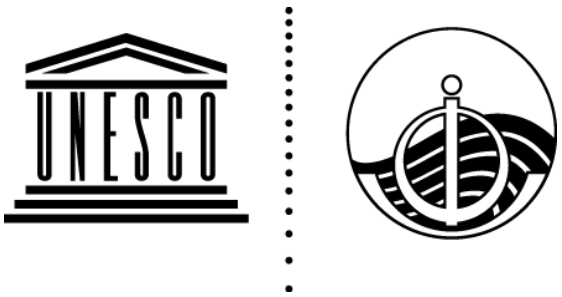
Intergovernmental Oceanographic Commission
Technical Series

128



EXERCISE INDIAN OCEAN WAVE 16
An Indian Ocean-wide Tsunami Warning and Communications Exercise

7-8 September 2016

Volume 1 Exercise Manual

UNESCO

Intergovernmental Oceanographic Commission
Technical Series

128

EXERCISE INDIAN OCEAN WAVE 16
An Indian Ocean-wide Tsunami Warning and Communications Exercise

7-8 September 2016

Volume 1 Exercise Manual

UNESCO 2016

IOC Technical Series, 128 Vol.1
Perth, April 2016
English only

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

Intergovernmental Oceanographic Commission. 2016. *Exercise Indian Ocean Wave 2016: An Indian Ocean-wide Tsunami Warning and Communication Exercise*, 7-8 September 2016. Volume 1: Exercise Manual. IOC Technical Series No. 128, Vol. 1. UNESCO.

Prepared by the Exercise IOWave16 Task Team for the Intergovernmental Coordination Groupfor the Indian Ocean Tsunami Warning and Mitigation System.

(IOC/2016/TS/128Vol.1)

TABLE OF CONTENTS

1. BACKGROUND

The devastating impact of the 26 December 2004 Indonesia earthquake and Indian Ocean Tsunami tragically demonstrated what can happen without an effective tsunami warning system. Tsunamis may not occur often, but when they do they can affect coasts, sometimes across an entire ocean. The 2004 tsunami caused damage and casualties across the entire Indian Ocean basin – even as far away as South Africa. Following this event, UNESCO's Intergovernmental Oceanographic Commission (IOC) was requested to establish an Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS), 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. An efficient and effective end-to-end warning system was needed, ready to react 24 hours a day to any potential tsunami threat, alert those at risk along coasts, and motivate them take immediate and appropriate steps to save their lives.

Under the guidance of the ICG/IOTWMS, Member States collaborated in the development of the IOTWMS, which was initially tested in the Indian Ocean-wide tsunami warning and response exercise IOWave09 (October 2009), and which then came into operation immediately following the subsequent IOWave11 (October 2011) exercise and was exercised again in IOWave14 (September 2014). Since 2011, the three Tsunami Service Providers (TSPs) of Australia, India and Indonesia have provided real-time tsunami products to the National Tsunami Warning Centres (NTWCs) of the IOTWMS Member States. The 10th Session of the ICG/IOTWMS in Muscat, Oman established a Task Team to organise the next Indian Ocean-wide tsunami exercise (IOWave16) in the second half of 2016.

Indian Ocean-wide tsunami exercises are effective tools for evaluating the readiness of the IOTWMS and for identifying changes that can improve its effectiveness. The ICG/IOTWMS notes the value of basin-wide tsunami exercises and drills such as IOWave16 and also encourages Member States to conduct further exercises and drills at the national and local levels.

Exercise IOWave16 will simulate Indian Ocean countries being put in a tsunami warning situation and require the National Tsunami Warning Centre (NTWC) and the National and/or Local Disaster Management Offices (NDMO/LDMO) in each country to implement their Standard Operating Procedures (SOPs). A significant observation from Exercise IOWave14 was that only two countries exercised community evacuation. A primary goal of IOWave16 therefore is to encourage more countries to involve coastal communities in the exercise to test the SOPs and communications links at all levels of the warning and response chain.

1.1 Previous IOWave Exercises

Eighteen (18) Indian Ocean Member States, out of an active twenty-four (24), participated in Exercise IOWave09, and twenty-two (22) participated in Exercise IOWave11 with four (4) countries exercising down to the community level. All twenty-four (24) Member States participated in Exercise IOWave14 with two (2) exercising down to the community level.

1.2 Exercise Dates and Scenarios

Exercise IOWave16 contains two earthquake scenarios on successive days, 7 and 8 September, with both scenarios run in real-time. The scenario details are provided in Table 1.

.

Table 1: Scenario Details

Scenario 1 – Sumatra		**Scenario 2 – Makran Trench**	
Date:	Wednesday 7 September 2016	**Date:**	Thursday 8 September 2016
Time:	0300 UTC	**Time:**	0600 UTC
Magnitude:	9.2 Mw	**Magnitude:**	9.0 Mw
Depth:	10 km	**Depth:**	10 km
Latitude:	1.93 S	**Latitude:**	24.8 N
Longitude:	99.22 E	**Longitude:**	62.2 E
Location:	Southern Sumatra, Indonesia	**Location:**	Off Coast of Pakistan

1.3 Exercise Involvement

The following organisations should be involved:

- Tsunami Service Providers (TSPs)
- National Tsunami Warning Centres (NTWCs)
- National Disaster Management Organisations (NDMOs)
- Local Disaster Management Organisations (LDMOs)
- Media Organisations
- Local communities, to the extent decided by each Member State, noting that this exercise has a focus on maximising community involvement.

1.4 Further Information

Further information for the exercise is available on the exercise website www.ioc-unesco.org/IOWave16.

2. CONCEPT OF EXERCISE IOWave16

2.1 Purpose

The purpose of Exercise IOWave16 is to evaluate and improve the effectiveness of the IOTWMS, through its operational TSPs, NTWCs, NDMOs and LDMOs, in responding to a potentially destructive tsunami. The exercise will provide an opportunity for Indian Ocean countries to test their operational lines of communications, to review their tsunami warning and emergency response SOPs, and to promote emergency preparedness. Regular exercises are important for maintaining staff readiness for real events. This is especially true for tsunamis, which are infrequent but require rapid response when they occur. The pre-exercise planning and post-exercise evaluation process is as important as the actual exercise, because it brings together all stakeholders to closely coordinate their actions. Every Indian Ocean country is encouraged to participate, down to the community level wherever possible.

2.2 Objectives

The objectives for Exercise IOWave16 are:

1. Validate the dissemination by TSPs of Tsunami Bulletin Notification Messages to NTWCs via Tsunami Warning Focal Points (TWFPs) of Indian Ocean countries and the reception by NTWCs of the TSP messages.

2. Validate the access by NTWCs to the tsunami bulletins and other products on the TSP websites, and the use of that information for the production of national warnings.
3. Validate the reporting by NTWCs to the TSPs of their National Tsunami Warning Status.
4. Validate the SOPs within countries for generating and disseminating tsunami warnings to their relevant emergency response agencies, media and the public.
5. Validate the SOPs within countries for the issuing of public safety messages, ordering evacuations and where possible issuing all-clear messages.
6. Validate the level of community awareness, preparedness and response.

Within the above framework, each country should develop its own specific objectives for the exercise.

2.3 Exercise Success Criteria

The exercise will be a success when the core objectives above have been exercised, performance evaluated and an exercise report produced. The broad success criteria, depending on the level of involvement of each country, are:

- The communication protocols between the TSPs, NTWCs, TWFPs and information dissemination points within countries are tested and understood.
- Areas of improvement in the tsunami warning and response chain are identified.
- Local communities participate in the exercise to the extent possible and increase their knowledge of tsunami preparedness and response.

2.4 Types of Exercise

Exercises stimulate the development, training, testing and evaluation of Disaster Plans and SOPs. Exercise participants may use their own past multi-hazard drills (e.g. flood, typhoon, earthquake, etc.) as a framework to conduct Exercise IOWave16.

Exercise IOWave16 should be conducted to a level of readiness that involves communication and decision making at government level, without disrupting or alarming the general public. Individual countries are encouraged to extend the exercise down to the level of public notification and community evacuation.

Exercises can be conducted at various scales of magnitude and sophistication. The types of exercises that can be conducted are:

1. Orientation Exercise
2. Drill
3. Tabletop Exercise
4. Functional Exercise
5. Full-scale Exercise

See Appendix IV for a more detailed description of each type of exercise.

For Exercise IOWave16, individual Member States should decide what type of exercise they are going to undertake, and whether they will participate in one or both scenarios. Participation in both scenarios, at least at the NTWC and NDMO level, has the advantage of

allowing SOP issues identified on the first day to be corrected and exercised again on the second day, and testing different elements of the SOPs because the tsunami arrival times will vary for each scenario.

Member States are encouraged to conduct a functional or full-scale exercise down to community level. If this is not possible, it is recommended that a tabletop exercise should be conducted as a minimum. Functional or full-scale exercises require an increasing level of planning and preparation, particularly when involving community evacuation. Due care should be taken not to inadvertently alarm the public.

3. SPECIFICS OF CONDUCTING EXERCISE IOWAVE16

3.1 Overview

The exercise will comprise two scenarios on successive days that will generate simulated tsunami waves travelling across the whole Indian Ocean basin. The first scenario simulates a magnitude 9.2 earthquake south of Sumatra, Indonesia and will commence at 0300 hours UTC on 7th September. The second scenario simulates a magnitude 9.0 earthquake in the Makran Trench south of Pakistan and will commence at 0600 hours UTC on 8th September.

Member States are invited to participate in either or both events, which will run in real-time. The scenario start times have been chosen to be more convenient for the "near field" (i.e. local) countries for each scenario. TSPs Australia, India and Indonesia will make exercise bulletins and detailed tsunami threat advice available on their password-protected websites during the events, and will send Notification Messages to NTWCs as the data is updated during the events.

The timelines for issuance of TSP bulletins for both events are given in Tables 2 and 4 below. Note that the actual bulletin issue times on the exercise days may be slightly different because the TSPs will be operating in a real-time simulation mode. Participant countries should use the timelines as a guide for planning their involvement in the exercise.

Coverage: All Member States are encouraged to participate. Estimated tsunami arrival times and wave amplitudes to all threatened IOTWMS countries are included in the TSP bulletins and products (refer to Appendix 2 and Section 3.2).

Messages: The TSPs will issue an initial Exercise Announcement Message to start the exercise on each day. Thereafter, NTWCs will receive Notification Messages from the TSPs according to the timelines shown in Table 2 (Sumatra) and 4 (Makran Trench), which will direct NTWCs to the TSP password-protected websites to view the detailed exercise bulletins and detailed threat information. Examples of the TSP Notification Messages are given in Appendix 1.

Threat Details: The following Section 3.2 provides the essential scenario details to facilitate the exercise plan. They include the estimated tsunami arrival times of the first significant wave above threat level and the maximum wave amplitudes for each affected country (Tables 3-Sumatra and Table 5-Makran Trench). Also provided are the sample threat map, the maximum wave amplitude map and/or the tsunami travel time map of the first detectable wave in the Indian Ocean (Figs 1&2 for Sumatra and Figs 3&4 for Makran Trench).

Countries are encouraged to conduct the exercise in real time and use the TSP websites to access the bulletins and other threat information available there. To facilitate the conduct of tabletop exercises and for planning the evacuation exercises, Appendix 2 provides sample TSP confirmed threat bulletins with tsunami wave observations for each scenario. Additional exercise sample bulletins will be available for download from the exercise website: www.ioc-unesco.org/IOWave16 approximately 1 month prior to the exercise.

3.2 Exercise Specifics

3.2.1 Scenario 1, Sumatra

This is the scenario of a magnitude 9.2 earthquake South of Sumatra, Indonesia (epicentre at 1.93S 99.22E), starting at 0300 UTC on Wednesday 7 September 2016. The simulated tsunami will take approximately 7.5 hours to travel from its source to the coasts of Iran and Pakistan, and 11 hours to travel to the southern coast of South Africa.

Table 2: Bulletin Timelines for Scenario 1, Sumatra

Magnitude 9.2 Earthquake, South of Sumatra, 0300UTC Wednesday 7 September 2016

TSP AUSTRALIA			TSP INDIA			TSP INDONESIA		
Time (UTC)	**Bulletin Number**	**Bulletin Type**	**Time (UTC)**	**Bulletin Number**	**Bulletin Type**	**Time (UTC)**	**Bulletin Number**	**Bulletin Type**
0300		*Announcement Message*	*0300*		*Announcement Message*	*0300*		*Announcement Message*
0309	1	Earthquake Bulletin (M8.1)	0305	1	Earthquake Bulletin (M8.5)	0307	1	Earthquake Bulletin (M 8.5)
0311	2	Potential Threat (M8.1)	0310	2	Potential Threat (M8.8)	0310	2	Potential Threat (M8.8)
0325	3	Confirmed Threat (M8.8)	0345	3	Confirmed Threat (M9.2)	0317	3	Confirmed Threat (M9.0)
0335	4	Confirmed Threat (M9.2)	0400	4	Confirmed Threat (M9.2)	0400	4	Confirmed Threat (M9.2)
0435	5	Confirmed Threat (M9.2)	0500	5	Confirmed Threat (M9.2)	0500	5	Confirmed Threat (M9.2)
0535	6	Confirmed Threat (M9.2)	0600	6	Confirmed Threat (M9.2)	0600	6	Confirmed Threat (M9.2)
0635	7	Confirmed Threat (M9.2)	0700	7	Confirmed Threat (M9.2)	0700	7	Confirmed Threat (M9.2)
0735	8	Confirmed Threat (M9.2)	0800	8	Confirmed Threat (M9.2)	0800	8	Confirmed Threat (M9.2)
0835	9	Confirmed Threat (M9.2)	0900	9	Confirmed Threat (M9.2)	0900	9	Confirmed Threat (M9.2)
0935	10	Confirmed Threat (M9.2)	1000	10	Confirmed Threat (M9.2)	1000	10	Confirmed Threat (M9.2)
1035	11	Confirmed Threat (M9.2)	1100	11	Confirmed Threat (M9.2)	1200	11	Confirmed Threat (M9.2)
1135	12	Confirmed Threat (M9.2)	1200	12	Confirmed Threat (M9.2)	1400	12	Confirmed Threat (M9.2)
1235	13	Confirmed Threat (M9.2)	1300	13	Confirmed Threat (M9.2)	1600	13	Final Bulletin
1335	14	Confirmed Threat (M9.2)	1400	14	Confirmed Threat (M9.2)			
1435	15	Final Bulletin	1500	15	Final Bulletin			

Table 3: The Estimated Tsunami Arrival Times and the Maximum Wave Amplitudes for Scenario 1, Sumatra.

T2 in UTC is the Estimated Tsunami Arrival Times (ETAs) for the first wave above the Threat Level of 0.5m. The earliest T2 out of the three TSPs is used for each listed country. MAX BEACH in metres is the estimated Maximum Wave Amplitude at the beach. The largest out of the three TSPs is used for each listed country. Not listed in the Table are those countries assessed by any of the three TSPs as not under threat.

No	Country Name	T2 (UTC)	MAX BEACH (m)
1	Australia	0348	7.44
2	Bangladesh	0724	3.25
3	British Indian Ocean Territory	0641	7.71
4	Comoros	1125	1.77
5	Djibouti	1251	2.97
6	French S & Antarctic Lands	0848	9.41
7	India	0409	6.27
8	Indonesia	0300	32.97
9	Iran	1048	2.12
10	Kenya	1120	3.19
11	Madagascar	1027	10.23
12	Malaysia	0652	1.24
13	Maldives	0626	5.56
14	Mauritius	0840	11.46
15	Mozambique	1155	3.11
16	Myanmar	0542	3.77
17	Oman	1002	3.49
18	Pakistan	1035	2.08
19	Reunion	0947	5.24
20	Seychelles	0923	5.96
21	Somalia	1020	3.46
22	South Africa	1324	8.48
23	Sri Lanka	0523	7.75
24	Tanzania	1142	2.49
25	Thailand	0520	3.02
26	Timor Leste	0735	0.71
27	UAE	1150	1.35
28	Yemen	0958	4.55

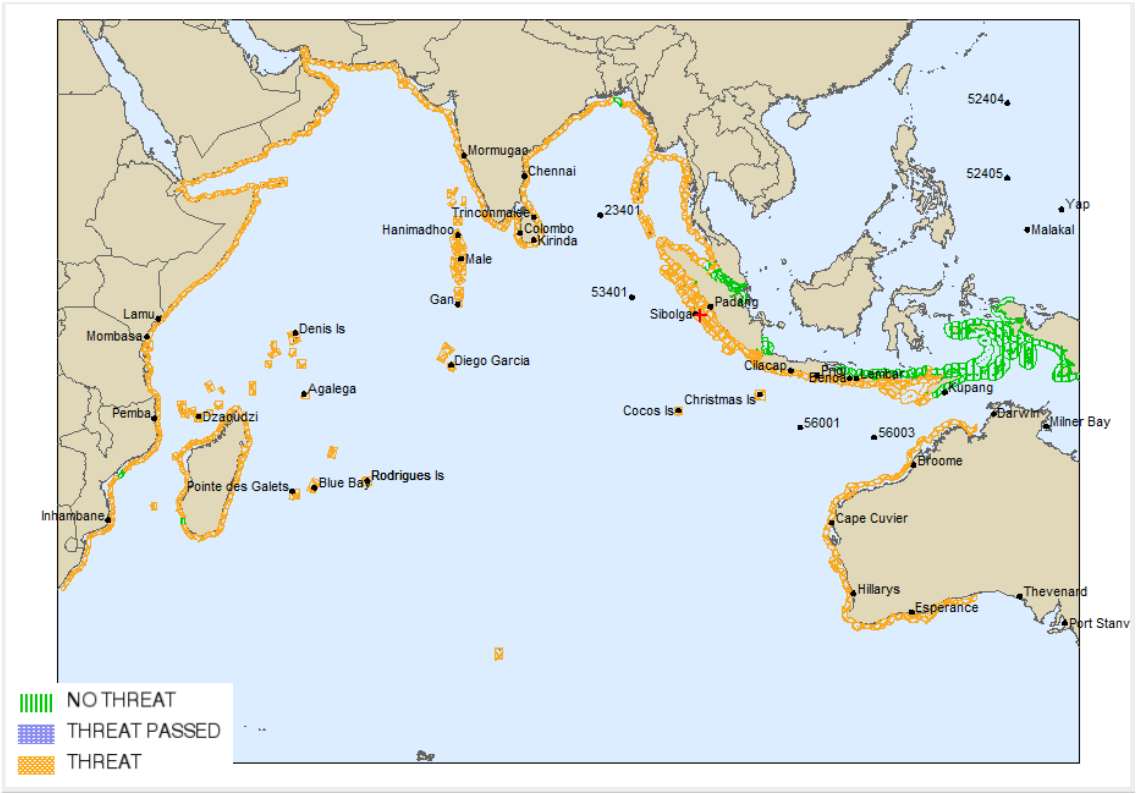


Figure 1. Threat Map produced by TSP Australia for Scenario 1, Sumatra.

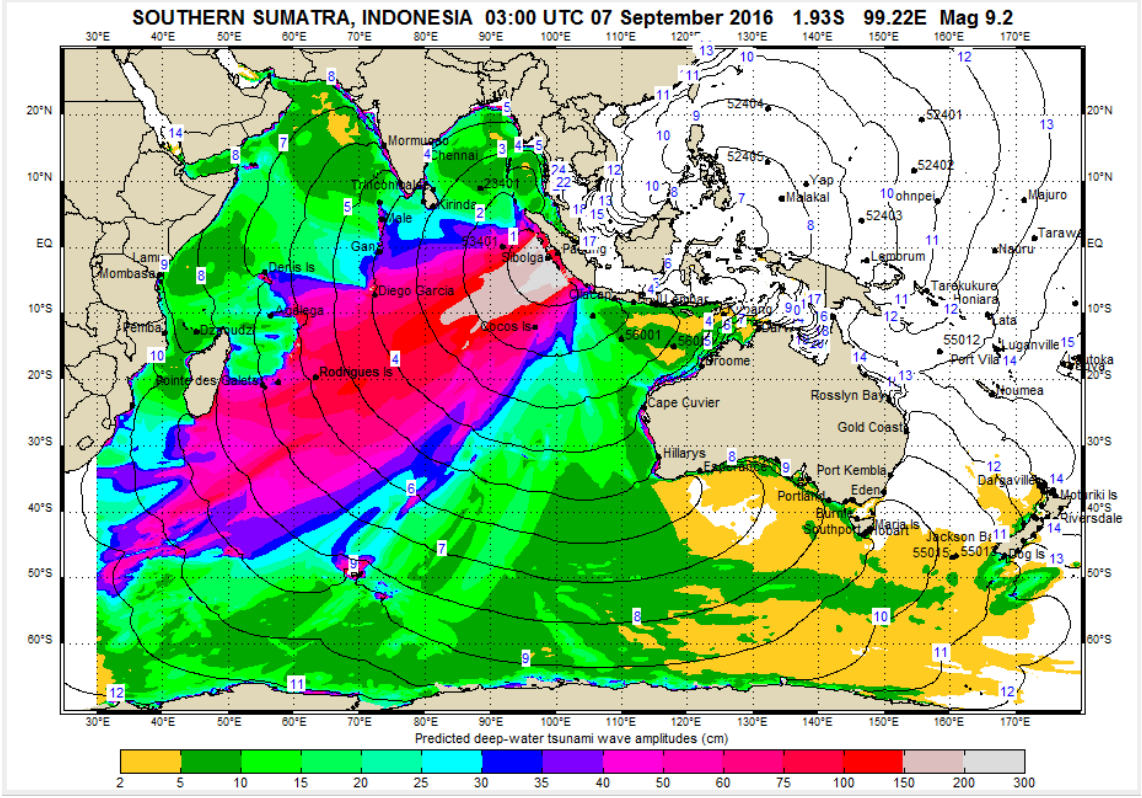


Figure 2. The Maximum Wave Amplitude Map overlayed with the first detectable wave Tsunami Travel Time contours produced by TSP Australia for Scenario 1, Sumatra.

3.2.2 Scenario 2, Makran Trench

This is a scenario of a magnitude 9.0 earthquake in the Makran Trench south of Pakistan (epicentre 24.8N 62.2E), starting at 0600 UTC on Thursday 8 September 2016. The simulated tsunami will take approximately 11 hours to travel from its source to the western coast of Australia.

Table 4: Bulletin Timelines for Scenario 2, Makran Trench

Magnitude 9.0 Earthquake, Off Coast of Pakistan, 0600UTC Thursday 08 September 2016

TSP AUSTRALIA			**TSP INDIA**			**TSP INDONESIA**		
Time (UTC)	**Bulletin Number**	**Bulletin Type**	**Time (UTC)**	**Bulletin Number**	**Bulletin Type**	**Time (UTC)**	**Bulletin Number**	**Bulletin Type**
0600		*Announcement Message*	*0600*		*Announcement Message*	*600*		*Announcement Message*
0612	1	Earthquake Bulletin (M8.3)	0605	1	Earthquake Bulletin (M8.2)	607	1	Earthquake Bulletin (M8.5)
0614	2	Potential Threat (M8.3)	0610	2	Potential Threat (M8.5)	610	2	Potential Threat (M8.7)
0625	3	Confirmed Threat (M8.8)	0645	3	Confirmed Threat (M9.0)	640	3	Confirmed Threat (M9.0)
0635	4	Confirmed Threat (M9.0)	0700	4	Confirmed Threat (M9.0)	700	4	Confirmed Threat (M9.0)
0735	5	Confirmed Threat (M9.0)	0800	5	Confirmed Threat (M9.0)	800	5	Confirmed Threat (M9.0)
0835	6	Confirmed Threat (M9.0)	0900	6	Confirmed Threat (M9.0)	900	6	Confirmed Threat (M9.0)
0935	7	Confirmed Threat (M9.0)	1000	7	Confirmed Threat (M9.0)	1000	7	Confirmed Threat (M9.0)
1035	8	Confirmed Threat (M9.0)	1100	8	Confirmed Threat (M9.0)	1100	8	Confirmed Threat (M9.0)
1135	9	Confirmed Threat (M9.0)	1200	9	Confirmed Threat (M9.0)	1200	9	Confirmed Threat (M9.0)
1235	10	Confirmed Threat (M9.0)	1300	10	Confirmed Threat (M9.0)	1300	10	Confirmed Threat (M9.0)
1335	11	Confirmed Threat (M9.0)	1400	11	Confirmed Threat (M9.0)	1400	11	Confirmed Threat (M9.0)
1435	12	Confirmed Threat (M9.0)	1500	12	Confirmed Threat (M9.0)	1500	12	Confirmed Threat (M9.0)
1535	13	Confirmed Threat (M9.0)	1600	13	Confirmed Threat (M9.0)	1700	13	Final Bulletin
1635	14	Confirmed Threat (M9.0)	1700	14	Confirmed Threat (M9.0)			
1735	15	Final Bulletin	1800	15	Final Bulletin			

Table 5: The Estimated Tsunami Arrival Times and the Maximum Wave Amplitudes for Scenario 2, Makran Trench.

T2 in UTC is the Estimated Tsunami Arrival Times (ETAs) for the first wave above the Threat Level of 0.5m. The earliest T2 out of the three TSPs is used for each listed country. MAX BEACH in metres is the estimated Maximum Wave Amplitude at the beach. The largest out of the three TSPs is used for each listed country. Not listed in the Table are those countries assessed by any of the three TSPs as not under threat.

No	Country Name	T2 (UTC)	MAX BEACH (m)
1	Australia	1400	1.18
2	Bangladesh	2144	0.58
3	British Indian Ocean Territory	1051	3.1
4	Comoros	1209	1.7
5	Djibouti	1053	3.1
6	French S & Antarctic Lands	1612	3.7
7	India	0600	4.89
8	Indonesia	1329	1.66
9	Iran	0600	19.1
10	Kenya	1130	1.7
11	Madagascar	1150	2.59
12	Maldives	0912	5.85
13	Mauritius	1143	1.72
14	Mozambique	1222	1.4
15	Oman	0610	17.3
16	Pakistan	0600	13.6
17	Reunion	1313	1.31
18	Seychelles	1036	2.61
19	Somalia	0905	3.6
20	South Africa	2121	0.66
21	Sri Lanka	1036	2.28
22	Tanzania	1200	2.4
23	UAE	0620	7.3
24	Yemen	0817	3.84

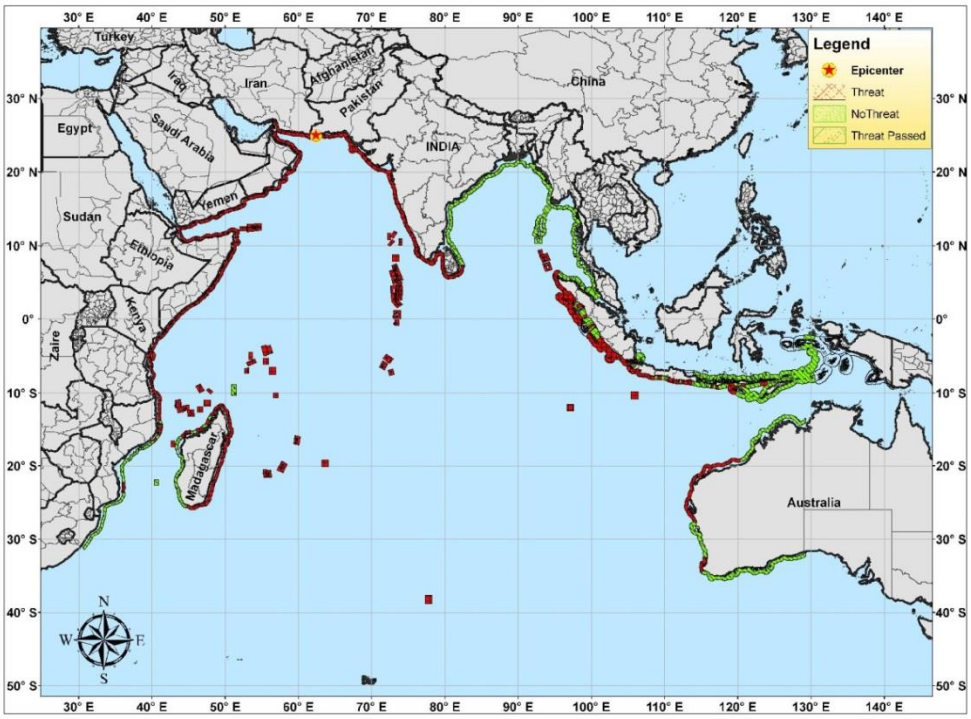


Figure 3. Threat Map produced by TSP India for Scenario 2, Makran Trench.

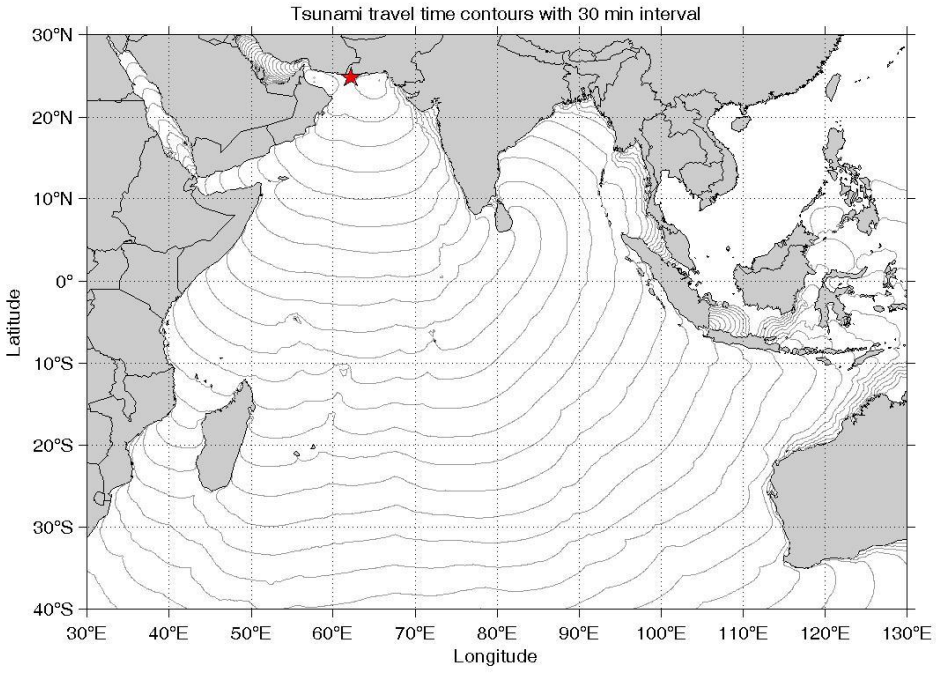


Figure 4. The first detectable wave Tsunami Travel Time contour map produced by TSP India for Scenario 2, Makran Trench

3.3 Logging and Status Reporting Procedure

During the exercise NTWCs are requested to log the times of reception of TSP Bulletin Notification Messages and of accessing TSP websites, and of reporting their National Warning Status via the TSP websites. The logging can be done either directly via the online evaluation form or via log forms – see Appendix V Post-Exercise Evaluation for details.

Detailed logging and reporting procedure:

1. Following the reception of each TSP Bulletin Notification Message, NTWCs should:
    - Log the time of reception of the TSP Notification Message, and how it was received (GTS, email, fax, SMS).
    - Use a web browser to access the password-protected website for the TSP given in the Notification Message, and log the success or otherwise of this access.
2. Following the times at which simulated National Warnings would be issued by the NTWC or NDMO in each country, the issuing agency should:
    - Report the National Tsunami Warning Status for their country via the web-based “NTWC Warning Status” form available on each TSP website.
    - Log the time of the status report and which TSP's website was used for the report. NOTE: **Only one status report is required after issuing each National Warning**, using the form on **any** of the TSP websites.

3.4 Website Passwords

The user names and passwords for accessing each of the TSP password-protected websites are known by NTWCs and are not included here (the websites are not intended to be viewed by the general public). If any NTWC is unsure of the passwords, please consult the TSP User Manuals, or the Technical Manual for the last IOTWMS Communications Test, or contact the IOTWMS Secretariat at: iotws@unesco.org.

3.5 Actions in Case of a Real Event

All documentation and correspondence relating to this exercise is to be clearly identified as **Exercise IOWave16** and **For Exercise Purposes Only**. In the case of a real event occurring during the exercise, TSPs and NTWCs will issue their normal message products for the event. Such messages will be given full priority and all TSPs should stop the exercise immediately and send an Announcement Message to that effect.

3.6 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 suggested that realistic resource levels be deployed in order to reflect some of the issues that are likely to be faced in a real event.

3.7 Media Involvement

The media have an important role in raising tsunami awareness to the public. Member States are therefore encouraged to involve the media in the exercise. Each country is responsible for the coordination of national in-country media communications for the

exercise. Media may be invited to participate or be simulated by exercise control staff.

The degree of media involvement in the exercise will vary from country to country, such as a paragraph in a newspaper, television coverage of an evacuation drill or information transmitted to the public via media networks. In all cases, it is important to ensure that the media and public know about the exercise beforehand so that they do not mistake it for a real tsunami warning.

Participating agencies should seek guidance from their National Contact for Exercise IOWave16 regarding responses to individual approaches by in-country media concerning the exercise.

3.8 Press Release

The UNESCO External Relations and Information department (ERI) will issue an international Media Advisory to alert the press of the Exercise IOWave16 about one week before the exercise.

ICG/IOTWMS Member States should consider issuing one or two exercise press releases to their respective country's media in conjunction with the UNESCO release. 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. Appendix III contains a sample press release that can be customised by Member States.

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

4. POST-EXERCISE EVALUATION

4.1 Evaluation and Debriefing

Following the exercise, participating countries are requested to complete the online Exercise Evaluation Survey. This feedback will assist in the evaluation of Exercise IOWave16 and in the development of subsequent exercises.

The goal of exercise evaluation is to validate SOPs and to 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 IOTWMS as a collective 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 and the community response.

The evaluation aims to inform and facilitate individual participant country evaluations as well as the integrated IOWave16 Report. The Post-Exercise Evaluation questionnaire addressing the respective focus areas and objectives is included in Appendix V for information and guidance. Please note that all participant countries are requested to complete the questionnaire **online** by **30 September 2016**. The link to the questionnaire will be provided to the IOWave16 National Contacts before the exercise.

Member States are encouraged to appoint Exercise Evaluators within each of their in-country agencies participating in the exercise, who would collect information during the exercise for the purposes of the Post-Exercise Evaluation. Member States are also encouraged to conduct formal exercise debriefs inclusive of all participants in their respective agencies, to facilitate a collective and official national evaluation. For details of

how to conduct a national evaluation refer to Appendix IV.

4.2 Exercise Observers

It is recommended that independent and objective Exercise Observers be appointed at all exercise points to support the collection of such data. Observers are to be guided by the exercise objectives and the information required in the Post-Exercise Evaluation questionnaire. International observers can be made available to Member States upon request and the understanding that the Member States will fund the observers' travel costs and per diems. Benefits of international observers include providing an independent assessment of the in-country response, recommending improvements to SOPs and communication linkages consistent with international best practice, and evaluating the success of the exercise in an Indian Ocean-wide context.

4.3 Exercise Report

In completing the online Post-Exercise Evaluation questionnaire, participating organisations are encouraged to note areas for improvement and actions that they plan to take. All official Post-Exercise Evaluation questionnaire responses are designated as "For Official Use Only" and will be restricted for use by the IOWave16 Task Team for the purpose of compilation of the Exercise Report. The Exercise Report will be submitted to the ICG/IOTWMS and Member States will have the opportunity to provide comments. The report will be published in the IOC Technical Series and will be in the public domain (i.e. available on the IOC website). Member States may also choose to share their national evaluation reports with the public.

APPENDIX I. EXAMPLES OF TSP BULLETIN NOTIFICATION MESSAGES

1. Full Notification Message – GTS, Fax, Email

The following is an example of an TSP Australia Notification Message that will be sent via GTS, fax and email. Notification Messages from TSP Indonesia and TSP India will be similar in format.

```
WEIO24 AMMC 070310
######################################################################
#
#  TEST TEST TEST - EXERCISE IOWAVE16 - NOT A REAL TSUNAMI EVENT
#
######################################################################
----------------------------------------------------------------------
TEST TSUNAMI BULLETIN NOTIFICATION MESSAGE NUMBER 1
TSUNAMI SERVICE PROVIDER - TSP AUSTRALIA [JATWC]
ISSUED AT 0310 UTC WEDNESDAY 7 SEPTEMBER 2016
----------------------------------------------------------------------
TO:   INDIAN OCEAN NATIONAL TSUNAMI WARNING CENTRES [NTWCs]
FROM: TSP AUSTRALIA

NOTIFICATION:
TSP AUSTRALIA HAS JUST ISSUED TSUNAMI BULLETIN NUMBER 1 FOR THE
INDIAN OCEAN, BASED ON THE FOLLOWING EARTHQUAKE EVENT:

MAGNITUDE:   8.3 MWP
DEPTH:       10KM
DATE:        07 SEP 2016
ORIGIN TIME: 0300 UTC
LATITUDE:    1.93S
LONGITUDE:   99.22E
LOCATION:    SOUTHERN SUMATRA, INDONESIA

TO VIEW THE BULLETIN GO TO THE TSP AUSTRALIA WEBSITE AT:

http://reg.bom.gov.au/tsunami/rtsp/index.shtml

NOTE: THIS IS A RESTRICTED-ACCESS WEBSITE CONTAINING TECHNICAL DATA
FOR NATIONAL TSUNAMI WARNING CENTRES ONLY. IT IS NOT FOR GENERAL
PUBLIC ACCESS.

GENERAL PUBLIC INFORMATION FOR THIS EVENT IS AVAILABLE FROM:

JOINT AUSTRALIAN TSUNAMI WARNING CENTRE [JATWC]
BUREAU OF METEOROLOGY
MELBOURNE, AUSTRALIA
http://www.bom.gov.au/tsunami

END OF NOTIFICATION MESSAGE
----------------------------------------------------------------------
######################################################################
#
#   TEST TEST TEST - EXERCISE IOWAVE16 - NOT A REAL TSUNAMI EVENT
#
######################################################################
```

Notes:

1. The words highlighted in red have been added to the normal notification message format for the purposes of Exercise IOWave16.

2. For GTS dissemination of the notification messages, the GTS headers used by each TSP will be of the form:

    a. TSP India: **WEIO20 DEMS 070310**
    b. TSP Indonesia: **WEIO22 WIIX 070310**
    c. TSP Australia: **WEIO24 AMMC 070310**

2. Abbreviated Notification Message - SMS

The following is an example of an abbreviated TSP Australia Notification Message that will be sent via mobile-phone SMS. SMS messages will be kept to a maximum length of 160 characters to enable them to be transmitted in a single SMS text message.

```
TEST TSP AUSTRALIA BULLETIN 1 ISSUED See http://reg.bom.gov.au/tsunami/TSP
EQ 03:00 07/09/2016 UTC MAG 8.3 1.93S 99.22E SOUTHERN SUMATRA, INDONESIA
```

SMS Notification Messages from TSP Indonesia and TSP India will be similar in format.

APPENDIX II. EXAMPLES OF TSP CONFIRMED THREAT BULLETINS WITH TSUNAMI WAVE OBSERVATIONS

1. Scenario 1 – Sumatra Sample Tsunami Bulletin Issued by TSP Indonesia

```
TEST TEST TEST TEST TEST IOWave-Sep-2016  TEST TEST TEST TEST TEST TEST
TEST TEST TEST TEST IOWave-Sep-2016  TEST TEST TEST TEST TEST
TSP-InaTEWS-nomorheader
---------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 4 (TYPE-III)
IOTWS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS-BMKG)
issued at 0400 UTC, Wednesday, 07 September 2016
---------------------------------------------------------------------

... CONFIRMED TSUNAMI THREAT IN THE INDIAN OCEAN ...

This bulletin applies to areas within and bordering the Indian Ocean. It is
issued in support of the UNESCO/IOC Indian Ocean Tsunami Warning and
Mitigation System (IOTWS).

1. EARTHQUAKE INFORMATION (updated)
IOTWS-TSP INDONESIA has detected an earthquake with the following details:

Magnitude  : 9.2 (Mw)
Depth      : 10km
Date       : 07 Sep 2016
Origin Time: 03:00:00 UTC
Latitude   : 1.93S
Longitude  : 99.22E
Location   : Southern Sumatra, Indonesia

2. EVALUATION
Sea level observations have confirmed that a TSUNAMI WAS GENERATED.
Maximum wave amplitudes observed so far:

LOCATION       COUNTRIES  LAT    LON   AMPL(m) TIME(UTC) DATE
---------------------------------------------------------------------
TELUK DALAM    INDONESIA 00.55N  97.82E 7.0    03:12    Sep 07, 2016
TANAH BALA     INDONESIA 00.53S  98.50E 5.0    03:50    Sep 07, 2016
PADANG         INDONESIA 00.95S 100.37E 6.5    03:52    Sep 07, 2016
---------------------------------------------------------------------

Based on pre-run model scenarios, the zones listed below are POTENTIALLY
UNDER THREAT.

3. TSUNAMI THREAT FOR THE INDIAN OCEAN
The list below shows the forecast arrival time of the first wave estimated
to exceed 0.5m amplitude at the beach in each zone (or a different
threshold nominated by an NTWC), and the amplitude of the maximum beach
wave predicted for the zone. Zones where the estimated wave amplitudes are
less than the threshold amplitude at the beach are not shown.

The list is grouped by country (alphabetic order) and ordered according to
the earliest estimated times of arrival at the beach.

Please be aware that actual wave arrival times may differ from those below,
and the initial wave may not be the largest. A tsunami is a series of waves
and the time between successive waves can be five minutes to one hour.
```

The threat is deemed to have passed two hours after the forecast time for last exceedance of the 0.5m threat threshold for a zone. As local conditions can cause a wide variation in tsunami wave action, CANCELLATION of national warnings and ALL CLEAR determination must be made by national/state/local authorities.

