golfe de Guinée ( <i>cancelled</i> )	F only
52	Cold water carbonate mounds and sediment transport on the Northeast Atlantic Margin. 1998	E only
53	The Baltic Floating University: Training Through Research in the Baltic, Barents and White Seas - 1997. 1998	E only
54	Geological Processes on the Northeast Atlantic Margin (8 <sup>th</sup> 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 <sup>th</sup> 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 <sup>th</sup> training-through-research cruise, July-August 2000). 2001	E only
61	Forecasting Ocean Science? Pros and Cons, Potsdam Lecture, 1999. 2002	E only
62	Geological Processes in the Mediterranean and Black Seas and North East Atlantic (11 <sup>th</sup> 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 <sup>th</sup> 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 <sup>th</sup> 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 <sup>th</sup> 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 <sup>nd</sup> 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 <sup>th</sup> 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 <sup>th</sup> training-through-research cruise, May–July 2006). 2008	E only
77	Indian Ocean Tsunami Warning and Mitigation System (IOTWS) – 12 September 2007 Indian Ocean Tsunami Event. Post-Event Assessment of IOTWS Performance. 2008	E only
78	Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (CARIBE EWS) – Implementation Plan 2013–2017 (Version 2.0). 2013	E only
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>Electronic publication</i>

(continued)

87.	Operational Users Guide for the Pacific Tsunami Warning and Mitigation System (PTWS) – Second Edition. 2011	E only
88.	Exercise Indian Ocean Wave 2009 (IOWave09) – An Indian Ocean-wide Tsunami Warning and Communication Exercise – 14 October 2009. 2009	E only
89.	Ship-based Repeat Hydrography: A Strategy for a Sustained Global Programme. 2009	E only
90.	12 January 2010 Haiti Earthquake and Tsunami Event Post-Event Assessment of CARIBE EWS Performance. 2010	E only
91.	Compendium of Definitions and Terminology on Hazards, Disasters, Vulnerability and Risks in a coastal context	<i>Under preparation</i>
92.	27 February 2010 Chile Earthquake and Tsunami Event – Post-Event Assessment of PTWS Performance (Pacific Tsunami Warning System). 2010	E only
93.	Exercise CARIBE WAVE 11 / LANTEX 11—A Caribbean Tsunami Warning Exercise, 23 March 2011	
	Vol. 1 Participant Handbook / Exercice CARIBE WAVE 11 —Exercice d'alerte au tsunami dans les Caraïbes, 23 mars 2011. Manuel du participant / Ejercicio Caribe Wave 11. Un ejercicio de alerta de tsunami en el Caribe, 23 de marzo de 2011. Manual del participante. 2010	E/F/S
	Vol. 2 Report. 2011	E only
	Vol. 3 Supplement: Media Reports. 2011	E/F/S
94.	Cold seeps, coral mounds and deep-water depositional systems of the Alboran Sea, Gulf of Cadiz and Norwegian continental margin (17th training-through-research cruise, June–July 2008)	E only
95.	International Post-Tsunami Survey for the 25 October 2010 Mentawai, Indonesia Tsunami	E only
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	E only
97.	Exercise PACIFIC WAVE 11: A Pacific-wide Tsunami Warning and Communication Exercise, 9–10 November 2011	
	Vol. 1 Exercise Manual. 2011	E only
	Vol. 2 Report. 2013	E only
98.	Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and connected seas. First Enlarged Communication Test Exercise (ECTE1). Exercise Manual and Evaluation Report. 2011	E only
99.	Exercise INDIAN OCEAN WAVE 2011 – An Indian Ocean-wide Tsunami Warning and Communication Exercise, 12 October 2011	E only
	Vol. 1 Exercise Manual. 2011	
	Supplement: Bulletins from the Regional Tsunami Service Providers	
	Vol. 2 Exercise Report. 2013	
100.	Global Sea Level Observing System (GLOSS) Implementation Plan – 2012. 2012	E only
101.	Exercise Caribe Wave/Lantex 13. A Caribbean Tsunami Warning Exercise, 20 March 2013. Volume 1: Participant Handbook. 2012	E only
102.	Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas — Second Enlarged Communication Test Exercise (CTE2), 22 May 2012.	E only
	Vol. 1 Exercise Manual. 2012	
	Vol. 2 Evaluation Report. 2014	
103.	Exercise NEAMWAVE 12. A Tsunami Warning and Communication Exercise for the North-eastern Atlantic, the Mediterranean, and Connected Seas Region, 27–28 November 2012.	E only
	Vol. 1: Exercise Manual. 2012	
	Vol. 2: Evaluation Report. 2013	
104.	Seísmo y tsunami del 27 de agosto de 2012 en la costa del Pacífico frente a El Salvador, y seísmo del 5 de septiembre de 2012 en la costa del Pacífico frente a Costa Rica. Evaluación subsiguiente sobre el funcionamiento del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico. 2012	Español solamente (resumen en inglés y francés)
105.	Users Guide for the Pacific Tsunami Warning Center Enhanced Products for the Pacific Tsunami Warning System, August 2014. Revised Edition. 2014	E, S