AUSTRALIA

CHRISTMAS ISLAND	03:59z 07Sep2016	1.51m
COCOS ISLAND	04:11z 07Sep2016	5.72m
LEARMONTH	06:15z 07Sep2016	2.69m
CARNARVON	06:17z 07Sep2016	2.19m
BORROW ISLAND	06:54z 07Sep2016	2.35m
HAMELIN POOL	07:05z 07Sep2016	2.93m
PORT DENISON	07:10z 07Sep2016	2.75m
PORT HEADLAND	07:26z 07Sep2016	3.20m
GREY	07:30z 07Sep2016	2.27m
WINCHESTER	07:37z 07Sep2016	1.83m
ROTTNEST ISLAND	07:41z 07Sep2016	1.42m
SEABIRD	07:44z 07Sep2016	2.30m
PADBURY	07:52z 07Sep2016	2.22m
KALBARRI	07:53z 07Sep2016	3.30m
WALKAWAY	07:54z 07Sep2016	2.69m
ROCKINGHAM	07:54z 07Sep2016	2.07m
YANCHEP	07:54z 07Sep2016	2.40m
DEGREY	07:55z 07Sep2016	2.01m
YALLINGUP	07:55z 07Sep2016	2.64m
IRWIN	07:56z 07Sep2016	2.21m
MANDURAH	07:59z 07Sep2016	2.19m
KUDARDUP	08:09z 07Sep2016	2.12m
DARDANUP	08:16z 07Sep2016	2.54m
MOONYOONOOKA	08:30z 07Sep2016	2.89m
WINDY HARBOUR	08:34z 07Sep2016	1.98m
KIMBERLEY DOWN S	08:40z 07Sep2016	0.67m
NORNALUP	08:40z 07Sep2016	1.24m
LAGRANGE	08:49z 07Sep2016	1.15m
KUNUNURRA	09:41z 07Sep2016	0.78m
BOONGAREE ISLAND	11:58z 07Sep2016	0.78m
ALBANY	11:59z 07Sep2016	1.25m
GIBSON	13:59z 07Sep2016	0.52m
PARDOO	14:06z 07Sep2016	0.78m
ESPERANCE	15:33z 07Sep2016	0.50m
UNICORP.WEST COAST	17:55z 07Sep2016	0.54m
ELLISTON	18:05z 07Sep2016	0.55m
GLENELG PORTLAND	18:25z 07Sep2016	0.59m
BREMER BAY	18:58z 07Sep2016	0.56m
HOPETOUN	20:35z 07Sep2016	0.74m

BANGLADESH

COXS BAZAR	08:29z 07Sep2016	1.42m
BARGUNA	08:36z 07Sep2016	1.62m
KUTUBDIA ISLAND	08:44z 07Sep2016	1.29m
CHALNA	13:13z 07Sep2016	1.12m

BRITISH INDIAN OCEAN TERRITORY

MORESBY ISLAND	06:47z 07Sep2016	4.18m
DIEGO GARCIA	06:48z 07Sep2016	5.12m

NW EGMONT ISLAND	07:05z 07Sep2016	4.44m

COMOROS

BAMBAO	11:34z 07Sep2016	1.15m
DZAOUDZI	11:36z 07Sep2016	1.06m
CHEZANI	11:42z 07Sep2016	1.35m
FOMBONI	11:43z 07Sep2016	1.33m

DJIBOUTI

MUHAMMAD ALI BIN FATHA SUMANA	13:14z 07Sep2016	1.10m
NW ARTA	13:20z 07Sep2016	3.58m
ALAILI DADDA	13:40z 07Sep2016	0.87m

FRENCH SOUTHERN AND ANTARCTIC LA

LLE SAINT-PAUL-NORTH	08:57z 07Sep2016	2.71m
LLE SAINT-PAUL-SOUTH	09:12z 07Sep2016	4.03m
AND ANTARCTIC LANDS	11:28z 07Sep2016	6.94m

INDIA

INDIRA POINT	04:27z 07Sep2016	3.98m
KOMATRA AND KATCHAL ISLAND	04:40z 07Sep2016	2.95m
CAR NICOBAR	04:56z 07Sep2016	2.71m
LITTLE ANDAMAN	05:15z 07Sep2016	2.75m
NORTH SENTINEL ISLAND	05:33z 07Sep2016	2.26m
PORT BLAIR	05:35z 07Sep2016	1.83m
HAVELOCK	05:46z 07Sep2016	1.84m
BARREN ISLAND	05:58z 07Sep2016	0.67m
RANGATH BAY	06:02z 07Sep2016	0.99m
DIGLIPUR	06:08z 07Sep2016	0.93m
FLAT ISLAND	06:09z 07Sep2016	2.28m
CUDDALORE	06:22z 07Sep2016	2.39m
KOLUVERI	06:24z 07Sep2016	2.43m
WEST AND LANDFALL ISLAND	06:26z 07Sep2016	1.50m
PUDUCHERRY	06:27z 07Sep2016	3.80m
NAGAPATTINAM	06:28z 07Sep2016	2.49m
NAGAPATTINAM-THANJAVUR	06:29z 07Sep2016	2.95m
KARAIKAL	06:31z 07Sep2016	1.99m
MAHABALIPURAM	06:31z 07Sep2016	4.23m
TUTICORIN	06:33z 07Sep2016	3.31m
PONNERI	06:36z 07Sep2016	2.10m
SRIHARIKOTA	06:39z 07Sep2016	2.36m
RAMESWARAM	06:42z 07Sep2016	2.72m
CHENNAI	06:43z 07Sep2016	2.86m
MACHILIPATNAM	06:43z 07Sep2016	3.46m
KAKINADA	06:47z 07Sep2016	2.56m
NIJAMPATTANAM	06:48z 07Sep2016	3.64m
KOTTAPATNAM	06:49z 07Sep2016	3.53m
KOODANKULAM	06:53z 07Sep2016	3.43m
VISAKHAPATNAM	07:03z 07Sep2016	3.25m
KANYAKUMARI	07:03z 07Sep2016	4.77m
KOYYAM	07:06z 07Sep2016	2.02m
QUILON	07:08z 07Sep2016	2.56m
PURI	07:10z 07Sep2016	1.57m

TRIVANDRUM	07:11z 07Sep2016	3.47m
MINICOY	07:12z 07Sep2016	1.37m
PARADIP	07:14z 07Sep2016	1.17m
GOPALPUR	07:17z 07Sep2016	2.24m
ALLEPPEY ALAPPUZHA	07:21z 07Sep2016	2.78m
ANDROTH	07:23z 07Sep2016	1.48m
RAJNAGAR	07:32z 07Sep2016	1.14m
KAVARATTI	07:41z 07Sep2016	1.10m
AMINI	07:51z 07Sep2016	1.15m
AGATTI	07:55z 07Sep2016	1.50m
MANATTALA	07:55z 07Sep2016	2.12m
COCHIN	07:57z 07Sep2016	2.68m
TIRURANGADI	08:01z 07Sep2016	2.70m
NAIKANIDIHI	08:02z 07Sep2016	1.46m
SAGAR AND KAKDWIP	08:05z 07Sep2016	1.14m
BALESHWAR	08:14z 07Sep2016	1.28m
BEYPORE	08:14z 07Sep2016	1.73m
CHANDRAGIRI FORT	08:23z 07Sep2016	2.77m
MADAYI KANNUR	08:24z 07Sep2016	2.28m
MANGALORE	08:50z 07Sep2016	1.67m
UDUPI	09:07z 07Sep2016	2.75m
KARWAR	09:26z 07Sep2016	2.32m
MALVAN BAY	09:38z 07Sep2016	2.23m
PANAJI	09:40z 07Sep2016	1.82m
ANJANWEL	10:08z 07Sep2016	1.69m
ALIBAG PORT	10:58z 07Sep2016	1.68m
VERAVAL	11:09z 07Sep2016	1.03m
DWARKA	11:11z 07Sep2016	1.42m
MANDVI	13:10z 07Sep2016	0.93m
VIRAR	13:17z 07Sep2016	1.16m
DAMAN	14:22z 07Sep2016	1.07m
PORBANDAR	14:37z 07Sep2016	1.18m
MUMBAI	14:48z 07Sep2016	1.70m
AMRELI	14:59z 07Sep2016	1.15m
BORSI	16:25z 07Sep2016	0.92m
MAHUVA	16:26z 07Sep2016	0.95m

INDONESIA

SUMUT NIAS BAGIAN BARAT	03:00z 07Sep2016	18.76m
SUMBAR KEPULAUAN-MENTAWAI PULAU SIPORA	03:00z 07Sep2016	18.79m
SUMUT NIAS-SELATAN PULAU NIAS	03:00z 07Sep2016	16.79m
SUMUT NIAS-SELATAN PULAU TANAHMASA	03:00z 07Sep2016	15.28m
SUMBAR KEPULAUAN-MENTAWAI P. SIBERUT	03:00z 07Sep2016	17.85m
SUMBAR KEPULAUAN-MENTAWAI KEP. PAGAI	03:00z 07Sep2016	15.77m
SUMUT NIAS-SELATAN PULAU TANABALA	03:00z 07Sep2016	15.78m
SUMBAR PESISIR-SELATAN BAGIAN SELATAN	03:14z 07Sep2016	25.34m
SUMBAR PESISIR-SELATAN BAGIAN UTARA	03:16z 07Sep2016	29.95m
NAD SIMEULUE PULAU SIMEULUE	03:17z 07Sep2016	7.10m
BENGKULU MUKOMUKO	03:19z 07Sep2016	27.70m
BENGKULU BENGKULU-UTARA PULAU ENGGANO	03:20z 07Sep2016	10.43m
SUMUT NIAS BAGIAN TIMUR	03:21z 07Sep2016	8.32m
NAD ACEH-SINGKIL KEPULAUAN BANYAK	03:25z 07Sep2016	6.22m
SUMBAR KOTA-PARIAMAN	03:27z 07Sep2016	18.55m
SUMBAR PADANG-PARIAMAN BAGIAN SELATAN	03:27z 07Sep2016	23.22m
SUMBAR KOTA-PADANG BAGIAN UTARA	03:31z 07Sep2016	24.98m
BENGKULU KOTA-BENGKULU PANTAI-PANJANG	03:31z 07Sep2016	14.02m
SUMBAR PADANG-PARIAMAN BAGIAN UTARA	03:31z 07Sep2016	22.88m
BENGKULU SELUMA	03:32z 07Sep2016	17.79m
BENGKULU BENGKULU-UTARA BAGIAN UTARA	03:33z 07Sep2016	30.00m

SUMBAR KOTA-PADANG BAGIAN SELATAN	03:34z 07Sep2016	26.82m
SUMBAR AGAM	03:34z 07Sep2016	16.41m
SUMUT NIAS-SELATAN PULAU PINI	03:37z 07Sep2016	15.74m
BENGKULU KAUR	03:38z 07Sep2016	11.22m
BENGKULU BENGKULU-UTARA BAGIAN SELATAN	03:38z 07Sep2016	26.86m
BENGKULU BENGKULU-SELATAN	03:40z 07Sep2016	10.07m
LAMPUNG LAMPUNG-BARAT PESISIR-UTARA	03:42z 07Sep2016	5.83m
LAMPUNG LAMPUNG-BARAT PESISIR-TENGAH	03:44z 07Sep2016	7.10m
LAMPUNG LAMPUNG-BARAT PESISIR-SELATAN	03:45z 07Sep2016	6.93m
SUMBAR PASAMAN-BARAT	03:48z 07Sep2016	17.49m
BANTEN PANDEGLANG BAGIAN SELATAN	03:53z 07Sep2016	6.18m
BANTEN PANDEGLANG PULAU PANAITAN	03:54z 07Sep2016	3.72m
NAD ACEH-SELATAN BAGIAN UTARA	03:56z 07Sep2016	3.56m
BANTEN PANDEGLANG BAGIAN UTARA	03:58z 07Sep2016	5.41m
SUMUT TAPANULI-TENGAH BAGIAN SELATAN	03:59z 07Sep2016	10.93m
SUMUT TAPANULI-SELATAN	04:00z 07Sep2016	11.55m
SUMUT MANDAILING-NATAL BAGIAN UTARA	04:02z 07Sep2016	16.72m
JABAR SUKABUMI PELABUHAN-RATU	04:04z 07Sep2016	4.26m
BANTEN LEBAK	04:05z 07Sep2016	4.04m
LAMPUNG TANGGAMUS PULAU TABUAN	04:06z 07Sep2016	4.12m

(Please note: the rest of the coastal zones for Indonesia is omitted to save space. This note is not part of the bulletin)

……

IRAN

PUSHT	11:21z 07Sep2016	1.34m
BIR	11:31z 07Sep2016	1.13m
MISKI	12:49z 07Sep2016	1.10m
SAR RIG	13:55z 07Sep2016	1.02m

KENYA

KIWAYU	11:29z 07Sep2016	1.84m
MALINDI	11:58z 07Sep2016	2.01m
KIPINI	12:01z 07Sep2016	2.05m
TAKAUNGU	12:02z 07Sep2016	1.74m
KISIMACHANDE	12:03z 07Sep2016	1.94m
MVULENI	12:26z 07Sep2016	1.33m

MADAGASCAR

VOHEMAR	10:31z 07Sep2016	5.39m
ANOROTSANGANA	10:38z 07Sep2016	2.42m
TOAMASINA AIRPORT	10:48z 07Sep2016	4.28m
TAMPOLO	10:51z 07Sep2016	4.62m
AMBAHY	11:01z 07Sep2016	7.14m
GLORIOSO ISLANDS	11:07z 07Sep2016	1.38m
FARAFAGANA	11:08z 07Sep2016	9.51m
MANANTENINA	11:15z 07Sep2016	5.03m
SAMPONA	11:49z 07Sep2016	4.96m
ANDROKA	12:05z 07Sep2016	3.47m
BALY	12:05z 07Sep2016	1.19m
TAMOTAMO	12:11z 07Sep2016	1.06m
EUROPA ISLAND	12:43z 07Sep2016	1.05m
JUAN DE NOVA ISLAND	12:44z 07Sep2016	1.13m
AMBANJA	13:47z 07Sep2016	1.01m

MANJA	15:40z 07Sep2016	1.21m

MALAYSIA

SEBERANG PERAI UTARA AND BARAT DAYA	08:10z 07Sep2016	0.96m
SATUN	12:53z 07Sep2016	0.99m
YAN	13:12z 07Sep2016	0.88m
WEST OF ALOR SETAR	13:26z 07Sep2016	0.81m
KERIAN	13:34z 07Sep2016	0.58m
KUALA MUDA	13:46z 07Sep2016	0.56m
MANJUNG	14:09z 07Sep2016	0.77m
SEBERANG PERAI SELATAN	15:44z 07Sep2016	0.68m
LARUT AND MATANG	18:32z 07Sep2016	0.73m

MALDIVES

DHIYAMIGILI	06:36z 07Sep2016	3.93m
HITHADHOO	06:36z 07Sep2016	3.13m
THINADHOO	06:37z 07Sep2016	4.46m
KOLHUFUSHI	06:37z 07Sep2016	3.71m
MALE-SOUTH	06:41z 07Sep2016	4.91m
MALE-NORTH	06:46z 07Sep2016	3.15m
KULHUDHUFFUSHI	06:47z 07Sep2016	3.65m
GOIDHOO	07:00z 07Sep2016	2.65m
FERIDHOO	07:02z 07Sep2016	3.64m

MAURITIUS

LA FERME	08:44z 07Sep2016	8.65m
CARGADOS CARAJOS	09:18z 07Sep2016	7.33m
GRANDE REVIERE SUD EST-EAST	09:27z 07Sep2016	3.98m
AGALEGA ISLAND	09:39z 07Sep2016	1.72m
GRANDE REVIERE SUD EST-WEST	09:43z 07Sep2016	4.16m

MOZAMBIQUE

MAGANJA	12:05z 07Sep2016	1.38m
QUITERAJO	12:17z 07Sep2016	1.24m
MERONVI	12:18z 07Sep2016	1.90m
TAVARI	12:19z 07Sep2016	1.03m
PEMBA	12:21z 07Sep2016	1.31m
LURIO	12:23z 07Sep2016	1.48m
MURREBUE	12:24z 07Sep2016	0.98m
NANGATA	12:24z 07Sep2016	1.47m
MINHAUINE	12:26z 07Sep2016	1.28m
MECUFI	12:27z 07Sep2016	1.09m
LUMBO	12:28z 07Sep2016	1.54m
MOGINCUAL	12:46z 07Sep2016	1.36m
INHARRIME	13:13z 07Sep2016	1.85m
POMENE	13:26z 07Sep2016	1.79m
VILANKULO	13:30z 07Sep2016	1.72m
MAGUEMBA	13:35z 07Sep2016	1.96m
MAPUTO	13:44z 07Sep2016	2.58m
ZAVALA	13:46z 07Sep2016	2.25m
INHASSORO	13:46z 07Sep2016	0.99m
MOEBASE	13:49z 07Sep2016	0.84m
OCONE	13:51z 07Sep2016	1.38m

XAI-XAI	13:52z 07Sep2016	2.54m
AMADE	13:59z 07Sep2016	1.25m
MALUANA	14:02z 07Sep2016	1.91m
NAMORRE	14:27z 07Sep2016	0.89m
VILA DO CHINDE	14:29z 07Sep2016	1.34m
NHANGAU	14:30z 07Sep2016	1.43m
MAIONGUE	14:46z 07Sep2016	1.22m
NOVA LUSITANIA	14:51z 07Sep2016	0.98m

MYANMAR

THAN KYUN	06:06z 07Sep2016	1.16m
LITTLE COCO ISLAND	06:23z 07Sep2016	1.40m
LORD LOUGHBOROUGH ISLAND	06:24z 07Sep2016	1.42m
PREPARIS ISLAND	06:37z 07Sep2016	0.94m
GREAT WESTERN TORRES ISLAND	07:04z 07Sep2016	1.47m
KYWEGYAUNG	07:06z 07Sep2016	1.54m
CHEDUBA ISLAND	07:10z 07Sep2016	1.75m
SITTWE	07:37z 07Sep2016	2.06m
KYAUKPYU	07:38z 07Sep2016	2.82m
MAGYIGYAING	07:46z 07Sep2016	1.89m
THAWINCHAUNG	07:46z 07Sep2016	1.33m
PHARPON	07:50z 07Sep2016	2.05m
MALI KYUN	08:16z 07Sep2016	0.82m
YE	08:44z 07Sep2016	0.97m
MAWYEN	09:09z 07Sep2016	2.57m
YANGON-S	18:52z 07Sep2016	0.80m

OMAN

HASIK	10:28z 07Sep2016	2.04m
MASIRAH	10:38z 07Sep2016	1.51m
MIRBAT	10:38z 07Sep2016	2.18m
SALALAH	10:43z 07Sep2016	1.63m
DHALKUT	10:48z 07Sep2016	3.80m
RASS AL HADD	10:50z 07Sep2016	2.20m
QALHAT	10:51z 07Sep2016	1.09m
JUWAYRAH	10:54z 07Sep2016	3.01m
ABU GHALAT	10:56z 07Sep2016	1.46m
ASSIFAH	11:08z 07Sep2016	1.12m
DARSAIT	11:22z 07Sep2016	0.63m
AL KHABURAH	11:49z 07Sep2016	0.69m
SUHAR	11:53z 07Sep2016	0.74m
MUSANDAM	12:31z 07Sep2016	1.06m
BARKA	15:20z 07Sep2016	0.68m
HAY ASEM	16:53z 07Sep2016	0.62m

PAKISTAN

ORMARA	11:12z 07Sep2016	1.76m
WINDER	11:25z 07Sep2016	1.27m
SINDH	11:33z 07Sep2016	2.16m
KARACHI	11:48z 07Sep2016	1.87m

REUNION

SAINT - JOSEPH	09:52z 07Sep2016	4.58m

SAINT DENIS	09:55z 07Sep2016	3.51m

SEYCHELLES		
COETIVY ISLAND	09:30z 07Sep2016	2.60m
FREGATE ISLAND	09:30z 07Sep2016	3.63m
TAKAMAKA	09:51z 07Sep2016	3.10m
ILE DESROCHES	10:02z 07Sep2016	2.26m
ALPHONSE ISLAND	10:14z 07Sep2016	1.20m
FARQUHAR GROUP	10:25z 07Sep2016	1.81m
ASTOVE ISLAND	10:57z 07Sep2016	1.33m
ALDABRA	11:08z 07Sep2016	1.15m

SOMALIA		
BANDER-BEYLA	10:29z 07Sep2016	3.33m
GALDOGOB	10:33z 07Sep2016	3.66m
JARIIBAN	10:35z 07Sep2016	2.97m
EYL	10:37z 07Sep2016	4.04m
TOOXIN	10:39z 07Sep2016	3.74m
CEEL DHEER	10:45z 07Sep2016	4.17m
XARARDHEERE	10:45z 07Sep2016	4.06m
MAREEG	10:47z 07Sep2016	3.13m
ITALA	10:50z 07Sep2016	2.43m
UARSCIECH	10:52z 07Sep2016	2.02m
MUQDISHO	10:57z 07Sep2016	2.86m
ABO	11:01z 07Sep2016	4.18m
BEYNAX BARRE	11:04z 07Sep2016	1.99m
BARAAWE	11:06z 07Sep2016	1.68m
JILIB	11:16z 07Sep2016	2.02m
TURDHO	11:20z 07Sep2016	2.71m
NE BEERNAASI	11:24z 07Sep2016	2.49m
QANDALA	11:26z 07Sep2016	1.40m
KAAMBOONI	11:27z 07Sep2016	1.68m
HADAAFTIMO	11:44z 07Sep2016	1.44m
BOSASO	11:46z 07Sep2016	1.29m
MAYDH	12:01z 07Sep2016	1.20m
KABURA	12:17z 07Sep2016	1.45m
BAKI	12:43z 07Sep2016	1.63m
SAYLAC	12:58z 07Sep2016	1.48m
LOYADO	13:10z 07Sep2016	0.95m

SOUTH AFRICA		
GWABALANDA HITAWI	13:30z 07Sep2016	2.18m
FUNK SEAMOUNT	13:31z 07Sep2016	4.58m
PORT DURNFORD	13:35z 07Sep2016	2.44m
LAKE SIBAYI	13:35z 07Sep2016	2.73m
KOSIMEER	13:38z 07Sep2016	2.66m
MARGATE	13:41z 07Sep2016	2.17m
KELSO	13:46z 07Sep2016	4.10m
MANDI	13:47z 07Sep2016	3.40m
BIZANA	13:49z 07Sep2016	2.53m
LUSIKISIKI	13:51z 07Sep2016	3.74m
ABORETUM	13:51z 07Sep2016	3.33m
PORT ST JOHNS	13:57z 07Sep2016	4.38m
NGQUELENI	14:00z 07Sep2016	4.12m
ELLIOTDALE	14:04z 07Sep2016	4.41m

WILLOWVALE	14:07z 07Sep2016	3.79m
KENTANI	14:10z 07Sep2016	3.60m
MARSHSTRAND	14:17z 07Sep2016	5.72m
	14:18z 07Sep2016	6.27m
ZIKHOVA	14:22z 07Sep2016	3.82m
PEDDIE	14:26z 07Sep2016	4.48m
BATHURST	14:37z 07Sep2016	5.11m
ALEXANDRIA	14:38z 07Sep2016	4.23m
PORT ELIZABETH	14:51z 07Sep2016	5.08m
GAMTOOS	14:57z 07Sep2016	3.21m
HUMANSDORP	15:29z 07Sep2016	2.84m
HANKEY	15:31z 07Sep2016	2.25m
GEORGE	15:48z 07Sep2016	2.90m
HEIDELBERG	15:52z 07Sep2016	3.82m
MOSSEL	16:01z 07Sep2016	5.32m
BREDASDORP	16:12z 07Sep2016	6.02m
WITAAND	16:22z 07Sep2016	5.81m

SRI LANKA

KIRINDA	05:35z 07Sep2016	4.52m
AKKARAIPATTU	05:36z 07Sep2016	3.16m
BATTICALOA	05:36z 07Sep2016	3.00m
OKANDA	05:41z 07Sep2016	5.41m
TANGALLA	05:43z 07Sep2016	2.71m
KATTANKUDI	05:44z 07Sep2016	3.02m
POTTUVIL	05:44z 07Sep2016	3.40m
ANAITIVU	05:47z 07Sep2016	2.35m
MATARA	05:48z 07Sep2016	4.03m
HAMBANTOTA	05:50z 07Sep2016	6.54m
PANKULAM	05:51z 07Sep2016	2.24m
MULLAITTIVU	05:52z 07Sep2016	3.07m
AMBALANGODA	05:52z 07Sep2016	4.07m
GALLE	05:54z 07Sep2016	4.11m
COLOMBO	06:06z 07Sep2016	3.30m
BERUWALA	06:06z 07Sep2016	3.74m
MORATUWA	06:12z 07Sep2016	3.96m
NEGOMBO	06:14z 07Sep2016	3.67m
CHUNDIKKULAM	06:17z 07Sep2016	2.38m
MUNDAL LAKE	06:20z 07Sep2016	2.22m
CHAVAKACHCHERI	06:26z 07Sep2016	3.16m
POINT PEDRO	06:27z 07Sep2016	2.86m
MANNAR ISLAND	06:28z 07Sep2016	2.03m
MUSALI	06:44z 07Sep2016	1.50m

TANZANIA

VUMBA	11:52z 07Sep2016	1.46m
ZANZIBAR	11:59z 07Sep2016	2.06m
SONGO SONGO ISLAND	12:06z 07Sep2016	1.69m
KUTANI	12:07z 07Sep2016	1.54m
RUVU	12:10z 07Sep2016	2.09m
MSASANI	12:10z 07Sep2016	2.37m
MADANGWA	12:13z 07Sep2016	1.94m
VUMBI	12:15z 07Sep2016	1.42m
JIMBO	12:18z 07Sep2016	1.15m
WEST TO KONDE	12:20z 07Sep2016	1.63m
BOMALANDNI	12:28z 07Sep2016	1.15m
BAGAMOYO	12:31z 07Sep2016	1.44m

GAZIJA	12:32z 07Sep2016	1.64m
THAILAND		
BAN KHAO BA	05:42z 07Sep2016	1.79m
KO RACHA YAI	05:50z 07Sep2016	2.49m
KO SURIN TAI	06:07z 07Sep2016	1.49m
WEST OF SURAT THANI	06:26z 07Sep2016	2.02m
THUNG WA	06:36z 07Sep2016	0.99m
KO RA WI	06:39z 07Sep2016	0.99m
PULAU LANGKAWI	07:36z 07Sep2016	1.57m
KO LANTA YAI	10:04z 07Sep2016	0.90m
TIMOR-LESTE		
DILI	07:47z 07Sep2016	0.72m
UNITED ARAB EMIRATES		
KALBA	12:00z 07Sep2016	0.80m
ZIGGHY BAY	12:17z 07Sep2016	0.95m
YEMEN		
SOCOTRA ISLAND SOUTH	10:22z 07Sep2016	4.06m
SOCOTRA ISLAND NORTH	10:32z 07Sep2016	2.92m
SOCOTRA ISLAND WEST	10:45z 07Sep2016	1.91m
DAMQAWT	10:49z 07Sep2016	2.49m
AL GHAYDAH AIRPORT	10:59z 07Sep2016	4.20m
HUSWAYN	11:10z 07Sep2016	3.23m
MASILAH WADI	11:23z 07Sep2016	2.32m
ALQUMRAH	11:23z 07Sep2016	2.43m
EAST TO HAMI	11:38z 07Sep2016	1.48m
HARRAH	11:39z 07Sep2016	1.34m
HAMI	11:48z 07Sep2016	2.44m
AL MUKALLA	11:49z 07Sep2016	2.62m
BROM MAYFA	11:54z 07Sep2016	1.53m
RUDUM	11:56z 07Sep2016	1.25m
AHWAR	12:16z 07Sep2016	1.34m
KHANFAR	12:28z 07Sep2016	1.49m
ADEN	12:46z 07Sep2016	1.74m
	12:53z 07Sep2016	1.56m
QAWAH	13:11z 07Sep2016	1.13m
AL MUALLA	13:41z 07Sep2016	0.78m
AT FUZAH	15:29z 07Sep2016	1.04m
BAYT AL FAQIAH	17:58z 07Sep2016	1.18m
YAKHTUL	18:46z 07Sep2016	0.98m
MAWSHIJ	19:02z 07Sep2016	0.75m

4. ADVICE
This bulletin is being issued as advice. Only national/state/local authorities and disaster management officers have the authority to make decisions regarding the official threat and warning status in their coastal areas and any action to be taken in response.

5. UPDATES

Additional bulletins will be issued by IOTWS-TSP INDONESIA for this event as more information becomes available.

Other IOTWS-TSPs may issue additional information at:
IOTWS-TSP AUSTRALIA: http://reg.bom.gov.au/tsunami/rtsp/
IOTWS-TSP INDIA: http://www.incois.gov.in/Incois/tsunami/eqevents.jsp

6. CONTACT INFORMATION
IOTWS-TSP INDONESIA:
THE AGENCY FOR METEOROLOGY CLIMATOLOGY AND GEOPHYSICS (BMKG)
InaTEWS - Indonesian Tsunami Early Warning System
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
P.O. Box 3540 Jakarta
Website: http://rtsp.bmkg.go.id/publicbull.php
http://www.bmkg.go.id
http://inatews.bmkg.go.id
E-Mail: inartsp@bmkg.go.id
monitrtwp@bmkg.go.id

END OF BULLETIN

TEST TEST TEST TEST TEST IOWave-Sep-2016 TEST TEST TEST TEST TEST TEST
TEST TEST TEST TEST IOWave-Sep-2016 TEST TEST TEST TEST TEST

2. Scenario 2 – Makran Trench Sample Tsunami Bulletin Issued by TSP Indonesia

```
TEST TEST TEST TEST TEST IOWave-Sep-2016  TEST TEST TEST TEST TEST
TEST TEST TEST TEST TEST IOWave-Sep-2016  TEST TEST TEST TEST TEST
TSP-InaTEWS-nomorheader
-----------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 5 (TYPE-III)
IOTWS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS-BMKG)
issued at 0800 UTC, Thursday, 08 September 2016
-----------------------------------------------------------------------

... CONFIRMED TSUNAMI THREAT IN THE INDIAN OCEAN ...

This bulletin applies to areas within and bordering the Indian Ocean. It is
issued in support of the UNESCO/IOC Indian Ocean Tsunami Warning and
Mitigation System (IOTWS).

1. EARTHQUAKE INFORMATION (updated)
IOTWS-TSP INDONESIA has detected an earthquake with the following details:

Magnitude  : 9.0 (Mw)
Depth      : 10km
Date       : 08 Sep 2016
Origin Time: 06:00:00 UTC
Latitude   : 24.80N
Longitude  : 62.20E
Location   : Off Coast of Pakistan

2. EVALUATION
Sea level observations have confirmed that a TSUNAMI WAS GENERATED.
Maximum wave amplitudes observed so far:

LOCATION   COUNTRIES   LAT    LON      AMPL(m) TIME(UTC) DATE
-----------------------------------------------------------------------
CHABAHAR    IRAN      25.29N  60.60E     8.0     06:30   Sep 08, 2016
MUSCAT      OMAN     23.63N  58.57E     5.0     06:40   Sep 08, 2016
KARACHI  PAKISTAN    24.81N  66.75E     7.0     07:40   Sep 08, 2016
-----------------------------------------------------------------------

Based on pre-run model scenarios, the zones listed below are POTENTIALLY
UNDER THREAT.

3. TSUNAMI THREAT FOR THE INDIAN OCEAN
The list below shows the forecast arrival time of the first wave estimated
to exceed 0.5m amplitude at the beach in each zone (or a different
threshold nominated by an NTWC), and the amplitude of the maximum beach
wave predicted for the zone. Zones where the estimated wave amplitudes are
less than the threshold amplitude at the beach are not shown.

The list is grouped by country (alphabetic order) and ordered according to
the earliest estimated times of arrival at the beach.

Please be aware that actual wave arrival times may differ from those below,
and the initial wave may not be the largest. A tsunami is a series of waves
and the time between successive waves can be five minutes to one hour.

The threat is deemed to have passed two hours after the forecast time for
last exceedance of the 0.5m threat threshold for a zone. As local
conditions can cause a wide variation in tsunami wave action, CANCELLATION
of national warnings and ALL CLEAR determination must be made by
national/state/local authorities.
```

AUSTRALIA

COCOS ISLAND	14:06z 08Sep2016	0.64m
CHRISTMAS ISLAND	15:08z 08Sep2016	0.62m
CARNARVON	17:35z 08Sep2016	0.92m
HAMELIN POOL	17:37z 08Sep2016	1.18m
BORROW ISLAND	17:43z 08Sep2016	0.90m
YALLINGUP	18:12z 08Sep2016	0.81m
KALBARRI	18:18z 08Sep2016	0.74m
KUDARDUP	18:26z 08Sep2016	1.08m
PORT HEADLAND	18:27z 08Sep2016	0.71m
WINDY HARBOUR	18:48z 08Sep2016	0.77m
DARDANUP	19:25z 08Sep2016	0.73m
LEARMONTH	21:37z 08Sep2016	0.55m
DEGREY	21:37z 08Sep2016	0.53m
WALKAWAY	21:46z 08Sep2016	0.71m
MOONYOONOOKA	22:39z 08Sep2016	0.65m
MANDURAH	22:54z 08Sep2016	0.63m
PADBURY	22:57z 08Sep2016	0.53m
YANCHEP	22:58z 08Sep2016	0.57m
PORT DENISON	23:09z 08Sep2016	0.83m
ROCKINGHAM	23:12z 08Sep2016	0.56m
WINCHESTER	23:27z 08Sep2016	0.62m
IRWIN	23:47z 08Sep2016	0.54m

BRITISH INDIAN OCEAN TERRITORY

MORESBY ISLAND	10:54z 08Sep2016	3.04m
NW EGMONT ISLAND	11:05z 08Sep2016	2.46m
DIEGO GARCIA	11:30z 08Sep2016	2.92m

COMOROS

CHEZANI	12:10z 08Sep2016	1.07m
BAMBAO	12:11z 08Sep2016	1.14m
FOMBONI	12:14z 08Sep2016	1.19m
DZAOUDZI	12:16z 08Sep2016	0.98m

DJIBOUTI

MUHAMMAD ALI BIN FATHA SUMANA	10:55z 08Sep2016	1.74m
NW ARTA	10:59z 08Sep2016	3.66m
ALAILI DADDA	11:20z 08Sep2016	1.28m

FRENCH SOUTHERN AND ANTARCTIC LA

LLE SAINT-PAUL-NORTH	16:20z 08Sep2016	1.63m
LLE SAINT-PAUL-SOUTH	16:36z 08Sep2016	0.94m
AND ANTARCTIC LANDS	18:34z 08Sep2016	3.70m

INDIA

MANDVI	07:47z 08Sep2016	4.59m
DWARKA	07:55z 08Sep2016	4.32m
PORBANDAR	07:57z 08Sep2016	2.75m

VERAVAL	08:13z 08Sep2016	3.69m
AGATTI	08:44z 08Sep2016	4.23m
AMINI	08:48z 08Sep2016	4.89m
KAVARATTI	08:56z 08Sep2016	1.80m
MALVAN BAY	08:58z 08Sep2016	2.53m
PANAJI	09:09z 08Sep2016	2.89m
MINICOY	09:11z 08Sep2016	2.27m
ANDROTH	09:12z 08Sep2016	3.07m
ANJANWEL	09:13z 08Sep2016	3.64m
KARWAR	09:19z 08Sep2016	3.70m
ALIBAG PORT	09:36z 08Sep2016	2.95m
MANGALORE	09:43z 08Sep2016	3.10m
UDUPI	09:45z 08Sep2016	3.34m
VIRAR	09:46z 08Sep2016	3.13m
CHANDRAGIRI FORT	09:46z 08Sep2016	2.96m
MUMBAI	09:49z 08Sep2016	3.46m
AMRELI	09:53z 08Sep2016	3.35m
MADAYI KANNUR	09:54z 08Sep2016	2.95m
MAHUVA	09:55z 08Sep2016	3.32m
ALLEPPEY ALAPPUZHA	09:58z 08Sep2016	2.56m
BORSI	10:00z 08Sep2016	3.33m
MANATTALA	10:01z 08Sep2016	2.69m
TIRURANGADI	10:02z 08Sep2016	2.77m
QUILON	10:02z 08Sep2016	2.65m
BEYPORE	10:04z 08Sep2016	2.80m
COCHIN	10:08z 08Sep2016	2.98m
DAMAN	10:14z 08Sep2016	2.75m
TRIVANDRUM	10:15z 08Sep2016	2.57m
KANYAKUMARI	10:26z 08Sep2016	2.56m
KOODANKULAM	11:03z 08Sep2016	2.42m
RAMESWARAM	11:09z 08Sep2016	1.07m
TUTICORIN	11:29z 08Sep2016	2.22m
KOMATRA AND KATCHAL ISLAND	13:50z 08Sep2016	1.09m
LITTLE ANDAMAN	13:52z 08Sep2016	0.82m
INDIRA POINT	16:00z 08Sep2016	0.92m
NORTH SENTINEL ISLAND	16:19z 08Sep2016	0.97m
CAR NICOBAR	17:38z 08Sep2016	0.75m
FLAT ISLAND	18:23z 08Sep2016	0.67m
PORT BLAIR	19:35z 08Sep2016	0.82m

INDONESIA

SUMUT NIAS BAGIAN BARAT	13:36z 08Sep2016	1.19m
NAD SIMEULUE PULAU SIMEULUE	13:51z 08Sep2016	0.70m
SUMUT NIAS-SELATAN PULAU NIAS	14:05z 08Sep2016	0.99m
NAD ACEH-SINGKIL KEPULAUAN BANYAK	14:15z 08Sep2016	0.91m
SUMBAR KEPULAUAN-MENTAWAI P. SIBERUT	14:15z 08Sep2016	0.91m
SUMUT NIAS-SELATAN PULAU TANABALA	14:17z 08Sep2016	1.03m
NAD ACEH-BESAR BAGIAN BARAT	14:19z 08Sep2016	1.66m
SUMUT NIAS-SELATAN PULAU TANAHMASA	14:22z 08Sep2016	0.81m
SUMBAR KEPULAUAN-MENTAWAI KEP. PAGAI	14:29z 08Sep2016	0.79m
NAD ACEH-SELATAN BAGIAN SELATAN	15:08z 08Sep2016	1.06m
LAMPUNG LAMPUNG-BARAT PESISIR-SELATAN	15:10z 08Sep2016	0.80m
BENGKULU KAUR	15:10z 08Sep2016	0.66m
LAMPUNG LAMPUNG-BARAT PESISIR-UTARA	15:10z 08Sep2016	0.82m
LAMPUNG LAMPUNG-BARAT PESISIR-TENGAH	15:12z 08Sep2016	0.80m
BANTEN PANDEGLANG BAGIAN SELATAN	15:15z 08Sep2016	0.78m
BANTEN PANDEGLANG PULAU PANAITAN	15:16z 08Sep2016	0.53m
BENGKULU SELUMA	15:19z 08Sep2016	1.22m
BENGKULU KOTA-BENGKULU PANTAI-PANJANG	15:19z 08Sep2016	0.84m

BENGKULU BENGKULU-UTARA BAGIAN SELATAN15:28z 08Sep2016 1.12m
LAMPUNG TANGGAMUS PULAU TABUAN 15:30z 08Sep2016 0.77m

(Please note: the rest of the coastal zones for Indonesia is omitted to save space. This note is not part of the bulletin)
……

IRAN

PUSHT	06:00z 08Sep2016	19.10m
BIR	06:09z 08Sep2016	8.61m
MISKI	07:20z 08Sep2016	6.07m
SAR RIG	08:24z 08Sep2016	4.65m
KUSHK SAR	09:48z 08Sep2016	1.09m
ABU MUSA	09:59z 08Sep2016	1.11m
SIRRI	10:52z 08Sep2016	0.70m

KENYA

KIWAYU	11:32z 08Sep2016	1.43m
MALINDI	12:04z 08Sep2016	1.57m
KIPINI	12:06z 08Sep2016	1.12m
TAKAUNGU	12:09z 08Sep2016	1.37m
KISIMACHANDE	12:10z 08Sep2016	1.31m
MVULENI	12:30z 08Sep2016	1.00m

MADAGASCAR

GLORIOSO ISLANDS	11:52z 08Sep2016	1.01m
ANOROTSANGANA	11:58z 08Sep2016	1.58m
VOHEMAR	12:10z 08Sep2016	2.59m
BALY	12:44z 08Sep2016	0.83m
TAMOTAMO	12:51z 08Sep2016	1.05m
JUAN DE NOVA ISLAND	13:16z 08Sep2016	0.61m
TAMPOLO	13:25z 08Sep2016	1.87m
TOAMASINA AIRPORT	13:28z 08Sep2016	1.02m
AMBAHY	13:54z 08Sep2016	1.28m
FARAFAGANA	14:10z 08Sep2016	1.35m
MANANTENINA	14:28z 08Sep2016	0.83m
SAMPONA	15:45z 08Sep2016	0.94m
AMBANJA	21:41z 08Sep2016	0.66m

MALDIVES

KULHUDHUFFUSHI	09:20z 08Sep2016	5.85m
GOIDHOO	09:33z 08Sep2016	4.01m
FERIDHOO	09:37z 08Sep2016	4.49m
KOLHUFUSHI	09:46z 08Sep2016	3.59m
MALE-NORTH	09:52z 08Sep2016	2.44m
DHIYAMIGILI	09:54z 08Sep2016	3.50m
MALE-SOUTH	09:55z 08Sep2016	3.05m
THINADHOO	10:08z 08Sep2016	4.11m
HITHADHOO	10:19z 08Sep2016	2.95m

MAURITIUS

AGALEGA ISLAND	11:43z 08Sep2016	1.49m
LA FERME	13:06z 08Sep2016	1.72m
GRANDE REVIERE SUD EST-WEST	13:12z 08Sep2016	1.16m
CARGADOS CARAJOS	13:24z 08Sep2016	1.31m
GRANDE REVIERE SUD EST-EAST	13:27z 08Sep2016	0.81m

MOZAMBIQUE

MAGANJA	12:23z 08Sep2016	1.40m
MERONVI	12:37z 08Sep2016	1.05m
QUITERAJO	12:39z 08Sep2016	1.07m
TAVARI	12:44z 08Sep2016	1.04m
PEMBA	12:49z 08Sep2016	0.84m
LURIO	12:53z 08Sep2016	1.05m
MURREBUE	12:53z 08Sep2016	0.66m
NANGATA	12:55z 08Sep2016	1.21m
MECUFI	12:56z 08Sep2016	1.00m
MINHAUINE	12:58z 08Sep2016	1.05m
LUMBO	13:00z 08Sep2016	1.01m
MOGINCUAL	13:21z 08Sep2016	0.74m

OMAN

DARSAIT	06:10z 08Sep2016	5.57m
ASSIFAH	06:11z 08Sep2016	11.50m
QALHAT	06:17z 08Sep2016	17.30m
BARKA	06:18z 08Sep2016	6.63m
HAY ASEM	06:23z 08Sep2016	5.90m
AL KHABURAH	06:29z 08Sep2016	6.11m
RASS AL HADD	06:30z 08Sep2016	10.00m
SUHAR	06:39z 08Sep2016	5.36m
MASIRAH	06:51z 08Sep2016	4.70m
ABU GHALAT	06:54z 08Sep2016	5.34m
MUSANDAM	07:13z 08Sep2016	5.60m
JUWAYRAH	07:38z 08Sep2016	3.20m
HASIK	07:47z 08Sep2016	3.05m
MIRBAT	07:53z 08Sep2016	1.61m
SALALAH	08:03z 08Sep2016	1.67m
DHALKUT	08:06z 08Sep2016	3.18m

PAKISTAN

ORMARA	06:00z 08Sep2016	12.07m
WINDER	06:18z 08Sep2016	7.63m
KARACHI	06:59z 08Sep2016	7.19m
SINDH	07:15z 08Sep2016	4.92m

REUNION

SAINT DENIS	13:15z 08Sep2016	1.31m

SEYCHELLES

FREGATE ISLAND	10:33z 08Sep2016	2.61m
ILE DESROCHES	10:50z 08Sep2016	1.82m

ALPHONSE ISLAND	11:04z 08Sep2016	0.94m
TAKAMAKA	11:12z 08Sep2016	3.02m
COETIVY ISLAND	11:13z 08Sep2016	1.33m
ASTOVE ISLAND	11:34z 08Sep2016	0.94m
ALDABRA	11:38z 08Sep2016	1.05m
FARQUHAR GROUP	11:44z 08Sep2016	0.91m

SOMALIA

ABO	09:07z 08Sep2016	3.60m
TOOXIN	09:11z 08Sep2016	3.55m
QANDALA	09:12z 08Sep2016	1.78m
BANDER-BEYLA	09:19z 08Sep2016	2.28m
HADAAFTIMO	09:29z 08Sep2016	1.59m
EYL	09:31z 08Sep2016	2.21m
BOSASO	09:32z 08Sep2016	1.88m
JARIIBAN	09:42z 08Sep2016	2.33m
MAYDH	09:45z 08Sep2016	1.85m
GALDOGOB	09:50z 08Sep2016	2.27m
KABURA	10:01z 08Sep2016	1.92m
XARARDHEERE	10:12z 08Sep2016	2.51m
BAKI	10:20z 08Sep2016	2.12m
CEEL DHEER	10:22z 08Sep2016	2.39m
MAREEG	10:27z 08Sep2016	2.10m
ITALA	10:29z 08Sep2016	1.23m
UARSCIECH	10:36z 08Sep2016	1.60m
SAYLAC	10:42z 08Sep2016	2.38m
MUQDISHO	10:44z 08Sep2016	1.34m
BEYNAX BARRE	10:52z 08Sep2016	1.48m
LOYADO	10:52z 08Sep2016	1.78m
BARAAWE	11:00z 08Sep2016	1.38m
JILIB	11:12z 08Sep2016	1.35m
TURDHO	11:17z 08Sep2016	1.30m
NE BEERNAASI	11:24z 08Sep2016	1.85m
KAAMBOONI	11:29z 08Sep2016	1.50m

SOUTH AFRICA

ELLIOTDALE	21:21z 08Sep2016	0.61m
NGQUELENI	22:16z 08Sep2016	0.51m
LUSIKISIKI	22:21z 08Sep2016	0.66m
ZIKHOVA	22:27z 08Sep2016	0.52m
KELSO	22:55z 08Sep2016	0.50m
WILLOWVALE	22:55z 08Sep2016	0.52m

SRI LANKA

COLOMBO	10:41z 08Sep2016	1.76m
AMBALANGODA	10:43z 08Sep2016	1.69m
NEGOMBO	10:44z 08Sep2016	0.99m
BERUWALA	10:51z 08Sep2016	1.33m
MORATUWA	10:52z 08Sep2016	1.52m
GALLE	10:54z 08Sep2016	1.41m
MATARA	10:55z 08Sep2016	2.28m
MANNAR ISLAND	10:57z 08Sep2016	0.95m
MUNDAL LAKE	11:00z 08Sep2016	0.82m
TANGALLA	11:00z 08Sep2016	1.10m
MUSALI	11:13z 08Sep2016	0.80m

HAMBANTOTA	11:33z 08Sep2016	1.01m
KIRINDA	14:23z 08Sep2016	1.12m
POTTUVIL	15:31z 08Sep2016	0.72m
OKANDA	17:12z 08Sep2016	0.72m

TANZANIA

VUMBA	12:01z 08Sep2016	1.07m
ZANZIBAR	12:10z 08Sep2016	1.17m
VUMBI	12:10z 08Sep2016	1.38m
KUTANI	12:18z 08Sep2016	1.30m
JIMBO	12:19z 08Sep2016	1.55m
GAZIJA	12:20z 08Sep2016	0.78m
SONGO SONGO ISLAND	12:21z 08Sep2016	1.18m
MSASANI	12:23z 08Sep2016	1.38m
MADANGWA	12:25z 08Sep2016	1.48m
RUVU	12:26z 08Sep2016	1.58m
WEST TO KONDE	12:28z 08Sep2016	1.28m
BOMALANDNI	12:33z 08Sep2016	0.98m
BAGAMOYO	12:37z 08Sep2016	0.97m

UNITED ARAB EMIRATES

KALBA	06:46z 08Sep2016	4.93m
ZIGGHY BAY	07:02z 08Sep2016	5.58m
ALDAREH	09:54z 08Sep2016	1.88m
AL HELIO	10:16z 08Sep2016	1.80m
DEIRA	11:00z 08Sep2016	2.78m
SIR BU NUAYR	11:41z 08Sep2016	0.72m
AL SMALIYAH	11:44z 08Sep2016	2.16m
DAS ISLAND	20:45z 08Sep2016	0.80m

YEMEN

DAMQAWT	08:17z 08Sep2016	2.05m
SOCOTRA ISLAND SOUTH	08:19z 08Sep2016	2.93m
AL GHAYDAH AIRPORT	08:26z 08Sep2016	3.53m
SOCOTRA ISLAND NORTH	08:28z 08Sep2016	2.73m
HUSWAYN	08:42z 08Sep2016	2.66m
SOCOTRA ISLAND WEST	08:42z 08Sep2016	2.40m
ALQUMRAH	08:52z 08Sep2016	2.68m
MASILAH WADI	09:01z 08Sep2016	2.15m
HARRAH	09:04z 08Sep2016	2.76m
EAST TO HAMI	09:07z 08Sep2016	1.63m
HAMI	09:17z 08Sep2016	3.84m
AL MUKALLA	09:20z 08Sep2016	3.48m
BROM MAYFA	09:26z 08Sep2016	1.85m
RUDUM	09:32z 08Sep2016	1.52m
AHWAR	09:53z 08Sep2016	1.43m
KHANFAR	10:08z 08Sep2016	3.15m
ADEN	10:26z 08Sep2016	3.12m
	10:32z 08Sep2016	2.78m
QAWAH	10:51z 08Sep2016	1.73m
AL MUALLA	11:19z 08Sep2016	1.22m
YAKHTUL	12:04z 08Sep2016	0.86m
MAWSHIJ	12:59z 08Sep2016	0.83m
AT FUZAH	13:02z 08Sep2016	1.03m
BAYT AL FAQIAH	13:38z 08Sep2016	1.04m

AL HUDAYDAH	19:59z 08Sep2016	0.65m
AL MAN SURIYAH	20:08z 08Sep2016	0.54m

4. ADVICE
This bulletin is being issued as advice. Only national/state/local authorities and disaster management officers have the authority to make decisions regarding the official threat and warning status in their coastal areas and any action to be taken in response.

5. UPDATES
Additional bulletins will be issued by IOTWS-TSP INDONESIA for this event as more information becomes available.

Other IOTWS-TSPs may issue additional information at:
IOTWS-TSP AUSTRALIA: http://reg.bom.gov.au/tsunami/rtsp/
IOTWS-TSP INDIA: http://www.incois.gov.in/Incois/tsunami/eqevents.jsp

6. CONTACT INFORMATION
IOTWS-TSP INDONESIA:
THE AGENCY FOR METEOROLOGY CLIMATOLOGY AND GEOPHYSICS (BMKG)
InaTEWS - Indonesian Tsunami Early Warning System
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
P.O. Box 3540 Jakarta
Website: http://rtsp.bmkg.go.id/publicbull.php
http://www.bmkg.go.id
http://inatews.bmkg.go.id
E-Mail: inartsp@bmkg.go.id
monitrtwp@bmkg.go.id

APPENDIX III. SAMPLE PRESS RELEASE

TEMPLATE FOR NEWS RELEASE - USE AGENCY LETTERHEAD

Contact: *(insert name)* **FOR IMMEDIATE RELEASE** *(insert phone number) (insert date) (insert email address)*

INDIAN OCEAN-WIDE TSUNAMI EXERCISE SET FOR SEPTEMBER 2016

(insert country name) will join over 20 other countries around the Indian Ocean Rim as a participant in mock tsunami scenarios on 7th and 8th September 2016. *(insert country name)* will exercise the Sumatra scenario on 7th September and/or Makran Trench scenario on 8th September *(select appropriate scenario(s))*.

The purpose of this Indian Ocean-wide exercise is to increase tsunami preparedness, evaluate response capabilities in each country and improve coordination throughout the region. The aim is to exercise all levels of the tsunami warning and response chain, with a primary focus on the local coastal community level.

"The 2004 Indian Ocean tsunami and subsequent events in the Indian and Pacific Oceans have brought to the attention of the world the urgent need to be more prepared for such events," said *(insert name of appropriate official)*. "This important exercise will test the current procedures of the Indian Ocean Tsunami Warning and Mitigation System and help identify operational strengths and weaknesses in each country."

The exercise, titled Exercise Indian Ocean Wave 2016 (IOWave16), will simulate Indian Ocean countries being put into a Tsunami Warning situation requiring government decision-making. It builds on previous Indian Ocean exercises conducted in 2009 (IOWave09), 2011 (IOWave11) and 2014 (IOWave14) *and on prior national tsunami warning drills carried out on (dates) (delete if not applicable)*.

During the exercise the three Tsunami Service Providers (TSPs) of Australia, India and Indonesia will provide simulated tsunami threat information to all National Tsunami Warning Centres (NTWCs) in the Indian Ocean region. Each NTWC will then evaluate the information and formulate test national tsunami warnings, which will be disseminated to the disaster response agencies and coastal communities participating in the exercise. *Due care will be taken to ensure the public is not inadvertently alarmed (delete if not applicable).*

Insert paragraph tailored for specific country. Could identify participating agencies and specific plans. Could describe current early warning programme, past evacuation drills (if any), ongoing mitigation and public education programmes, 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 exercise will be terminated.

Following the exercise, a review and evaluation will be conducted by all participating countries and agencies.

"We see this exercise as an essential element in the routine maintenance of the Indian Ocean Tsunami Warning and Mitigation System," said *(insert name of appropriate official)*.
"Our goal is to ensure the timely and effective notification of tsunamis, to educate communities at risk about safety preparedness, and to improve our overall coordination. We

will evaluate what works well, where improvements are needed, make necessary changes, and continue to practice."

The exercise is in the Work Plan of the Intergovernmental Coordination Group of the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS). ICG/IOTWMS is a body of UNESCO's Intergovernmental Oceanographic Commission.

IOWave16 Information: http://www.ioc-unesco.org/IOWave16.

APPENDIX IV. EXERCISE FORMAT

TYPES OF EXERCISE

1. **An Orientation Exercise** lays the groundwork for a comprehensive exercise programme. It is a planned event, developed to bring together individuals and officials with a role or interest in multi-hazard response planning, problem solving, development of standard operational procedures (SOPs), and resource integration and coordination. An Orientation Exercise will have a specific goal and written objectives and result in an agreed upon Plan of Action.
2. **A Drill** is a planned activity that tests, develops, and/or maintains skills in a single or limited emergency response procedure. Drills generally involve operational response of single departments or agencies, organizations, or facilities, but may be a subset of full-scale exercises. Drills can involve internal notifications and/or field activities. Limited evacuation may or may not be conducted, such as within a school, pilot hotel, or village.
3. **A Tabletop Exercise** is a planned activity in which local officials, key staff, and organizations with disaster management responsibilities are presented with simulated emergency situations. It is usually informal, in a conference room environment, and is designed to elicit constructive discussion from the participants to assess plans, policies, and procedures. Individuals are encouraged to discuss decisions based on their organization's Standard Operating Procedures (SOPs) with emphasis on slow-paced problem solving, rather than rapid, real-time decision-making. A Tabletop Exercise should have specific goals, objectives, and a scenario narrative.
4. **A Functional Exercise** is a planned activity designed to test and evaluate individual functions, multiple activities within a function, or interdependent groups of functions among various agencies. It is based on a simulation of a realistic emergency situation. The Functional Exercise gives the decision-makers a fully simulated experience of being in a major disaster event. It should take place at the appropriate coordination locations (e.g. warning centres and emergency operations centres) and activate all the appropriate members designated by the plan. Organisations should test their SOPs using real-time simulation tsunami bulletins. Public evacuations may or may not be included. A Functional Exercise should have specific goals, objectives, and a scenario narrative.
5. **A Full-scale Exercise** is the culmination of a progressive exercise programme that has grown with the capacity of the community to conduct exercises. A Full-Scale exercise is a planned activity in a "challenging" environment that encompasses a majority of the tsunami warning and emergency management functions, and involves multiple layers of government (national, provincial, local). This type of exercise involves the actual mobilization and deployment of the appropriate personnel and resources needed to demonstrate operational capabilities. DMOs (Disaster Management Office) and other local command centres are required to be activated. It tests all aspects of emergency response, and should demonstrate inter-agency cooperation. A Full-scale exercise is the largest, costliest and most complex exercise type. It may or may not include public evacuations.

NATIONAL EXERCISE EVALUATION

It is recommended that both a hot and a cold debrief be held following the exercise. Held immediately after an exercise, a hot debrief is an opportunity for all participants to provide feedback while the exercise is still fresh in their minds. A suggested format for this is:

- Have a short break for about 10 minutes after the end of the exercise.
- The in-country/agency Exercise Director gives his or her initial feedback.
- Obtain participant round-table feedback.
- Evaluators provide their feedback.
- Provide appropriate acknowledgements.

A cold debrief is a more formal debrief held within four weeks following the exercise. The debrief process should include:

- What happened during the exercise?
- What went well?
- What needs improvement?
- What plans, procedures or training programmes need amendments?
- What follow up is required, including identifying any capability gaps for future capacity building?
- Was the exercise realistic?
- How could the exercise have been improved?

APPENDIX V. POST-EXERCISE EVALUATION

IOWave16 Post Exercise Evaluation

General Instructions

The evaluation will take approximately 60-90 minutes to complete assuming that the answers have already been collected and only one scenario has been exercised.

If both scenarios have been exercised, the respondent can choose which scenario he/she wishes to complete the survey for first and then complete the survey for the second scenario at a later time.

It is possible to exit a partially completed survey for completion at a later time. Simply exit the survey and use the link provided to you by email to access it again when you are ready to answer more questions. In this way you can complete the survey at your own pace and go back to amend responses if necessary.

The last page of the survey is marked, "End of Survey". Following this you will be directed to the "Thank You" page and then to the IOC UNESCO Exercise Indian Ocean Wave 2016 webpage.

Please complete and submit the online survey by **30 September 2016**.

Any questions can be directed to the ICG/IOTWMS Secretariat (email: iotws@unesco.org).

Exercise Objectives

There are six (6) core objectives that the IOWave16 Post Exercise Evaluation will evaluate.

The **Objective 1, 2 and 3** survey questions are to be completed by National Tsunami Warning Centres (NTWCs):

- **Objective 1:** Validate the dissemination by Tsunami Service Providers (TSPs) of Tsunami Bulletin Notification Messages to NTWCs via Tsunami Watch Focal Points (TWFPs) of Indian Ocean countries and the reception by NTWCs of the TSP messages.
- **Objective 2:** Validate the access by NTWCs to the tsunami bulletins and other products on the TSP websites, and the use of that information for the production of national warnings.
- **Objective 3:** Validate the reporting by NTWCs to the TSPs of their National Tsunami Warning status.

The **Objective 4 and 5** survey questions are to be completed by Disaster Management Organisations (DMOs) and/or NTWCs depending how tsunami response roles are structured within a particular country:

- **Objective 4:** Validate the SOPs within countries for generating and disseminating tsunami warnings to their relevant disaster response agencies, media, and the public.
- **Objective 5:** Validate the SOPs within countries for the issuing of public safety messages, ordering evacuations and where possible issuing all-clear messages.

The **Objective 6** survey question are to be completed by all DMOs regardless of whether evacuations were conducted or not.

- **Objective 6:** Validate the level of community awareness, preparedness and response.

Member State Details

Country

Details of National Contact for Exercise IOWave16

Name

Position

Agency

Email

Phone

Is there a second National Contact for Exercise IOWave16 in your country?

- Yes
- No

If *yes*, please provide the details of the second National Contact for Exercise IOWave16.

Name

Position

Agency

Email

Phone

Scenarios Exercised

Which scenarios did your country exercise?
(Select one or both.)

- [ ] Sumatra scenario, 7 September 2016
- [ ] Makran Trench scenario, 8 September 2016

Level of Participation

Please indicate if the following statements reflect your level of in-country participation.

	Yes	No
National disaster management organisations were involved.	○	○
Local disaster management organisation(s) participated.	○	○
Media representatives participated	○	○
The community was involved (not necessarily evacuation).	○	○
Public evacuation drills were conducted.	○	○

Comments

Please indicate the type of exercise(s) conducted.
Refer to Appendix III in the Exercise Manual for a description of the types of exercise.
(More than 1 option can be selected.)

- [ ] Orientation Exercise
- [ ] Drill
- [ ] Tabletop Exercise
- [ ] Functional Exercise
- [ ] Full Scale Exercise

Comments

Objective 1: Validate the dissemination by TSPs of Tsunami Bulletin Notification Messages to NTWCs via TWPFs of Indian Ocean countries and the reception by NTWCs of the TSP Messages.

Page description:
To be completed by NTWCs

1(a) Name of NTWC (organisational name)

1(b) For each of the four notification message delivery mediums was the information received in a timely manner for you to carry out your warning response SOPs.

	GTS	Fax	Email	SMS
TSP Australia	Received in time Received late Not received	Received in time Received late Not received	Received in time Received late Not received	Received in time Received late Not received
TSP India	Received in time Received late Not received	Received in time Received late Not received	Received in time Received late Not received	Received in time Received late Not received
TSP Indonesia	Received in time Received late Not received	Received in time Received late Not received	Received in time Received late Not received	Received in time Received late Not received

Comments

1(c) Please provide the **TSP Australia** notification message receipt times in UTC.

	GTS Time Received (UTC)	**Fax** Time Received (UTC)	**Email** Time Received (UTC)	**SMS** Time Received (UTC)
xx:xx Announcement Message				
xx:xx Notification Message				

Notification Message 1				
xx:xx Notification Message 2				
xx:xx Notification Message 3				
xx:xx Notification Message 4				
xx:xx Notification Message 5				
xx:xx Notification Message 6				
xx:xx Notification Message 7				
xx:xx Notification Message 8				
xx:xx Notification Message 9				
xx:xx Notification Message 10				
xx:xx Notification Message 11				
xx:xx Notification Message 12				
xx:xx				

xx:xx Notification Message 13				
xx:xx Notification Message 14				
xx:xx Notification Message 15				

1(d) Please provide the **TSP India** notification message receipt times in UTC.

	GTS Time Received (UTC)	**Fax** Time Received (UTC)	**Email** Time Received (UTC)	**SMS** Time Received (UTC)
xx:xx Announcement Message				
xx:xx Notification Message 1				
xx:xx Notification Message 2				
xx:xx Notification Message 3				
xx:xx Notification Message 4				
xx:xx Notification Message 5				
xx:xx Notification Message 6				

xx:xx Notification Message 7				
xx:xx Notification Message 8				
xx:xx Notification Message 9				
xx:xx Notification Message 10				
xx:xx Notification Message 11				
xx:xx Notification Message 12				
xx:xx Notification Message 13				
xx:xx Notification Message 14				
xx:xx Notification Message 15				

1(e) Please provide the **TSP Indonesia** notification message receipt times in UTC.

	GTS Time Received (UTC)	**Fax** Time Received (UTC)	**Email** Time Received (UTC)	**SMS** Time Received (UTC)
xx:xx Announcement Message				

xx:xx Notification Message 1				
xx:xx Notification Message 2				
xx:xx Notification Message 3				
xx:xx Notification Message 4				
xx:xx Notification Message 5				
xx:xx Notification Message 6				
xx:xx Notification Message 7				
xx:xx Notification Message 8				
xx:xx Notification Message 9				
xx:xx Notification Message 10				
xx:xx Notification Message 11				
xx:xx Notification Message 12				

xx:xx Notification Message 13				

Objective 2: Validate the access by NTWCs to the tsunami bulletins and other products on the TSP websites, and the use of that information for the production of national warnings.

Page description:
To be completed by NTWCs

2(a) Please indicate which TSP exchange products you accessed on the password-protected websites.

	Bulletins	Coastal Zone Threat Map	Threat Table	Maximum Amplitude Map	Tsunami Travel Time (TTT) Map
TSP Australia	Yes / No / Unable to access	Yes / No / Unable to access	Yes / No / Unable to access	Yes / No / Unable to access	Yes / No / Unable to access
TSP India	Yes / No / Unable to access	Yes / No / Unable to access	Yes / No / Unable to access	Yes / No / Unable to access	Yes / No / Unable to access
TSP Indonesia	Yes / No / Unable to access	Yes / No / Unable to access	Yes / No / Unable to access	Yes / No / Unable to access	Yes / No / Unable to access

Were any other TSP exchange products (e.g. Spatial Files) accessed on the password-protected websites?

2(b) Was tsunami threat information from TSP websites (bulletins and other products) **used** in the production of your national warnings?

- Yes
- No

If *yes*, please indicate which information was used:

	Tsunami Wave Observations	Predicted Wave Arrival Times				Predicted Maximum Wave Amplitudes	Coastal Forecast Zone Threat Levels	Other
		T1	T2	T3	T4			
TSP Australia	☐	☐	☐	☐	☐	☐	☐	☐
TSP India	☐	☐	☐	☐	☐	☐	☐	☐
TSP Indonesia	☐	☐	☐	☐	☐	☐	☐	☐

Comments

If *no*, please comment why the tsunami threat information from the TSP websites was not used.

Objective 3: Validate the reporting by NTWCs to the TSPs of their National Tsunami Warning status.

Page description:
To be completed by NTWCs

3(a) Did your NTWC send reports of its warning status to the TSPs?

- Yes
- No

3(b) If *yes*, at what time (UTC) did the NTWC first report its status?

3(c) If *yes*, how many status reports did the NTWC send to the TSPs?

If *no*, why did your NTWC not report its warning status on a TSP website?

Objective 4: Validate the SOPs within countries for generating and disseminating tsunami warnings to their relevant disaster response agencies, media, and the public.

Page description:
To be completed by DMOs and/or NTWCs as appropriate.

The following section is designed to assess who is responsible for generating and disseminating tsunami warnings and information to five types of recipients:

1. National Disaster Management Organisation (NDMO)
2. Local Disaster Management Organisation - Provincial/Regional (LDMO-P)
3. Local Disaster Management Organisation - City/District (LDMO-C)
4. Media
5. Public

4(a) In the following table, please indicate who is responsible for the generation and dissemination of tsunami warnings and information to each recipient listed in the left-hand column, and if exercised, the details of the warning delivery.

	Who sends tsunami messages to you? (e.g. NTWC, NDMO, LDMO-P, LDMO-C and/or media)	Number of messages sent	Time of 1st message	Time of last message sent	Methods of delivery (e.g. email, webpage, sms, fax, phone, tv, radio)	Were the messages received in a timely manner?
NDMO						Yes No n/a
LDMO-P						Yes No n/a
LDMO-C						Yes No n/a
Media						Yes No n/a
Public						Yes No n/a

Comments

4(b) How well did your SOPs perform for generating and disseminating tsunami warnings within your country?

- extremely well
- very well
- well
- poor

Comments

Objective 5: Validate the SOPs within countries for the issuing of public safety messages, ordering evacuations and where possible issuing all-clear messages.

Page description:
To be completed by DMOs and/or NTWCs as appropriate.

Agency abbreviations used are:

1. National Tsunami Warning Centre (NTWC)
2. National Disaster Management Organisation (NDMO)
3. Local Disaster Management Organisation - Provincial/Regional (LDMO-P)
4. Local Disaster Management Organisation - City/District (LDMO-C)

5(a) Were **public safety messages** issued during the exercise? Public safety messages provide information about the tsunami threat and appropriate actions to take for each level of threat, but do not include evacuation orders or all-clear messages.

- Yes
- No

If *yes*, please complete to following table for **public safety messages** issued during the exercise.
(Complete one row for each agency/authority that issued public safety messages as required.)

	Name of agency/authority that issues public safety messages	Agency type	Time message issued (UTC)	Communication method (e.g. email, webpage, sms, fax, phone, tv, radio)	Were there any communication problems?
1.		NTWC NDMO LDMO-P LDMO-C Other			Yes No
2.		NTWC NDMO LDMO-P LDMO-C Other			Yes No
3.		NTWC NDMO LDMO-P LDMO-C Other			Yes No
4.		NTWC NDMO LDMO-P LDMO-C Other			Yes No
5.		NTWC NDMO LDMO-P LDMO-C Other			Yes No

The table below is a continuation of the previous table from the right-most column. In the online survey, there will be only one continuous table. Please complete each row in accordance with the agency/authority listed in the same row of the the previous table.

	Content of message	Reason message issued	Comments
1.			
2.			
3.			
4.			
5.			

5(b) Were **evacuation orders** issued during the exercise?

- Yes
- No

If *yes*, please complete to following table for **evacuation orders** issued during the exercise.
(Complete one row for each agency/authority that issued public safety messages as required.)

	Name of agency/authority that issues evacuation orders	Agency type	Time message issued (UTC)	Communication method (e.g. email, webpage, sms, fax, phone, tv, radio)	Were there any communication problems?
1.		NTWC NDMO LDMO-P LDMO-C Other			Yes No
2.		NTWC NDMO LDMO-P LDMO-C Other			Yes No
3.		NTWC NDMO LDMO-P LDMO-C Other			Yes No
4.		NTWC NDMO LDMO-P LDMO-C Other			Yes No
5.		NTWC NDMO LDMO-P LDMO-C Other			Yes No

The table below is a continuation of the previous table from the right-most column. In the online survey, there will be only one continuous table. Please complete each row in accordance with the agency/authority listed in the same row of the the previous table.

	Content of message	Reason message issued	Comments
1.			
2.			
3.			
4.			
5.			

5(c) Were **all-clear messages** issued during the exercise?

- Yes
- No

If *yes*, please complete to following table for **all-clear messages** issued during the exercise.
(Complete one row for each agency/authority that issued public safety messages as required.)

	Name of agency/authority that issues all-clear messages	Agency type	Time message issued (UTC)	Communication method (e.g. email, webpage, sms, fax, phone, tv, radio)	Were there any communication problems?
1.		NTWC NDMO LDMO-P LDMO-C Other			Yes No
2.		NTWC NDMO LDMO-P LDMO-C Other			Yes No
3.		NTWC NDMO LDMO-P LDMO-C Other			Yes No
4.		NTWC NDMO LDMO-P LDMO-C Other			Yes No
5.		NTWC NDMO LDMO-P LDMO-C Other			Yes No

The table below is a continuation of the previous table from the right-most column. In the online survey, there will be only one continuous table. Please complete each row in accordance with the agency/authority listed in the same row of the the previous table.

	Content of message	Reason message issued	Comments
1.			
2.			
3.			
4.			
5.			

Objective 6: Validate the level of community awareness, preparedness and response.

Page description:
To be completed by all DMOs regardless of whether evacuations were conducted or not.

6(a) Have there been any pre-exercise community preparedness activities?

- Yes
- No

If *yes*, what were the community preparedness activities?
(Select all that apply.)

- [ ] Tsunami exercise
- [ ] Tsunami education in schools
- [ ] Participatory evacuation planning
- [ ] Community education seminars
- [ ] Evacuation maps
- [ ] Evacuation signage
- [ ] Shelter facilities
- [ ] Other - Write In

6(b) Has there been any government support with regard to the following prior to the exercise?

	Yes	No
Tsunami signage	○	○
Vertical evacuation shelters	○	○
Hazard mapping	○	○
Tsunami inundation mapping	○	○
Evacuation route mapping	○	○
Enter another option	○	○

6(c) Were community evacuations conducted in any areas?

- Yes
- No

If *yes*, please answer the following questions for each community that evacuated.

6(d) Location of evacuation (name of town or community):

6(e) Please rank the following from 1 (none), 2 (low), 3 (high) to 4 (very high) in regard to the community that evacuated.

	1	2	3	4
Availability of tsunami risk assessment information such as inundation/evacuation maps	☐	☐	☐	☐
The level of community awareness of the local tsunami risk	☐	☐	☐	☐

6(f) Have community members received any prior evacuation training?

- Yes
- No

Comments

6(g) Are there SOPs for community evacuation in place?

- ○ Yes
- ○ No

If yes, please provide the details.

6(h) How were community members notified that an evacuation order was issued? (Select all that apply.)

- ☐ Siren
- ☐ Door-to-door
- ☐ Public announcement
- ☐ Radio / TV
- ☐ Mobile Phone / Social Media
- ☐ Evacuation time set prior to the exercise
- ☐ Other - Write In

6(i) What time did the community receive the evacuation notification? (Specify UTC or local time.)

6(j) At what time was the evacuation? (Specify UTC or local time.)

6(k) What is the estimated number of people that evacuated?

6(l) Who evacuated? (Select all that apply.)

- [ ] Beachgoers
- [ ] Boat Users
- [ ] Home Residents
- [ ] Businesses
- [ ] Schools
- [ ] Hospitals
- [ ] Elderly Peoples Homes
- [ ] Hotels
- [ ] Other - Write In

6(m) Where did the evacuees go to?

6(n) Did the community receive an all-clear message?

- Yes
- No

If *yes*, at what time did the community receive the all-clear message? (Specify UTC or local time.)

6(o) At what time did the people return to their residences? (Specify UTC or local time.)

6(p) Did the evacuation process happen smoothly?

- Yes
- No

If *no*, please provide the details of the problems encountered during evacuation.

6(q) How could future evacuation exercises be improved?

General Questions

7(a) Please rank the following from 1 (poor), 2 (good), 3 (very good) to 4 (extremely good).

	1	2	3	4
Exercise planning and communication with Member States: Timeliness and usefulness of information provided by the ICG/IOTWMS Secretariat.	☐	☐	☐	☐
Exercise documentation: Manual, websites, bulletins	☐	☐	☐	☐
Exercise format and style: Real-time operation, exercise messages similar to real event	☐	☐	☐	☐
Exercise evaluation	☐	☐	☐	☐

Comments

7(b) Our country benefited from the exercise by:

1.

2.

3.

7(c) Future exercises could be improved by:

1.
2.
3.

7(d) Our country used exercise observers?

- ○ Yes
- ○ No

If yes, please rank the following from 1 (poor), 2 (good), 3 (very good) to 4 (extremely good).

	1	2	3	4
Feedback provided by the exercise observers	☐	☐	☐	☐
Information for the evaluation provided by the exercise observers	☐	☐	☐	☐

Comments

End of Survey

Thank You!

Thank you for completing the IOWave16 Post Exercise Evaluation.

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 Interealibration 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 Bathymerographs 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 *Pacem in Maribus* 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 1'exploitation des pêcheries maritimes au Cameroun et leur gestion intégrée dans la sous-région du Golfe de Guinée *(cancelled)*	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 (8th 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 (9th 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 (10th 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 (11th 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 (12th training-through-research cruise, June-August 2002). 2003	E only
68	Interdisciplinary Studies of North Atlantic and Labrador Sea Margin Architecture and Sedimentary Processes (13th 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 (14th 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 (2nd Revision). 2009	E only
72	Deep-water Cold Seeps, Sedimentary Environments and Ecosystems of the Black and Tyrrhenian Seas and the Gulf of Cadiz (15th 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 *(electronic only)*	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 (16th 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.	*Cancelled*	
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	*Electronic publication*

(continued)

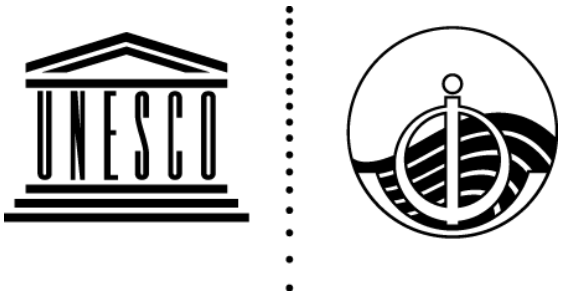
87.	Operational Users Guide for the Pacific Tsunami Warning and Mitigation System (PTWS) – Second Edition. 2011	E only
88.	Exercise Indian Ocean Wave 2009 (IOWave09) – An Indian Ocean-wide Tsunami Warning and Communication Exercise – 14 October 2009. 2009	E only
89.	Ship-based Repeat Hydrography: A Strategy 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	*Under preparation*
92.	27 February 2010 Chile Earthquake and Tsunami Event – Post-Event Assessment of PTWS Performance (Pacific Tsunami Warning System). 2010	E only
93.	Exercise CARIBE WAVE 11 / LANTEX 11—A Caribbean Tsunami Warning Exercise, 23 March 2011	
	Vol. 1 Participant Handbook / Exercise CARIBE WAVE 11 —Exercice d'alerte au tsunami dans les Caraïbes, 23 mars 2011. Manuel du participant / Ejercicio Caribe Wave 11. Un ejercicio de alerta de tsunami en el Caribe, 23 de marzo de 2011. Manual del participante. 2010	E/F/S
	Vol. 2 Report. 2011	E only
	Vol. 3 Supplement: Media Reports. 2011	E/F/S
94.	Cold seeps, coral mounds and deep-water depositional systems of the Alboran Sea, Gulf of Cadiz and Norwegian continental margin (17th training-through-research cruise, June–July 2008)	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 Educations 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, 2nd edition: revised and expanded. 2016	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.	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	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 Vol 2: Areas Beyond National Jurisdiction	E only
120.	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	*In preparation*
121.	Exercise Indian Ocean Wave 14, an Indian Ocean wide Tsunami Warning and Communications Exercise, 9–10 September 2014	*In preparation*
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)	*In preparation*
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

(continued)

126	Exercise Pacific Wave 16. A Pacific-wide Tsunami Warning and Enhanced Products Exercise, 1-5 February 2016. Volume 1: Exercise Manual.	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: Evaluation report (with supplements)	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	E only
132.	*In preparation*	
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	E only

Intergovernmental Oceanographic Commission
Technical Series
128



EXERCISE INDIAN OCEAN WAVE 16
An Indian Ocean-wide Tsunami Warning and Communications Exercise

7-8 September 2016

Volume 2 Exercise Report

UNESCO

Intergovernmental Oceanographic Commission
Technical Series
128

EXERCISE INDIAN OCEAN WAVE 16
An Indian Ocean-wide Tsunami Warning and Communications Exercise

7-8 September 2016

Volume 2 Exercise Report

UNESCO 2017

IOC Technical Series, 128 Vol.2
Perth, July 2017
English only

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

Intergovernmental Oceanographic Commission. 2017. *Exercise Indian Ocean Wave 16. An Indian Ocean-wide Tsunami Warning and Communications Exercise, 7- 8 September 2016. Volume 2: Exercise Report*. IOC Technical Series No. 128. Perth, UNESCO.

Prepared by the Exercise IOWave16 Task Team for the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System.

(IOC/2016/TS/128 Vol.2)

TABLE OF CONTENTS

page

ANNEXES

EXECUTIVE SUMMARY

The Indian Ocean tsunami of 26 December 2004 was one of the most devastating natural disasters ever, in which over 230,000 people were killed and more than 1 million people were displaced. Recognising the need for a tsunami early warning system in the Indian Ocean region, the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS) was set up in 2005 as a subsidiary body of the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO), with the purpose of establishing a tsunami early warning and mitigation system to cater to the needs of member countries in the Indian Ocean region. At that time, arrangements were also put in place for the Pacific Tsunami Warning Center (PTWC) in Hawaii and the Japanese Meteorological Agency (JMA) in Tokyo to commence provision of an Interim Advisory Service (IAS) for the Indian Ocean, pending the establishment of the IOTWMS.

The Tsunami Service Providers (TSPs) of Australia, India and Indonesia commenced providing service for the Indian Ocean on 12 October 2011, coincident with Exercise Indian Ocean Wave 11 (IOWave11). From 31 March 2013 the TSPs of Australia, India and Indonesia assumed full operational responsibility and the IAS provided by PTWC and JMA ceased.

The IOTWMS works as a “system of systems” with three (3) TSPs generating tsunami advisory products simultaneously and making them available to the National Tsunami Warning Centres (NTWCs) of the Indian Ocean countries. It remains the responsibility of NTWCs to issue tsunami warnings for their countries. The tsunami warning centres of Australia, India and Indonesia have built up their capabilities for provision of Indian Ocean-wide tsunami advice and are the designated TSPs for the Indian Ocean region. The ICG/IOTWMS also focuses on enhancing the capacities of the NTWCs to modify their Standard Operating Procedures (SOPs) to handle the products being generated by the TSPs.

The Exercise Indian Ocean Wave 16 (IOWave16, IOC/2016/TS/128Vol.1) was conducted on 7 and 8 September 2016 to evaluate and improve the effectiveness of the IOTWMS and its operational TSPs, NTWCs, and Disaster Management Organisations (DMOs), in responding to potentially destructive tsunamis. It also provided an opportunity for Indian Ocean countries to test their communication methods and review their SOPs, tsunami emergency response plans and tsunami emergency preparedness. The exercise included community evacuation drills, involving around 60,000 participants, in Australia, Comoros, India, Indonesia, Iran, Kenya, Mauritius, Oman, Pakistan, Seychelles, Sri Lanka and Timor Leste.

The exercise highlighted both the strengths and weaknesses of the IOTWMS, identified areas requiring further attention, and provided a benchmark of the present status of the system. The three (3) designated TSPs and twenty-four (24) Member States with designated Tsunami Warning Focal Points (TWFPs) participated, with twelve (12) countries taking the exercise down to the community level, and all countries providing feedback via a post-exercise survey questionnaire.

The objectives of the exercise were to:

1. Validate the dissemination by TSPs of Tsunami Bulletin Notification Messages to NTWCs via Tsunami Warning Focal Points (TWFPs) of Indian Ocean countries and the reception by NTWCs of the TSP messages.
2. Validate the access by NTWCs to the tsunami bulletins and other products on the TSP websites, and the use of that information for the production of national warnings.
3. Validate the reporting by NTWCs to the TSPs of their National Tsunami Warning Status.

4. Validate the SOPs within countries for generating and disseminating tsunami warnings to their relevant emergency response agencies, media and the public.
5. Validate the SOPs within countries for the issuing of public safety messages, ordering evacuations and where possible issuing all-clear messages.
6. Validate the level of community awareness, preparedness and response.

Key Findings

Exercise Participation

Exercise IOWave16 comprised, for the second time in Indian Ocean exercises, two earthquake scenarios on successive days. All twenty-four (24) IOTWMS Member States participated in either one or both IOWave16 scenarios. Eleven (11) Member States participated in only the Sumatra scenario on day 1 and nine (9) Member States participated in only the Makran scenario on day 2. Four (4) Member States participated in both scenarios.

Twenty-two countries (92%) included national disaster management organisations in the exercise; nineteen countries (79%) included local disaster management organisations; fifteen counties (63%) had media representative participate; and twelve countries (50%) conducted public evacuation drills. In total, nearly 60,000 people were evacuated during IOWave16 with 40,000 of these being in India.

Objectives 1-3: Communications, Access to Information, Status Reporting

Dissemination of TSP messages to NTWCs by email and GTS (the World Meteorological Organization (WMO) Global Telecommunications System) was very successful, with average message reception rates of 94% (Sumatra) and 80% (Makran) in the two scenarios for email, and 79% and 62% for GTS. Dissemination by mobile-phone SMS achieved average reception rates of 64% and 55% for the two scenarios, while fax average reception rates were poor at 47% and 38%. These results are similar to those achieved in the 6-monthly IOTWMS Communication Tests and in previous IOWave exercises.

Access rates to the tsunami threat information on TSP websites by NTWCs across both scenarios were quite high. In the Sumatra scenario, the average access rate was 82% across all types of TSP products. In the Makran scenario, TSP bulletins were accessed at a very high rate of 97% while the access rate was slightly lower for other products.

This exercise was the first in which NTWCs were asked whether they used the TSP information they accessed to assist in the production of their national warnings. Given the high access rates to the TSP information, the reported usage rate of that information by NTWCs to formulate their national warnings was lower than expected - mostly below 50%. The predicted Max Wave Amplitude values were the most widely used, with usage rates of 56% and 52% for the two scenarios.

However it is important to note in this context that all three TSPs (India, Indonesia and Australia) formulate their national warnings using their own tsunami assessments, so don't use other TSPs' products, and also in this exercise both Iran and Oman tested their own threat assessment methods that did not rely on TSP products. If these 5 countries' responses are excluded from the figures, the usage rates of TSP products by NTWCs are mostly above, or close to, 50%.

The average rate of warning status reporting by NTWCs was 73% across the two scenarios (54% for the Sumatra scenario, 92% for the Makran). This average rate was similar to that of IOWave14 and higher than the preceding 2015 and 2016 Communication Tests. It is important

to note that this exercise marked the first usage of TSP India's new, more robust, status reporting website.

Objectives 4-5: Procedures for Tsunami Warning Dissemination, Public Safety Messages, Ordering Evacuations, and Issuing All-Clear Messages

Procedures for tsunami warning dissemination from the National Tsunami Warning Centres (NTWC) to National Disaster Management Organisations (NDMO) were reported to be in place in all IOTWMS Member States. Downstream procedures for tsunami warning dissemination, in at least one community, are in place in approximately half of IOTWMS Member States. Messages are largely disseminated via multiple delivery methods with the most utilised being email, SMS, telephone and fax. 91% of Member States reported that the delivery of all messages was timely and 91% of Member States also reported that their SOPs for tsunami warning dissemination performed well to extremely well.

Public safety messages, evacuation orders and all-clear messages were issued by 46%, 54% and 71% of IOTWMS Member States respectively. The most utilised delivery methods for message delivery were SMS, telephone, fax and email, and to a lesser extent radio and television. Most countries (~65%) reported that there were no communication problems in the delivery of any single type of notification.

Objective 6: Community Awareness, Preparedness and Response

Pre-exercise preparedness activities had been held in 64% of IOTWMS Member States and pre-exercise government support had been provided in 77% of Member States. Of the Member States that exercised community evacuations, 60% reported that community members received prior evacuation training and 60% also reported that standard operating procedures for community evacuation are in place. Methods of notification of community members of the evacuation most commonly included door-to-door notification, public announcements, sirens, radio, mobile phones, and social media. The people who evacuated during IOWave16 were mainly home residents, beachgoers, boat users, and schools. The time between the evacuation and people returning to their residences was as short as 25 minutes in Australia (Christmas Island) to as long as 11 hours and 15 minutes in India.

Member States suggested several improvements for future tsunami evacuations including community education for tsunami awareness and evacuation along the entire coastline; regular exercises; increasing the number of evacuees; increasing the number of organisations involved; evaluation of all steps by expert observers; having inundation maps in place; having evacuation route maps; having evacuation SOPs in place for all institutions including hospitals and elderly people's homes; and use of sirens or alarms.

Exercise Conduct

In order to assess the overall success of the exercise planning, organisation and conduct, Member States ranked activities of the IOWave16 Task Team from 4 (extremely good), 3 (very good), 2 (good) to 1 (poor). Exercise planning and communication with Member States including timeliness and usefulness of information provided by the ICG/IOTWMS Secretariat was assessed at 3.6. Exercise documenation including manual, websites, and bulletins was assessed at 3.6. Exercise format and style including real-time operation and exercise messages similar to real those in a real event was ranked at 3.5. The Exercise evaluation was assessed at 3.2. As all activities were assessed between very good and extremely good (3-4) the conduct of IOWave16 is considered to be successful.

Reported Benefits and Suggested Enhancements for Future Exercises

Member States listed many benefits from the exercise including: testing communication chains between organisations; validating and identifying gaps in SOPs; improving community awareness; testing message dissemination and reception; exploring social media communication platforms; involving media; and identifying weakenesses so that these shortcomings can be addressed.

Member States also suggested improvements for future exercises including: rectifying weaknesses in SOPs; better media communication; upskilling of staff; public awareness campaigns including greater media involvement; providing back-up methods of downstream message communication; better communication among stake holders; better defining the roles of all agencies; and better local preparation.

1. INTRODUCTION

Overall 38% of the world's population live within 100 km of the coast or estuaries and these coastal communities are directly exposed to threats from natural disasters such as cyclones, storm surges, coastal erosion, and tsunamis. Though tsunamis are infrequent, the death toll from tsunamis is huge compared with other natural disasters. The 26 December 2004 Indian Ocean tsunami resulted in disastrous loss of life and property. Around 230,000 people died with the highest death toll in Indonesia, which was near the tsunami source. Casualties were also reported in countries as far away as Somalia, Tanzania and Kenya. The 11 March 2011 Tohoku, Japan tsunami, which is believed to be the most costly natural disaster in the world, resulted in some 20,000 people dead or missing and US$210 billion of economic damage (estimated by Japan's Cabinet Office and Reconstruction Agency and reported by the World Bank, 2012).

The major challenge with tsunamis is that they are infrequent, which requires great persistence in sustaining the process of capacity building and preparedness. Because of this infrequency, instruction through mock tsunami drills is the best way to train coastal communities to prepare for devastating actual events. A very high level of public awareness is essential, especially in the regions which are close to tsunami source locations. These communities need to be trained to act on their knowledge of natural signs plus awareness acquired through tsunami drills, rather than waiting for warnings from local officials. This situational awareness and ability to respond quickly is best achieved through pre-event education and mock drills. The drills not only educate the public on natural signs but also on: where they would receive the official warnings, by which means, what those warnings indicate, how to understand them, and what they need to do in response.

1.1 BACKGROUND

During the Tenth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning And Mitigation System (ICG/IOTWMS-X) held in Muscat, Oman, from 24 to 26 March 2015, it was decided to conduct an Indian Ocean-wide Tsunami Warning and Communication Exercise (IOWave16) during the second half of 2016. A Task Team was established to organise it, with membership comprising Australia, India, Indonesia and Seychelles. Keeping in view the major tsunamigenic earthquakes in the last few years, the readiness of the IOTWMS was tested thoroughly through this tsunami exercise.

1.2 EXERCISE CONDUCT AND PARTICIPATION

Exercise IOWave16 was conducted on 7 and 8 September 2016 (IOC/2016/TS/128Vol.1). Twenty-four (24) IOTWMS Member States participated. The participating Member States were:

- NTWCs: Bangladesh, Comoros, France (La Réunion), Iran, Kenya, Madagascar, Malaysia, Maldives, Mauritius, Mozambique, Myanmar, Oman, Pakistan, Seychelles, Singapore, South Africa, Sri Lanka, Tanzania, Thailand, Timor-Leste and Yemen.
- TSPs (also NTWCs for their own country): Australia, India and Indonesia.

Each Member State nominated a National Exercise Contact who was expected to confirm the accuracy of existing tsunami warning arrangements within their country, including the identification of operational points of contact for receipt and dissemination of tsunami warnings downstream from the NTWC. The designated National Contact was also responsible for coordinating input to the exercise evaluation. The details of the IOTWMS National Exercise Contacts for IOWave16 are contained in Annex I.

Exercise IOWave16 comprised, for the second time in Indian Ocean exercises, two earthquake scenarios conducted on successive days, 7 and 8 September, with each scenario run in real-time. The scenario details are given in Table 1.

Scenario 1 – Sumatra		**Scenario 2 – Makran Trench**	
Date:	Wednesday 7 September 2016	**Date:**	Thursday 8 September 2016
Time:	0300 UTC	**Time:**	0600 UTC
Magnitude:	9.2 Mw	**Magnitude:**	9.0 Mw
Depth:	10 km	**Depth:**	10 km
Latitude:	1.93 S	**Latitude:**	24.8 N
Longitude:	99.22 E	**Longitude:**	62.2 E
Location:	Southern Sumatra, Indonesia	**Location:**	Off Coast of Pakistan

Table-1. Earthquake parameters for the Java scenario and the Makran scenario.

Fifteen (15) ICG/IOTWMS Member States participated in the Sumatra scenario and thirteen (13) participated in the Makran scenario (Figure-1).