106.	Exercise Pacific Wave 13. A Pacific-wide Tsunami Warning and Enhanced Products Exercise, 1–14 May 2013. Vol. 1 Exercise Manual. 2013 Vol. 2 Summary Report. 2013	E only
107.	Tsunami Public Awareness and Education Strategy for the Caribbean and Adjacent Regions. 2013	E only
108.	Pacific Tsunami Warning and Mitigation System (PTWS) Medium-Term Strategy, 2014–2021. 2013	E only
109.	Exercise Caribe Wave/Lantex 14. A Caribbean and Northwestern Atlantic Tsunami Warning Exercise, 26 March 2014. Vol. 1 Participant Handbook. 2014	E/S
110.	Directory of atmospheric, hydrographic and biological datasets for the Canary Current Large Marine Ecosystem, 3 <sup>rd</sup> edition: revised and expanded. 2017	E only
111.	Integrated Regional Assessments in support of ICZM in the Mediterranean and Black Sea Basins. 2014	E only
112.	11 April 2012 West of North Sumatra Earthquake and Tsunami Event - Post-event Assessment of IOTWS Performance	E only
113.	Exercise Indian Ocean Wave 2014: An Indian Ocean-wide Tsunami Warning and Communication Exercise. Vol.1 Manual Vol. 2 Exercise Report. 2015	E only
114.	Exercise NEAMWAVE 14. A Tsunami Warning and Communication Exercise for the North-Eastern Atlantic, the Mediterranean, and Connected Seas Region, 28–30 October 2014 Vol. 1 Manual Vol. 2 Evaluation Report – Supplement: Evaluation by Message Providers and Civil Protection Authorities	E only
115.	Oceanographic and Biological Features in the Canary Current Large Marine Ecosystem. 2015 ( <i>revised in 2016</i> )	E only
116.	Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas. Third Enlarged Communication Test Exercise (CTE3), 1st October 2013. Vol. 1 Exercise Manual Vol. 2 Evaluation Report	E only
117.	Exercise Pacific Wave 15. A Pacific-wide Tsunami Warning and Enhanced Products Exercise, 2–6 February 2015 Vol. 1: Exercise Manual; Vol. 2: Summary Report	E only
118.	Exercise Caribe Wave/Lantex 15. A Caribbean and Northwestern Atlantic Tsunami Warning Exercise, 25 March 2015 (SW Caribbean Scenario) Vol. 1: Participant Handbook	E only
119.	Transboundary Waters Assessment Programme (TWAP) Assessment of Governance Arrangements for the Ocean Vol 1: Transboundary Large Marine Ecosystems; <u>Supplement</u> : Individual Governance Architecture Assessment for Fifty Transboundary Large Marine Ecosystems Vol 2: Areas Beyond National Jurisdiction	E only
120.	Transboundary Waters Assessment Programme (TWAP) – Status and Trends in Primary Productivity and Chlorophyll from 1996 to 2014 in Large Marine Ecosystems and the Western Pacific Warm Pool, Based on Data from Satellite Ocean Colour Sensors. 2017	E only
121.	Exercise Indian Ocean Wave 14, an Indian Ocean wide Tsunami Warning and Communications Exercise, 9–10 September 2014	<i>In preparation</i>
122.	Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas. Sixth Communication Test Exercise (CTE6), 29 July 2015. Vol. 1: Exercise Manual Vol. 2: Evaluation Report	E only
123	Preparing for the next tsunami in the North-Eastern Atlantic, the Mediterranean and Connected Seas – Ten years of the Tsunami Warning System (NEAMTWS). 2017 — <i>Cancelled</i> —	(IOC/INF-1340)