- Sumatra scenario participants: Australia, Bangladesh, France (La Reunion), India, Indonesia, Kenya, Madagascar, Malaysia, Maldives, Myanmar, Seychelles, Singapore, Sri Lanka, Thailand, Timor Leste
- Makran scenario participants: Australia, Comoros, India, Indonesia, Iran, Madagascar, Mauritius, Mozambique, Oman, Pakistan, South Africa, Tanzania, Yemen

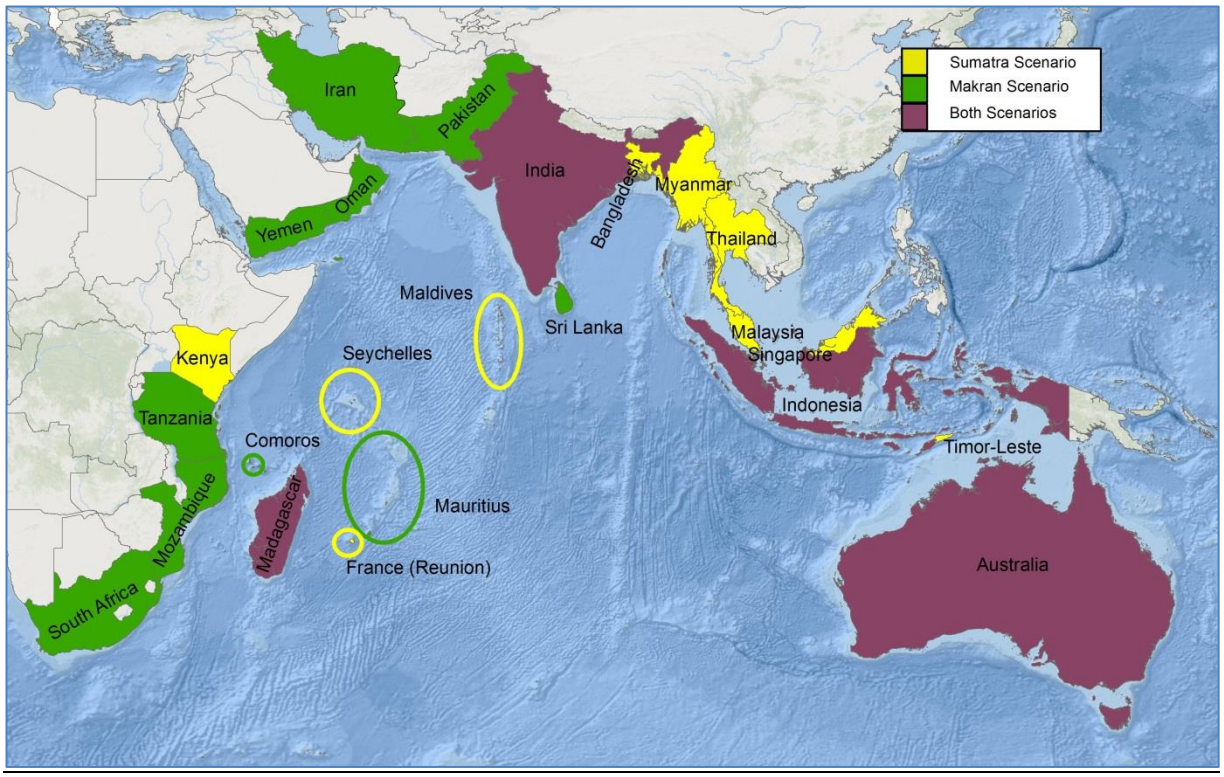


Figure-1. Exercise participation by scenario in ICG/IOTWMS Member States.

All twenty-four countries exercised their tsunami warning and mitigation SOPs to varying degrees. Twenty-two countries (92%) involved national disaster management organisations; nineteen countries (79%) involved local disaster management organisations; fifteen counties (63%) had media representative participate; and twelve countries (50%) conducted public evacuation drills. The level of Member State participation in IOWave16 is provided in Annex II and the countries that undertook community evacuation are shown in Figure-2. In total, nearly 60,000 people evacuated during IOWave16 with 40,000 of these evacuation being carried out in India.

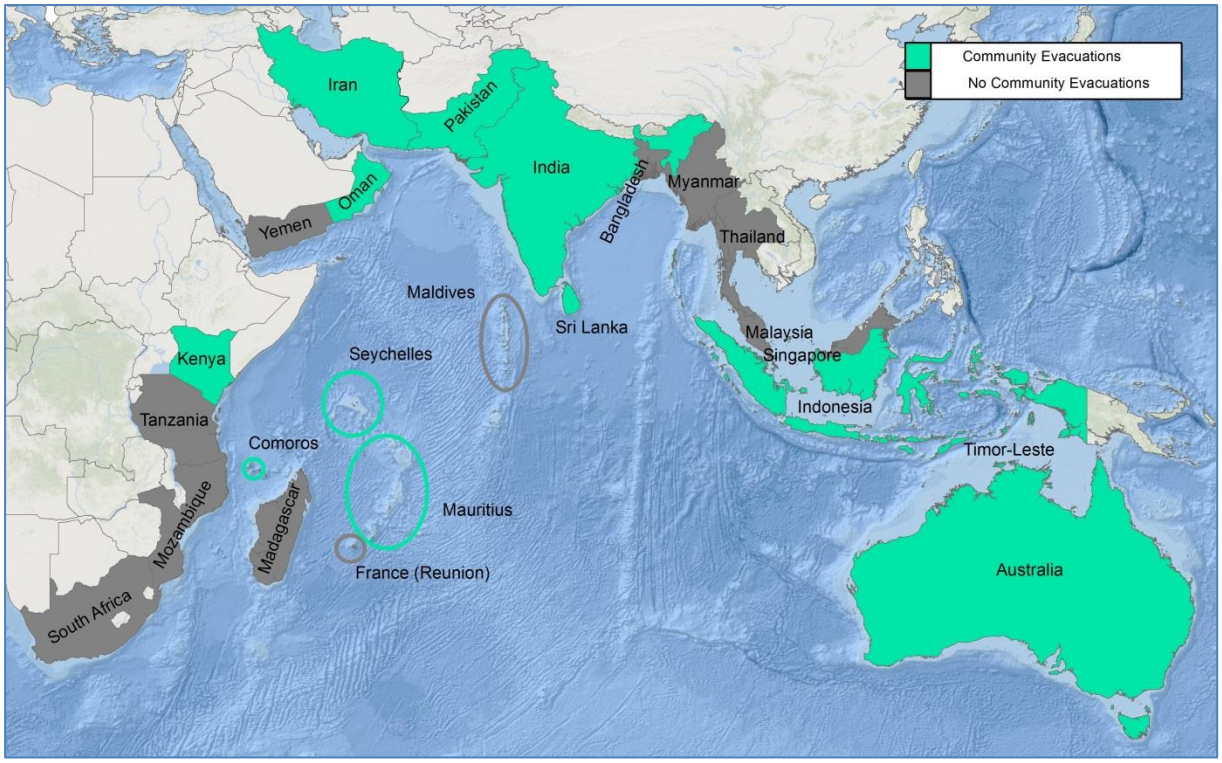


Figure-2. Community evacuations in ICG/IOTWMS Member States during IOWave16.

Member States reported on the type of exercise(s) conducted. Of the twenty four participating Member States, fourteen (58%) conducted table top exercises, nine (38%) conducted drills, eight (33%) conducted full scale exercises, seven (29%) conducted functional exercises, and six (25%) conducted orientation exercises. The types of exercise conducted in each Member State are detailed in Annex III.

Following the exercise, Member States were asked to complete an online survey questionnaire describing their participation in the exercise. The twelve Member States who conducted community evacuation were also asked to provide a summary capturing the details of community participation. Moreover, international observers were deployed to India and Seychelles to provide independent observations of the exercise. A lessons-learnt workshop on community participation in IOWave16 was held in Bandung, Indonesia on 5-6 December 2016. The IOWave16 Exercise Report is a compilation of all these results.

2. EXERCISE OBJECTIVES AND RESULTS

2.1 OBJECTIVE 1 – TSUNAMI SERVICE PROVIDER MESSAGE DISSEMINATION

Objective 1: Validate the dissemination by TSPs of Tsunami Bulletin Notification Messages to NTWCs via Tsunami Warning Focal Points (TWFPs) of Indian Ocean countries and the reception by NTWCs of the TSP messages.

2.1.1 Objective 1: Results

Timeliness of the Message Dissemination

The first part of the objective was assessed by asking NTWCs if the notification messages issued by the TSPs were timely for them to carry out their warning response SOPs. Table 2 summarises the NTWC responses for each exercise scenario. The NTWCs for each Member State are contained in Annex IV.

TSP	Sumatra Scenario (out of total 14 responses)			
	Email	GTS	SMS	Fax
Australia	93%	86%	79%	57%
India	93%	71%	43%	71%
Indonesia	100%	86%	79%	21%
Average	**95%**	**81%**	**67%**	**50%**
	Makran Scenario (out of total 12 responses)			
	Email	**GTS**	**SMS**	**Fax**
Australia	92%	75%	67%	67%
India	92%	75%	58%	50%
Indonesia	100%	75%	58%	33%
Average	**95%**	**75%**	**61%**	**50%**

Table-2. NTWC reporting of the percentage of TSP notification messages that were received in a timely manner, for each scenario.

In both scenarios the order of the timeliness of TSP messages delivered to NTWCs for performing their warning response was (from most timely to least timely): Email, GTS, SMS, Fax.

For details of the above survey results, refer to Annex V – Timeliness of TSP Notification Delivery Mediums.

Reception of TSP Notification Messages

The second part of Objective 1 was to assess the success rate of NTWCs in receiving TSP notification messages for each delivery method.

The percentages of NTWCs receiving each TSP notification message are presented in Table 3 for all arrivals regardless of when they were received and for arrivals within 15 minutes of TSP messages being issued. For details, refer to Annex VI – TSP Messages Received from NTWCs.

TSP	Sumatra Scenario			
	Email	**GTS**	**SMS**	**Fax**
Australia	**92%** (90%)	**79%** (78%)	**69%** (68%)	**65%** (50%)
India	**91%** (90%)	**79%** (75%)	**59%** (58%)	**54%** (34%)
Indonesia	**99%** (99%)	**79%** (77%)	**63%** (63%)	**22%** (18%)
Average	**94%** (93%)	**79%** (77%)	**64%** (63%)	**47%** (34%)
	Makran Scenario			
	Email	**GTS**	**SMS**	**Fax**
Australia	**84%** (84%)	**67%** (67%)	**60%** (59%)	**60%** (49%)
India	**70%** (65%)	**58%** (55%)	**60%** (55%)	**40%** (34%)
Indonesia	**85%** (85%)	**62%** (62%)	**45%** (43%)	**14%** (13%)
Average	**80%** (78%)	**62%** (61%)	**55%** (52%)	**38%** (32%)

Table-3. Percentage of TSP notification messages reported as received by NTWCs for each scenario. Messages received at any time are indicated in bold font and messages received within 15 minutes of being issued are shown in parentheses.

Email was found to be the most effective method of communication to receive the TSP notification messages with average reception rates of 94% and 80% for the two scenarios. Additional points concerning email reception:

- The reception rate was higher in the Sumatra Scenario (at least 90% in all cases) than in the Makran Scenario (ranging from 65% to 85% percent).
- There was little difference in the reception rate between messages received at any time and those received within 15min of issue, indicating that most email messages were received within 15 minutes of issue.
- There was little difference in the email reception rates for messages from the three TSPs.

GTS was the second-most effective method of communication with average reception rates for the two scenarios of 79% and 62%, with SMS the next most effective method with average reception rates of 64% and 55%. And similar to email, the GTS and SMS reception rates were higher in the Sumatra scenario than the Makran scenario, most messages were received within 15 minutes, and there was little difference in reception rates across the 3 TSPs.

Fax had the lowest reception rate of all four delivery methods, as in almost all previous Communications Tests and IOWave exercises. In addition, the rates of receiving fax messages within 15 minutes of issue were distinctly lower than those of receiving messages anytime, indicating many fax messages were not received in a timely manner.

Comparison with Previous Exercise and Tests – Message Delivery

The above findings of the relative strength of each delivery method are consistent across the past exercises and communication tests.

Figure 2 below shows the TSP to NTWC message delivery success rates in this exercise compared with IOWave11, IOWave14 and the regular IOTWMS communications tests.

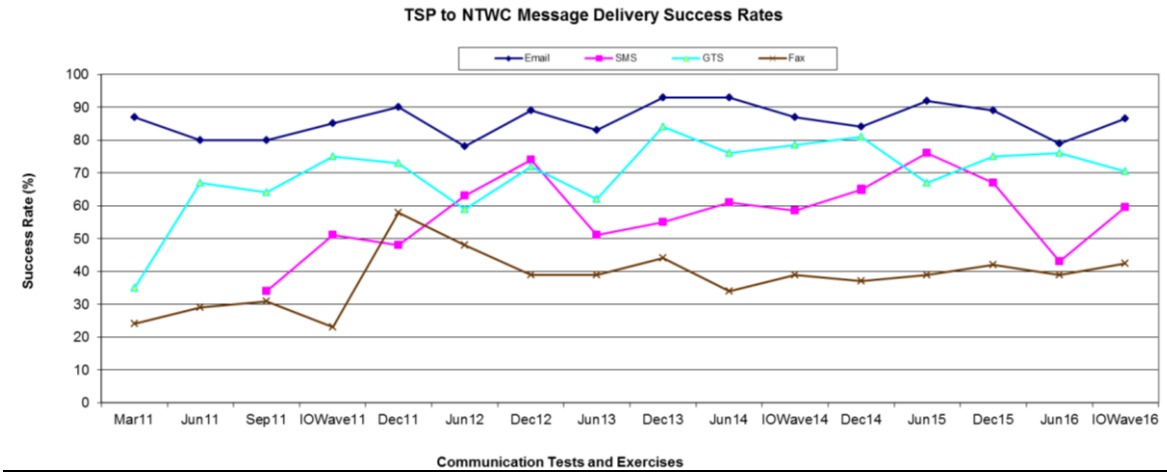


Figure-2. TSP to NTWC message delivery success rates in this exercise of IOWave16 compared with those of IOWave11, IOWave 14 and regular IOTWMS communication tests. Figures are the average delivery rates for each medium across all TSPs (and across both scenarios for IOWave14 and IOWave16).

2.1.2 Objective 1: Issues for follow-up

- Email Delivery:
  - TSP Australia: Investigate why Kenya did not receive its emails.
  - TSP India: Investigate why Kenya did not receive its emails.
- GTS Delivery:
  - TSP Australia: Investigate why Madagascar, Sri Lanka and Timor Leste did not receive its GTS messages.
  - TSP India: Investigate why Madagascar and Timor Leste did not receive its GTS messages.
  - TSP Indonesia: Investigate why Madagascar, Sri Lanka and Timor Leste did not receive its GTS messages.
- SMS Delivery:
  - TSP Australia: Investigate why France (La Reunion), Myanmar, Seychelles, Sri Lanka did not receive its SMS messages.
  - TSP India: Investigate why France (La Reunion), Madagascar, Seychelles, Thailand did not receive its SMS messages, and why Timor Leste only received its first two SMS messages.
  - TSP Indonesia: Investigate why France (La Reunion), Madagascar, Seychelles, Thailand, and Timor Leste did not receive its SMS messages.
- Fax Delivery:
  - TSP Australia: Investigate why Kenya, Madagascar, Timor Leste did not receive its fax messages, and why France (La Reunion) only received two of its fax messages.
  - TSP India: Investigate why France (La Reunion), Kenya, Myanmar, Timor Leste did not receive its fax messages.
  - TSP Indonesia: Investigate why India, Kenya, Madagascar, Maldives, Seychelles, Sri Lanka, Thailand, Timor Leste did not receive its fax messages, and several others only received intermittent fax messages.

2.2 OBJECTIVE 2 – NTWC ACCESS TO TSP WEBSITES AND USE OF TSP INFORMATION

Objective 2: Validate the access by NTWCs to the tsunami bulletins and other products on the TSP websites, and the use of that information for the production of national warnings.

2.2.2 Objective 2: Results

This objective has been expanded from IOWave14 by asking more specifically what products on each TSP website each NTWC accessed. In addition and for the first time in IOWave exercises, it included another question on which TSP tsunami threat information NTWCs actually used to help formulate their national warnings.

Detailed feedback from each country can be found in
- ANNEX VII - TSP Exchange Products Accessed By NTWCs, and
- ANNEX VIII - Tsunami Threat Information from TSP Websites used by NTWCs to Produce National Warnings.

TSP Web Access
A summary of NTWC responses to the questions on web access is provided below in Table-4.

In the Sumatra scenario, Malaysia did not access any TSP websites due to technical issues at their end and Kenya also experienced internet connection problems. In addition one NTWC decided not to access all TSP websites. As a result, the average access rate was 82% across most types of TSP products.

In the Makran scenario, apart from Tanzania having had some difficulty accessing the TSP India website, all NTWCs who responded to the survey reported having successfully accessed all three TSP websites. This is reflected on the very high 97% access rate for Bulletins, while the access rate was slightly lower for Threat Maps, Threat Tables, Max Amplitude Maps and TTT Maps.

Total number of countries that answered the survey question	13	12
2a) Exchange Product Viewed	**Sumatra scenario**	**Makran scenario**
Bulletins	**82%**	**97%**
Coastal Zone Threat Map	**82%**	**78%**
Threat Table	**82%**	**89%**
Maximum Amplitute Map	**79%**	**89%**
Tsunami Travel Time Map	**82%**	**86%**

Table-4. Percentage of NTWCs who viewed each TSP product type for each scenario.

Comparison with Previous Exercise and Tests – Web Access

The average web access rate by considering the statistics for bulletins only is about 90% (based on 82% for Sumatra and 97% for Makran). This is on par with the access rates achieved in the IOWave11 and IOWave14 exercises and IOTWMS communication tests (Figure-3).

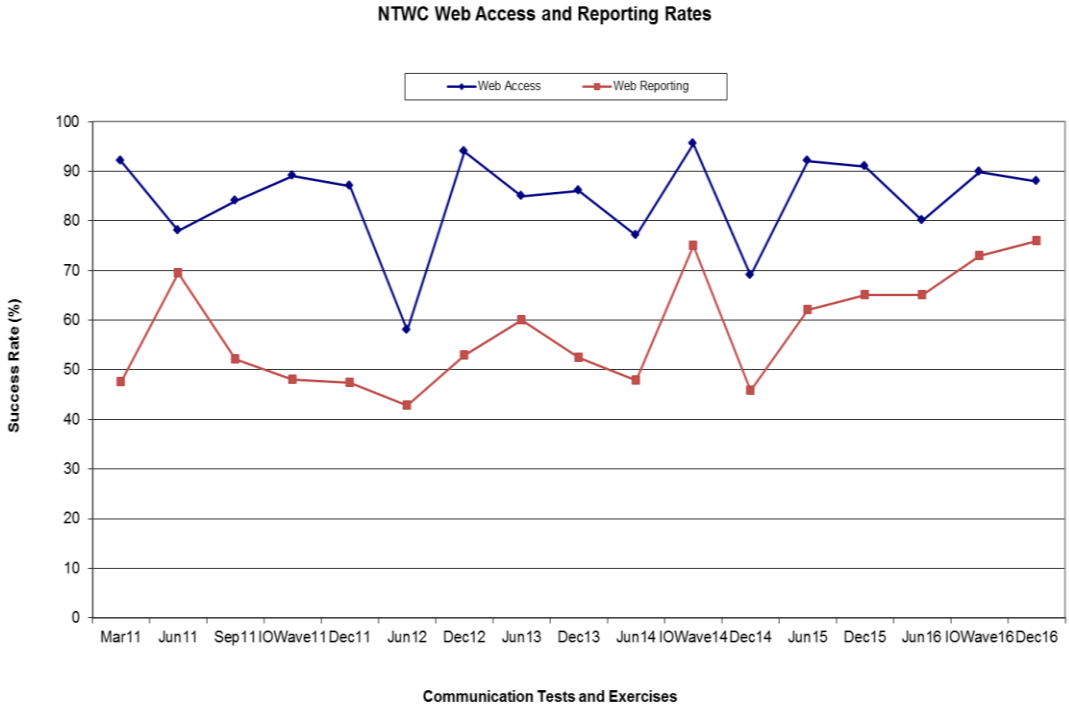


Figure-3. Percentage (or Rate) of NTWCs accessing TSP websites (blue line) and reporting warning status to TSPs (red line) in IOWave16 compared with IOWave11, IOWave14 and 6-monthly IOTWMS communication tests. The rates for IOWave16 (and IOWave14) are averaged across the two exercise scenarios.

TSP Products Used to Formulate National Warnings

A summary of NTWC responses to this question is given in Table-5 below.

In general the rate of NTWC usage of TSP products was lower than expected - mostly below 50% - for both scenarios. A contributing factor is that 5 of the 24 NTWCs in this exercise used their own threat assessment methods that did not rely on any TSP products:

- The 3 TSPs (Australia, India, Indonesia) always use their own threat assessments
- Iran and Oman tested their own threat assessments in this exercise

If these 5 countries' responses are excluded from the figures (figures in parentheses in Table 5), the usage rates of TSP products by NTWCs are mostly above, or close to, 50%.

In this exercise all the information provided by TSPs was used by many NTWCs in formulating their own warnings. The predicted Max Wave Amplitude value was used most widely.

2b) Tsunami Threat Information Used for Warning	Sumatra scenario	Makran scenario
Tsunami Wave Observations	**56% (73%)**	**36% (50%)**
T1 Predicted Wave Arrival Time	**33% (43%)**	**36% (50%)**
T2 Predicted Wave Arrival Time	**41% (53%)**	**39% (55%)**
T3 Predicted Wave Arrival Time	**18% (23%)**	**30% (42%)**
T4 Predicted Wave Arrival Time	**31% (40%)**	**36% (50%)**
Predicted Max. Wave Amplitude	**56% (73%)**	**52% (71%)**
CFZ Threat Levels	**56% (73%)**	**30% (48%)**
Other	**0% (0%)**	**6% (10%)**

Table-5. Percentage of all 24 NTWCs using TSP tsunami threat information to formulate national warnings in each scenario. Figures in parentheses exclude the 3 NTWCs who never use TSP information and the 2 NTWCs who were testing their own national threat assessment in this exercise.

2.2.3 Objective 2: Issues for follow-up

- Secretariat to check with Malaysia and Tanzania if they routinely have access issues with the websites of the three TSPs.
- TSPs to investigate further on the usage rate of threat information by NTWCs

2.3 OBJECTIVE 3 – NTWC NATIONAL TSUNAMI WARNING STATUS REPORTING

Objective 3: Validate the reporting by NTWCs to the TSPs of their National Tsunami Warning Status.

2.3.1 Objective 3: Results

Details of the revelant survey results can be found in Annex IX – NTWC National Tsunami Warning Status Reports to TSPs.

The NTWC warning status reporting rates of 54% (Sumatra) and 92% (Makran) produced an overall exercise average of 73%, which is on par with that of IOWave14 and higher than those of the communication tests between the two exercises (see red curve on Figure-3). This was the first time that TSP India's newly-developed status reporting web tool was used, in place of the now-decommissioned tool hosted by TSP Australia. The new tool is advantageous over the old one in that it does not require an email account at the NTWC end to enable the submission of the status report.

There are several reasons why the reporting rate in the Sumatra scenario was quite low.:

- Bangladesh and Maldives only ran desktop exercises so did not activate their operational procedures.
- France (La Reunion) did not believe it needed to report because of no threat (thus no warning) to French island territories.
- Kenya experienced frequent internet dropouts and were also too busy with warnings to send the report to TSPs.
- Malaysia attempted but could not send the report.
- Myanmar was busy with dealing with an actual local earthquake.

In the Makran scenario, Yemen was the only NTWC that did not provide a report. This is due to them focussing on "sending the warnings to our stakeholders in Yemen and sending the warning to a majority of public in the coastal area".

It is interesting to note the diverse range of the number of status reports that each NTWC provided. Countries like India and Indonesia reported more than 14 times in each scenario in synchonisation with the number of warning updates they produced for their respective countries. Some other NTWCs only reported a handful or just one.

Timing of the status reports also varied a lot from country to country. This variation may be related to the different timing of warnings issued by each country but may also be due to the delay in some countries focussing on their more urgent tasks and neglecting this step of reporting their warning status to TSPs.

2.3.2 Objective 3: Issues for Follow-up

- TSP India to follow-up with Malaysia why they had difficulty sending a status report.
- Stressing at the IOTWMS Regional SOP training workshops the need for NTWCs to report their warning status to TSPs as soon as possible after each national warning is issued

2.4 OBJECTIVE 4 – PROCEDURES FOR TSUNAMI WARNING DISSEMINATION

Objective 4: Validate the SOPs within countries for generating and disseminating tsunami warnings to their relevant emergency response agencies, media and the public.

2.4.1 Objective 4: Results

This objective was assessed by confirming the generation and dissemination of tsunami warnings and information to five key recipients in each Member State:

1) National Disaster Management Organisation (NDMO)
2) Local Disaster Management Organisation – Provincial/Regional (LDMO-P)
3) Local Disaster Management Organisation – City/District (LDMO-C)
4) Media
5) Public

Twenty-three Member States completed the online questionnaire for Objective 4. Each Member State reported on the agency that sends tsunami warning and information messages to each recepient, the number of messages sent, the time the first and last messages were sent, the method(s) of delivery, and the timeliness of the messages (Annex X).

All reporting Member States indicated that national-level standard operating procedures are in place for tsunami warning dissemination from the NTWC to the NDMO. Procedures for tsunami warning dissemination to the LDMO-P and the LDMO-C are in place for sixteen (70%) and fourteen (61%) of the 23 reporting Member States, respectively, indicating that local-level SOPs for warning dissemination are not in place in all countries. Procedures for tsunami warning dissemination to the media and the public are in place for twelve Member States each (52%). This is consistent with the number of countries that conducted community evacuations. The number and percentage of reporting Member States who exercised tsunami warning and information dissemination to the five key recipients are given in Table-6.

		Tot	Yes	%
Recipient	**NDMO**	23	23	100%
	LDMO-P	23	16	70%
	LDMO-C	23	14	61%
	Media	23	14	61%
	Public	23	12	52%
	All	23	12	52%

Table-6. Numbers of Member States with Standard Operating Procedures in place for Dissemination of Tsunami Warning and Information Messages to Downstream Users

The reported responsible agencies for the generation/dissemination of tsunami warnings and information to downstream users are as follows:

- All Member States reported that the NTWC is responsible for the generation and dissemination of tsunami warnings to the NDMO.
- In contrast, the disseminating of tsunami warnings downstream to the LDMO-P is the responsibility of either the NTWC or the NDMO.
- Disseminating tsunami warnings to the LDMO-C is the responsibility of either the NTWC, the NDMO or the LDMO-P.
- Tsunami warning notifications to the media are largely the responsibility of the NTWC and to a lesser extent the NDMO; the LDMO-P and LDMO-C play a minimal role.
- Messages to the public are disseminated through varied and often mixed channels incuding via the NTWC, NDMO, LDMO, LDMO-P, LDMO-C and media.

Figure-4 and Table-7 illustrate the division of responsibility for generation and dissemination of tsunami warning and information messages. The details of responsibility for each Member State are provided in Annex X.

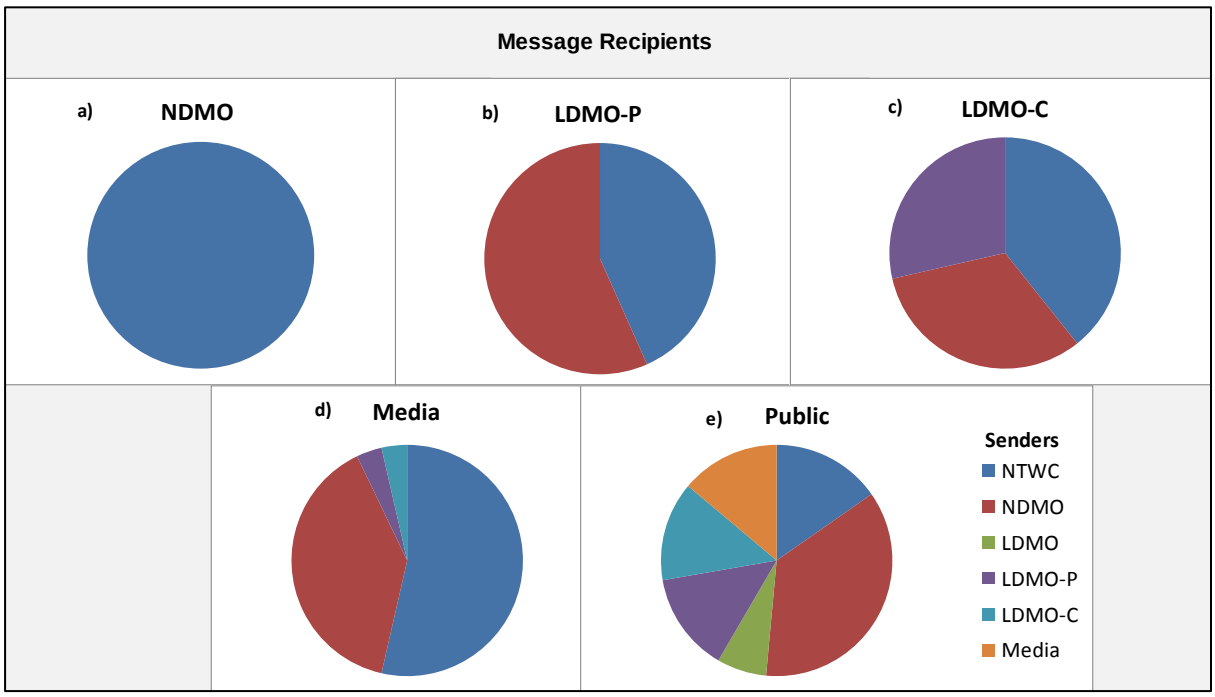


Figure-4. Responsible Agencies for Dissemination of Tsunami Warnings and Information to Disaster Response Agencies, Media and the Public. The right-hand-side list corresponds to the sender(s) of the message.

		Recipient				
		NDMO	LDMO-P	LDMO-C	Media	Public
Sender	NTWC	100%	43%	39%	54%	15%
	NDMO	0%	57%	32%	39%	36%
	LDMO	0%	0%	0%	0%	7%
	LDMO-P	0%	0%	29%	4%	14%
	LDMO-C	0%	0%	0%	4%	14%
	Media	0%	0%	0%	0%	14%

Table-7. Responsible Agencies for Dissemination of Tsuanmi Warnings and Information to Disaster Response Agencies, Media and the Public. The reported percentages represent the relative proportions of messages from the sender to the receipient with 100% being all of the disseminated messages to the recipient.

The methods of delivery of the tsunami warnings and information vary between Member States. Messages are largely disseminated via multiple delivery methods providing redundancy. The most utilised delivery methods are email, SMS, telephone, and fax. To a lesser extent webpages, radio, WhatsApp, door-to-door, sirens, television, warning towers, facebook, megaphones, police, military, public alert systems, VHF radio, and Virtual Private Networks (VPNs) are utilised for tsunami message dissemination (Figure-5). WhatsApp is a relatively new social media method of delivery that is being employed in three Member States for rapid message dissemination.

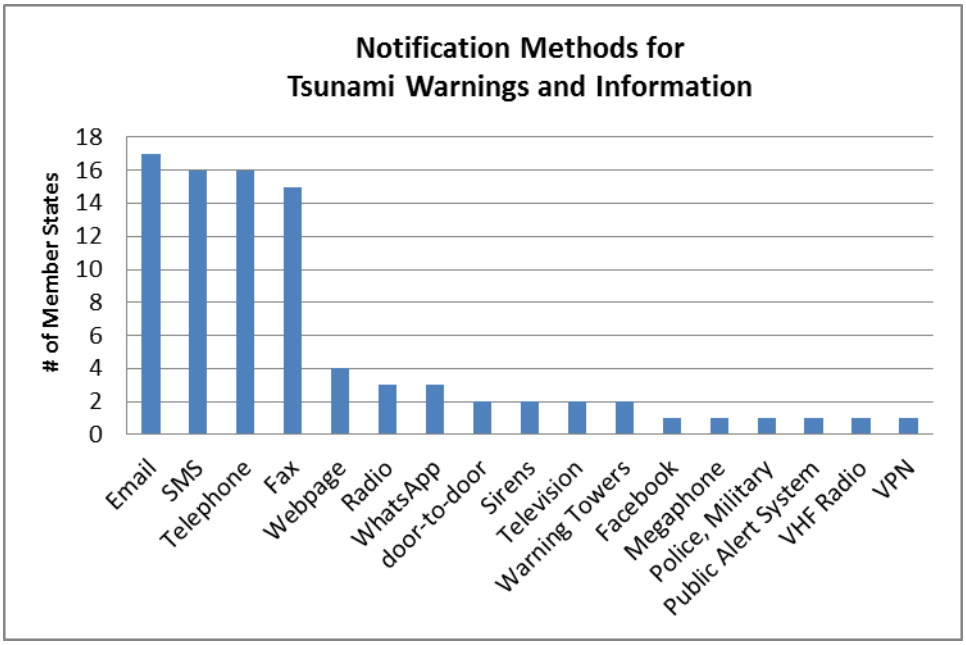


Figure-5. Message delivery methods for tsunami warnings and information.

Twenty Member States (or 91%) reported that the delivery of all messages was timely and two Member States (or 9%) reported that the delivery of most messages was timely. Member States noted that this exercise identfitied issues in their SOPs that will require follow-up. Shortages in trained personnel and not following the SOPs are two issues that were specifically highlighted and need to be addressed. Overall, twenty-two Member States reported that their SOPs performed well to extremely well, while one Member State reported their SOPs performed poorly due to agencies not following them (Annex XI).

2.4.2 Objective 4: Issues for follow-up

- Local-level SOPs are not in place for all Member States and need to be developed. This will encourage more countries to conduct community evacuations in future exercises.
- Ensure all notifications are issued in a timely manner (Australia, Mozambique).
- SOPs should be updated in response to issues identified during the exercise. (Australia, Tanzania)
- Capacity building should increase so that there are more experts capable of covering more of the coast (Kenya)
- All agencies should adhere to their SOPs (Seychelles)

2.5 OBJECTIVE 5 – PROCESSES FOR PUBLIC SAFETY MESSAGES, ORDERING EVACUATONS AND ISSUING ALL-CLEAR MESSAGES.

Objective 5: Validate the SOPs within countries for the issuing of public safety messages, ordering evacuations and where possible issuing all-clear messages.

2.5.1 Objective 5: Results

Objective 5 was assessed by asking Member States if they issued public safety messages, ordered evacuations and issued all-clear messages during IOWave16. Of the twenty-four reporting Member States, eleven (46%) issued public safety messages, thirteen (54%) issued evacuation orders, and seventeen (71%) issued all-clear messages (refer to Annex XII). The

details of public safety messages, evacuation orders and all-clear messages are contained in Annexes XIII, XIV and XV respectively. Details include the name of the issuing agency, the agency type, the message issue time, communication method(s), communication problems, message content, and the reason for issuing the message.

Public safety messages were mostly issued by NDMOs, to a lesser extent by NTWCs and LDMO-Ps, and in a couple of cases by LDMO-Cs. Evacuation orders were mostly issued by NDMOs, to a lesser extent by LDMO-Cs, and occassionally by LDMO-Ps and NTWCs. All-clear messages were mostly issued by NTWCs and to a lesser extent by NDMOs and LDMO-Cs (refer to Table-8 and Figure-6).

Issuing Agency Type	Public Safety Messages	Evacuation Orders	All Clear Messages
NTWC	33%	12%	53%
NDMO	40%	42%	28%
LDMO-P	23%	14%	0%
LDMO-C	5%	32%	19%

Table-8. Agency types responsible for issuing public safety messages, evacuation orders and all-clear messages during IOWave16.

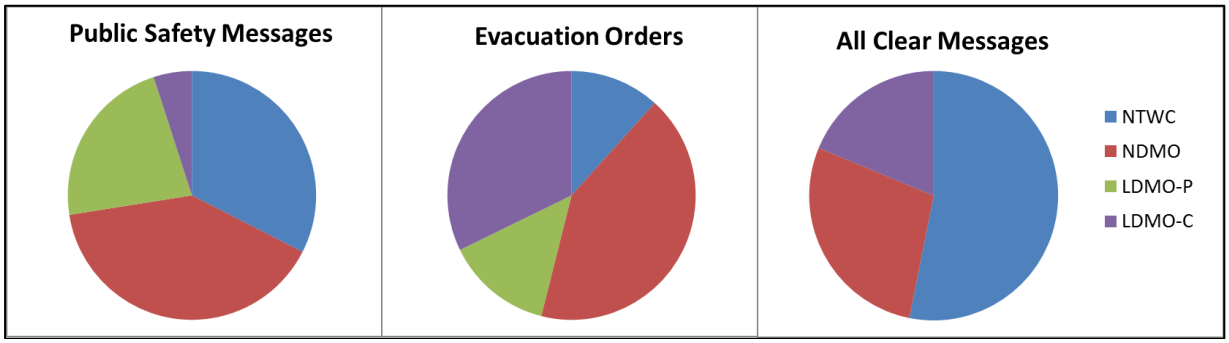


Figure-6. Agency types responsible for issuing public safety messages, evacuation orders and all-clear messages during IOWave16.

The methods of delivery of the public safety messages, evacuation orders, and all-clear messages vary between Member States (refer to Figure-7). Messages are largely disseminated via multiple delivery methods providing redundancy. The most utilised delivery methods for public safety messages during IOWave16 were fax, SMS, telephone and email. Television, facebook and WhatsApp are also commonly employed for public safety message delivery and to a lesser extent so are face-to-face communication, and webpages.

The most utilised delivery methods for evacuation orders during IOWave 16 were SMS, radio, sirens, television, and telephone. Fax, face-to-face communications, email, police public alert system, HF/HT/VHF radio, warning towers, and webpges are also commonly employed for evacuation order delivery and to a lesser extent so are church bells, megaphones, military, public announcments, public call centres, and warning towers.

The most utilised delivery methods for all-clear messages during IOWave16 were telephone, fax, SMS and email. Radio, sirens, television, police, public announcment systems, HF/HT/VHF radio, warning towers, and webpages are also commonly employed for all-clear message delivery and to a lesser extent so are church bells, door-to-door communications, military, public call centres and WhatsApp.

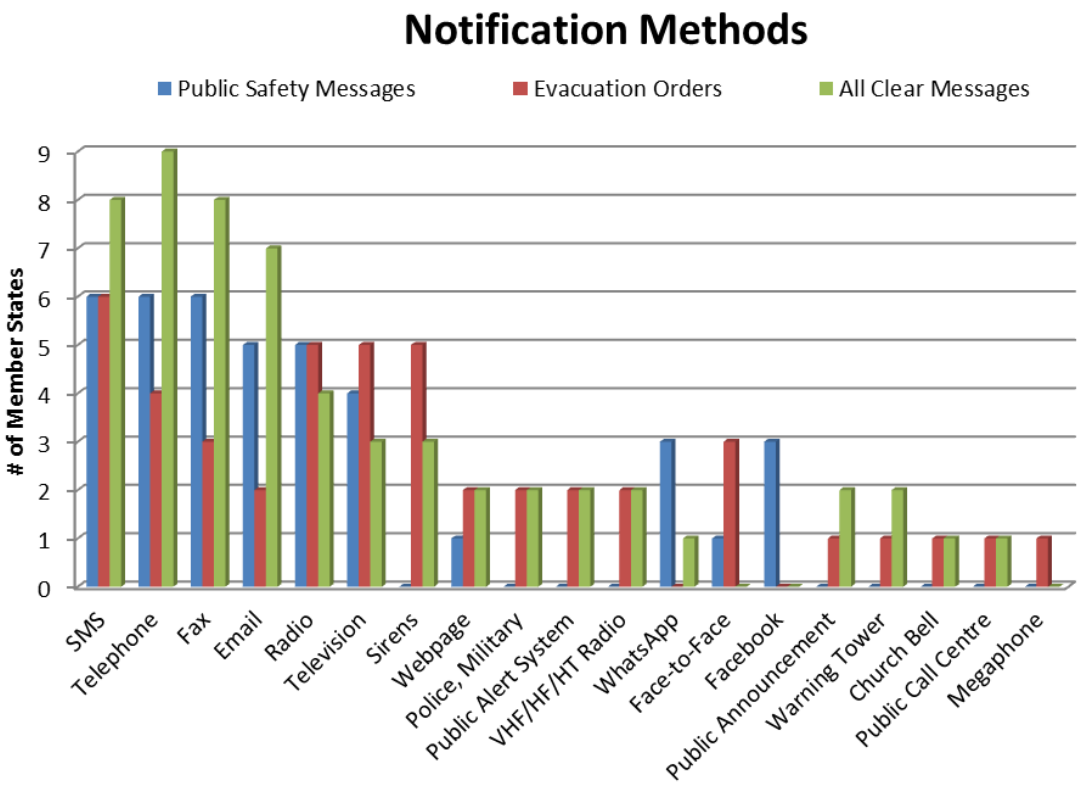


Figure-7. Notification methods of public safety messages, evacuation orders,and all-clear messages.

Most countries reported that there were no communication problems during the exercise. However, approximately one third of Member States (38%, 40% and 26% respectively) reported at least one communication issue while issuing public safety messages, ordering evacuations, and issuing all-clear messages.

2.5.2 Objective 5: Issues for follow-up

- SOPs for public safety messges, evacuation orders and all-clear messages to be developed in all Member States.
- Communication problems duirng issuing public safety messages to be addressed by Kenya, Pakistan and Yemen.
- Communication problems during ordering evacuations to be addressed by Kenya, Mozambique, Pakistan and Sri Lanka.
- Communication problems during issuing all-clear messages to be addressed by Kenya, Pakistan, Seychelles and Sri Lanka

2.6 OBJECTIVE 6 – COMMUNITY AWARENESS, PREPAREDNESS AND RESPONSE

Objective 6: Validate the level of community awareness, preparedness and response.

2.6.1 Objective 6: Results

Objective 6 was assessed by asking each Member State about pre-exercise awareness and preparedness as well as community evacuations during IOWave16.

Twenty-two Member States completed the online questionnaire for Objective 6. Fourteen of the responding Member States (64%) reported that pre-exercise preparedneess activities had been held in their countries. The most common actitvities included community education seminars, participatory evacuation planning and tsunami education in schools. Other less common preparedness initiatives included tsunami exercises, evacuation signage, evacuation maps, and shelter facilities (refer to Figure-8 and Annex XVI).

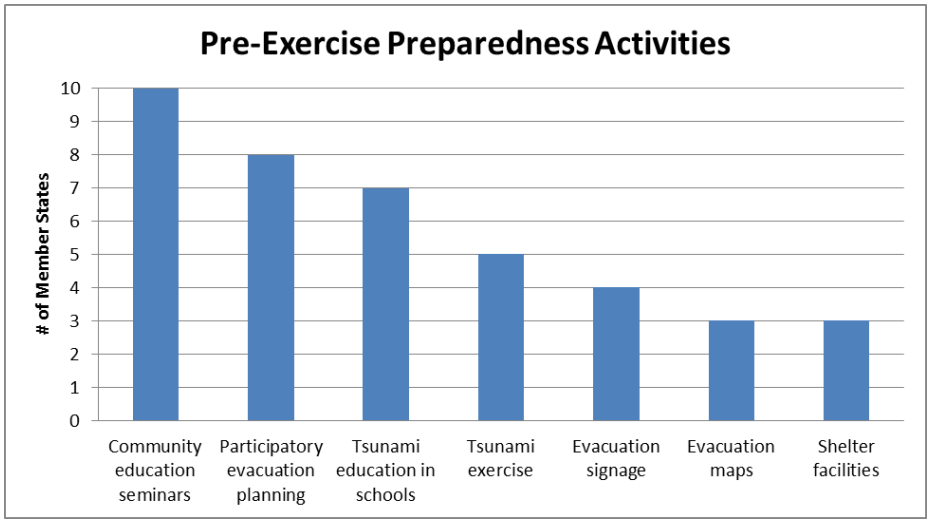


Figure-8: Pre-exercise preparedness activities reported by Member States

Seventeen of the responding Member States (77%) reported pre-exercise government support in tsunami preparedness initiatives. These included hazard mapping, tsunami inundation mapping, vertical evacuation shelters, tsunami signage and evacuation route mapping (refer to Figure-9 and Annex XVII).

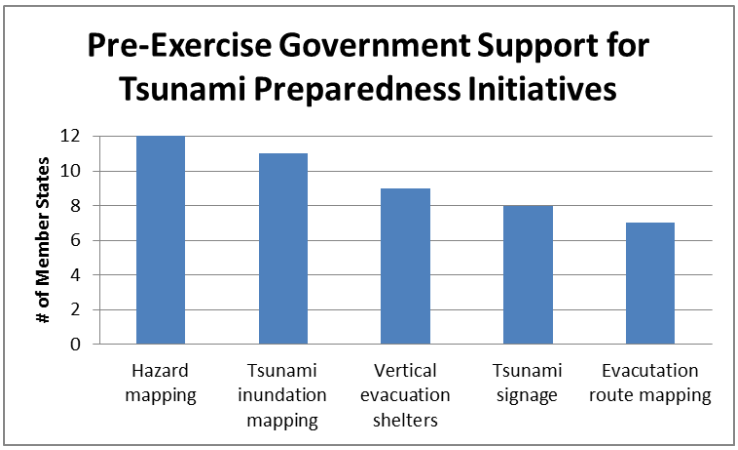


Figure-9. Pre-Exercise Government Support for Tsunami Preparedness Initiatives

Community evacuations were conducted in twelve Member States (50%). This was a significant advancement from IOWave14 where only two Member States (India and Seychelles) reported conducting community evacuations. The communities that evacuated in IOWave16 included:

- *Australia:* Kampong on Christmas Island
- *Comoros:* Bandamadi on Grand Comore; Vouani on Anjouan

- *India:* 350 villages of 33 coastal districts from 8 provinces. The coastal districts include: Srikakulam, Viziayanagaram, Visakhapatnam, East Godavari, West Godavari, Krishna, Guntur, Prakasam and SPS Nellore districts in Andhra Pradesh province; Balasore, Bhadrak, Kendrapara, Jagatsinghpur, Puri and Ganjam districts in Odisha province; Villupuram, Tirunelveli, Tiruvallur and Pudukkottai districts in Tamil Nadu province; North 24-Paraganas, South 24-Paraganas and East Medinpur districts in West Bengal province; Andaman in Andaman & Nicobar Islands; Thiruvananthapuram, Alappuzha, Kasaragod and Kozhikode districts in Kerala province; Porbandar and Devbhumi Dwarka districts in Gujarat province; Udupi, Uttara Kannada and Dakshina Kannada districts in Karnataka province.
- *Indonesia:* Padang; Pangandaran; Pacitan
- *Iran:* Ramin village
- *Kenya:* Shelly public beach – Likoni
- *Mauritius:* Ban des Dames; Pointes aux Biches; Grand Baie; Palmer; Grand Sables / Petit Sables; Rodrigues
- *Seychelles:* Eden Island; North East Point Hospital and Home of the Elderly; Some areas of Mahe, Praslin, La Digue, Ille au Cerf and Silhouette Islands
- *Sri Lanka:* Ampara; Matara; Kilnochchi; Mannar; Colombo; Galle; Hambantoata; Batticaloa; Jaffna; Kalutara; Mullaitivu; Gampaha; Puttlam; Trincomalee
- *Oman*: schools
- *Pakistan:* Surbandar in District Gwadar
- *Timor Leste:* Beach Tasi Tolu

Ten of the Member States that conducted community evacuations completed the online questionnaire for Objective 6. Sri Lanka and Timor Leste did not provide input to this part of the survey. Details of the preparedness of the communities that evacuated are contained in Annex XVIII. The evacuating communities ranked the availability of tsunami risk assessment information such as inundation and evacuation maps at 2.5 using the scale of 1 (none), 2 (low), 3 (high), to 4 (very high). The level of community awareness of the local tsunami risk was also ranked at 2.5 on this scale. These rankings indicate that although some awareness and preparedness initiatives had been undertaken in Member States, more activities are required to mitigate against the threat of tsunamis.

Six of the responding Member States (60%) that conducted commuity evacuations reported that community members received prior evacuation training. On Christmas Island, Australia, the Kampong community was briefed prior to the exercise although no actual evacuation training was conducted. In Iran a training workshop was held on 7 September (a day before the exercise). The community members of Padang, Indonesia received prior evacuation training from the Disaster Management Organisation with support from related institutions and NGO. In Kenya evacuation training was given on the day prior to the exercise. In Mauritius tsunami simulation exercises are carried out regularly by local authorities in vulnerable areas. Seychelles started training for emergency and essential services prior to the exercise but has not undertaken community training.

Six out of ten responding Member States (60%) have standard operating proceedures for community evacuation in place. Australia's Emergency Management Committee has developed a procedure for evacuation. India employs community level standard operating procedures. In Iran the standard operating procedures include: sirens to alert people and public

speakers to broadcast advice; the Red Crescent can be sent to evacuate people and ambulances are made available; an established procedure to help stranded children and old people; and establishment of temporary shelters on high land near inundated areas. In Mauritius the tsunami standard operating procedures are described in the National Disaster Scheme 2015. The Seychelles standard operating procedures are part of the district contingency plans that cover cyclone, flooding and tsunami but these need to be updated.

Methods of notifying community members of the evacuation most commonly included door-to-door notification, public announcements, sirens, radio, television, mobile phones, and social media. Other less common notification methods included setting the evacuation time prior to the exercise, loudspeakers, megaphones, fire alarms, and public call centers (refer to Figure-10 and Annex XIX).

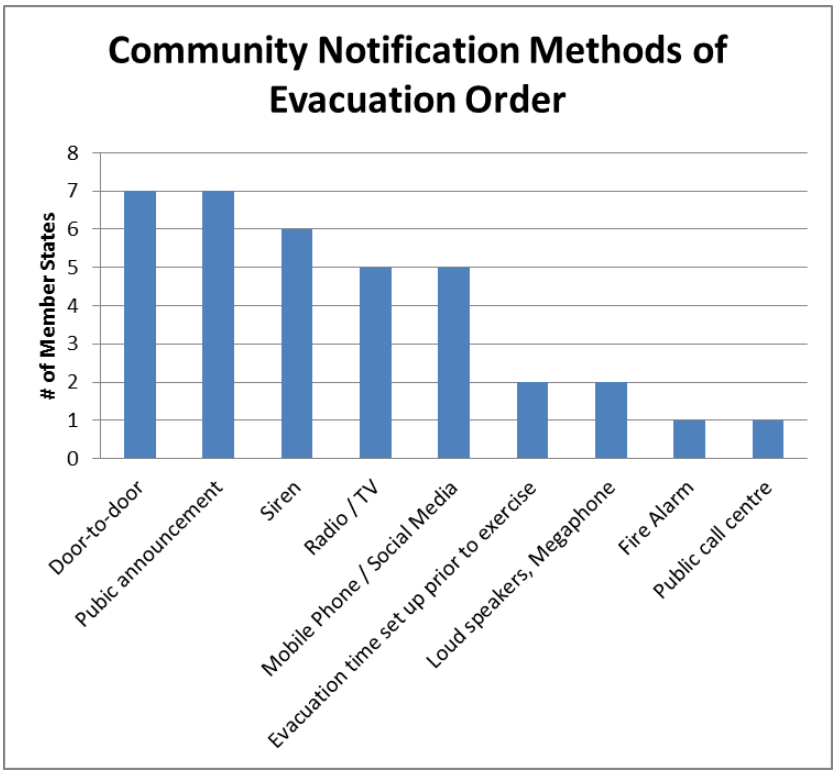


Figure-10: Community Notification Methods for Evacuation Orders

The people who evacuated during IOWave16 were mainly home residents, beachgoers, boat users and school students and staff; to a lesser extent the evacuees were associated with hospitals, businesses, elderly people's homes and hotels, and in some cases were associated with the harbour master, Red Cross, the ambulance service or the country inspectorate (refer to Figure-11 and Annex XX).

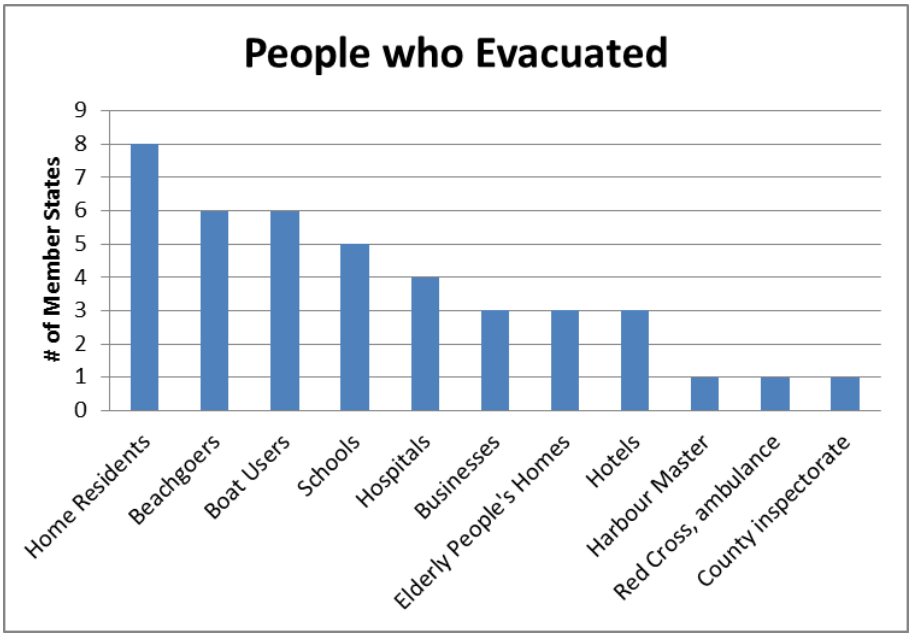


Figure-11: Categories of People Evacuated

The timing of communities receiving the evacuation notification and undertaking evacuations varied between Member States. During the Sumatra scenario Indian communities began to evacuate twenty-two minutes after the earthquake and the Australian community on Christmas Island evacuated 43 minutes after the earthquake. During the Makran scenario, Iran started to evacuate 9 minutes after the earthquake and Pakistan 10 minutes after the earthquake. Community evacuations in Comoros, Indonesia, Kenya, Oman, and Seychelles commenced more than an hour after the earthquake (refer to Table-9).

Nearly 60,000 members of Indian Ocean coastal communities partcipated in evacuations during IOWave16, in the following 12 Member States: Australia, Comoros, India, Indonesia, Iran, Kenya, Mauritius, Oman, Pakistan, Seychelles, Sri Lanka and Timor Leste. Most evacuees were in India, with 40,000 people partcipating in community evacuations. Table-9 shows the number of community members who participated in evacuations from each of the twelve participating Member States. The evacuation process was reported as happening smoothly in all countries with the exception of Kenya where people fainted and had to be given medical aid.

Country	# People
Australia	50
Comoros	500
India	40,000
Indonesia	4,820
Iran	30
Kenya	300
Maurititus	198
Oman	5,000
Paksitan	200
Seychelles	900
Sri Lanka	5,963
Timor Leste	900
Total	**58,861**

Table 9. Countries and number of people who evacuated during IOWave16.

The elapsed time of evacuations varied among Member States. The time between the evacuation and people returning to their residents was as short as 25 minutes in Australia to as long as 11 hours and 15 minutes in India. The average time of evacuation was 4 hours and 20 minutes (refer to Table-10).

Sumatra Scenario	AUS	IN	IND	KN	SY	SLK	TL
What time did the community first receive the evacution notification?	42 min (03:42)	1 hr (04:00)	13 min (03:13)	1 hr 4 min (04:04)	2 hrs (05:00)	-	-
At what time was the evacution?	43 min (03:43)	1 hr 15 min (04:15)	22 min (03:22)	1 hr 10 min (04:10)	2 hrs 10 min (06:10)	-	-
What is the estimated number of people that evacuated?	50	40,000	4,820	300	900	5,963	900
At what time did the community first receive the all-clear message?	-	12 hrs 2 min (15:02)	5 hrs 56 min (08:56)	7 hrs 5 min (10:05)	-	-	-
At what time did people return to their residents?	1 hr 8 min (04:08)	12 hrs 30 min (15:30)	6 hrs (09:00)	7 hrs 15 min (10:15)	8 hrs (11:00)	-	-
Total time of evacuation	25 min	11 hrs 15 min	5 hrs 38 min	6 hrs 5 min	5 hrs 50 min	-	-

Makran Scenario	COM	IR	MAU	OM	PK
What time did the community first receive the evacution notification?	3 hrs (09:00)	8 min (06:08)	3 hrs (09:00)	1 hr (07:00)	7 min (06:07)
At what time was the evacution?	4 hrs (10:00)	9 min (06:09)	3 hr 45 min (09:45)	-	10 min (06:10)
What is the estimated number of people that evacuated?	500	30	198	5,000	200
At what time did the community first receive the all-clear message?	-	1 hr (07:00)	6 hrs 30 min (12:30)	2 hrs (08:00)	5 hrs 2 min (11:02)
At what time did people return to their residents?	7 hrs 30 min (13:30)	1 hr 1 min (07:01)	7 hrs (13:00)	2 hrs 30 min (08:30)	5 hrs 2 min (11:02)
Total time of evacuation	3 hrs 30 min	52 min	3 hrs 15 min	1 hr 30 min	4 hrs 52 min

Table 10. Timing (UTC) of community evacuation notification, timing of the evacuation, and the estimated number of people who evacuated. The Sumatra scenario (participating countries in yellow) earthquake occurred at 03:00 UTC. The Makran scenario (participating countries in green) earthquake occurred at 06:00 UTC.

Member States proposed several improvements for future tsunami evacuations. These include (as tabled in Annex XXI):

- Community education for tsunami awareness and evacuation along the entire coastline
- Regular exercises
- The number of evacuees should increase
- The number of organisations involved should be increased
- Expert observers should evaluate all steps
- Having inundation maps in place
- Having evacuation route maps

- Evacuation SOPs in place for all institutions including hospitals and elderly peoples homes
- Use of sirens or alarms

2.6.2 Objective 6: Issues for follow-up

Pre-exercise (event) prepareness activity intiatives need to be implemented. In particular, implementation of:.

- National tsunami exercises in Bangladesh, Comoros, France (La Reunion), India, Iran, Madagascar, Malaysia, Maldives, Mozambique, Pakistan, South Africa, Seychelles, Singapore, Tanzania, Thailand and Yemen;
- Tsunami education in schools in Bangladesh, Comoros, France (La Reunion), Iran, Kenya, Malaysia, Maldives, Mauritius, Mozambique, South Africa, Seychelles Singapore, Tanzania, Thailand and Yemen;
- Participatory evacuation planning in Bangladesh, Comoros, France (La Reunion), Iran, Malaysia, Maldives, Mozambique, Oman, South Africa, Seychelles, Singapore, Tanzania, Thailand and Yemen;
- Community education seminars in Bangladesh, Comoros, France (La Reunion), Maldives, Mauritius, Mozambique, Oman, South Africa, Seychelles, Tanzania and Thailand;
- Evacuation maps in Australia, Bangladesh, Comoros, France (La Reunion), Iran, Kenya, Madagascar, Malaysia, Maldives, Mauritius, Mozambique, Oman, Pakistan, South Africa, Seychelles, Singapore, Tanzania, Thailand and Yemen;
- Evacuation signage in Australia, Bangladesh, Comoros, France (La Reunion), India, Madagascar, Malaysia, Maldives, Mauritius, Mozambique, Oman, Pakistan, South Africa, Seychelles, Singapore, Tanzania, Thailand, and Yemen; and
- Shelter facilities in Australia, Bangladesh, Comoros, France (La Reunion), Iran, Kenya, Madagascar, Malaysia, Maldives, Mauritius, Mozambique, Oman, Pakistan, South Africa, Seychelles, Singapore, Tanzania, Thailand and Yemen.

Tsunami preparedness initiatives would benefit from government support. In particular, support for:

- Tsunami signage in Australia, Bangladesh, Comoros, France (La Reunion), India, Madagascar, Malaysia, Maldives, Mozambique, South Africa, Seychelles, Singapore, Tanzania and Yemen;
- Vertical evacuation shelters in Australia, Bangladesh, Comoros, France (La Reunion), Iran, Kenya, Madagascar, Malaysia, Maldives, South Africa, Seychelles, Singapore and Yemen;
- Hazard mapping in Bangladesh, France (La Reunion), Iran, Kenya, Malaysia, Maldives, Myanmar, Seychelles, Tanzania and Yemen;
- Tsunami inundation mapping in Bangladesh, Comoros, France (La Reunion), Iran, Kenya, Malaysia, Maldives, Mozambique, South Africa, Tanzania and Yemen; and
- Evacuation route mapping in Australia, Bangladesh, Comoros, France (La Reunion), Iran, Kenya, Madagascar, Malaysia, Maldives, Mozambique, Oman, South Africa, Seychelles, Tanzania and Yemen.

Futhermore, Member States that did not exercise community evacuations in IOWave16 should be encouraged to do so in the next Indian Ocean-wide Exercise.

3. OVERALL SUCCESS OF THE EXERCISE

Tsunami exercises like IOWave16 entail the exercising of systems and procedures to meet core objectives, the performance against those objectives being evaluated, and an exercise report being produced and communicated. The broad success criteria of the exercise, depending on the level of involvement of each country, are:

(i). The communication protocols between the TSPs, NTWCs, TWFPs and information dissemination points within countries are tested and understood.

(ii). Areas of improvement in the tsunami warning and response chain are identified.

(iii). Local communities participate in the exercise to the extent possible and increase their capacity in terms of tsunami preparedness and response.

The participation rate for the exercise was 100%, with all of the 24 countries with designated Tsunami Warning Focal Points participating, and then submitting formal evaluations to varying levels of completeness.

In order to assess the overall success of the exercise planning, organisation and conduct, Member States ranked the activities of the IOWave16 Task Team from 4 (extremely good), 3 (very good), 2 (good) to 1 (poor). Exercise planning and communication with Member States including timeliness and usefulness of information provided by the ICG/IOTWMS Secretariat was assessed at 3.6. Exercise documenation including manual, websites, and bulletins was assessed at 3.6. Exercise format and style including real-time operation and exercise messages similar to those in a real event was ranked at 3.5. The Exercise evaluation itself was assessed at 3.2. (The individual country responses are given in Annex XXII.) As all activities were assessed between very good and extremely good (3-4) the conduct of IOWave16 is considered to be successful.

In addition countries were asked to comment on the benefits of the exercise as well as suggest improvements for future exercises.

Reported benefits of the exercise included:

- Tested communication chains between organisations
- Validated and identified gaps in SOPs
- Improved community awareness
- Tested message dissemination and reception
- Explored social media communication platforms
- Involved Media
- Identified weaknesses so that these shortcomings can be addressed

Suggested improvements for future exercises included:

- Address identified communication gaps
- Rectify weaknesses in SOPs
- Better media communication
- Upskilling of staff
- Public awareness campaigns including greater media involvement
- Provide back-up methods of downstream message communication
- Better communication among stake holders
- Better defining the roles of all agencies
- Better local preparation

Individual country comments on the benefits of this exercise and suggested improvements for future exercises are contained in Annexes XXIII and XXIV, respectively.

4. COUNTRY REPORTS ON COMMUNITY EVACUATIONS

The twelve Member States that undertook community evacuations were requested to provide a one-page summary of their in-country activities during IOWave16. The reports were collated and edited by the Indian Ocean Tsunami Information Centre (IOTIC) in Jakarta, Indonesia and are included below.

4.1 Australia

Dr. Yuelong Miao | Acting Head, Tsunami Warning & Ocean Services (a/STOC)

Exercise Date:
7 September 2016

Exercise Scenario:
Sumatra earthquake

Malay Kampong residents wait at the Christmas Island tsunami evacuation point.

SGT Steve Wiggins, Territory Controller Christmas Island, briefs evacuation participants on tsunami risk.

Exercise Participants in Australia

IOWave16 participants in Australia were predominantly emergency service organisations who conducted functional or desktop exercises.

However, on Christmas Island, Australia's first successful community evacuation was undertaken. Approximately 50 residents were moved from the Kampong residential area to the evacuation muster point on higher ground.

The full evacuation was completed within 26 minutes of face-to-face notification of the population who had already been made aware that the exercise was taking place.

The Australian Tsunami Early Warning System

Australia is mostly susceptible to seismically generated tsunami events. From the north-west and east, 8000 km tectonic plate boundaries are capable of producing a tsunami that could reach the mainland in 2 to 4 hours. The offshore territories, such as Christmas Island and the Cocos Islands in the Indian Ocean, are especially vulnerable, and could experience much earlier wave arrival from nearby earthquake sources such as from the Java and Sumatra Trenches.

The Australian Tsunami Warning System (ATWS) is an end-to-end system from warning to emergency response. At the heart of the ATWS is the Joint Australian Tsunami Warning Centre (JATWC) which operates in partnership between the Bureau of Meteorology and Geoscience Australia (GA). The JATWC issues tsunami warnings and liaises with federal and state emergency responding agencies, as well as the media. The State/Territory emergency services are responsible for evacuation orders.

In Country Tsunami Exercise at the IOWave16

Organisation and planning for IOWave16 was led by the Bureau of Meteorology in consultation with the Australian Tsunami Advisory Group (ATAG) which includes State/Territory emergency services.

IOWave16 began in Australia with GA advising the Bureau of the occurrence of the Sumatra earthquake. The Bureau National Operations Centre in Melbourne then assessed the potential tsunami threat and issued appropriate watches and warnings to participating agencies. Liaison with these agencies primarily occurred through the Bureau's Regional Forecasting Centres in the affected states and territories. The Australian Government Crisis Coordination Centre also exercised the issuing of information bulletins to its Australian Government stakeholders.

Land inundation warnings were issued for Western Australia, the Cocos Islands and Christmas Island as well as for the Australian Antarctic stations at Mawson, Davis and Casey. Marine warnings were issued for South Australia as well as for parts of the Northern Territory, Victoria and Tasmania.

Feedback was sought from all of the participating agencies through several post exercise debrief meetings. Overall, this feedback was generally positive but with areas for improvement identified.

Key lessons learned and recommendations for community participation in future IOWave exercises

The community evacuation exercise on Christmas Island highlighted the need for improved warning infrastructure. At present there is no signage to alert visitors or unfamiliar residents to appropriate evacuation routes. Furthermore, there is no capability to remotely activate a warning siren and Australian Federal Police officers must enter the danger areas to alert residents face-to-face. Planning for a major tsunami event at the low-lying Cocos Islands is especially challenging since there is no higher ground to which the community can move.

Future IOWave exercises in Australia will look to expand public participation to also include mainland coastal communities.

4.2 Comoros

Saifou-Dine ALIANI TOIHA, in charge of research, Agence Nationale de l'Aviation Civile et de la Météorologie

Exercise Date:
8 September 2016

Exercise Scenario:
Makran earthquake

Community sensitization meeting run by the DMO

People of the community running to help the army and the DMO with rescue efforts.

Exercise Participants

200 people were directly involved. However, people from all segments of society participated in the exercise at the two localities.

The Interior Minister, the Army chief of staff and the Mayor visited the areas where the exercise took place.

Schoolchildren participated in the simulation at the beach

In general people participated each at respective level. This was also shown by the temporary closure of the main road that connects the capital to the international airport.

Comoros Tsunami Early Warning System

The risk of tsunami to the Comoros is growing due to an increased number of local earthquakes. It was previously considered that tsunamis affecting Comoros would be remote events resulting in only a small local impact. It is now likely, however, that a local tsunami could be triggered given the increasing number of earthquakes occurring locally.

The tsunami alert system begins at the Comoros National Tsunami Warning Centre (NTWC). The NTWC provides information to the DMO which, if ready, can be issued within 5 minutes. Within 15 to 30 minutes, the DMO informs all stakeholders and within 60 minutes they are ready to act. Unfortunately, apart from a tide gauge, no specialized equipment or facilities are available to support monitoring and early warning at the National Meteorological and Hydrological Services (NMHS) or National Tsunami Warning Centre (NTWC) for the alert chain, nor at the Directorate General for Civil Security (DGSC) or Disaster Management Office (DMO) for the evacuation order call. Monitoring is limited to notification messages from Tsunami Service Providers (TSPs) and the evacuation, the means commonly used in the country by the DMO.

In Country Tsunami Exercise at the IOWave16

The simulation of a tsunami has been a topical issue for stakeholders in Comoros. As such, when presented with the opportunity to take part in IOWave16, the NTW FP motivated the NTWC to participate.

After some discussion, the scenario of 8 September (Makran earthquake scenario) was chosen. Following two meetings and further email discussion between the focal point of the Directorate General of the Disaster Management Office, two locations were chosen for the exercise (Itsandra beach and Bandamadji town on the Ngazidja Island and Vouani on the Anjoaun Island).

Sensitization meetings were held with the communities by the DMO-LDMO (Local DMO) over several days. Apart from the date of the exercise and the level of alert (Red) to be reached, no information was forwarded to the DMO by NTWC.

The implementation of the plan followed the text of the Tsunami SOP as much as possible and the whole chain, starting from the NTWCs through to the Interior Ministry, the Army, the Mayors and the community. The application of the Tsunami SOP actions were followed by all stakeholders as far as possible.

Key lessons learned and recommendations for community participation in future IOWave exercises

The population expects to be made aware of threats by Tsunami stakeholders. Self-evacuation and assistance must be tested. The fluidity and clarity of messages between the NTWCs and DMO was good.

We learned the following lessons:

Currently, if a real event occurred, it is likely that people will have received information via SMS or GTS before the NTWC are aware. The concept of self-help should be supported. A dedicated Early Warning System for Tsunami is necessary.

Local exercise programs should support regional ones

For the regional cooperation and in coming exercises, countries with more experience and facilities could donate their older specialized equipment and tested evacuation plans to others.

4.3 India

Ajay Kumar BANDELA, Indian National Centre for Ocean Information Services

Exercise Date:
7 & 8 September 2016

Exercise Scenario:
Sumatra earthquake & Makran earthquake

Evacuations during mock drill in West Bengal

Community evacuations during drill in Odisha

Rescue operations during the drill

Awareness campaigns during the mock drill

Exercise Participants in India

Around 40,000 people were involved and evacuated during the mock drill from around 350 coastal villages in 33 districts of 8 provinces.

7 Sep 16: West Bengal (3 districts), Odisha (6), Andhra Pradesh (10), Tamil Nadu (4), Andaman & Nicobar (1)

8 Sep 16: Kerala (4 districts), Karnataka (3) and Gujarat (2)

Indian Navy, Coast Guard and National Disaster Response Force were also involved.

Indian Tsunami Early Warning System (ITEWS)

India is at risk of tsunami from the Andaman-Sumatra-Java subduction zone and Makran trench. Andaman & Nicobar Islands fall within the very near source field of tsunamis.

Following the devastating tsunami on 26 December, 2004, the Indian Tsunami Early Warning System (ITEWS) was established at the Indian National Center for Ocean Information Services (INCOIS), under the Ministry of Earth Science (MoES), Govt. of India, Hyderabad and has been operational since October 15, 2007. ITEWS has all of the necessary computational and communication infrastructure to receive real-time data from sensors, analyse data and generate and disseminate tsunami advisories following a Standard Operating Procedure (SOP). Seismic and sea-level data are continuously monitored at the Early Warning Centre using a custom-built software application which generates alarms/alerts in the warning centre whenever a pre-set threshold is crossed.

Indian Tsunami Early Warning Centre (ITEWC) is responsible for providing tsunami advisories, along with Australia and Indonesia, to Indian Ocean rim countries in the framework of Indian Ocean Tsunami Warning and Mitigation System (IOTWMS) of IOC/UNESCO.

In India, ITEWS provides tsunami advisories (Warning/Alert/Watch) to National/State Disaster Management Organisations (DMOs). National/State DMOs are responsible for disseminating this information to communities and evacuations.

In Country Tsunami Exercise at the IOWave16

ITEWC, India, participated in the IOWave16 tsunami mock drill on both days at National and Regional Level. They issued tsunami test bulletins through Email, SMS, Fax, Web and GTS.

As preparation for the exercise, INCOIS organised a National SOP workshop for DMOs on August 2, 2016. Around 95 participants attended from all of the coastal states of India. Additionally, Coastal Province (State) officials organised local training and meetings with District and village level officials. Awareness programmes and campaigns by school children were organised in a few provinces.

The IOwave16 tsunami mock drill was a huge success and the first of its kind. Approximately 40,000 participants were evacuated to safe shelters from 350 villages in 8 coastal provinces (5 provinces were involved on 7 Sept 2016 and 3 provinces involved on 8 Sept 2016).

Key lessons learned and recommendations for community participation in future IOWave exercises

- IOWave16 Tsunami mock drill was very successful creating awareness and preparedness among the coastal people of India
- Time taken to notify the public varied between 15 and 45 minutes.
- DMOs requested that Email/fax messages should contain detailed threat information
- A few districts have lacunas in their current SOPs , this needs to be rectified
- Dedicated Siren systems need to be installed in the most vulnerable regions by DMOs
- Regular Training programs/workshops/mock drill need to be conducted at community level

4.4 Indonesia

Exercise Date:
7 & 8 September 2016

Exercise Scenario:
Sumatra earthquake & Makran Earthquake

Weniza, M.Sc| Agency for Meteorology, Climatology, and Geophysics of Indonesia

Coordination at the NTWC (BMKG)

Press Conference

Exercise Participants in Indonesia

The IOWave16 was implemented in Jakarta (BMKG, BNPB, Metro TV and MNC Group offices) and in four respective municipalities (Padang city, Pangandaran regency, Pacitan regency and Pandeglang regency).

The exercise participants included facilitators, observers and subjects. Facilitators and observers belongs to various ministries / agencies, including BNPB, local BMKG (Padang, Yogyakarta, Bandung, and Tangerang), UNESCO-IOTIC, Mercy Corps, YPRB, Kogami, MPBI, ITB, Universitas Andalas, LIPI, KKP, and BIG . As for subject, this includes *Pusdalops* officers and community elements, such as school community (teachers and students), private companies (e.g., PT Sampoerna) and various local disaster stakeholder (e.g., BAGUNA, navy / military).

Overall, there were 4,820 participants involved in the IOWave16 in Indonesia.

The Indonesia Tsunami Early Warning System

Indonesia is prone to tsunamis, particularly at the islands that are directly adjacent to the boundaries of the Eurasian, Indo-Australian and Pacific Plates, including the western part of Sumatra, the southern part of Java, Nusa Tenggara, the northern parts of Papua, Sulawesi and Maluku, and the eastern part of Kalimantan

The tsunami early warning communication chain allows for the dissemination of prompt and effective tsunami early warnings and guidance. The warnings and guidance are issued by recognised agencies using the agreed channels of communication to allow the community exposed to the tsunami risk to react appropriately and, if necessary, to evacuate and save themselves before the tsunami reaches the shore. This chain links the National Tsunami Early Warning Centre to communities at risk along the tsunami-prone coasts of Indonesia.

The agencies that play a role in the InaTEWS tsunami early warning communication chain are: The Meteorological, Climatological and Geophysical Agency (Badan Meteorologi, Klimatologi dan Geofisika – BMKG), with its head office in Jakarta, which hosts the National Tsunami Warning Centre; local governments at provincial, district and municipal levels; national and local television and radio stations (public and commercial); the National Disaster Management Agency or BNPB; the Indonesian Military; the Indonesian National Police; cellular service providers; managers of hotels/tourist sites; and communities at risk.

In Country Tsunami Exercise at the IOWave16

At the national level, there was enormous support and close collaboration between BMKG, BNPB, ITB, LIPI, BIG, KKP, and other institutions. There was also an increasing number of media companies (broadcast and print) that are participating; i.e. Metro TV, MNC Group and Kompas, whereas previously only metro TV. In addition, the media also performed its role not only as participants but also by performing dedicated news coverage for of the IOWave16 and related tsunami preparedness activities, e.g., Program Metro 360 and coverage by TVRI West Sumatra regional office.

At the local level, active participation and contributions of locally-generated resources from local and relevant stakeholders BPBDs in Padang, Pangandaran, Pacitan, and Pandeglang were beneficial for the implementation of the IOWAVE16. In addition, there were also substantial media coverage of IOWave16 with 45 articles at international, national and local levels.

An evaluation involving all of the participating agencies was conducted. Overall, all agencies and the communities reported benefits from the implementation of IOWave exercise. There are follow-ups activities and action points that have been identified for improving tsunami preparedness in general, such as capacity building of officers and to ensure availability tsunami early warning SOPs.

Key lessons learned and recommendations for community participation in future IOWave exercises

Based on the evaluation and feedback from various agencies, six key recommendations have been identified to improve tsunami risk preparedness. The recommendations are:

- Conduct regular drills for preparing against tsunami disaster
- Develop dedicated device and system for exercise at BMKG (the NTWC ComTest)
- Intensively improve the level of understanding to the products of earthquake information and tsunami early warning
- Ensure the availability of Tsunami Early Warning SOPs at local and national level
- Capacity building and preparation for *Pusdalops* officer to perform 24/7 operation
- Enhance maintenance of devices for communication and information dissemination at national emergency operation center (*Pusdalops* BNPB and BPBD) as well as evacuation facilities and infrastructure

4.5 Iran

Dr. Ali Khoshkholgh, *Iranian National Institute for Oceanography and Atmospheric Science*

Exercise Date:
8 September 2016

Exercise Scenario:
Makran Scenario

The participants of the training pre-workshop held in Chabahar a day before IOWave 16 in 7th of Sep

Temporary shelters are prepared in safe zone

Exercise Participants

Some residents in one of the coastal areas near Chabahar Port in Iran, Ramin town, have been trained to participate in the exercise. Moreover, accidental beachgoers were participated in the exercise after they heard the siren and speakers. After all , around 30 people were evacuated and moved to high places to be safe.

Iran Tsunami Early Warning System

Iranian National Institute for Oceanography (INIO) established a national center (INCOH) for forecasting and warning hazardous marine phenomena regarding the number and importance of marine hazards in country. Due to the vicinity of Makran Trench to Iranian coastline, a National Tsunami Early Warning System has been under construction since the beginning. 824 Tsunami scenarios are being simulated via ComMIT numerical model and the results, including inundation maps, tsunami wave heights and tsunami arrival times for some predefined points are being linked to a web application. When an earthquake occurs in Makran Trench the application receives the earthquake data from Iranian Seismological Center and searches for the closest tsunami scenario from the database and extracts the related information and based on prepared SOP, suite warning and notification will be disseminated. Besides, INCOH is connected to IOTWMS and is responsible to receive their tsunami warnings on a 24hr base.

In Country Tsunami Exercise at the IOWave 16

In 8th of September 2016, the IOWAVE16 tsunami exercise has been carried out in Chabahar, Iran. According to this event, an unreal 9 Mw earthquake would occur in Makran trench and had a huge effect on Iranian coasts. To plan for the best reaction, Iranian National Center for Ocean Hazards (INCOH) set up some meetings with related organizations like National Disaster Management Organization (NDMO), Iranian Red Crescent Society, Emergency Medical Services (EMS). During the meetings the start time of the exercise and the communication protocols between organizations were set. Also a training pre-workshop was held in 7th of September in Chabahar so that the participants from the organizations were educated about IOWave16. According to the plan the first message has been sent to the related organizations via SMS, Fax and Telephone at 6:00 UTC. After the start of the tsunami a siren went off in the field. Besides, people in the area have been informed of the danger and have been given safety instructions by public speakers. Then evacuees were taken to a predesigned safe place by a bus and several ambulances.

Soon after the exercise ended, managers and executives gathered in one of the shelters and discussed about the strong and weak points of the exercise performance. After all the whole exercise was rated as successful.

Key Lessons Learned and recommendation for future community participation on IOWave Exercise

One of the key achievements of IOWave 16 was the establishment of a communication protocol between related organizations. The exercise has been done in real time and the messages have been sent and received in an almost correct time. However, there were some areas that should be improved. For example, it's better to increase the number of organizations involved in the future exercises, the messages should be managed to be sent automatically rather than manually, the number of evacuees should be increased in future and they'd better include school members and business offices and the warning infrastructure should be improved.

4.6 Kenya

Mr. Peter Mirara Macharia
Assistant Director, Earthquake Monitoring and Tsunami Information Services - Kenya Meteorological Department

Exercise Date:
7 September 2016

Exercise Scenario:
South Java Scenario

Kenya Tsunami Early Warning System

The extent of tsunami risk in Kenya is high. The 2004 Sumatra tsunami affected the Kenyan Coastline as well as the coastline of neighbouring north and south countries.

The Kenya Meteorological Department is the designated National Tsunami Warning Centre (NTWC) and operates 24/7. It has a Global Telecommunication System which receives Tsunami Warning on a 24 hour basis and a real time earthquake monitoring system (SeisComP3).

Its mandate is to receive the earthquake/tsunami bulletins from the Regional Tsunami service Providers (RTSP), to evaluate the bulletins and pass the bulletins on to the National Disaster Operations Centre (NDOC) when a threat is possible. NDOC is responsible for the rest of the warning chain including evacuations. The warning chain involves the media, local disaster organizations, local community organizations, Coastal County Governments and NGOs, among others.

The department operates and maintains 4 tidal gauges, 2 seismic stations and 5 more which will be added to the warning system once they are completed/operational.

Exercise Participants

Approximately 300 people participated with large nearby communities also showing interest.

The local community participated in the exercise

The exercise was conducted in Mombasa County, Likoni shelly beach.

Many community groups were involved as well as NGOs, a nearby school, Kenya Red Cross, beach club, divers club, the elderly and the private sector (Beach Hotels and other business communities) among others.

In Country Tsunami Exercise at the IOWave16

The organization, planning and execution of IOWave16 in Kenya, was spear-headed by the Kenya NTWC in collaboration with NDOC, Kenya. It started with a series of meetings at the national level involving these two organizations and other government organisations and stakeholders.

Resources were identified and the strategic direction was agreed. Every stakeholder was assigned duties related to their organization, and individual organization resource contributions were agreed. The coastal county governments also contributed resources and personnel during the execution.

There was an overwhelming involvement from local communities, media and NGOs among others. The local communities and NGOs, especially the Red Cross, were trained and participated in evacuations.

The exercise in Kenya can be rated as very successful. However, it's recommended that this should be replicated in communities along the entire coastline and also adopted as a regular practice as a refresher.

The exercise was well accepted by the county governments and the coastal communities.

Key lessons learned and recommendations for community participation in future IOWave exercises

- The community showed an eagerness to participate as this is regarded as a precautionary measure for tsunami disaster preparedness
- Community awareness on tsunami disasters and preparedness is still very low
- Gaps were identified spanning from capacity to response, government preparedness and coordination, human resources capacity, funding, equipment and community awareness.
- The exercise worked well and according to plan; The exercise utilized the SOPs and gaps for its review were identified, -
- Community awareness was successfully carried out
- All stakeholders agreed to improve on the identified gaps

4.7 Mauritius

Bhye Muslim Heetun | Deputy Director, Mauritius Meteorological Services

Exercise Date:
8 September 2016

Exercise Scenario:
Makran earthquake

National Emergency Operations Command (NEOC) activation

Minister for Disaster receiving an update on progress of the wave and situation on the ground

Republic of Mauritius Tsunami Early Warning System

There are **three stages** in the Tsunami Early Warning System in Mauritius.

Tsunami Watch: Implies strong earthquake (M>7.0) in region adjacent to Indian ocean and likelihood of tsunami being generated is evoked.

Tsunami Warning: Confirmation a destructive tsunami is likely to affect the islands of Mauritius in 5-7 hours

Termination: Issued after confirmation that tsunami waves are no longer reported

The Meteorological Services is the National Tsunami Warning Center (NTSW). NDRRMC (National Disaster Risk Reduction and Management Centre) is the NDMO (National Disaster Management Organisation), District & Municipal Councils are the Local Disaster Management Organisations (LDMOs). They activate the National Emergency Operations Command (NEOC) and the Local Emergency Operations Command (LEOC) respectively.

The Crisis Committee, chaired by the Minister of Environment, Sustainable Development and Disaster and Beach Management, after consultation with the Prime Minister, is responsible for making decisions regarding evacuations. The NEOC is activated and is responsible to coordinate and monitor evacuation throughout the Republic of Mauritius.

In Country Tsunami Exercise at the IOWave16

The IOWave16 planning and preparation was coordinated by the NDRRMC and involved the local coordinator of the 6 coastal District Councils and the City Council of Port-Louis, the Mauritius Oceanography Institute (MOI), Association des Hoteliers et Restaurateurs de l`ile Maurice (AHRIM) (which represents and promotes the interest of hotels, restaurants and the tourism industry in Mauritius), Mauritius Port Authority (MPA), Fisheries Department, the Outer Island Development Corporation (OIDC) and other stakeholders.

At the District levels, the LEOC's in the concerned District Councils were activated to coordinate activities within their jurisdiction.

The NDRRMC, under the aegis of the Ministry of Environment, Sustainable Development and Disaster and Beach Management. conducted the table top exercise at the national Level and conducted evacuation drills on a small scale with some of the vulnerable communities along the coastal areas.

A tsunami inundation map was developed by the Mauritius Oceanography Institute (MOI), for the Makran Trench scenario for IOWave16.

Exercise Participants

Some vulnerable coastal communities in the 6 District Councils (Pamplemousses, Riviere Du Rempart, Grand Port, Flacq, Savanne, Black River), the City Council of Port- Louis, and the outer islands (Rodrigues and Agalega) participated in the exercise whereby 804 persons were evacuated at Bain des Dames, Port Louis.

25 hotels participated in the exercise.

In the educational sector, the school in the affected zone did not physically carry out an evacuation but all zone directorates were informed and tested their communication network involving all school inspectors and administrators.

Key lessons learned and recommendations for community participation in future IOWave exercises

- This exercise has brought tsunami awareness to the vulnerable communities.
- It has improved and strengthened measures to deal with such a situation.
- The participants and vulnerable communities are better prepared to respond to a tsunami.

4.8 Oman

Badar ALRUMHI, Director Forecasting and Observing Practices

Exercise Date:
8 September 2016

Exercise Scenario:
Makran earthquake

Exercise Participants

This exercise targeted school students. Six schools were selected and each school had between 700 and 900 students.

The schools were in four Provinces along Oman coastal areas near to the Makran Subduction zone.

Sultanate of Oman Tsunami Early Warning System

Oman is exposed to local tsunamis (Makran subduction zone) and distant tsunamis (Sunda trench zone). Other extreme hazards in Oman are tropical cyclones and flash floods. The Makran subduction zone generated an earthquake of magnitude 8.1 in 1945. As a result, there were 4,000 casualties in Pakistan, and Iran, India and Oman were also affected. Tropical cyclones have hit the Omani coast several times; Cyclone Gonu in 2007 resulted in 49 casualties, while in 1890 a cyclone took 727 lives. Flash floods happen almost every year with infrequent casualties but high economic impact.

Oman has operated the National Multi Hazard Early Warning Centre (NMHEWC) since March, 2015. The Tsunami Early Warning System consists of 21 broadband seismicstations, 10 GPS stations (in operation since January, 2014), 10 sea level stations (operational since March, 2013), 5 wave radar and the dissemination system (DSS). Oman National Committee for Civil Defense (NCCD) is responsible calling for evacuation and the NMHEWC is a very active member of the NCCD and head of the Observing and Early Warning Working Group.

In Country Tsunami Exercise at the IOWave16

Oman formed a committee for IOWave16 including stakeholders from; Public Authority for Civil Aviation (PACA), National Committee for Civil Defense (NCCD), Public Authority for Civil Defense and Ambulance (PACDA), Public Authority for Radio and TV, Ministry of Education, and National Committee for UNESCO.

PACA introduced the IOWave16 exercise to the committee and announced that Oman would participate in the IOWave16 exercise on September 8, 2016. The Committee developed the roles and recommendations for participating. The committee selected 6 schools, according to the recommendations and roles, along the coastal Areas of Oman.

PACA gave an introduction presentation to the personnel and teachers from the 6 schools and announced the plan and the scenario. The plan was to form small working groups to assist the evacuation and to evacuate the students to the roof of the schools quickly (less than 20 minutes). The schools did some practices prior to IOWave16.

On September 8, at 10 am local time, the evacuation was carried out in the presence of PACDA and PACA in less than 10 minutes.

The students were evacuated to the roof of the schools. Each school had between 2 to 4 stairways to the roof. Each school developed its own plan taking in to account any students with special requirements. The total time of the exercise was one hour from 10am to 11am.

The exercise was successfully completed due to early planning and the willingness of the participants.

Key lessons learned and recommendations for community participation in future IOWave exercises

1- Early planning and selected date: IOWave16 was before an Eid Holiday and 20 days after the opening of the schools.

2- Strong commitment of all stakeholders.

3- Recommended to exercise schools twice yearly in the future

4- A need to reselect, reshuffle and redesign the schools that are community shelters.

5- More public awareness is required.

6- Regularly testing the dissemination and communication system.

4.9 Pakistan

Karam Khan, National Contact forIOWave 16 - PMD, NTWC, Karachi, Pakistan

Exercise Date:
8 September 2016

Exercise Scenario:
Makran earthquake

Exercise Participants

The evacuation exercise was conducted in the coastal town of Surbandar, near Gwadar. The school community, local residents, fishermen, government officials and NGOs participated in the exercise. Approximately 200 people participated in the event. All the arrangements were made by an NGO Trust for Conservation of Coastal Resources (TCCR) in collaboration with UK based NGO Oxfam GB.