(continued)

124	Indicadores Marino Costeros del Pacífico Sudeste / Coastal and Marine Indicators of the Southeast Pacific (SPINCAM)	E/S
125	Exercise CARIBE WAVE 2016: A Caribbean and Adjacent Regions Tsunami Warning Exercise, 17 March 2016 (Venezuela and Northern Hispaniola Scenarios) Volume 1: Participant Handbook	E only
126	Exercise Pacific Wave 16. A Pacific-wide Tsunami Warning and Enhanced Products Exercise, 1-5 February 2016. Volume 1: Exercise Manual. Volume 2: Summary Report	E only
127	How to reduce coastal hazard risk in your community – A step by step approach	E only
128.	Exercise Indian Ocean Wave 2016: An Indian Ocean-wide Tsunami Warning and Communications Exercise, 7–8 September 2016 Vol 1: Participant Manual Vol. 2: Exercise Report	E only
129	What are Marine Ecological Time Series telling us about the Ocean – A status report	E only
130	Tsunami Watch Operations – Global Service Definition Document	E only
131	Exercise Pacific Wave 2017. A Pacific-wide Tsunami Warning and Enhanced Products Exercise, 15-17 February 2017. Volume 1: Exercise Manual Volume 2: Exercise Report	E only
132.	2nd March 2016 Southwest of Sumatra Earthquake and Tsunami Event Post-Event Assessment of the Performance of the Indian Ocean Tsunami Warning and Mitigation System; <u>Supplement</u> : Tsunami Service Provider Bulletins and Maps	E only
133.	Exercise CARIBE WAVE 17. A Caribbean and Adjacent Regions Tsunami Warning Exercise, 21 March 2017 (Costa Rica, Cuba and Northeastern Antilles Scenarios). Volume 1: Participant Handbook Volume 2: Final Report	E only
134.	Tsunami Exercise NEAMWave17 – A Tsunami Warning and Communication Exercise for the North-eastern Atlantic, the Mediterranean, and Connected Seas Region, 31 October – 3 November 2017 Volume 1: Exercise Instructions. 2017	E only
135.	User's Guide for the Pacific Tsunami Warning Center Enhanced Products for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (CARIBE-EWS), October 2017	E only
136.	Exercise CARIBE WAVE 18. Tsunami Warning Exercise, 15 March 2018 (Barbados, Colombia and Puerto Rico Scenarios). Volume 1: Participant Handbook. 2017	E only
137.	The Ocean is losing its breath: declining oxygen in the world's ocean and coastal waters	(under preparation)
138.	Exercise Indian Ocean Wave 2018: An Indian Ocean-wide Tsunami Warning and Communication Exercise, 4–5 September 2018 Volume 1: Exercise Manual & Supplements	E only
139.	Exercise Pacific Wave 2018. A Pacific-wide Tsunami Warning and Enhanced Products Exercise, September to November 2018. Volume 1: Exercise Manual.	E only