Pakistan Tsunami Early Warning System

Pakistan's coastline, especially the port cities of Gwadar, Pasni, Ormara, Jiwani and Karachi, are at high risk from tsunami due to the Makran subduction zone (MSZ).

The National Seismic Monitoring Centre, Karachi, of the Pakistan Meteorological Department has been designated as the National Tsunami Warning Centre (NTWC) to issue tsunami early warning. NTWC has real time earthquake monitoring systems. Data acquisition is mostly through internet, SeisComp3 analysis software and simulation software are used to produce tsunami warning bulletins and Global Telecommunication System (GTS) is available to receive information from Regional tsunami service providers (RTSP). SMS, email, auto/manual faxes are used to disseminate the warnings.

A contact list of organizations in the warning chain and media representatives is maintained and updated from time to time. Besides NTWC, the other organizations in the warning chain include the National Disaster Management Authority (NDMA), Provincial Disaster Management Authorities (PDMAs), Local/District authorities, electronic media and NGOs. NTWC is responsible for recommending evacuation based on evaluation where as local authorities are responsible for manage the onsite evacuation.

In Country Tsunami Exercise at the IOWave16

A series of meetings were conducted at NTWC and it was agreed in principle to conduct the exercise down to community level. A special team was constituted at NTWC and each member was assigned a particular task.

NTWC is mandated to issue tsunami warnings and recommend evacuation to national/local disaster management organizations and media according to SOPs. Physical evacuation is the responsibility of DDMAs under the guidance of national and provincial organizations.

NTWC contacted all of the coastal DDMAs, PDMAs and NDMA requesting a nominated contact person for IOWave 16 Exercise. The response was over whelming. After a series of discussions with the contact persons it was decided that NTWC would disseminate tsunami warnings to all of the organizations except for the media.

Partner NGOs were to arrange the community level evacuation at a town near Gwadar with facilitation support from relevant disaster organizations. A press release was issued on the template provided in the exercise manual about a week prior to exercise date. Media channels were invited to NTWC on the day of exercise.

After receiving feedback from various sectors, the exercise can be evaluated as successful. However, a lot of work can be done to improve things.

Key lessons learned and recommendations for community participation in future IOWave exercises

It was noted that the school community and fishermen were much more interested in participating in such an event than any other community. NTWC and disaster management authorities are working under different administrative authorities. Most of the disaster management authorities are of the opinion that NTWC is responsible both for issuing tsunami warning and to carry out the community level evacuation. However, NTWC is neither mandated nor has any such experience. This is the main gap in warning chain. It is recommended that two separate country contacts may be appointed (one each from NTWC & Disaster Management Organization) for future IOWave exercises. NGOs may be encouraged to enhance the public awareness. Regional Cooperation may also be extended to enhance the capacity of NTWCs in terms of equipment and human resource.

4.10 Seychelles

Exercise Date:
7 September 2016

Exercise Scenario:
Sumatra earthquake

Ms. Regina Prosper | Senior Disaster Management Officer,
Department of Risk and Disaster Management

The Seychelles Tsunami Early Warning System

The Seychelles' location, topography, and landscape make the country vulnerable to a range of natural hazards, including tsunami. This is likely to be exacerbated by the effects of climate change.

On receipt of a tsunami warning from the Regional Tsunami Service Providers (TSP's), the NTWC (National Meteorological Authority) is responsible for issuing a warning to the DRDM (Division of Risk and Disaster Management). The DRDM is responsible for issuing an advisory to ELO's (Emergency Liaison Officers), First Responders, focal persons from the Seychelles Maritime Safety Administration (SMSA), Seychelles Port Authority (SPA), IDC and media. They are also responsible for issuing evacuation orders which are then carried out by local responders.

In Country Tsunami Exercise at the IOWave16

Key stakeholders were invited to participate and several meetings took place to brief them on the exercise scenario and Tsunami SOP's. Hotel participants were provided with a hotel tsunami preparedness guide. The NEOC (National Emergency Operations Centre) SMS communications system was tested for all participants pre-exercise.

The Australian, Indian and Indonesian TSP's issued warnings to the NTWC. The NTWC issued advisory message to DRDM which was not received.

The SOP was activated and the NEOC established a Communications Cell, a Responder Cell (Police, Fire and Rescue Services Agency and Ministry of Health coordinated preparation activities to reduce impact and evacuation) and a GIS Mapping Group (simulated potentially impacted/inundated areas).

Due to election activities taking place in the country (involving all districts) communities were not able to fully participate. Key partners and stakeholders tested their own emergency plans as well as Tsunami SOP and Early Warning System. Some participants did internal table top exercises, some conducted a full evacuation and others a partial evacuation.

Evacuations

Many community evacuation exercises took place including the evacuation of residents, tourists, vessels within marinas (e.g. super yachts), hospital patients, care home residents and public utility stations (e.g. electric, water and sewage).

Table Tops

Table top exercises were held to test emergency plans by Seychelles Civil Aviation Authority, Zil Air Helicopter Company, Cable and Wireless Telecoms Company, most hotels, Seychelles Petroleum Company (testing all tankers, fuel pipe connections and oil reservoirs) and jointly by the Seychelles Port Authority, Seychelles Marine Safety Administration, Customs Office, Land Marine Private Company.

Exercise Participants in Seychelles

Participants of the IOWave16 exercise in the Seychelles included Police; Fire; Ministry of Health; DRDM; Seychelles Red Cross; Customs; Seychelles Port Authority, Maritime Safety Administration, Land Marine, Customs, People's Defense Force, Coastguard, Civil Aviation Authority and Petroleum Company; Hotels; Zil Air Helicopter Company; tourists; hospitals and care homes; public utility stations and residents.

Key lessons learned and recommendations for community participation in future IOWave exercises

- To have updated risk assessment and inundation mappings done.
- To revise and update the Tsunami Contingency Plan.
- To have an Evacuation Plan for each district.
- To update and finalise the shelter management plan.
- To put up evacuation signs and shelter signs in every district and the main town.
- To further practice and participate in exercises per agency, inter-agency and especially in the community and nationally.
- Further improvements with communication means and protocols.

4.11 Sri Lanka

Pradeep Kodippili | Assistant Director at Disaster Management Centre

Exercise Date:
7 September 2016

Exercise Scenario:
Sumatra earthquake

Exercise Participants in Sri Lanka

Tabletop exercises were carried out in 14 coastal districts Gampaha, Colombo, Kalutara, Galle, Matara, Hambantota, Ampara, Batticaloa, Trincomalee, Killinochchi, Jaffna, Mannar, Puttalam and Mullaitivu) involving over 750 stakeholders. In total, almost 6,000 people participated in the exercise, which involved disabled people in the communities.

The Sri Lanka Tsunami Early Warning System

In Country Tsunami Exercise at the IOWave16

The National Tsunami Warning Centre (NTWC) in Sri Lanka issued an amber warning message within 6 minutes of receiving a bulletin from the Regional Tsunami Service Provider (TSP) to: all 14 participating coastal districts administrative divisions; Office of the Chief of Defence Staff (OCDS); Army, navy and Air Force HQ; fisheries; Islamic Relief; NBRO (national Building Research Organization); health sector; Ceylon Government Railway (CGR); Ceylon Transport Board (CTB) and the call centre.

All coastal early warning towers were activated, radio messages were given to all 14 districts and a fax sent to the 14 DDMCU's (District Disaster Management Coordinating Unit). Additionally, the DEWN (Disaster and Early Warning Network) System was used to send a mass SMS alert.

The Department of Meteorology (the NTWC) issued an evacuation fax message to the Emergency Operations Centre (EOC) and within 9 minutes all 14 districts and agencies mentioned above had been notified.

At the district level, the DDMCU issued the early warning message and evacuation order to the district and divisional secretariats and the village officers (Grama Niladari (GN)).

At the divisional level, the divisional secretariat issued early warning, evacuation and stand down messages to the GN and relevant stakeholders in the DDMCC (District Disaster Management Coordinating Committee).

Mega phones, sirens and PA systems were used at the village level and villagers were evacuated to safe locations on foot and using buses. Some people brought their tsunami malla (evacuation bags) but not all.

External evaluators were used from various organisations to observe and provide feedback on the exercise.

Key lessons learned and recommendations for community participation in future IOWave exercises

- Management of media coordination and briefings was not properly organised and some media interferences disturbed the response. Media should be briefed outside of the EOC.
- Contingency planning needs to be done for possible fire and power failure
- Templates need to be created for early warning SMS to save time
- Live digital map facility to be considered to display up to date situation updates
- Evacuation messages were not properly disseminated in some locations
- Some early warning towers did not work properly
- Most people did not know what emergency evacuation kits (Tsunami "malla") were
- It took too long to get gender and age disaggregated data at the evacuation centre
- Evacuation centre was not decided scientifically nor in consultation with the DM centre
- Existence of evacuation signs needs re-checking
- The Disaster Management Committee should be an active body

4.12 Timor Leste

Exercise Date:
7 September 2016

Exercise Scenario:
Sumatra earthquake

Mr Lorenço Cosme Xavier | Chief, Department of National Disaster Operation Centre (NDOC)

The Timor Leste Tsunami Early Warning System

Timor-Leste is prone to disaster events. The country is located on the boundary of the "Ring of Fire", meaning it is subject to nearby seismic activity and subsequent tsunami hazards.

In Country Tsunami Exercise at the IOWave16

The IOWave16 exercise in Timor Leste took place in Tasitolu, Dili.

The aim of IOWave16 in Timor Leste was to validate SOP's, test the response of relevant institutions, practice and test government contingency plans and validate and test early warning communication measures. The main phases tested were the dissemination of messages and emergency response capacity down to community leader level.

4 groups were set up for the exercise (1 for monitoring, warning and dissemination, 1 for decision making, 1 for execution and 1 for observers).

The exercise was organized by the Ministry of Interior and the Ministry of Social Solidarity including preparation meetings attended by various line ministries, the national police and HCT members.

Technical units set up tents for the wounded, and doctors and nurses provided medical assistance.

Exercise Participants in Timor Leste

Approximately 900 people participated in the IOWave16 exercise in Timor Leste. Those taking part included the Ministry of Social Solidarity (MoS), Ministry of Health (MoH), National Police of Timor Leste (PNTL), Red Cross (CVTL), the National Disaster Operations Centre (NDOC), the District Disaster Management Committee (DDMC), Bombeiros Fire and Rescue, the Humanitarian Country Team (HCT), National Directorate of Meteorology and Geophysics (NDMG), the Ministry of Public Works (MoP) and members of the community.

Key lessons learned and recommendations for community participation in future IOWave exercises

- Lack of coordination across units with people seeming to act independently.
- Lack of clarity of roles
- Operational processes were not followed
- National Disaster Operations Centre (NDOC) alert was a few minutes late
- Radio communications collapsed and could not be used for dissemination
- Lack of understanding of warning messages even after receiving a training session (More training sessions required).
- Frontline dissemination system is very costly (only used as a back-up)
- Not all staff understand how to use equipment

5. OBSERVER REPORTS

Two international observers participated in Exercise IOWave16 with funding from the United Nations Office for International Strategy for Disaster Reduction (UNISDR). The observers were invited to observe the exercise in India and Seychelles, two countries that conducted community evacuations during Exercise IOWave14. The observers were provided with information on the exercise purpose, Terms of Reference, exercise objectives, observer guidelines and reference material from the ICG/IOTWMS Secretariat. The Terms of Reference included:

1. Provide a chronology of the events and actions that you observed.
2. Where appropriate, provide a statement of your observations in relation to each of the core exercise objectives 1-6 (as provided below).
3. Comment on the testing and understanding of communication protocols between the TSPs, NTWCs, TWFPs and information dissemination points within countries.
4. Identify strengths in the tsunami warning and response chain.
5. Identify areas of potential improvement in the tsunami warning and response chain.
6. Comment on the extent that local communities participated in the exercise.
7. Provide examples of how community knowledge of tsunami preparedness and response has been increased as a result of the exercise.

5.1 India

Ms Christa von Hillebrant-Andrade, Manager of the US NOAA NWS Caribbean Tsunami Warning Program and Chair of the UNESCO IOC Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (CARIBE EWS) was invited by the Indian National Center for Ocean Information Services (INCOIS) to visit its Indian Tsunami Early Warning Centre (ITEWC). As part of the observer activities Ms von Hillebrant-Andrade visited and met with the staff of the ITEWC and the Odisha State Disaster Management Agency (OSDMA), as well as attended the 7 September Mock Drill in the Village of Patisunapur on the Northeast coast of India in the State of Odisha. Comments from Ms von Hillebrant-Andrade include:

- The exercise was a great success in Odisha with a participation of over 30,000 people resulting in a greater awareness and readiness of the coastal inhabitants. The inhabitants became familiar and practiced the protocols from the council meeting to the evacuation itself.
- There was a recommendation among OSDMA that these exercises should be done annually as they really contribute to better awareness and readiness and if they are done every year they can be set in the calendar.
- The residents of Patisunapur demonstrated they were ready; the challenge is to stay ready.
- The interactive web reporting tool for the NTWCs of IOTWMS Member States to update the status of their tsunami alert could also be considered by other TSPs and ICGs
- Further discussions on use of the cyclone evacuation shelters for tsunami vertical evacuations between ITEWC and OSDMA are recommended.
- At the village level there are few people who speak English which is the language that is used in the messages of the ITEWC and the State, therefore the District and Blocks play a critical role in getting the messages in the appropriate language.
- Tsunami signage was not observed and OSDMA indicated that this will require more scientific/technical input as well as funding.

The full report of Ms von Hillebrant-Andrade is contained in Annex XXV.

5.2 Seychelles

Mr Kazuya Sugiyasu from Tohoku University observed the exercise in Seychelles on 7 September 2016. During the exercise, Mr Sugiyasu observed the Meteorological Office (NTWC), the Division of Risk and Disaster Mangement (NDMO), and the Police Office and examined how they exchanged information with the TSP. He also observed the evacuations of Eden Island and Bel Eau School. Comments from Mr Sugiyasu include:

- Awareness of disaster risk reduction amongst local residents should be raised.
- Urban planning should be connected with disaster risk reduction, and the planning needs to contribute smooth and proactive evacuation of local residents and tourists.
- Evacuation centres should be considered in accordance with evacuation situation in tsunami disasters.
- Multiple scenarios of evacuation drill should be prepared. Especially, it should be taken into consideration that evacuation takes a long time in tsunami disasters due to destruction of houses and it causes a long stay at evacuation centres.
- The facilities, which play central functions in response phase and are relevant to disaster risk reduction, should be strengthened.
- Disaster reduction measures should focus on both residents and foreign tourists.
- Hazard maps for tsunami evacuation should be prepared that include the places to go to during an evacuation.
- People need a way to get further information once they reach places of evacuation. This was difficult in the exercise as the designated evacuation places were an open space such as a parking lot.

The full report of Mr Sugiyasu is contained in Annex XXV.

6. LESSONS LEARNT WORKSHOP ON COMMUNITY PARTICIPATION IN THE INDIAN OCEAN WAVE EXERCISE 2016

As a follow up to the IOWave16 exercise, UNESCAP, IOC/UNESCO Indian Ocean Tsunami Information Centre, the ICG/IOTWMS Secretariat, and the Institute of Technology Bandung organized a regional Lessons Learnt Workshop on Community Participation in the Indian Ocean Tsunami Wave Exercise 2016 in Bandung, Indonesia on 5-6 December 2016. Indian Ocean Member States were invited to the workshop, particularly countries that exercised community level activity during IOWave16. Forty seven (47) participants from 11 Member States of the IOTWMS attended the workshop, consisting of Australia, Comoros, India, Indonesia, Iran, Kenya, Mauritius, Oman, Pakistan, Seychelles and Timor Leste. In addition, 4 local governments in Indonesia (Padang, Pandeglang, Pangandaran and Pacitan) and 2 international organizations (RIMES and GIZ) also participated in this workshop.

The aim of the workshop was to serve as a platform to share experiences and lessons learned of tsunami emergency response at the Indian Ocean Tsunami Wave Exercise 2016. The workshop had two primary objectives. Firstly, to compile lessons learned from Indian Ocean Member States conducting community level activities at the IOWave16 Exercise. Secondly, to provide recommendations to Working Group 1 of the ICG/IOTWMS on sustaining and increasing the number of Indian Ocean Member States doing community level activities in future IOWave exercises.

6.1 Lessons Learnt from IOWave16 Community Activities

6.1.1 Role of IOWave in Community Awareness

All participating countries appreciated the IOWave16 and considered their IOWave exercise activities at the community level as successful. They took IOWave16 as a good opportunity to

do exercise not only at the upstream level (involving NTWC and NDMO at national and/or local) but also to include the downstream activities. The IOWave16, as an international event, was also considered a good way to create awareness in the country, educate the community as well as to build preparedness. As tsunami hazards occur infrequently, IOWave16 was also considered as an effective vehicle for countries to sustain their tsunami risk reduction efforts.

6.1.2 Decision to do Community Level Activity

Australia and India decided to do community level activity after the training/workshops on Standard Operating Procedures for Tsunami Early Warning and Emergency Response held in Hyderabad (2015) and in Melbourne (2016). Seychelles decided to do community activities following its success in doing community exercise at the IOWave14. Mauritius decided to do community level activity as a new law requiring the country to do one disaster exercise annually was enacted. Other countries decided to do the community level activity after receiving the circular letter on IOWave16 from UNESCO/IOC.

6.1.3 Community Participation

Approximately 60,000 people participated in the IOWave16. The participation of communities varied in each country. Australia, Iran, Kenya, Mauritius, Pakistan, and Timor Leste involved one community each with evacuation of 50 to 900 people. Comoros and Seychelles, involved 2+ communities, around 900 people were involved in Seychelles. Indonesia involved 1 city and 3 districts with a total of 8000 people evacuated. Oman had a total of more than 5000 students evacuated from 6 schools. India had the largest community involvement; 350 villages participated in the exercise and more than 40,000 people were evacuated to shelters / safe places.

In addition to communities and schools, some countries also involved the private sector. Mauritius and Seychelles involved the hotel industry in the exercise. Seychelles also involved hospitals and elderly homes with 133 residents, 29 staff and 40 mentally ill patients evacuated. Seychelles, also concerned about the private vessels in one of their communities, managed to evacuate 80 vessels from the marinas during the exercise. One district in Indonesia, Pacitan, also involved participation of one power plant and one company during the exercise, accounted for a total of 200 staffs from both companies.

6.1.4 Exercise Scenarios

All countries appreciated having two exercise scenarios, on different dates. These scenarios allowed them to choose an exercise that fitted with their need. Comoros, participating on 8 September using the Makran scenario, indicated that the scenario gave a wave height too low for them to initiate evacuation. Therefore, in the exercise they added 2m to the tsunami height and used this to initiate evacuation. Timor Leste participated on 7 September; however, as the scenario did not put them under tsunami threat, they did the exercise using the Banda Sea Scenario (a scenario used during an IOTIC training workshop on Tsunami Exercise).

6.1.5 Planning and Timing

All countries appreciated the exercise being done over two days and allowing them to choose the date and the scenario. Most countries felt the preparation time for community level activity was very tight, as they started the preparation after the circular letter was issued. India, Australia and Seychelles decided to do community level activity prior to the circular letter and had more time for the planning, preparation and coordination with stakeholders.

Coordination among key national stakeholders was the main challenge and in some countries turned out to be difficult when planning for the community level activity. Location of the tsunami prone community to be involved also provided a challenge in coordinating the community level activity exercise. Both of these challenges required months to settle and, therefore, planning after the circular letter was issued also become a challenge.

In planning and preparation, all countries conducted a pre-IOWave16 meeting and workshop in the country at different levels. Some did only at national level; some did both at national and local level (including community level). Some countries held workshops several times for the preparation.

Seychelles and Timor Leste had difficulties in coordinating and planning due to unforeseen decisions by the government on conducting political elections in the country. This affected their planning and eventually a need to reduce their plan and scope of the exercise.

6.1.6 Resources (Funding and Support)

Budget preparation for community activity required sufficient time to process. Some countries managed the community level activity budgeting by sharing at national and local level.

6.1.7 Media Coverage

Indonesia involved two Broadcasting media companies to participate in IOWave16. However, all countries managed to get high coverage from national and local media in IOWave16. There were more than 160 items of media coverage (printing, electronic, and social media) of the IOWave16. The UNESCAP, IOC/UNESCO IOTIC and BMKG initiated the official website of IOWave16 community level activity (www.iowave16.org) with more than 20 GB records accumulated and documented including more than 30 videos (official and unofficial videos). During the regional workshop, there were screenings of six videos: 1) news coverage from Australia, 2) IOWave16 video from UNESCAP utilizing footage pooled by UNESCO/IOC-IOTIC, 3) PEER Science ITB video, 4) IOWave16 video from India, 5) IOWave16 video from Iran and 6) IOWave16 video from Seychelles in collaboration with UNISDR.

6.2 Recommendations for Future IOWave Exercises

6.2.1 IOWave Exercises

The workshop participants recommended for ICG/IOTWMS to continue to organize and conduct regular IOWave exercises in the future. It was recommended that the IOWave exercise be fixed to run every two years as an international exercise organized by ICG/IOTWMS. Having the IOWave as a biennium activity the Member States are encouraged to have national exercises in between.

6.2.2 Dates for IOWave Exercises

To have the participation of the communities in IOWave exercise would require good planning and execution, therefore, timing is very important. Some of the issues discussed with regards to the dates of the exercise were:

- Conducting the exercise on working days reduced the number of community participants as their priority would be to work. Having the exercise on the weekend would increase the participation of the community, however, some schools are closed on the weekend, and therefore, special arrangement would need to be made.
- Deciding on the dates needs to consider the general public holidays. However, it might be difficult to consider specific national public holidays as each country would be different.
- There were cases where the exercise dates fell on the same date as special national events, such as elections, sport events, etc.
- It would be good to align the exercise dates with global commemoration days/events, such as International Day for Disaster Reduction (13 October) or the World Tsunami Awareness Day (5 November).

The workshop participants recommended having a fixed date for all IOWave exercises in the future. Having fixed dates for IOWaves and for the exercise to be conducted every two years

would help the Member States to have sufficient time for all the necessary preparation for community participations (stakeholder coordination, planning, resource allocation, etc.). Preferably, the exercise should be conducted before the global commemoration days/event so the exercise activities can be reported at these events, i.e. every 2nd week of September.

6.2.3 Time of the Exercises

Conducting real time exercises is a challenge, especially when communities are involved. Special consideration might also be taken in deciding the scenarios to make sure that each country could conduct community exercises. i.e. a country would not have to do the evacuation at night in most of the IOWave exercises.

6.2.4 Activities toward IOWave Exercises

The workshop participants acknowledged the importance of the ICG/IOTWMS SOP trainings / workshops conducted prior to the IOWave exercise. The trainings / workshops were very important in gearing the Member States towards IOWave exercises. The workshop participants recommended continuing to organize the SOP training / workshop prior to IOWave exercises. The workshop participants also stressed the importance of including broadcasting media again in the SOP training / workshop. The workshop participants recommended:

- Activities organized by ICG/IOTWMS (such as trainings/workshops) continue to be aligned with the IOWave exercise schedule.
- All Member States are encouraged to organize national workshops aligned to the IOWave schedule.
- Example of recommended timeframe for IOWaves and activities toward it:
  2018 - September IOWave18
  - July National Workshops organized by each Member States
  - June ICG/IOTWMS SOP Workshop
  - March National Workshops organized by each Member States
  - January UNESCO/IOC Circular Letter on Exercise Manual

  2017 - September ICG/IOTWMS SOP Workshop
  - June Circular Letter on Report of IOWave16

6.2.5 IOWave National Contacts and Task Team

The workshop participants recommended having a fixed IOWave National Contact (INC) in each Member State. Having a fixed INC would support the better coordination and the continuation of IOWave activities in the country as well as eliminate the need for ICG/IOTWMS secretariat to request for INC each time there is an IOWave exercise. Should there be changes in INC, then the Member States could inform ICG/IOTWMS secretariat. To ensure there will be community participation activities in IOWave exercises, the workshop participants recommended the INC to be from the National Disaster Management Office. In all preparation of the IOWave the INC would need to closely coordinate and work with the Tsunami National Contact (TNC) and the NTWC.

The workshop participants also recommended having a fixed IOWave Task Team for IOWave planning and development of the scenario and manual. The members of the task team should be representatives from the TSPs, 2 INCs (from Western side of Indian Ocean and North West of Indian Ocean) and representative of IOTIC.

6.2.6 IOWave Scenarios

The workshop participants appreciated that there were two scenarios in the IOWave16 exercise. It was also recognized that the scenarios developed tried to accommodate and ensure that all Member States could participate in the exercise. However, in IOWave16 scenarios there were cases in which countries did not need to do evacuations (i.e. Comoros and Timor Leste). To ensure there will be community level activities in future IOWaves, the workshop participants recommended to consider scenarios that will have impact on the coast

of the Member States. There might be a need to have additional scenarios for specific countries.

6.2.7 IOWave Manuals

The workshop participants appreciated the IOWave16 manuals developed by the IOWave Task Team. The manual was considered as a helpful tool for the Member States to make in-country preparations. Several of the workshop participants considered that the IOWave16 manual already has all the information needed by the Member States to do the exercise including for community activities. However, additionally having some guidance on community exercise and utilising IOWave as a platform for engaging with other agencies in the manual would be helpful. Two countries (India and Australia) developed national IOWave16 manuals to better plan and guide the community level activities. The workshop participants recommended that all countries develop national IOWave manuals for better planning and organizing of IOWave community level activities. The workshop participants recommended for ICG/IOWMS Secretariat and/or IOTIC to facilitate the sharing of India's and Australia's National IOWave16 Manual as examples.

6.2.8 IOWave Observers

The workshop participants discussed the importance of observers. In IOWave16, most countries had observers during the exercise, only Seychelles and India had international observers (from ISDR). The observers are very important as they are outside of the system and, therefore, give more neutral and insightful observations, measuring the performance and could help in providing better evaluations.

The workshop participants recommended there be an official observer from ICG/IOTWMS dispatched to countries conducting community level activities during the IOWave exercise. It is acknowledged that dispatching international observers might be costly; therefore, it might be limited to several countries. ICG/IOTWMS could also assign official in-country ICG/IOTWMS observers. Potential ICG/IOTWMS observers could be identified by the TNC in the country. The workshop participants also recommended for ICG/IOTMWS to have a template of a standard observation form to be used for community level activities during IOWave exercises.

6.2.9 IOWave Evaluation Forms and Template

The workshop participants appreciated the evaluation of IOWave16 conducted by ICG/IOTWMS secretariat and acknowledged there are already components on community activity. The participants recommended having a specific evaluation form / template for community level activities. The evaluation criteria have to be general enough to be able to be used in different countries, whilst giving flexibility for the country to customize based on their locality and their specific objectives. The evaluation form / template should be part of the guideline to ensure better evaluation reporting.

6.2.10 Role of Media in IOWave

The media covered the IOWave16 exercise very well and, therefore, increased the visibility of IOWave16. Seychelles and Indonesia involved the media in training/workshop prior to IOWave16, therefore, during the exercise, the media actually responded better as they already had the knowledge. Media should be trained on the tsunami early warning system and be involved in exercises in order to do better during actual emergencies. The workshop participants recommended strengthening the participation of the media, not only for them to cover the IOWave activities (to increase the IOWave visibility), but also to involve them as participants in the IOWave exercise. In addition, the media should continue to be involved in the ICG/IOTWMS SOP trainings / workshops.

6.3 Recommendations on Increasing and Strengthening Member State Community Level Activities

IOWave16 set a new record on the number of Indian Ocean Member States participating involving community participation. The workshop participants acknowledged that this has become a new benchmark and would encourage the countries that already included the community in IOWave16 to continue to do so in the next IOWave exercises. In addition, there should be an increase in the number of countries including community participation in their IOWave exercises. The workshop participants recommended several measures that can be taken:

- Countries start to plan and coordinate for the next IOWave one year beforehand i.e. if next IOWave would be September 2018, the planning should start the latest in September 2017. Countries should not wait for the circular letter (CL) notification about IOWave.
- The official circular letter notification of IOWave exercise, in addition to being sent to the TNCs, should also be sent to the highest level in the organization, i.e. Minister, and also cc'd to Ministry of Foreign Affairs, Disaster Management Office in the country, UNESCO Permanent Delegates, NatCom, etc.
- IOWave report should have a special chapter and good visibility on community activities in IOWave and special acknowledgement of countries doing the activity. This stresses the importance of community level activity in IOWaves. The report should be sent to the highest level in the organization, i.e. Minister, and also cc'd to Ministry of Foreign Affairs, Disaster Management Office in the country, UNESCO Permanent Delegates, NatCom, etc.
- Develop official ICG/IOTWMS and IOTIC promotional video regarding the importance of community activity during IOWave exercises and share this with the Member States to be used to promote to other stakeholders in the country.
- Give special acknowledgement to countries that include community level activities at formal meetings, i.e. the Sessional Meeting of the ICG/IOTWMS.
- To continue to make use of the IOWave16 portal developed by ESCAP and IOTIC to promote IOWave exercise in the future.
- Invite countries not doing community activity to see and learn from countries doing community exercise in IOWave.
- To widely promote the next IOWave exercise via social media, posters, videos, to assist countries in triggering interest of the community to participate in IOWave exercises.

7. REFERENCES

Intergovernmental Oceanographic Commission. 2016. *Exercise Indian Ocean Wave 2016: An Indian Ocean-wide Tsunami Warning and Communication Exercise,* 7-8 September 2016. Volume 1: Exercise Manual. IOC Technical Series No. 128, Vol. 1. UNESCO.

Intergovernmental Oceanographic Commission of UNESCO. 2017. *Exercise Indian Ocean Wave 2016: An Indian Ocean-wide Tsunami Warning and Communication Exercise*, 7-8 September 2016. Volume 2: Exercise Report. IOC Technical Series No. 128, Vol. 2, Supplement 1: TSP Bulletins for Scenario 1 Sumatra.

Intergovernmental Oceanographic Commission of UNESCO. 2017. *Exercise Indian Ocean Wave 2016: An Indian Ocean-wide Tsunami Warning and Communication Exercise*, 7-8 September 2016. Volume 2: Exercise Report. IOC Technical Series No. 128, Vol. 2, Supplement 2: TSP Bulletins for Scenario 2 Makran Trench.

World Bank. 2012. *The Great East Japan Earthquake, Knowledge Notes from the Learning from Megadisasters Project: Executive Summary*, 22 p., Washington DC.

ANNEX I

NATIONAL EXERCISE CONTACTS

AUSTRALIA
Dr. Yuelong MIAO
National Manager Tsunami Warning Services
Bureau of Meteorology, Melbourne
700 Collins StreetDocklandsGPO Box 1289
Melbourne VIC 3001
Australia
Tel: +61 3 9669 4110
Email: y.miao@bom.gov.au

BANGLADESH
Mr Md. Momenul ISLAM
Meteorologist and Officer in Charge
Bangladesh Meteorological Department
Seismic Observatory and Research Center,
Bangladesh Meteorological Department,
Agargaon, Dhaka
Dhaka 1207
Bangladesh
Tel: +880 (0)17 58 46 46 49
Fax: 88-02-8118230
Email: momenulislam799@hotmail.com

COMOROS
Saifou-Dine ALIANI TOIHA
in charge of research
Agence Nationale de l'Aviation Civile et de la Météorologie
Comoros
Tel: 002693343924
Email: alianitoiha@yahoo.fr

FRANCE (REUNION)
Mr Jacques ECORMIER
Meteo-France
Direction Interrégionale de La Réunion
BP 4 – 97491 Sainte-Clotilde Cedex
Reunion
Email: jacques.ecormier@meteo.fr

INDIA
Mr Ajay Kumar BANDELA
Scientist 'B'
Indian National Centre for Ocean Information Services
Ocean Valley, Pragathi Nagar (B.O.),
Nizampet (S.O.)
Hyderabad 500090
India
Tel: +91-40-23886071
Fax: +91-40-23895012
Email: ajay@incois.gov.in

INDONESIA
Dr Wandono
Head of Earthquake and Tsunami Warning Division
Meteorological Climatological and Geophysics Agency
Jakarta 10720
Indonesia
Tel: +62 21 6546316
Fax: +62 21 6546316
Email: wandono@bmkg.go.id

IRAN
Dr Ali KHOSHKHOLGH
Assistant Professor
Iranian National Institute for Oceanography and Atmospheric Science
No.3, EtemadZadeh St., Fatemi Ave., Tehran , Iran, 1411813389
Tehran 014155-4781
Iran Islamic Rep of
Tel: +989126208073
Email: a_khosh@inio.ac.ir

KENYA
Mr. Peter Mirara MACHARIA
Assistant Director, Earthquake Monitoring and Tsunami Information Services
Kenya Meteorological Department
P.O. Box 30259
Nairobi 00100
Kenya
Tel: +254-722484413
Email: macharia10@yahoo.com

MADAGASCAR
Mr Jean Bernardo ANDRIANAIVOARISOA
Researcher
Institute and Observatory of Geophysics in Antananarivo (IOGA)
P.O. Box 3843
Antananarivo 101
Madagascar
Tel: +261 22 301 82
Email: andrijb08@gmail.com

Mr Ramarolahy Rina ANDRIANASOLO
Associate Researcher
Institute and Observatory of Geophysics in Antananarivo (IOGA)
Antananarivo Madagascar
Tel: +261202230182
Email: rinaranamana@gmail.com

MAYALSIA
Ms. Irene Swee Neo EU
Section Head
Earthquake and Tsunami Centre
Jalan Sultan
Petaling Jaya Selangor Darul Ehsan 46667
Malaysia
Tel: 603 79678000
Fax: 603 79584824
Email: irene@met.gov.my

MALDIVES
Mr. Ali SHAREEF
Deputy Director General
Maldives Meteorological Service
Hulhule
22000
Maldives
Tel: +960 3326200
Fax: +960 3320021
Email: shareef@meteorology.gov.mv

MAURITIUS
Mr. Bhye Muslim HEETUN
Deputy Director
Mauritius Meteorological Services
St Paul Road
Vacoas Mauritius
Tel: +230 686 1031; +230 5749 4252
Fax: +230 686 1033
Email: bmheetun@yahoo.com

MOZAMBIQUE
Mr. Dennis GUIAMBA
Information Management Officer
National Operative Center for Emergency-CENOE
National Institute of Disaster Management, Main office
Av. 19 de Outubro
Recinto da Base Aérea de Mavalane,
Maputo 1101
Mozambique
Tel: +25821477211/3
Fax: +25821477279
Email: dennis.guiamba@gmail.com

MYANMAR
Mr Kyaw Kyaw LIN
Assistant Director
Department of Meteorology and Hydrology,
Nay Pyi Taw
Nay Pyi Taw Myanmar
Tel: +9567411269, +959250954652
Email: kyawkyawlin.dmh@gmail.com

Dr. Yin Myo MIN HTWE
Assistant Director
Department of Meteorology and Hydrology,
Nay Pyi Taw
Nay Pyi Taw Myanmar
Tel: +959401593377
Email: jianyou.wu007@gmail.com

OMAN
Director Badar ALRUMHI
Director Forecasting and Observing Practices
Muscat Sultanate of Oman 111
Oman
Tel: 0096824519610
Fax: 0096824519610
Email: b.alrumhi@met.gov.om

PAKISTAN
Mr Karam KHAN
Meteorologist
National Tsunami Warning Centre, Karachi
Pakistan Meteorological Department
Karachi Pakistan
Tel: 92-21-9261423
Email: karamkhan31@hotmail.com

SEYCHELLES
Ms Regina Edwina PROSPER
Communication & Information Officer
Division of Risk and Disaster Management
Global Village
Block B
Suit No. 3
Mont Fleuri
P.O. Box 445
Victoria Seychelles
Tel: +248-4672200
Fax: +248-4325324
Email: rprosper@gov.sc

SINGAPORE
Mr Li Ka WING
Meteorological Service Singapore
PO Box 8
Changi Airport Post Office
918141
Singapore
Email: Li_ka_wing@nea.gov.sg

SOUTH AFRICA
Mr. Kevin RAE
Chief Forecaster
Operations
South African Weather Service, Head Office
Private Bag X097
442 Rigel Avenue South
Erasmusrand
Pretoria Gauteng 0001
South Africa
Tel: +27-12 367 6002
Fax: +27-12 367 6042
Email: kevin.rae@weathersa.co.za

SRI LANKA
Mr Pradeep KODIPPILI
Deputy Director - Early warning
Early Warning
Disaster Management Centre
Kalutara WEstern 12050
Sri Lanka
Email: pradeepkodippili@gmail.com

TANZANIA
Samwel MBUYA
Manger of Forecasting Services
Tanzania Meteorological Agency, Dar es Salaam
Tanzania Meteorological Agency
P.O. Box 3056
Dar es Salaam Tanzania
Tel: +255 764 750980
Fax: +255 22 2460735
Email: samwel.mbuya@meteo.go.tz

THAILAND
Rear Admiral. Song EKMAHACHAI
Acting Director,Warning & Dissemination section
National Disaster Warning Center
Thailand
Tel: +6681-4003981
Email: song.ekmahachai@gmail.com

TIMOR-LESTE
Mr. Lorenco Cosme XAVIER
Chief, Department of National Disaster Operation Centre (NDOC)
National Disaster Management Directorate
Timor-Leste
Tel: +670-3322597
Email: xavier.lorenco2797@gmail.com

YEMEN
Mr Mohammed Ali AL-ERYANI
Director of Assessment and Recovery
G.D of enviromental emergency and Disaster
Hadda st
Sana'a Yemen
Tel: 00967-770627746
Fax: 00967-1-335015
Email: m.aleryani@yahoo.com

ANNEX II

MEMBER STATE PARTICIPATION LEVELS

ACTIVITY	%Y	No.	Total	AUS	BAN	COM	FR	IN	IND	IR	KN	MAD	MAL	MD	MAU	MZ	MM	OM	PK	SY	SIN	SA	SLK	TAN	THA	TL	YEM
National disaster management organisations were involved.	92%	22	24	●	●	●	o	●	●	●	●	●	●	o	●	●	●	●	●	●	●	●	●	●	●	●	●
Local disaster management organisations were involved.	79%	19	24	●	●	●	o	●	●	●	●	●	●	o	●	●	●	●	●	o	o	o	●	●	●	●	●
Media representatives participated.	63%	15	24	●	●	●	o	●	●	o	●	o	o	o	●	●	o	●	●	●	o	o	●	●	o	●	●
The community was involved (not necessarily evacuations).	67%	16	24	●	o	●	●	●	●	●	●	o	o	o	●	●	●	●	●	●	o	o	●	o	o	●	●
Public evacuation drills were conducted.	50%	12	24	●	o	●	o	●	●	●	●	o	o	o	●	o	o	●	●	●	o	o	●	o	o	●	o

Table II-1. Member State Participation Levels

AUS=Australia, BAN=Bangladesh, COM=Comoros, FR=France (La Reunion), IN=India, IND=Indonesia, IR=Iran, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, SLK=Sri Lanka, TAN=Tanzania, THA=Thailand, TL=Timor-Leste, YEM=Yemen

%Y= percentage answering yes, No. = number of countries answering yes, Total = total responses, ●= yes, ○= no

ANNEX III

TYPES OF EXERCISES CONDUCTED

EXERCISE TYPE	%Y	No.	Total	AUS	BAN	COM	FR	IN	IND	IR	KN	MAD	MAL	MD	MAU	MZ	MM	OM	PK	SY	SIN	SA	SLK	TAN	THA	TL	YEM
Orientation Exercise	25%	6	24	o	o	o	●	o	●	o	●	o	●	o	o	o	●	o	o	o	o	o	o	o	o	o	●
Drill	38%	9	24	o	o	o	o	●	●	o	●	o	o	o	●	●	●	o	o	o	●	o	●	o	o	●	o
Tabletop Exercise	58%	14	24	●	●	o	o	●	●	o	o	●	●	●	●	o	o	o	o	●	o	o	●	●	●	●	●
Functional Exercise	29%	7	24	●	●	o	o	o	o	●	o	o	o	o	o	o	o	o	●	o	o	●	o	o	●	o	●
Full Scale Exercise	33%	8	24	●	o	●	o	o	●	o	●	o	o	o	o	●	o	●	o	●	o	o	o	o	o	●	o

Table III-1. Types of Exercises Conducted

AUS=Australia, BAN=Bangladesh, COM=Comoros, FR=France (La Reunion), IN=India, IND=Indonesia, IR=Iran, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, SLK=Sri Lanka, TAN=Tanzania, THA=Thailand, TL=Timor-Leste, YEM=Yemen

%Y= percentage answering yes, No. = number of countries answering yes, Total = total responses, ●= yes, ○= no

ANNEX IV

NATIONAL TSUNAMI WARNING CENTRES

Country	National Tsunami Warning Centre (NTWC)
Australia	Joint Australian Tsunami Warning Centre (JATWC)
Bangladesh	Bangaldesh Meteorological Department
Comoros	Direction Technique de la Meteorologie/ Agence Nationale de l'Aviation Civile et de la Meteorologie
France (Reunion)	La Reunion (France) - Meteo-France
India	Indian Tsunami Early Warning Centre (ITEWC)
Indonesia	Agency for Meteorology Climotology and Geophysics (BMKG)
Iran	Iranian National Institute for Oceanography and Atmospheric Science (INIOAS)
Kenya	Kenya Meteorological Department
Madagascar	Institute and Observatory of Geophysics of Antananarivo
Malaysia	Malaysian Meteorological Department
Maldives	Maldives Meteorological Service
Mauritius	Mauritius Meteorological Services
Mozambique	National Institute of Management and Disaster
Myanmar	Department of Meteorology and Hydrology
Oman	Directorate of Meteorology (DGMET) - Public Authority for Civil Aviation (PACA)
Pakistan	National Seismic Monitoring and Tsunami Early Warning Centre, Karachi
Seychelles	Seychelles Meteorological Authority
Singapore	Meteorological Service Singapore
South Africa	South African Weather Service
Sri Lanka	Department of Meteorology
Tanzania	Tanzania Meteorological Agency
Thailand	National Disaster Warning Center
Timor-Leste	National Disaster Operation Centre
Yemen	General Directorate of Emergency and Enviromental Disaster, and Meteorology Authority

ANNEX V

TIMELINESS OF TSP NOTIFICATION DELIVERY MEDIUMS

Sumatra Scenario	Medium	RiT (•)	RL (o)	NR (-)	AUS	BAN	FR	IN	IND	KN	MAD	MAL	MD	MM	SY	SIN	SLK	THA	TL
IOTWMS-TSP AUSTRALIA	Email	93%	0%	7%	•	•	•	•	•	-	•	•	•	•	•	•		•	•
	GTS	86%	0%	14%	•	•	•	•	•	•	-	•	•	•	•	•		•	-
	SMS	79%	0%	21%	•	•	-	•	•	•	•	•	•	-	-	•		•	•
	Fax	57%	21%	21%	•	•	o	•	o	-	-	•	•	•	•	•		o	-
IOTWMS-TSP INDIA	Email	93%	0%	7%	•	•	•	•	•	-	•	•	•	•	•	•		•	•
	GTS	71%	14%	14%	o	•	•	•	•	•	-	•	•	•	•	o		•	-
	Fax	43%	21%	36%	•	•	o	•	o	-	-	•	•	-	-	o		•	-
	SMS	71%	0%	29%	•	•	-	•	•	•	-	•	•	•	-	•		-	•
IOTWMS-TSP INDONESIA	Email	100%	0%	0%	•	•	•	•	•	•	•	•	•	•	•	•		•	•
	GTS	86%	0%	14%	•	•	•	•	•	•	-	•	•	•	•	•		•	-
	SMS	79%	0%	21%	•	•	-	•	•	•	-	•	•	•	-	•		•	•
	Fax	21%	0%	79%	-	•	-	-	•	-	-	-	-	•	-	-		-	-

Table V.1. Timeliness of TSP Notification Delivery Mediums for the Sumatra Scenario based on responses from NTWC on whether or not messages were received in a timely manner. These responses correspond to Section 2.1.1 of the report.

AUS=Australia, BAN=Bangladesh, FR=France (La Reunion), IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MM=Myanmar, SY=Seychelles, SIN=Singapore, SLK=Sri Lanka, THA=Thailand, TL=Timor-Leste

RiT (●)= Received in Time, RL (o) = Received Late, NR (-) = Not Received, a blank space = did not answer

Makran Scenario	Medium	RiT (•)	RL (o)	NR (-)	AUS	COM	IN	IND	IR	MAD	MAU	MZ	OM	PK	SA	TAN	YEM
IOTWMS-TSP AUSTRALIA	Email	92%	0%	8%	•	•	•	•	•	•	•		-	•	•	•	•
	GTS	75%	0%	25%	•	-	•	•	-	-	•		•	•	•	•	•
	SMS	67%	0%	33%	•	-	•	•	•	•	-		•	•	-	-	•
	Fax	67%	8%	25%	•	-	•	•	•	-	•		•	-	•	•	o
IOTWMS-TSP INDIA	Email	92%	0%	8%	•	•	•	•	•	•	•		-	•	•	•	•
	GTS	75%	0%	25%	•	-	•	•	-	-	•		•	•	•	•	•
	SMS	58%	0%	42%	•	-	•	•	-	-	•		•	-	•	-	•
	Fax	50%	25%	25%	•	-	•	o	•	-	•		•	-	o	•	o
IOTWMS-TSP INDONESIA	Email	100%	0%	0%	•	•	•	•	•	•	•		•	•	•	•	•
	GTS	75%	0%	25%	•	-	•	•	-	-	•		•	•	•	•	•
	SMS	58%	0%	42%	•	-	•	•	-	-	-		•	•	•	-	•
	Fax	33%	8%	58%	-	-	-	•	-	-	•		•	-	-	•	o

Table V.2. Timeliness of TSP Notification Delivery Mediums for the Makran Scenario based on responses from NTWC on whether or not messages were received in a timely manner. These responses correspond to Section 2.1.1 of the report.

AUS=Australia, COM=Comoros, IN=India, IND=Indonesia, IR=Iran, MAD=Madagascar, MAU=Mauritius, MZ=Mozambique, OM=Oman, PK=Pakistan, SA=South Africa, TAN=Tanzania, THA=Thailand, YEM=Yemen

RiT (●)= Received in Time, RL (o) = Received Late, NR (-) = Not Received, a blank space = no answer provided

ANNEX VI

TSP MESSAGES RECEIVED FROM NTWCS

Sumatra Scenario: Email

Sumatra Scenario	Email Message No	AUS	BAN	FR	IN	IND	KN	MAD	MAL	MD	MM	SY	SIN	SLK	THA	TL	All Messages			Messages within 15 minutes		
																	Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP AUSTRALIA	0300 Test Start	0301	0300	0300	0301	0300	-	0300	0302	0301	-	0301	0302	0300	0331	0301	13	87%		12	80%	
	0310 Bulletin 1	0311	0312	0310	0311	0310	-	0310	0311	0311	0310	0311	0315	0311	0330	0311	14	93%		12	80%	
	0313 Bulletin 2	0313	0317	0313	0314	0313	-	0313	0314	0313	0313	0314	0317	0313	0333	0313	14	93%		13	87%	
	0325 Bulletin 3	0326	0326	0326	0326	0326	-	0325	0331	0326	0326	0327	0328	0326	0326	0326	14	93%		14	93%	
	0339 Bulletin 4	0340	0340	0339	0341	0337	-	0339	-	0340	0339	0340	0340	0339	0340	0330	13	87%		12	80%	
	0436 Bulletin 4	0437	0338	0437	0437	-	-	0436	0437	0437	0339	0437	0437	0437	0437	0437	13	87%		13	87%	
	0534 Bulletin 5	0535	0540	0537	0535	0535	-	0534	0537	0535	0535	0535	0535	0535	0535	0535	14	93%		14	93%	
	0635 Bulletin 6	0636	0635	0635	0637	0635	-	0636	0639	0636	0635	0636	0636	0635	0636	0636	14	93%		14	93%	
	0734 Bulletin 7	0735	0735	0734	0735	0734	-	0734	0735	0735	0734	0736	0737	0735	0734	0735	14	93%		14	93%	
	0836 Bulletin 8	0837	0838	0836	0837	0836	-	0837	0837	0837	0837	0837	0841	0837	0838	0837	14	93%		14	93%	
	0933 Bulletin 9	0934	0933	0934	0935	0934	-	0934	0934	0934	0934	0934	0934	0934	0934	0934	14	93%		14	93%	
	1035 Bulletin 10	1036	1035	1035	1036	1035	-	1035	1038	1035	1036	1036	1036	1035	1035	1036	14	93%		14	93%	
	1133 Bulletin 11	1136	1136	1135	1136	1135	-	1136	1136	1136	1135	1136	1136	1135	1135	1136	14	93%		14	93%	
	1236 Bulletin 12	1237	1237	1237	1238	1237	-	1236	1237	1237	1239	1237	1237	1237	1237	1237	14	93%		14	93%	
	1335 Bulletin 13	1336	1335	1335	1336	1335	-	1335	1336	1336	1336	1336	1336	1335	1335	1336	14	93%		14	93%	
	1435 Bulletin 14	1436	1436	1435	1437	1425	-	1436	1436	1436	1435	1436	1436	1435	1435	1436	14	93%	**92%**	14	93%	**90%**
IOTWMS-TSP INDIA	0300 Test Start	0300	0300	0258	0301	0258	-	0300	0301	0259	-	0300	0300	0330	0300	0302	13	87%		13	87%	
	0307 Bulletin 1	0307	0308	0305	0308	0305	-	0307	0307	0306	0306	0307	0313	0332	0330	0309	14	93%		13	87%	
	0311 Bulletin 2	0312	0312	0309	0312	0309	-	0311	0315	0310	0309	0312	0316	0337	0332	0313	14	93%		13	87%	
	0343 Bulletin 3	0344	0344	0342	0344	0342	-	0343	0344	0342	0342	0344	0344	0343	0344	0345	14	93%		14	93%	
	0400 Bulletin 4	0400	0401	0358	0400	0358	-	0400	0401	0358	0358	0400	0400	0400	0400	0402	14	93%		14	93%	
	0503 Bulletin 5	0504	0503	0501	0502	-	-	0503	0506	0502	0501	0504	0504	0503	0502	0506	13	87%		13	87%	
	0601 Bulletin 6	0602	0602	0559	0603	-	-	0601	0602	0600	0559	0602	0602	0601	0601	0604	13	87%		13	87%	
	0701 Bulletin 7	0701	0702	0659	0701	0659	-	0701	0701	0659	0659	0701	0701	0701	0702	0703	14	93%		14	93%	
	0800 Bulletin 8	0801	0801	0759	0801	0759	-	0800	0801	0759	0759	0801	0801	0800	0759	0803	14	93%		14	93%	
	0900 Bulletin 9	0901	0900	0859	0901	0859	-	0900	0901	0839	0901	0901	0901	0900	0859	0902	14	93%		14	93%	
	1000 Bulletin 10	1001	1001	0959	1001	0959	-	1001	1001	0959	1100	1001	1002	1001	0959	1004	14	93%		14	93%	
	1100 Bulletin 11	1101	1102	1059	1101	1059	-	1101	1101	1059	1135	1102	1102	1101	1059	1102	14	93%		14	93%	
	1202 Bulletin 12	1203	1203	1200	1203	-	-	1202	1204	1201	1200	1203	1203	1203	1200	1205	13	87%		13	87%	
	1302 Bulletin 13	1302	1303	1300	1302	1300	-	1302	1302	1300	1305	1302	1302	1302	1300	1304	14	93%		14	93%	
	1400 Bulletin 14	1401	1401	1359	1401	1359	-	1401	1403	1359	1400	1401	1401	-	1359	1405	13	87%		13	87%	
	1501 Bulletin 15	1501	1501	1459	1501	1459	-	1502	1503	1459	1501	1501	1501	-	1502	1504	13	87%	**91%**	13	87%	**90%**

Sumatra Scenario: Email continued

Sumatra Scenario	Email Message No	AUS	BAN	FR	IN	IND	KN	MAD	MAL	MD	MM	SY	SIN	SLK	THA	TL	All Messages			Messages within 15 minutes		
																	Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP INDONESIA	0300 Test Start	0259	0300	0300	0259	0301	0300	0258	0300	0258	-	-	0259	0258	0259	0302	13	87%		13	87%	
	0307 Bulletin 1	0308	0307	0307	0308	0308	0307	0307	0308	0307	0308	0308	0313	0307	0307	0309	15	100%		15	100%	
	0310 Bulletin 2	0311	0311	0310	0311	0311	0310	0310	0310	0310	0310	0311	0315	0310	311	0312	15	100%		15	100%	
	0317 Bulletin 3	0317	0318	0317	0318	0318	0317	0317	0317	0317	0317	0317	0320	0317	0317	0320	15	100%		15	100%	
	0400 Bulletin 4	0400	0401	0400	0401	0401	0400	0400	0400	0400	0400	0401	0400	0400	0400	0403	15	100%		15	100%	
	0500 Bulletin 5	0500	0501	0500	0501	0501	-	0500	0501	0500	0500	0500	0500	0500	0500	0503	14	93%		14	93%	
	0600 Bulletin 6	0601	0601	0600	0601	0601	0600	0600	0600	0600	0600	0600	0601	0600	0600	0602	15	100%		15	100%	
	0700 Bulletin 7	0701	0701	0700	0701	0701	0700	0700	0701	0700	0700	0701	0701	0700	0701	0703	15	100%		15	100%	
	0800 Bulletin 8	0801	0801	0800	0801	0800	0800	0800	0801	0800	0800	0801	0800	0800	0800	0802	15	100%		15	100%	
	0900 Bulletin 9	0901	0901	0900	0901	0901	0900	0900	0900	0900	0900	0900	0901	0900	0900	0902	15	100%		15	100%	
	1000 Bulletin 10	1000	1001	1000	1001	1000	1000	1000	1001	1000	1000	1000	1000	1000	1000	1002	15	100%		15	100%	
	1200 Bulletin 11	1200	1203	1200	1201	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1202	15	100%		15	100%	
	1400 Bulletin 12	1400	1402	1400	1401	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1402	15	100%		15	100%	
	1600 Bulletin 13	1600	1601	1600	1559	1600	1600	1601	1600	1600	1600	1601	1601	1601	1501	1602	15	100%	**99%**	15	100%	**99%**

Table VI-1. Summary of Email messages received by each NTWC for the Sumatra Scenario

---

AUS=Australia, BAN=Bangladesh, FR=France (La Reunion), IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MM=Myanmar, SY=Seychelles, SIN=Singapore, SLK=Sri Lanka, THA=Thailand, TL=Timor-Leste

Tot = number of NTWCs who received the message, % = percentage of NTWCs who received the message, Ave = average percentage of NTWCs who received the message, * = corrected figure (Tot, %, Ave) that only includes the messages received withing 15 minutes of the issue time, - messege not received, blank space = no answer provided. Highlighted times indicate that themessage was received more than 15 minutes after being issued.

Makran Scenario: Email

Makran Scenario	SMS Message No	AUS	COM	IN	IND	IR	MAD	MAU	MZ	OM	PK	SA	TAN	YEM	All Messages			Messages within 15 minutes		
															Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP AUSTRALIA	0600 Test Start	0601	0601	0601	0600	0600	0601	-		-	0600	0601	0614	0600	10	77%		10	77%	
	0614 Bulletin 1	0614	0614	0615	0614	0614	0614	0614		-	0614	0614	0615	0614	11	85%		11	85%	
	0614 Bulletin 2	0615	0615	0616	0615	0615	0615	0614		-	0615	0615	0615	0615	11	85%		11	85%	
	0625 Bulletin 3	0626	0625	0624	0625	0625	0626	0625		-	0625	0626	0626	0625	11	85%		11	85%	
	0639 Bulletin 4	0640	0639	0640	0639	0639	0640	0639		-	0639	0640	0642	0639	11	85%		11	85%	
	0735 Bulletin 5	0736	0736	0737	0736	0736	0736	0735		-	0736	0736	0740	0736	11	85%		11	85%	
	0835 Bulletin 6	0836	0835	0836	0835	0835	0836	0833		-	0835	0835	0837	0835	11	85%		11	85%	
	0935 Bulletin 7	0935	0935	0936	0935	0935	0935	0935		-	0935	0935	0937	0935	11	85%		11	85%	
	1036 Bulletin 8	1036	1044	1037	1036	1036	1036	1036		-	1036	1036	1037	1036	11	85%		11	85%	
	1135 Bulletin 9	1135	1135	1136	1135	1135	1137	1136		-	1135	1135	1135	1135	11	85%		11	85%	
	1235 Bulletin 10	1236	1235	1236	1235	1235	1236	1235		-	1235	1235	1238	1235	11	85%		11	85%	
	1335 Bulletin 11	1335	1335	1336	1335	1335	1335	1336		-	1335	1335	1336	1335	11	85%		11	85%	
	1435 Bulletin 12	1436	1435	1436	1435	1435	1436	1436		-	1435	1436	1437	1435	11	85%		11	85%	
	1535 Bulletin 13	1536	1540	1536	1535	1535	1536	1536		-	1535	1535	1537	1535	11	85%		11	85%	
	1635 Bulletin 14	1636	1635	1634	1635	1635	1636	1635		-	1635	1635	1638	1635	11	85%		11	85%	
	1735 Bulletin 15	1736	1735	1734	1735	1735	1736	1735		-	1735	1735	1736	1735	11	85%	**84%**	11	85%	**84%**
IOTWMS-TSP INDIA	0600 Test Start	0600	0600	0601	-	0558	0600	0558		-	0558	0600	-	0600	9	69%		9	69%	
	0607 Bulletin 1	0607	0607	0607	-	0605	0607	0607		-	0605	0607	-	0607	9	69%		9	69%	
	0612 Bulletin 2	0612	0612	0613	-	0610	0612	0612		-	0610	0608	-	0612	9	69%		9	69%	
	0648 Bulletin 3	0648	0648	0648	0646	0646	0648	0648		-	0646	0648	-	0648	10	77%		10	77%	
	0700 Bulletin 4	0701	0700	0701	-	0659	0701	0700		-	0659	0700	-	0700	9	69%		9	69%	
	0800 Bulletin 5	-	0808	0809	0826	0808	0808	0805		-	0800	0808	-	-	8	62%		7	54%	
	0828 Bulletin 5	0829	0928	0830	-	0826	-	-		-	0826	0828	-	0828	7	54%		6	46%	
	0904 Bulletin 6	0905	1002	0905	-	0902	0905	0904		-	0902	0904	-	0904	9	69%		8	62%	
	1002 Bulletin 7	1003	1101	1003	-	1001	1003	1000		-	1001	1002	-	1002	9	69%		8	62%	
	1101 Bulletin 8	1102	1202	1102	-	1059	1101	1101		-	1059	1105	-	1101	9	69%		8	62%	
	1202 Bulletin 9	1203	1301	1203	1200	1200	1202	1202		-	1200	1202	-	1202	10	77%		9	69%	
	1301 Bulletin 10	1302	1400	1301	1259	1259	1301	1301		-	1259	1301	-	1301	10	77%		9	69%	
	1400 Bulletin 11	1401	1500	1401	1358	1358	1400	1400		-	1358	1401	-	1400	10	77%		9	69%	
	1500 Bulletin 12	1502	1601	1501	1459	1459	1501	1501		-	1459	1501	-	1501	10	77%		9	69%	
	1601 Bulletin 13	1602	1702	1602	-	1559	1601	1601		-	1559	1601	-	1601	9	69%		8	62%	
	1700 Bulletin 14	1701	1801	1700	1658	1658	1700	1700		-	1658	1700	-	-	9	69%		8	62%	
	1801 Bulletin 15	1801	-	1800	-	1759	1801	1801		-	1759	1801	-	1801	8	62%	**70%**	8	62%	**65%**

Makran Scenario: Email continued

Makran Scenario	SMS Message No	AUS	COM	IN	IND	IR	MAD	MAU	MZ	OM	PK	SA	TAN	YEM	All Messages			Messages within 15 minutes		
															Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP INDONESIA	0600 Test Start	0600	0600	0600	0600	0600	0600	0557		0600	0600	0601	-	0600	11	85%		11	85%	
	0607 Bulletin 1	0607	0607	0608	0607	0607	0607	0607		0607	0607	0607	-	0607	11	85%		11	85%	
	0610 Bulletin 2	0610	0610	0611	0610	0610	0610	0610		0610	0610	0611	-	0610	11	85%		11	85%	
	0640 Bulletin 3	0640	0648	0641	0640	0640	0640	0640		0640	0640	0641	-	0640	11	85%		11	85%	
	0700 Bulletin 4	0700	0700	0701	0700	0700	0700	0700		0700	0700	0701	-	0700	11	85%		11	85%	
	0800 Bulletin 5	0800	0800	0800	0800	0800	0800	0800		0800	0800	0801	-	0800	11	85%		11	85%	
	0900 Bulletin 6	0900	0900	0901	0901	0900	0900	0900		0900	0900	0900	-	0900	11	85%		11	85%	
	1000 Bulletin 7	1000	1000	1001	1000	1000	1000	0958		1000	1000	1001	-	1000	11	85%		11	85%	
	1100 Bulletin 8	1100	1100	1101	1100	1100	1100	1057		1100	1100	1101	-	1100	11	85%		11	85%	
	1200 Bulletin 9	1200	1200	1201	1200	1200	1200	1157		1200	1200	1201	-	1200	11	85%		11	85%	
	1300 Bulletin 10	1300	1300	1301	1302	1300	1301	1300		1300	1300	1301	-	1300	11	85%		11	85%	
	1400 Bulletin 11	1401	1400	1401	1401	1400	1400	1404		1400	1400	1400	-	1400	11	85%		11	85%	
	1500 Bulletin 12	1502	1501	1502	1502	1500	1500	1501		1501	1501	1503	-	1501	11	85%		11	85%	
	1700 Bulletin 13	1700	1700	1700	1700	1700	1700	1700		1700	1700	1703	-	1700	11	85%	**85%**	11	85%	**85%**

Table VI-2. Summary of Email messages received by each NTWC for the Makran Scenario

---

AUS=Australia, COM=Comoros, IN=India, IND=Indonesia, IR=Iran, MAD=Madagascar, MAU=Mauritius, MZ=Mozambique, OM=Oman, PK=Pakistan, SA=South Africa, TAN=Tanzania, THA=Thailand, YEM=Yemen

Tot = number of NTWCs who received the message, % = percentage of NTWCs who received the message, Ave = average percentage of NTWCs who received the message, * = corrected figure (Tot, %, Ave) that only includes the messages received withing 15 minutes of the issue time, - messege not received, blank space = no answer provided. Highlighted times indicate that themessage was received more than 15 minutes after being issued.

Sumatra Scenario: GTS

GTS Message No	AUS	BAN	FR	IN	IND	KN	MAD	MAL	MD	MM	SY	SIN	SLK	THA	TL	All Messages			Messages within 15 minutes		
																Tot	%	Ave	Tot*	%*	Ave*
0300 Test Start	0300	0300	0300	0300	0301	0300	-	0300	-	-	0300	0300	-	0301	-	10	67%		10	67%	
0310 Bulletin 1	0310	0310	0310	0312	0311	0310	-	0310	-	0308	0310	0310	-	0311	-	11	73%		11	73%	
0313 Bulletin 2	0313	0315	0313	0315	0314	0313	-	0313	0314	0309	0313	0313	-	0314	-	12	80%		12	80%	
0325 Bulletin 3	0325	0335	0326	0326	0326	0325	-	0325	0326	0315	0325	0325	-	0326	-	12	80%		12	80%	
0339 Bulletin 4	0339	0343	0339	0340	0340	0339	-	0339	0340	0344	0340	0339	-	0340	-	12	80%		12	80%	
0436 Bulletin 4	0436	0439	0437	0438	0437	0436	-	-	0437	0344	0436	0436	-	0439	-	11	73%		11	73%	
0534 Bulletin 5	0535	0540	0537	0535	0535	0534	-	0534	0536	0349	0534	0535	-	0536	-	12	80%		12	80%	
0635 Bulletin 6	0635	0636	0635	0636	0636	0635	-	0635	0636	0548	0635	0635	-	0637	-	12	80%		12	80%	
0734 Bulletin 7	0734	0745	0734	0735	0735	0734	-	0735	0736	0631	0734	0734	-	0735	-	12	80%		12	80%	
0836 Bulletin 8	0836	-	0836	0837	0837	0836	-	0835	0838	0731	0836	0836	-	0837	-	11	73%		11	73%	
0933 Bulletin 9	0934	0935	0934	0934	0934	0933	-	0933	0935	0832	0933	0933	-	0934	-	12	80%		12	80%	
1035 Bulletin 10	1035	1038	1035	1036	1035	1035	-	1034	1035	0932	1035	1035	-	1037	-	12	80%		12	80%	
1133 Bulletin 11	1135	-	1135	1136	1135	1135	-	1135	1136	1034	1135	1135	-	1136	-	11	73%		11	73%	
1236 Bulletin 12	1237	1240	1237	1237	1237	1236	-	1235	1236	1149	1236	1237	-	1238	-	12	80%		12	80%	
1335 Bulletin 13	1335	1339	1335	1336	1335	1335	-	1335	1335	1246	1335	1335	-	1336	-	12	80%		12	80%	
1435 Bulletin 14	1435	1435	1435	1436	1435	1435	-	1435	1435	1428	1435	1435	-	1436	-	12	80%	**79%**	12	80%	**78%**
0300 Test Start	-	0300	0256	-	-	-	-	-	0310	-	0257	-	0305	-	-	5	33%		5	33%	
0307 Bulletin 1	0356	0308	0306	-	0357	0307	-	0355	0356	-	0337	0356	0402	0357	-	11	73%		8	53%	
0311 Bulletin 2	0342	0313	0318	0343	0343	0310	-	0341	0356	-	0310	0343	0438	0357	-	12	80%		9	60%	
0343 Bulletin 3	0355	0344	0346	0346	0356	0343	-	0345	0356	0346	0343	0355	0439	0357	-	13	87%		13	87%	
0400 Bulletin 4	0451	0402	0411	0402	0451	0400	-	0450	0451	0346	0400	0451	0451	0451	-	13	87%		12	80%	
0503 Bulletin 5	0504	0505	0505	0502	0505	0503	-	0503	0504	0547	0503	0504	0504	0505	-	13	87%		12	80%	
0601 Bulletin 6	0605	0603	0605	0601	0605	0601	-	0603	0605	0547	0601	0605	0607	0606	-	13	87%		13	87%	
0701 Bulletin 7	0708	0703	0708	0705	0708	0701	-	0706	0709	0603	0701	0708	0708	0709	-	13	87%		13	87%	
0800 Bulletin 8	0803	0804	0803	0808	0803	0801	-	0802	0805	0705	0800	0803	0803	0826	-	13	87%		13	87%	
0900 Bulletin 9	0901	0903	0901	0903	0901	0900	-	0900	0902	0808	0900	0901	0901	0906	-	13	87%		13	87%	
1000 Bulletin 10	1001	1006	1001	1001	1001	1000	-	1000	1002	0859	1000	1001	-	1002	-	12	80%		12	80%	
1100 Bulletin 11	1101	1103	1101	1101	1101	1100	-	1100	1102	0958	1100	1101	-	1102	-	12	80%		12	80%	
1202 Bulletin 12	1203	-	1204	1202	1203	1202	-	1202	1203	1119	1202	1203	-	1204	-	11	73%		11	73%	
1302 Bulletin 13	1302	1305	1302	1302	1302	1302	-	1301	1302	1201	1301	1302	-	1303	-	12	80%		12	80%	
1400 Bulletin 14	1401	1404	1401	1403	1402	1400	-	1400	1401	1425	1400	1401	-	-	-	11	73%		11	73%	
1501 Bulletin 15	1501	1502	1502	1501	1502	1501	-	1500	1502	1426	1500	1501	-	1503	-	12	80%	**79%**	12	80%	**75%**

Sumatra Scenario: GTS continued

GTS Message No	AUS	BAN	FR	IN	IND	KN	MAD	MAL	MD	MM	SY	SIN	SLK	THA	TL	All Messages			Messages within 15 minutes		
																Tot	%	Ave	Tot*	%*	Ave*
0300 Test Start	0258	0300	0302	0258	0258	0300	-	0300	0302	-	0257	0258	-	0259	-	11	73%		11	73%	
0307 Bulletin 1	0307	0308	0308	0308	0307	0307	-	0307	0310	0308	0307	0307	-	0308	-	12	80%		12	80%	
0310 Bulletin 2	0310	0312	0312	0310	0310	0310	-	0310	0310	0309	0309	0310	-	0312	-	12	80%		12	80%	
0317 Bulletin 3	0317	0319	0318	0318	0317	0317	-	0317	0319	0310	0316	0317	-	0318	-	12	80%		12	80%	
0400 Bulletin 4	0400	0403	0402	0410	0400	0400	-	0400	0402	0547	0359	0400	-	0401	-	12	80%		11	73%	
0500 Bulletin 5	0500	0505	0501	0501	0500	0500	-	0500	0502	0549	0500	0500	-	0503	-	12	80%		12	80%	
0600 Bulletin 6	0600	0603	0604	0601	0600	0600	-	0600	0602	0556	0600	0600	-	0601	-	12	80%		12	80%	
0700 Bulletin 7	0700	0705	0701	0700	0700	0700	-	0700	0701	0658	0700	0700	-	0701	-	12	80%		12	80%	
0800 Bulletin 8	0800	0803	0802	0801	0800	0800	-	0800	0801	0758	0800	0800	-	0827	-	12	80%		12	80%	
0900 Bulletin 9	0900	-	0901	0901	0900	0900	-	0900	0901	0857	0900	0900	-	0934	-	11	73%		10	67%	
1000 Bulletin 10	1000	1002	1003	1001	1000	1000	-	1000	1002	1157	1000	1000	-	1001	-	12	80%		11	73%	
1200 Bulletin 11	1200	1210	1204	1201	1200	1200	-	1200	1203	1159	1200	1200	-	1201	-	12	80%		12	80%	
1400 Bulletin 12	1400	1405	1401	1401	1400	1400	-	1400	1400	1426	1400	1400	-	1402	-	12	80%		11	73%	
1600 Bulletin 13	1600	1600	1601	1601	1600	1600	-	1600	1600	-	1600	1600	-	1501	-	11	73%	**79%**	11	73%	**77%**

Table VI-3. Summary of GTS messages received by each NTWC for the Sumatra Scenario

AUS=Australia, BAN=Bangladesh, FR=France (La Reunion), IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MM=Myanmar, SY=Seychelles, SIN=Singapore, SLK=Sri Lanka, THA=Thailand, TL=Timor-Leste

Tot = number of NTWCs who received the message, % = percentage of NTWCs who received the message, Ave = average percentage of NTWCs who received the message, * = corrected figure (Tot, %, Ave) that only includes the messages received withing 15 minutes of the issue time, - messege not received, blank space = no answer provided. Highlighted times indicate that themessage was received more than 15 minutes after being issued.

Makran Scenario: GTS

Makran Scenario	GTS Message No	AUS	COM	IN	IND	IR	MAD	MAU	MZ	OM	PK	SA	TAN	YEM	All Messages			Messages within 15 minutes		
															Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP AUSTRALIA	0600 Test Start	0600	-	0601	0601	-	-	0558		0601	0601	0601	0615	0604	9	69%		9	69%	
	0614 Bulletin 1	0614	-	0618	0614	-	-	0614		0615	0614	0614	0615	0615	9	69%		9	69%	
	0614 Bulletin 2	0615	-	0619	0615	-	-	0614		-	0615	0615	0615	0615	8	62%		8	62%	
	0625 Bulletin 3	0625	-	0626	0626	-	-	-		0626	0625	0625	0626	0627	8	62%		8	62%	
	0639 Bulletin 4	0639	-	0640	0640	-	-	0639		0641	0640	0639	0642	0640	9	69%		9	69%	
	0735 Bulletin 5	0736	-	0737	0736	-	-	0735		0738	0738	0736	0740	0737	9	69%		9	69%	
	0835 Bulletin 6	0835	-	0836	0836	-	-	0835		0836	0800	0835	0837	0836	9	69%		9	69%	
	0935 Bulletin 7	0935	-	0936	0935	-	-	0936		0937	0900	0935	0937	-	8	62%		8	62%	
	1036 Bulletin 8	1036	-	1037	1036	-	-	1036		1037	1000	1036	1037	yes	9	69%		9	69%	
	1135 Bulletin 9	1135	-	1135	1135	-	-	1136		1136	1135	1135	1135	yes	9	69%		9	69%	
	1235 Bulletin 10	1235	-	1235	1236	-	-	1236		1237	1200	1235	1238	1236	9	69%		9	69%	
	1335 Bulletin 11	1335	-	1335	1335	-	-	1336		1336	1335	1335	1336	1336	9	69%		9	69%	
	1435 Bulletin 12	1435	-	1436	1436	-	-	1436		1437	1400	1435	1437	-	8	62%		8	62%	
	1535 Bulletin 13	1535	-	1536	1536	-	-	1536		1536	1501	1535	1537	yes	9	69%		9	69%	
	1635 Bulletin 14	1635	-	1636	1635	-	-	1636		1637	1536	1635	1637	yes	9	69%		9	69%	
	1735 Bulletin 15	1735	-	1736	1735	-	-	1736		1736	1735	1735	1736	yes	9	69%	**67%**	9	69%	**67%**
IOTWMS-TSP INDIA	0600 Test Start	0611	-	0607	0611	-	-	0557		0601	-	0611	-	0609	7	54%		7	54%	
	0607 Bulletin 1	0607	-	0611	0612	-	-	0607		0608	0607	0609	-	0612	8	62%		8	62%	
	0612 Bulletin 2	0612	-	0616	0612	-	-	0612		0613	0612	0612	-	0613	8	62%		8	62%	
	0648 Bulletin 3	0649	-	0648	0649	-	-	0648		0650	0650	0649	-	0649	8	62%		8	62%	
	0700 Bulletin 4	0700	-	0701	0701	-	-	0700		0701	0700	0700	-	0701	8	62%		8	62%	
	0800 Bulletin 5	-	-	0829	0830	-	-	0828		-	0800	0829	-	0830	6	46%		1	8%	
	0828 Bulletin 5	0829	-	-	-	-	-	-		0830	0830	0831	-	0906	5	38%		4	31%	
	0904 Bulletin 6	0905	-	0905	0905	-	-	0904		0907	0905	0905	-	yes	8	62%		8	62%	
	1002 Bulletin 7	1003	-	1003	1003	-	-	1004		1005	1003	1003	-	yes	8	62%		8	62%	
	1101 Bulletin 8	1102	-	1102	1102	-	-	1103		1103	1103	1102	-	-	7	54%		7	54%	
	1202 Bulletin 9	1203	-	1203	1204	-	-	1202		1204	1204	1203	-	yes	8	62%		8	62%	
	1301 Bulletin 10	1301	-	1301	1301	-	-	1301		1302	1301	1301	-	1303	8	62%		8	62%	
	1400 Bulletin 11	1401	-	1401	1401	-	-	1400		1402	1401	1401	-	1403	8	62%		8	62%	
	1500 Bulletin 12	1501	-	1501	1501	-	-	1502		1502	1501	1501	-	yes	8	62%		8	62%	
	1601 Bulletin 13	1601	-	1601	1602	-	-	1602		-	1601	1601	-	yes	7	54%		7	54%	
	1700 Bulletin 14	1700	-	1701	1701	-	-	1701		1702	1701	1701	-	yes	8	62%		8	62%	
	1801 Bulletin 15	1802	-	1801	1802	-	-	1802		1804	1802	1802	-	yes	8	62%	**58%**	8	62%	**55%**

Makran Scenario: GTS continued

Makran Scenario	GTS Message No	AUS	COM	IN	IND	IR	MAD	MAU	MZ	OM	PK	SA	TAN	YEM	All Messages			Messages within 15 minutes		
															Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP INDONESIA	0600 Test Start	0600	-	0601	0600	-	-	0601		0601	0600	0600	-	0604	8	62%		8	62%	
	0607 Bulletin 1	0607	-	0608	0607	-	-	0607		0608	0607	0607	-	0606	8	62%		8	62%	
	0610 Bulletin 2	0610	-	0617	0610	-	-	0610		0611	0610	0610	-	0611	8	62%		8	62%	
	0640 Bulletin 3	0640	-	0640	0640	-	-	0640		0642	0640	0640	-	0641	8	62%		8	62%	
	0700 Bulletin 4	0700	-	0701	0700	-	-	0700		0701	0700	0700	-	0701	8	62%		8	62%	
	0800 Bulletin 5	0800	-	0800	0800	-	-	0800		0801	0800	0800	-	0801	8	62%		8	62%	
	0900 Bulletin 6	0900	-	0901	0900	-	-	0900		0901	0903	0900	-	0901	8	62%		8	62%	
	1000 Bulletin 7	1000	-	1001	1000	-	-	0958		1001	1004	1000	-	yes	8	62%		8	62%	
	1100 Bulletin 8	1100	-	1100	1100	-	-	1101		1102	1103	1100	-	yes	8	62%		8	62%	
	1200 Bulletin 9	1200	-	1201	1200	-	-	1207		1202	1200	1200	-	1201	8	62%		8	62%	
	1300 Bulletin 10	1300	-	1300	1300	-	-	1300		1301	1302	1300	-	1301	8	62%		8	62%	
	1400 Bulletin 11	1400	-	1401	1400	-	-	1359		1401	1402	1400	-	1402	8	62%		8	62%	
	1500 Bulletin 12	1502	-	1502	1502	-	-	1503		1503	1502	1500	-	yes	8	62%		8	62%	
	1700 Bulletin 13	1700	-	1703	1700	-	-	1701		1702	1700	1700	-	yes	8	62%	**62%**	8	62%	**62%**

Table VI-4. Summary of GTS messages received by each NTWC for the Makran Scenario

---

AUS=Australia, COM=Comoros, IN=India, IND=Indonesia, IR=Iran, MAD=Madagascar, MAU=Mauritius, MZ=Mozambique, OM=Oman, PK=Pakistan, SA=South Africa, TAN=Tanzania, THA=Thailand, YEM=Yemen

Tot = number of NTWCs who received the message, % = percentage of NTWCs who received the message, Ave = average percentage of NTWCs who received the message, * = corrected figure (Tot, %, Ave) that only includes the messages received withing 15 minutes of the issue time, - messege not received, blank space = no answer provided. Highlighted times indicate that themessage was received more than 15 minutes after being issued.

Sumatra Scenario: SMS

Sumatra Scenario	SMS Message No	AUS	BAN	FR	IN	IND	KN	MAD	MAL	MD	MM	SY	SIN	SLK	THA	TL	All Messages			Messages within 15 minutes		
																	Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP AUSTRALIA	0300 Test Start	0301	0300	-	0301	0301	0301	0301	0301	0301	-	-	0301	-	0332	0303	11	73%		10	67%	
	0310 Bulletin 1	0311	0311	-	0311	0311	0311	0311	0311	0311	-	-	0311	-	0311	0305	11	73%		11	73%	
	0313 Bulletin 2	0314	0316	-	0313	0313	0313	0314	0313	0313	-	-	0313	-	0314	0315	11	73%		11	73%	
	0325 Bulletin 3	0326	0326	-	0326	0326	0326	0326	0326	0326	-	-	0326	-	0326	0327	11	73%		11	73%	
	0339 Bulletin 4	0340	0340	-	0340	0339	0339	0340	0338	0340	-	-	0340	-	0340	0331	11	73%		11	73%	
	0436 Bulletin 4	0437	0337	-	0437	0437	0437	0437	-	0437	-	-	0437	-	0437	0438	10	67%		10	67%	
	0534 Bulletin 5	0535	0535	-	0535	0535	0535	0535	0535	0535	-	-	0535	-	0535	0536	11	73%		11	73%	
	0635 Bulletin 6	0636	0635	-	0636	0635	0635	0635	0635	0636	-	-	0636	-	-	0637	10	67%		10	67%	
	0734 Bulletin 7	0735	0735	-	0735	0735	0735	0735	0735	0735	-	-	0735	-	-	0736	10	67%		10	67%	
	0836 Bulletin 8	0837	0837	-	0837	0837	0837	0837	0837	0837	-	-	0837	-	-	0837	10	67%		10	67%	
	0933 Bulletin 9	0934	0934	-	0934	0934	0934	0934	0934	0934	-	-	0934	-	-	0935	10	67%		10	67%	
	1035 Bulletin 10	1035	1035	-	1035	1035	1035	1035	1035	1035	-	-	1035	-	-	1037	10	67%		10	67%	
	1133 Bulletin 11	1135	1136	-	1135	1135	135	1135	1135	1135	-	-	1135	-	-	1137	10	67%		10	67%	
	1236 Bulletin 12	1237	1236	-	1237	1237	1237	1237	1246	1237	-	-	1237	-	-	1238	10	67%		10	67%	
	1335 Bulletin 13	1335	1335	-	1335	1335	1335	1335	1329	1335	-	-	1335	-	-	1337	10	67%		10	67%	
	1435 Bulletin 14	1435	1436	-	1436	-	1435	1436	1505	1435	-	-	1436	-	-	1437	9	60%	**69%**	8	53%	**68%**
IOTWMS-TSP INDIA	0300 Test Start	0301	0300	-	0300	0302	0300	-	-	0301	-	-	0301	0301	-	0307	9	60%		9	60%	
	0307 Bulletin 1	0307	0307	-	0307	0307	0307	-	-	0307	0308	-	0307	-	-	0316	9	60%		9	60%	
	0311 Bulletin 2	0311	0311	-	0311	0315	0311	-	0338	-	-	-	0312	0311	-	-	8	53%		7	47%	
	0343 Bulletin 3	0343	0343	-	0343	0343	0343	-	0415	0343	0343	-	0349	0343	-	-	10	67%		9	60%	
	0400 Bulletin 4	0400	0400	-	0400	0400	0400	-	0420	0400	0400	-	0401	0400	-	-	10	67%		9	60%	
	0503 Bulletin 5	0503	0503	-	0503	0503	0503	-	-	0503	0503	-	0503	0503	-	-	9	60%		9	60%	
	0601 Bulletin 6	0601	0601	-	0601	0601	0601	-	0608	0601	0602	-	0601	0601	-	-	10	67%		10	67%	
	0701 Bulletin 7	0701	0701	-	0701	0706	0701	-	-	0701	0704	-	0701	0701	-	-	9	60%		9	60%	
	0800 Bulletin 8	0800	0800	-	0801	0801	0800	-	-	0801	0814	-	0801	0801	-	-	9	60%		9	60%	
	0900 Bulletin 9	0900	0900	-	0901	0901	0900	-	-	0901	0901	-	0901	0901	-	-	9	60%		9	60%	
	1000 Bulletin 10	1001	1000	-	1001	1001	1000	-	-	1001	-	-	1001	1001	-	-	8	53%		8	53%	
	1100 Bulletin 11	1101	1101	-	1101	1101	1100	-	1107	1101	-	-	1101	1101	-	-	9	60%		9	60%	
	1202 Bulletin 12	1202	1202	-	1202	1201	1202	-	-	1202	-	-	1202	1201	-	-	8	53%		8	53%	
	1302 Bulletin 13	1302	1302	-	1302	1302	1302	-	-	1302	-	-	1302	1301	-	-	8	53%		8	53%	
	1400 Bulletin 14	1400	1400	-	1400	1401	1400	-	-	1401	-	-	1401	1401	-	-	8	53%		8	53%	
	1501 Bulletin 15	1501	1501	-	1501	1501	1501	-	1505	1501	-	-	1502	1501	-	-	9	60%	**59%**	9	60%	**58%**

Sumatra Scenario: SMS continued

Sumatra Scenario	SMS Message No	AUS	BAN	FR	IN	IND	KN	MAD	MAL	MD	MM	SY	SIN	SLK	THA	TL	All Messages			Messages within 15 minutes		
																	Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP INDONESIA	0300 Test Start	0301	0300	-	0301	0258	0300	-	0300	0300	-	-	0258	0301	-	-	9	60%		9	60%	
	0307 Bulletin 1	0312	0307	-	0308	0311	0311	-	-	0311	-	-	0311	0311	-	-	8	53%		8	53%	
	0310 Bulletin 2	0314	0310	-	0316	0313	0318	-	0319	0312	0310	-	0319	0314	-	-	10	67%		10	67%	
	0317 Bulletin 3	0322	0318	-	0323	0319	0323	-	0324	0321	0318	-	0323	0315	-	-	10	67%		10	67%	
	0400 Bulletin 4	0401	0400	-	0404	0406	0403	-	0405	0403	0406	-	0403	0402	-	-	10	67%		10	67%	
	0500 Bulletin 5	0505	0500	-	0504	0501	0502	-	0503	0501	0505	-	0504	0502	-	-	10	67%		10	67%	
	0600 Bulletin 6	0603	0600	-	0601	0601	0606	-	0600	0601	0602	-	0602	0603	-	-	10	67%		10	67%	
	0700 Bulletin 7	0701	0701	-	0704	0700	0703	-	0703	0702	0704	-	0702	0702	-	-	10	67%		10	67%	
	0800 Bulletin 8	0801	0800	-	0805	0801	0803	-	0805	0802	0818	-	0804	0803	-	-	10	67%		10	67%	
	0900 Bulletin 9	0901	0901	-	0859	0905	0904	-	0905	0901	0905	-	0905	0902	-	-	10	67%		10	67%	
	1000 Bulletin 10	1001	1001	-	1005	1001	1004	-	1004	1000	-	-	1001	1003	-	-	9	60%		9	60%	
	1200 Bulletin 11	1205	1202	-	1203	1202	1204	-	1158	1201	-	-	1205	1204	-	-	9	60%		9	60%	
	1400 Bulletin 12	1403	1401	-	1402	1401	1404	-	1400	1404	-	-	1402	1404	-	-	9	60%		9	60%	
	1600 Bulletin 13	1601	1600	-	1602	1601	1602	-	1620	1603	-	-	1601	1603	-	-	9	60%	**63%**	9	60%	**63%**

Table VI-5. Summary of SMS messages received by each NTWC for the Sumatra Scenario

---

AUS=Australia, BAN=Bangladesh, FR=France (La Reunion), IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MM=Myanmar, SY=Seychelles, SIN=Singapore, SLK=Sri Lanka, THA=Thailand, TL=Timor-Leste

Tot = number of NTWCs who received the message, % = percentage of NTWCs who received the message, Ave = average percentage of NTWCs who received the message, * = corrected figure (Tot, %, Ave) that only includes the messages received withing 15 minutes of the issue time, - messege not received, blank space = no answer provided. Highlighted times indicate that themessage was received more than 15 minutes after being issued.

Makran Scenario: SMS

Makran Scenario	SMS Message No	AUS	COM	IN	IND	IR	MAD	MAU	MZ	OM	PK	SA	TAN	YEM	All Messages			Messages within 15 minutes		
															Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP AUSTRALIA	0600 Test Start	0600	-	0559	0600	0600	0600	-		0601	0601	-	-	0600	8	62%		8	62%	
	0614 Bulletin 1	0620	-	0620	-	-	0620	-		0621	0614	-	-	0625	6	46%		6	46%	
	0614 Bulletin 2	0620	-	0620	0620	0620	0615	-		0622	0615	-	-	-	7	54%		7	54%	
	0625 Bulletin 3	0626	-	0625	0625	0626	0626	-		0627	0625.	-	-	0626	8	62%		8	62%	
	0639 Bulletin 4	0640	-	0645	0639	0640	0639	-		0641	0639	-	-	0640	8	62%		8	62%	
	0735 Bulletin 5	0736	-	0736	0736	0736	0736	-		1016	0735	-	-	0736	8	62%		7	54%	
	0835 Bulletin 6	0836	-	0836	0835	0835	0836	-		1016	0800	-	-	0835	8	62%		7	54%	
	0935 Bulletin 7	0935	-	0935	0935	0936	0935	-		1016	0900	-	-	0935	8	62%		7	54%	
	1036 Bulletin 8	1036	-	1036	1036	1036	1038	-		1038	1000	-	-	1036	8	62%		8	62%	
	1135 Bulletin 9	1135	-	1135	1135	1135	1135	-		1137	1135	-	-	1135	8	62%		8	62%	
	1235 Bulletin 10	1235	-	1235	1235	1235	1235	-		1237	1235	-	-	1235	8	62%		8	62%	
	1335 Bulletin 11	1335	-	1335	1335	1335	1335	-		1337	1335	-	-	1335	8	62%		8	62%	
	1435 Bulletin 12	1436	-	1436	1436	1435	1436	-		1438	1435	-	-	1437	8	62%		8	62%	
	1535 Bulletin 13	1535	-	1535	1535	1535	1541	-		1537	1535	-	-	1601	8	62%		8	62%	
	1635 Bulletin 14	1635	-	1635	1635	1635	1636	-		1637	1635	-	-	1635	8	62%		8	62%	
	1735 Bulletin 15	1735	-	1735	1735	1735	1736	-		1737	1735	-	-	1735	8	62%	**60%**	8	62%	**59%**
IOTWMS-TSP INDIA	0600 Test Start	0600	-	0600	0600	-	-	0640		0602	-	0600	0600	0606	8	62%		8	62%	
	0607 Bulletin 1	0607	-	0607	0607	-	-	0607		0609	-	0607	0608	0608	8	62%		8	62%	
	0612 Bulletin 2	0612	-	-	0612	-	-	0612		0614	-	0612	0612	0614	7	54%		7	54%	
	0648 Bulletin 3	0648	-	0648	0649	-	-	0648		1014	-	0648	0648	0701	8	62%		7	54%	
	0700 Bulletin 4	0701	-	0700	0701	-	-	0700		1014	-	0900	0701	0811	8	62%		5	38%	
	0800 Bulletin 5	0811	-	0811	0811	-	-	0811		1014	-	1011	0811	0704	8	62%		6	46%	
	0828 Bulletin 5	0828	-	0828	-	-	-	0828		1014	-	1028	0829	0811	7	54%		5	38%	
	0904 Bulletin 6	0904	-	0905	0905	-	-	0904		1014	-	0904	0905	-	7	54%		6	46%	
	1002 Bulletin 7	1002	-	1003	1003	-	-	1003		1014	-	1003	1003	0904	8	62%		7	54%	
	1101 Bulletin 8	1102	-	1101	1102	-	-	1102		1104	-	1102	1102	1002	8	62%		8	62%	
	1202 Bulletin 9	1203	-	1203	1207	-	-	1203		1212	-	1203	1203	1203	8	62%		8	62%	
	1301 Bulletin 10	1301	-	1301	1301	-	-	1301		1302	-	1301	1301	1301	8	62%		8	62%	
	1400 Bulletin 11	1400	-	1400	1401	-	-	1400		1402	-	1400	1401	1400	8	62%		8	62%	
	1500 Bulletin 12	1500	-	1500	1501	-	-	1500		1502	-	1501	1501	1500	8	62%		8	62%	
	1601 Bulletin 13	1601	-	1601	1602	-	-	1601		1603	-	1601	1602	1601	8	62%		8	62%	
	1700 Bulletin 14	1700	-	1700	1701	-	-	1700		1702	-	1700	1701	1700	8	62%		8	62%	
	1801 Bulletin 15	1801	-	1800	1802	-	-	-		1803	-	1801	1802	1801	7	54%	**60%**	7	54%	**55%**

Makran Scenario: SMS continued

Makran Scenario	SMS Message No	AUS	COM	IN	IND	IR	MAD	MAU	MZ	OM	PK	SA	TAN	YEM	All Messages			Messages within 15 minutes		
															Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP INDONESIA	0600 Test Start	0603	-	0604	0603	-	-	-		0601	0600	0601	-	0603	7	54%		7	54%	
	0607 Bulletin 1	0608	-	0613	0611	-	-	-		0613	0607	0611	-	0611	7	54%		7	54%	
	0610 Bulletin 2	0616	-	0615	0615	-	-	-		0619	0610	0618	-	0618	7	54%		7	54%	
	0640 Bulletin 3	0641	-	0646	0642	-	-	-		1014	0640	0643	-	0645	7	54%		6	46%	
	0700 Bulletin 4	0703	-	0702	0701	-	-	-		1014	0700	0703	-	0705	7	54%		6	46%	
	0800 Bulletin 5	0800	-	0803	0803	-	-	-		1014	0800	0804	-	0804	7	54%		6	46%	
	0900 Bulletin 6	0902	-	0904	0902	-	-	-		1014	0900	0904	-	0904	7	54%		6	46%	
	1000 Bulletin 7	1001	-	1003	1002	-	-	-		1014	1000	1005	-	1005	7	54%		7	54%	
	1100 Bulletin 8	1100	-	1105	1100	-	-	-		1107	1100	1105	-	1105	7	54%		7	54%	
	1200 Bulletin 9	1200	-	1204	1202	-	-	-		1212	1200	1703	-	1205	7	54%		7	54%	
	1300 Bulletin 10	1300	-	-	1302	-	-	-		-	1300	-	-	-	3	23%		3	23%	
	1400 Bulletin 11	1400	-	-	1403	-	-	-		-	1400	-	-	-	3	23%		3	23%	
	1500 Bulletin 12	1503	-	-	1503	-	-	-		-	1500	-	-	-	3	23%		3	23%	
	1700 Bulletin 13	1701	-	-	1702	-	-	-		-	1700	-	-	-	3	23%	**45%**	3	23%	**43%**

Table VI-6. Summary of SMS messages received by each NTWC for the Makran Scenario

---

AUS=Australia, COM=Comoros, IN=India, IND=Indonesia, IR=Iran, MAD=Madagascar, MAU=Mauritius, MZ=Mozambique, OM=Oman, PK=Pakistan, SA=South Africa, TAN=Tanzania, THA=Thailand, YEM=Yemen

Tot = number of NTWCs who received the message, % = percentage of NTWCs who received the message, Ave = average percentage of NTWCs who received the message, * = corrected figure (Tot, %, Ave) that only includes the messages received withing 15 minutes of the issue time, - messege not received, blank space = no answer provided. Highlighted times indicate that themessage was received more than 15 minutes after being issued.

Sumatra Scenario: Fax

Sumatra Scenario	Fax Message No	AUS	BAN	FR	IN	IND	KN	MAD	MAL	MD	MM	SY	SIN	SLK	THA	TL	All Messages			Messages within 15 minutes		
																	Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP AUSTRALIA	0300 Test Start	0304	0301	0345	0304	0314	-	-	-	0320	-	0305	0301	0305	-	-	9	60%		7	47%	
	0310 Bulletin 1	0334	0312	-	0334	0316	-	-	0320	0320	0328	-	0326	0330	0336	-	10	67%		4	27%	
	0313 Bulletin 2	0335	0318	-	0335	0317	-	-	0354	0321	0329	0350	0326	0356	0336	-	11	73%		5	33%	
	0325 Bulletin 3	0336	0340	-	0336	-	-	-	0402	0409	0330	0351	0333	0357	0336	-	10	67%		6	40%	
	0339 Bulletin 4	0424	0345	-	0424	0412	-	-	0402	0410	0426	-	0410	-	0354	-	9	60%		2	13%	
	0436 Bulletin 4	0443	0440	0450	0455	-	-	-	-	0454	0426	0442	0445	0454	-	-	9	60%		8	53%	
	0534 Bulletin 5	0543	-	-	0554	0448	-	-	0535	0548	0554	0546	0536	0552	0542	-	10	67%		7	47%	
	0635 Bulletin 6	0641	0636	-	0652	0644	-	-	0644	0641	0658	0646	0637	0640	0638	-	11	73%		9	60%	
	0734 Bulletin 7	0738	0744	-	0740	-	-	-	0735	0742	0755	0746	0736	0738	0737	-	10	67%		9	60%	
	0836 Bulletin 8	0841	-	-	0842	0848	-	-	0837	0850	0852	0855	0841	0851	0842	-	10	67%		8	53%	
	0933 Bulletin 9	0938	0935	-	0951	0943	-	-	0937	0941	0939	0936	0937	-	0937	-	10	67%		9	60%	
	1035 Bulletin 10	1038	1037	-	1053	-	-	-	1044	1040	1047	-	1036	1047	1040	-	9	60%		8	53%	
	1133 Bulletin 11	1140	-	-	1142	1144	-	-	1140	1145	1138	1141	1135	1144	1140	-	10	67%		10	67%	
	1236 Bulletin 12	1241	1245	-	1249	-	-	-	1244	1250	1258	1239	1241	1248	1242	-	10	67%		9	60%	
	1335 Bulletin 13	1340	1340	-	1348	-	-	-	1335	1344	1338	1351	1336	1342	1345	-	10	67%		10	67%	
	1435 Bulletin 14	1440	1440	-	1441	-	-	-	1443	1442	1438	-	1437	1447	1438	-	9	60%	**65%**	9	60%	**50%**
IOTWMS-TSP INDIA	0300 Test Start	0319	0300	-	-	0346	-	-	0307	-	-	-	-	0305	-	-	5	33%		3	20%	
	0307 Bulletin 1	0319	0310	-	0354	0346	-	-	0326	0440	-	-	-	0350	-	-	7	47%		2	13%	
	0311 Bulletin 2	0319	0315	-	-	0347	-	-	0327	0440	-	0952	0402	0405	-	-	8	53%		2	13%	
	0343 Bulletin 3	0347	0350	-	0347	0347	-	-	0340	0611	-	0951	0348	0609	0358	-	10	67%		7	47%	
	0400 Bulletin 4	0404	0405	-	0403	-	-	-	-	0618	-	-	0405	0707	-	-	6	40%		4	27%	
	0503 Bulletin 5	0501	0510	-	0501	0506	-	-	0506	0619	-	-	0502	0800	-	-	8	53%		6	40%	
	0601 Bulletin 6	0602	0606	-	0723	0636	-	-	0636	0811	-	-	0603	0601	0610	-	9	60%		5	33%	
	0701 Bulletin 7	0703	0710	-	0728	0803	-	-	0720	0811	-	1304	0705	0707	0709	-	10	67%		5	33%	
	0800 Bulletin 8	0801	-	-	0801	0831	-	-	0810	0916	-	-	0802	0802	0803	-	8	53%		6	40%	
	0900 Bulletin 9	0901	0910	-	0901	0931	-	-	0923	1012	-	-	0902	0905	0902	-	9	60%		6	40%	
	1000 Bulletin 10	1003	1012	-	1000	-	-	-	1050	1135	-	-	1005	1004	1005	-	8	53%		6	40%	
	1100 Bulletin 11	1101	1105	-	1101	-	-	-	1113	1224	-	-	1102	1200	1102	-	8	53%		6	40%	
	1202 Bulletin 12	1200	1205	-	1200	1201	-	-	-	1318	-	-	1201	1308	1201	-	8	53%		6	40%	
	1302 Bulletin 13	1304	1309	-	1301	-	-	-	1303	1412	-	-	1305	1404	1305	-	8	53%		6	40%	
	1400 Bulletin 14	1403	1410	-	1403	1439	-	-	1406	1529	-	1937	1405	-	1405	-	9	60%		6	40%	
	1501 Bulletin 15	1500	1505	-	1500	1530	-	-	1506	1615	-	2035	1501	-	1501	-	9	60%	**54%**	6	40%	**34%**

Sumatra Scenario: Fax continued

Sumatra Scenario	Fax Message No	AUS	BAN	FR	IN	IND	KN	MAD	MAL	MD	MM	SY	SIN	SLK	THA	TL	All Messages			Messages within 15 minutes		
																	Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP INDONESIA	0300 Test Start	-	0300	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7%		1	7%	
	0307 Bulletin 1	-	0310	0410	-	0308	-	-	-	-	-	-	0309	-	-	-	4	27%		3	20%	
	0310 Bulletin 2	-	0314	-	-	0313	-	-	-	-	-	-	-	-	-	-	2	13%		2	13%	
	0317 Bulletin 3	-	-	-	-	0320	-	-	0346	-	0321	-	-	-	0335	-	4	27%		3	20%	
	0400 Bulletin 4	0448	0410	-	-	0406	-	-	0419	-	0412	-	0405	-	-	-	6	40%		4	27%	
	0500 Bulletin 5	-	0503	-	-	0507	-	-	0520	-	0547	-	-	-	0504	-	5	33%		3	20%	
	0600 Bulletin 6	-	0605	-	-	0606	-	-	-	-	0616	-	0606	-	-	-	4	27%		3	20%	
	0700 Bulletin 7	-	0710	-	-	0703	-	-	0702	-	0714	-	0658	-	-	-	5	33%		5	33%	
	0800 Bulletin 8	-	0810	-	-	0802	-	-	-	-	0825	-	0813	-	-	-	4	27%		3	20%	
	0900 Bulletin 9	-	0915	-	-	0901	-	-	-	-	-	-	-	-	-	-	2	13%		2	13%	
	1000 Bulletin 10	-	1007	-	-	1003	-	-	-	-	-	-	-	-	-	-	2	13%		2	13%	
	1200 Bulletin 11	-	1214	-	-	1201	-	-	-	-	-	-	-	-	-	-	2	13%		2	13%	
	1400 Bulletin 12	-	1410	-	-	1401	-	-	1237	-	-	-	-	-	-	-	3	20%		3	20%	
	1600 Bulletin 13	-	1603	-	-	1601	-	-	-	-	-	-	-	-	-	-	2	13%	**22%**	2	13%	**18%**

Table VI-7. Summary of Fax messages received by each NTWC for the Sumatra Scenario

---

AUS=Australia, BAN=Bangladesh, FR=France (La Reunion), IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MM=Myanmar, SY=Seychelles, SIN=Singapore, SLK=Sri Lanka, THA=Thailand, TL=Timor-Leste

Tot = number of NTWCs who received the message, % = percentage of NTWCs who received the message, Ave = average percentage of NTWCs who received the message, * = corrected figure (Tot, %, Ave) that only includes the messages received withing 15 minutes of the issue time, - messege not received, blank space = no answer provided. Highlighted times indicate that themessage was received more than 15 minutes after being issued.

Makran Scenario: Fax

Makran Scenario	SMS Message No	AUS	COM	IN	IND	IR	MAD	MAU	MZ	OM	PK	SA	TAN	YEM	All Messages			Messages within 15 minutes		
															Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP AUSTRALIA	0600 Test Start	0604	-	0604	-	0612	-	0601		-	-	0604	0630	0620	7	54%		5	38%	
	0614 Bulletin 1	0628	-	0630	0642	0614	-	0623		-	-	0623	0631	0623	8	62%		5	38%	
	0614 Bulletin 2	0629	-	0631	0706	0645	-	0626		-	-	0624	0631	0707	8	62%		4	31%	
	0625 Bulletin 3	0630	-	0632	-	0646	-	0627		0632	-	0701	0632	0708	8	62%		6	46%	
	0639 Bulletin 4	0716	-	0726	0707	0647	-	0715		0642	-	0702	0645	-	8	62%		3	23%	
	0735 Bulletin 5	0751	-	0742	-	0744	-	0743		-	-	0751	0743	0749	7	54%		5	38%	
	0835 Bulletin 6	0844	-	0852	0851	-	-	0835		-	-	0841	0840	0857	7	54%		4	31%	
	0935 Bulletin 7	0940	-	0944	0946	0946	-	0936		-	-	0938	0941	0950	8	62%		8	62%	
	1036 Bulletin 8	1040	-	1044	1041	1043	-	1036		1040	-	1036	1046	1100	9	69%		8	62%	
	1135 Bulletin 9	1140	-	1149	1151	-	-	1136		1142	-	1135	1138	yes	8	62%		7	54%	
	1235 Bulletin 10	1239	-	1247	-	1239	-	1235		1238	-	1235	1240	-	7	54%		7	54%	
	1335 Bulletin 11	1339	-	1350	1343	-	-	1337		1339	-	-	1338	1347	7	54%		7	54%	
	1435 Bulletin 12	1439	-	1446	1441	1439	-	1436		1438	-	1438	1439	-	8	62%		8	62%	
	1535 Bulletin 13	1540	-	1542	1542	1512	-	1535		1541	-	1539	1539	yes	9	69%		9	69%	
	1635 Bulletin 14	1643	-	1644	-	1635	-	1636		1638	-	1635	1641	yes	8	62%		8	62%	
	1735 Bulletin 15	1741	-	1743	-	1739	-	1736		1738	-	-	1740	yes	7	54%	**60%**	7	54%	**49%**
IOTWMS-TSP INDIA	0600 Test Start	0601	-	-	-	-	-	0617		-	-	-	-	-	2	15%		1	8%	
	0607 Bulletin 1	0607	-	0601	-	0607	-	0617		0613	-	-	0838	0646	7	54%		5	38%	
	0612 Bulletin 2	0617	-	0616	-	0616	-	-		0625	-	-	0847	0649	6	46%		4	31%	
	0648 Bulletin 3	0652	-	0652	0700	-	-	-		-	-	-	0932	0646	5	38%		4	31%	
	0700 Bulletin 4	0703	-	0703	-	0703	-	-		-	-	-	0934	0718	5	38%		4	31%	
	0800 Bulletin 5	0801	-	0804	0812	0804	-	-		-	-	-	1033	0802	6	46%		5	38%	
	0828 Bulletin 5	-	-	-	-	-	-	-		-	-	-	-	-	0	0%		0	0%	
	0904 Bulletin 6	0902	-	0906	-	0903	-	0909		-	-	-	-	yes	5	38%		5	38%	
	1002 Bulletin 7	1001	-	1112	1043	1111	-	1110		-	-	-	-	1013	6	46%		2	15%	
	1101 Bulletin 8	1102	-	1102	1046	1102	-	1100		1105	-	-	-	1114	7	54%		7	54%	
	1202 Bulletin 9	1200	-	1200	1205	1203	-	-		-	-	-	-	1202	5	38%		5	38%	
	1301 Bulletin 10	1302	-	1312	-	-	-	1305		1303	-	1303	-	1304	6	46%		6	46%	
	1400 Bulletin 11	1400	-	1400	-	-	-	1400		1406	-	1400	-	1402	6	46%		6	46%	
	1500 Bulletin 12	1500	-	1501	-	-	-	1502		1504	-	1501	-	yes	6	46%		6	46%	
	1601 Bulletin 13	1602	-	1601	-	-	-	1602		-	-	1601	-	yes	5	38%		5	38%	
	1700 Bulletin 14	1701	-	1700	-	-	-	1701		1704	-	1701	-	yes	6	46%		6	46%	
	1801 Bulletin 15	1800	-	1800	-	-	-	1802		1805	-	-	-	yes	5	38%	**40%**	5	38%	**34%**

Makran Scenario: Fax continued

Makran Scenario	SMS Message No	AUS	COM	IN	IND	IR	MAD	MAU	MZ	OM	PK	SA	TAN	YEM	All Messages			Messages within 15 minutes		
															Tot	%	Ave	Tot*	%*	Ave*
IOTWMS-TSP INDONESIA	0600 Test Start	-	-	-	-	-	-	-		0610	-	-	-	-	1	8%		1	8%	
	0607 Bulletin 1	-	-	-	0609	-	-	-		0610	-	-	-	-	2	15%		2	15%	
	0610 Bulletin 2	-	-	-	0611	-	-	-		-	-	-	-	-	1	8%		1	8%	
	0640 Bulletin 3	-	-	-	0643	-	-	0645		-	-	-	-	-	2	15%		2	15%	
	0700 Bulletin 4	-	-	-	0702	-	-	0714		-	-	-	-	0718	3	23%		2	15%	
	0800 Bulletin 5	-	-	-	0802	-	-	0809		0803	-	-	-	-	3	23%		3	23%	
	0900 Bulletin 6	-	-	-	0903	-	-	-		-	-	-	-	-	1	8%		1	8%	
	1000 Bulletin 7	-	-	-	1001	-	-	-		-	-	-	-	-	1	8%		1	8%	
	1100 Bulletin 8	-	-	-	1103	-	-	-		1103	-	-	-	-	2	15%		2	15%	
	1200 Bulletin 9	-	-	-	1201	-	-	-		-	-	-	-	-	1	8%		1	8%	
	1300 Bulletin 10	-	-	-	1302	-	-	-		-	-	-	-	-	1	8%		1	8%	
	1400 Bulletin 11	-	-	-	1402	-	-	-		-	-	-	-	-	1	8%		1	8%	
	1500 Bulletin 12	-	-	-	1503	-	-	-		1505	-	-	-	yes	3	23%		3	23%	
	1700 Bulletin 13	-	-	-	1702	-	-	-		1703	-	-	-	yes	3	23%	**14%**	3	23%	**13%**

Table VI-8. Summary of Fax messages received by each NTWC for the Makran Scenario

---

AUS=Australia, COM=Comoros, IN=India, IND=Indonesia, IR=Iran, MAD=Madagascar, MAU=Mauritius, MZ=Mozambique, OM=Oman, PK=Pakistan, SA=South Africa, TAN=Tanzania, THA=Thailand, YEM=Yemen

Tot = number of NTWCs who received the message, % = percentage of NTWCs who received the message, Ave = average percentage of NTWCs who received the message, * = corrected figure (Tot, %, Ave) that only includes the messages received withing 15 minutes of the issue time, - messege not received, blank space = no answer provided. Highlighted times indicate that themessage was received more than 15 minutes after being issued.

ANNEX VII

TSP EXCHANGE PRODUCTS ACCESSED BY NTWCS

Sumatra Scenario	Exchange Product	Tot	%	AUS	BAN	FR	IN	IND	KN	MAD	MAL	MD	MM	SY	SIN	SLK	THA	TL
IOTWMS-TSP AUSTRALIA	Bulletins	13	85%	•	•	•	•	•	•	•	o	•	•	•	o	-	•	-
	Coastal Zone Threat Map	13	85%	•	•	•	•	•	•	•	o	•	•	•	o	-	•	-
	Threat Table	13	85%	•	•	•	•	•	•	•	o	•	•	•	o	-	•	-
	Maximum Amplitute Map	13	85%	•	•	•	•	•	•	•	o	•	•	•	o	-	•	-
	Tsunami Travel Time Map	13	85%	•	•	•	•	•	•	•	o	•	•	•	o	-	•	-
IOTWMS-TSP INDIA	Bulletins	13	85%	•	•	•	•	•	•	•	o	•	o	•	•	-	•	-
	Coastal Zone Threat Map	13	85%	•	•	•	•	•	•	•	o	•	o	•	•	-	•	-
	Threat Table	13	85%	•	•	•	•	•	•	•	o	•	o	•	•	-	•	-
	Maximum Amplitute Map	13	77%	•	•	•	•	•	•	•	o	•	o	•	o	-	•	-
	Tsunami Travel Time Map	13	85%	•	•	•	•	•	•	•	o	•	o	•	•	-	•	-
IOTWMS-TSP INDONESIA	Bulletins	13	77%	•	•	•	•	•	•	•	o	•	•	o	o	-	•	-
	Coastal Zone Threat Map	13	77%	•	•	•	•	•	•	•	o	•	•	o	o	-	•	-
	Threat Table	13	77%	•	•	•	•	•	•	•	o	•	•	o	o	-	•	-
	Maximum Amplitute Map	13	77%	•	•	•	•	•	•	•	o	•	•	o	o	-	•	-
	Tsunami Travel Time Map	13	77%	•	•	•	•	•	•	•	o	•	•	o	o	-	•	-

Table VII-1. TSP Exchange Productes Accessed by NTWCs during the Sumatra Scenario*

AUS=Australia, BAN=Bangladesh, FR=France (La Reunion), IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MM=Myanmar, SY=Seychelles, SIN=Singapore, SLK=Sri Lanka, THA=Thailand, TL=Timor-Leste

Tot = total number of NTWCs who answered the quesiton, % = percentage of NTWC that access the exchange product relative to total

● = Accessed, ° = Not accessed, - = did not anwer the question

Makran Scenario	Exchange Product	Tot	%	AUS	COM	IN	IND	IR	MAD	MAU	MZ	OM	PK	SA	TAN	YEM
IOTWMS-TSP AUSTRALIA	Bulletins	12	100%	•	•	•	•	•	•	•	-	•	•	•	•	•
	Coastal Zone Threat Map	12	75%	•	•	•	•	•	•	o	-	•	•	o	•	o
	Threat Table	12	92%	•	•	•	•	•	•	•	-	•	•	o	•	•
	Maximum Amplitute Map	12	100%	•	•	•	•	•	•	•	-	•	•	•	•	•
	Tsunami Travel Time Map	12	92%	•	•	•	•	•	•	•	-	•	•	•	•	o
IOTWMS-TSP INDIA	Bulletins	12	92%	•	•	•	•	•	•	•	-	•	•	•	o	•
	Coastal Zone Threat Map	12	83%	•	•	•	•	•	•	o	-	•	•	•	o	•
	Threat Table	12	83%	•	•	•	•	•	•	•	-	•	•	o	o	•
	Maximum Amplitute Map	12	83%	•	•	•	•	•	•	•	-	•	•	o	o	•
	Tsunami Travel Time Map	12	83%	•	•	•	•	•	•	•	-	•	•	o	o	•
IOTWMS-TSP INDONESIA	Bulletins	12	100%	•	•	•	•	•	•	•	-	•	•	•	•	•
	Coastal Zone Threat Map	12	75%	•	•	•	•	•	•	o	-	•	•	o	•	o
	Threat Table	12	92%	•	•	•	•	•	•	•	-	•	•	o	•	•
	Maximum Amplitute Map	12	83%	•	•	•	•	•	•	•	-	•	•	o	•	o
	Tsunami Travel Time Map	12	83%	•	•	•	•	•	•	•	-	•	•	o	•	o

Table VII-2. TSP Exchange Productes Accessed by NTWCs during the Makran Scenario*

AUS=Australia, COM=Comoros, IN=India, IND=Indonesia, IR=Iran, MAD=Madagascar, MAU=Mauritius, MZ=Mozambique, OM=Oman, PK=Pakistan, SA=South Africa, TAN=Tanzania, THA=Thailand, YEM=Yemen

Tot = total number of NTWCs who answered the quesiton, % = percentage of NTWC that access the exchange product relative to total

● = Accessed, ◦ = Not accessed, - = did not anwer the question

ANNEX VIII

TSUNAMI THREAT INFORMATION FROM TSP WEBSITES USED BY NTWCS TO PRODUCE NATIONAL WARNINGS

Sumatra Scenario	Tsunami Threat Information	Tot	%	AUS	BAN	FR	IN	IND	KN	MAD	MAL	MD	MM	SY	SIN	SLK	THA	TL
IOTWMS-TSP AUSTRALIA	Tsunami Wave Observations	13	54%	o	•	•	o	o	•	•	o	o	•	•	o	-	•	-
	T1 Predicted Wave Arrival Time	13	31%	o	•	•	o	o	•	o	o	o	o	•	o	-	o	-
	T2 Predicted Wave Arrival Time	13	38%	o	o	o	o	o	•	•	o	o	•	•	o	-	•	-
	T3 Predicted Wave Arrival Time	13	15%	o	o	o	o	o	•	o	o	o	o	•	o	-	o	-
	T4 Predicted Wave Arrival Time	13	31%	o	o	o	o	o	•	o	o	o	•	•	o	-	•	-
	Predicted Max. Wave Amplitude	13	54%	o	•	•	o	o	•	•	o	o	•	•	o	-	•	-
	CFZ Threat Levels	13	54%	o	•	•	o	o	•	•	o	o	•	•	o	-	•	-
	Other	13	0%	o	o	o	o	o	o	o	o	o	o	o	o	-	o	-
IOTWMS-TSP INDIA	Tsunami Wave Observations	13	62%	o	•	•	•	o	•	•	o	o	o	•	•	-	•	-
	T1 Predicted Wave Arrival Time	13	38%	o	•	•	•	o	•	o	o	o	o	•	o	-	o	-
	T2 Predicted Wave Arrival Time	13	46%	o	o	o	•	o	•	•	o	o	o	•	•	-	•	-
	T3 Predicted Wave Arrival Time	13	23%	o	o	o	•	o	•	o	o	o	o	•	o	-	o	-
	T4 Predicted Wave Arrival Time	13	31%	o	o	o	•	o	•	o	o	o	o	•	o	-	•	-
	Predicted Max. Wave Amplitude	13	62%	o	•	•	•	o	•	•	o	o	o	•	•	-	•	-
	CFZ Threat Levels	13	62%	o	•	•	•	o	•	•	o	o	o	•	•	-	•	-
	Other	13	0%	o	o	o	o	o	o	o	o	o	o	o	o	-	o	-
IOTWMS-TSP INDONESIA	Tsunami Wave Observations	13	54%	o	•	•	o	•	•	•	o	o	•	o	o	-	•	-
	T1 Predicted Wave Arrival Time	13	31%	o	•	•	o	•	•	o	o	o	o	o	o	-	o	-
	T2 Predicted Wave Arrival Time	13	38%	o	o	o	o	•	•	•	o	o	•	o	o	-	•	-
	T3 Predicted Wave Arrival Time	13	15%	o	o	o	o	•	•	o	o	o	o	o	o	-	o	-
	T4 Predicted Wave Arrival Time	13	31%	o	o	o	o	•	•	o	o	o	•	o	o	-	•	-
	Predicted Max. Wave Amplitude	13	54%	o	•	•	o	•	•	•	o	o	•	o	o	-	•	-
	CFZ Threat Levels	13	54%	o	•	•	o	•	•	•	o	o	•	o	o	-	•	-
	Other	13	0%	o	o	o	o	o	o	o	o	o	o	o	o	-	o	-

Table VIII-1. Tsunami Threat Information from TSP Websites used by NTWCs to Produce National Warnings during the Sumatra Scenario

AUS=Australia, BAN=Bangladesh, FR=France (La Reunion), IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MM=Myanmar, SY=Seychelles, SIN=Singapore, SLK=Sri Lanka, THA=Thailand, TL=Timor-Leste

Tot = total number of NTWCs who answered the quesiton, % = percentage of NTWC that access the exchange product relative to total

● = Accessed, ◦ = Not accessed, - = did not anwer the question

Makran Scenario	Tsunami Threat Information	Tot	%	AUS	COM	IN	IND	IR	MAD	MAU	MZ	OM	PK	SA	TAN	YEM
IOTWMS-TSP AUSTRALIA	Tsunami Wave Observations	11	45%	o	•	o	o	o	•	•	-	-	o	o	•	•
	T1 Predicted Wave Arrival Time	11	36%	o	•	o	o	o	o	•	-	-	o	o	•	•
	T2 Predicted Wave Arrival Time	11	36%	o	•	o	o	o	•	•	-	-	o	o	•	o
	T3 Predicted Wave Arrival Time	11	27%	o	•	o	o	o	o	•	-	-	o	o	•	o
	T4 Predicted Wave Arrival Time	11	36%	o	•	o	o	o	o	•	-	-	o	o	•	•
	Predicted Max. Wave Amplitude	11	55%	o	•	o	o	o	•	•	-	-	•	•	•	o
	CFZ Threat Levels	11	27%	o	o	o	o	o	•	•	-	-	o	o	•	o
	Other	11	0%	o	o	o	o	o	o	o	-	-	o	o	o	o
IOTWMS-TSP INDIA	Tsunami Wave Observations	11	45%	o	•	•	o	o	•	•	-	-	o	o	o	•
	T1 Predicted Wave Arrival Time	11	36%	o	•	•	o	o	o	•	-	-	o	o	o	•
	T2 Predicted Wave Arrival Time	11	45%	o	•	•	o	o	•	•	-	-	o	o	o	•
	T3 Predicted Wave Arrival Time	11	36%	o	•	•	o	o	o	•	-	-	o	o	o	•
	T4 Predicted Wave Arrival Time	11	36%	o	•	•	o	o	o	•	-	-	o	o	o	•
	Predicted Max. Wave Amplitude	11	55%	o	•	•	o	o	•	•	-	-	o	•	o	•
	CFZ Threat Levels	11	36%	o	o	•	o	o	•	•	-	-	o	o	o	•
	Other	11	9%	o	o	o	o	o	o	o	-	-	o	o	o	•
IOTWMS-TSP INDONESIA	Tsunami Wave Observations	11	45%	o	•	o	•	o	•	•	-	-	o	o	o	•
	T1 Predicted Wave Arrival Time	11	36%	o	•	o	•	o	o	•	-	-	o	o	o	•
	T2 Predicted Wave Arrival Time	11	36%	o	•	o	•	o	•	•	-	-	o	o	o	o
	T3 Predicted Wave Arrival Time	11	27%	o	•	o	•	o	o	•	-	-	o	o	o	o
	T4 Predicted Wave Arrival Time	11	36%	o	•	o	•	o	o	•	-	-	o	o	o	•
	Predicted Max. Wave Amplitude	11	45%	o	•	o	•	o	•	•	-	-	o	•	o	o
	CFZ Threat Levels	11	27%	o	o	o	•	o	•	•	-	-	o	o	o	o
	Other	11	9%	o	o	o	•	o	o	o	-	-	o	o	o	o

Table VIII-2. Tsunami Threat Information from TSP Websites used by NTWCs in Production of National Warnings during the Makran Scenario

---

AUS=Australia, COM=Comoros, IN=India, IND=Indonesia, IR=Iran, MAD=Madagascar, MAU=Mauritius, MZ=Mozambique, OM=Oman, PK=Pakistan, SA=South Africa, TAN=Tanzania, THA=Thailand, YEM=Yemen

Tot = total number of NTWCs who answered the quesiton, % = percentage of NTWC that access the exchange product relative to total

● = Accessed, ◦ = Not accessed, - = did not anwer the question

ANNEX IX

NTWC NATIONAL TSUNAMI WARNING STATUS REPORTS TO TSPS

Sumatra Scenario	Tot	%	AUS	BAN	FR	IN	IND	KN	MAD	MAL	MD	MM	SY	SIN	SLK	THA	TL
Did your NTWC send reports of its warning status to the TSP?	13	54%	•	o	o	•	•	o	•	o	o	o	•	•	-	•	-
At what time (UTC) did the NTWS first report its status?	7		0500	-	-	0323	0346	-	0315	-	-	-	0410	0345	-	0824	-
How many status reports did the NTWC send to the TSPs?	7		2	-	-	14	3	-	15	-	-	-	2	1	-	2	-

Table IX-1. NTWC National Tsunami Warning Status Reports to TSPs during the Sumatra Scenario*

AUS=Australia, BAN=Bangladesh, FR=France (La Reunion), IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MM=Myanmar, SY=Seychelles, SIN=Singapore, SLK=Sri Lanka, THA=Thailand, TL=Timor-Leste

Tot = total number of NTWCs who answered the quesiton, % = percentage of NTWC that access the exchange product relative to total

● = Yes ᵒ = No, - = did not anwer the question or not applicable

Makran Scenario	Tot	%	AUS	COM	IN	IND	IR	MAD	MAU	MZ	OM	PK	SA	TAN	YEM
Did your NTWC send reports of its warning status to the TSP?	12	92%	•	•	•	•	•	•	•	-	•	•	•	•	○
At what time (UTC) did the NTWS first report its status?	11		0719	0900	0623	0611	0607	0610	0617	-	1100	0605	0622	0910	-
How many status reports did the NTWC send to the TSPs?	11		2	1	14	4	14	13	7	-	1	5	3	2	-

Table IX-2. NTWC National Tsunami Warning Status Reports to TSPs during the Makran Scenario*

AUS=Australia, COM=Comoros, IN=India, IND=Indonesia, IR=Iran, MAD=Madagascar, MAU=Mauritius, MZ=Mozambique, OM=Oman, PK=Pakistan, SA=South Africa, TAN=Tanzania, THA=Thailand, YEM=Yemen

Tot = total number of NTWCs who answered the quesiton, % = percentage of NTWC that access the exchange product relative to total

● = Yes ○ = No, - = did not anwer the question or not applicable

ANNEX X

TSUNAMI WARNING INFORMATION GENERATION AND DISSEMINATION TO DISASTER RESPONSE AGENCIES, MEDIA AND THE PUBLIC

	Recipient	Who sends tsunami messages to the recipient?	Number of messages sent	Time 1st message sent	Time last message sent	Methods of delivery	Were the messages received in a timely manner?
AUS	NDMO	NTWC	102	0313	0939	email, sms, fax, telephone, password protected web page	Yes
	LDMO-P	NTWC	102	0313	0939	email, sms, fax, telephone, password protected web page	Yes
	LDMO-C	NTWC	102	0313	0939	email, sms, fax, telephone, password protected web page	Yes
	Media	NTWC	3	0423	0725	email	No
	Public	NTWC, LDMOs, media	4	0332	0440	face to face, facebook and radio on Chrismas Island only	Yes
BAN	NDMO	NTWC	4	0315	1350	email	Yes
	LDMO-P	n/a	n/a	n/a	n/a	n/a	n/a
	LDMO-C	DDM	4	0318	1355	email, fax	Yes
	Media	NTWC	4	0320	1355	faz,phone	Yes
	Public	n/a	n/a	n/a	n/a	n/a	n/a
FR	NDMO	NTWC	10	0322	1153	email, fax, phone	Yes
	LDMO-P	Prefecture	0	-	-	-	-
	LDMO-C	Prefecture	0	-	-	-	-
	Media	Prefecture	0	-	-	-	-
	Public	Prefecture	0	-	-	-	-
IN	NDMO	NTWC	15	0305	1500	email, sms, fax, webpage	Yes
	LDMO-P	NTWC, NDMO	15	0305	1500	email, sms, fax, webpage	Yes
	LDMO-C	NTWC, LDMO-P	15	0305	1500	email, sms, fax, webpage	Yes
	Media	LDMO-P, LDMO-C	15	0305	1500	tv, radio	Yes
	Public	LDMO-P, LDMO-C, Media	15	0305	1500	telephone, sms, public radio, tv, website, siren, public alert system, police, door-to-door, mega phone, vhf, etc	Yes

	Recipient	Who sends tsunami messages to the recipient?	Number of messages sent	Time 1st message sent	Time last message sent	Methods of delivery	Were the messages received in a timely manner?
IND	NDMO	NTWC	8	0304	0855	sms, fax, email	Yes
	LDMO-P	NTWC	8	0304	0855	sms, fax, email	Yes
	LDMO-C	NTWC	8	0304	0855	sms, fax, email	Yes
	Media	NTWC	8	0304	0855	sms, fax, email	Yes
	Public	NDMO, LDMO-P, LDMO-C	8	0304	0855	sms, fax, email	Yes
KN	NDMO	NTWC	15	0301	1502	email, sms, mobile phone call	Yes
	LDMO-P	NDMO	15	0304	1504	email, sms, mobile phone call	Yes
	LDMO-C	LDMO-P	15	0306	1505	email, sms, mobile phone call	Yes
	Media	NTWC and NDMO	15	0304	1503	email, sms, mobile phone call	Yes
	Public	LDMO-C	15	0308	1510	email, sms, mobile phone call	Yes
MAD	NDMO	NTWC	10	0415	1510	sms, email	Yes
	LDMO-P	-	-	-	-	-	-
	LDMO-C	-	-	-	-	-	-
	Media	-	-	-	-	-	-
	Public	-	-	-	-	-	-
MAL	NDMO	NTWC	4	1105	1600	sms, fax, phone	Yes
	LDMO-P	-	-	-	-	-	-
	LDMO-C	-	-	-	-	-	-
	Media	-	-	-	-	-	-
	Public	-	-	-	-	-	-
MD	NDMO	NDMC	0	-	-	none	n/a
	LDMO-P	-	-	-	-	-	-
	LDMO-C	-	-	-	-	-	-
	Media	-	-	-	-	-	-
	Public	-	-	-	-	-	-

	Recipient	Who sends tsunami messages to the recipient?	Number of messages sent	Time 1st message sent	Time last message sent	Methods of delivery	Were the messages received in a timely manner?
MM	NDMO	Relief and Resettlement Department	5	0310	0345	fax and phone	Yes
	LDMO-P	-	-	-	-	-	-
	LDMO-C	-	-	-	-	-	-
	Media	-	-	-	-	-	-
	Public	-	-	-	-	-	-
SY	NDMO	LDMO-P, LDMO-C, Media, Public	24	0415	1115	sms and phone	Yes
	LDMO-P	-	-	-	-	-	-
	LDMO-C	-	-	-	-	-	-
	Media	-	-	-	-	-	-
	Public	-	-	-	-	-	-
SIN	NDMO	NTWC	7	0301	0902	email, sms	Yes
	LDMO-P	-	-	-	-	-	-
	LDMO-C	-	-	-	-	-	-
	Media	-	-	-	-	-	-
	Public	-	-	-	-	-	-
SLK	NDMO	NTWC	4	0853	1120	sms, sirens, towers, media, tel, fax, web, emails	Yes
	LDMO-P	NDMO	4	0907	1125	sirens, tel, vpn, police and military	Yes
	LDMO-C	NDMO	4	0907	1125	sirens, tel, vpn, police and military	Yes
	Media	NDMO	4	0910	1128	sms, tele, fax, web, emails, ign	Yes
	Public	NDMO, LDMO	4	0919	1130	sms, sirens, towers, media, tel, fax, web, emails	Yes

	Recipient	Who sends tsunami messages to the recipient?	Number of messages sent	Time 1st message sent	Time last message sent	Methods of delivery	Were the messages received in a timely manner?
THA	NDMO	NDWC	13	0304	0730	sms, fax, phone, warning tower system	Yes
	LDMO-P	NDWC	13	0304	0730	sms, fax, phone, warning tower system	Yes
	LDMO-C	-	-	-	-	-	-
	Media	-	-	-	-	-	-
	Public	-	-	-	-	-	-
TL	NDMO	-	-	-	-	-	-
	LDMO-P	-	-	-	-	-	-
	LDMO-C	-	-	-	-	-	-
	Media	-	-	-	-	-	-
	Public	-	-	-	-	-	-

Table X-1. Tsunami Warning and Information Generation and Dissemination to Disaster Response Agencies, Media and the Public during the Sumatra Scenario

---

AUS=Australia, BAN=Bangladesh, FR=France (La Reunion), IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MM=Myanmar, SY=Seychelles, SIN=Singapore, SLK=Sri Lanka, THA=Thailand, TL=Timor-Leste

- = did not anwer the question

	Recipient	Who sends tsunami messages to the recipient?	Number of messages sent	Time 1st message sent	Time last message sent	Methods of delivery	Were the messages received in a timely manner?
AUS	NDMO	NTWC	11	0619	1032	email, phone	Yes
	LDMO-P	NTWC	-	-	-	-	-
	LDMO-C	NTWC	-	-	-	-	-
	Media	NTWC	-	-	-	-	-
	Public	NTWC, LDMOs, media	-	-	-	-	-
COM	NDMO	NTWC	7	0930	1305	email, phone, paper	Yes
	LDMO-P	NDMO	3	1100	1305	phone, paper	Yes
	LDMO-C	LDMO-P	3	1100	1305	phone, paper	Yes
	Media	NDMO	3	1100	1305	phone, paper	n/a
	Public	LDMO-P	3	1100	1305	phone, paper	n/a
IN	NDMO	NTWC	15	0605	1800	email, sms, fax, webpage	Yes
	LDMO-P	NTWC, NDMO	15	0605	1800	email, sms, fax webpage	Yes
	LDMO-C	NTWC, LDMO-P	15	0605	1800	email, sms, fax, webpage	Yes
	Media	LDMO-P, LDMO-C	15	0610	1800	electronic media	Yes
	Public	LDMO-P, LDMO-C, Media	15	0610	1800	telephone, sms, public radio, tv, website, siren, public alerty system, police, door-to-door, mega phone, vhf, etc.	Yes
IND	NDMO	-	-	-	-	-	-
	LDMO-P	-	-	-	-	-	-
	LDMO-C	-	-	-	-	-	-
	Media	-	-	-	-	-	-
	Public	-	-	-	-	-	-

	Recipient	Who sends tsunami messages to the recipient?	Number of messages sent	Time 1st message sent	Time last message sent	Methods of delivery	Were the messages received in a timely manner?
IR	NDMO	Iranian National Institute for Oceanography	-	-	-	-	-
	LDMO-P	Iranian National Institute for Oceanography	4	0607	0700	phone, sms, fax	Yes
	LDMO-C	Iranian National Institute for Oceanography	4	0607	0700	phone, sms, fax	Yes
	Media	Iranian National Institute for Oceanography	-	-	-	-	-
	Public	NDMO	4	0608	0701	phone, sms, fax	Yes
MAD	NDMO	NTWC	13	0740	1850	sms, email, phone	Yes
	LDMO-P	NDMO	-	-	-	sms, phone	-
	LDMO-C	-	-	-	-	-	-
	Media	-	-	-	-	-	-
	Public	-	-	-	-	-	-
MAU	NDMO	NTWC	7	0610	1200	fax, email, phone	Yes
	LDMO-P	NDRRMC	7	0650	1208	fax, email	Yes
	LDMO-C	-	-	-	-	-	-
	Media	-	-	-	-	-	-
	Public	-	-	-	-	-	-
MZ	NDMO	NTWC	2	0630	0640	fax,email, sms	Yes
	LDMO-P	NDMO	1	0650	-	fax, email, sms, phone, radio, tv	Yes
	LDMO-C	NDMO	1	0710	-	fax, email, sms, phone, radio, tv	No
	Media	NTWC & NDMO	1	0720	-	fax, email, sms, phone, radio, tv	Yes
	Public	Media	1	0800	-	fax, email, sms, phone, radio, tv	Yes
OM	NDMO	NCCD	5	1006	1200	sms, fax, email	Yes
	LDMO-P	-	-	-	-	-	-
	LDMO-C	-	-	-	-	-	-
	Media	-	-	-	-	-	-
	Public	-	-	-	-	-	-

	Recipient	Who sends tsunami messages to the recipient?	Number of messages sent	Time 1st message sent	Time last message sent	Methods of delivery	Were the messages received in a timely manner?
PK	NDMO	NTWC	5	0605	1100	email, webpage, sms, fax	Yes
	LDMO-P	NTWC	5	0605	1100	email, webpage, sms, fax	Yes
	LDMO-C	NTWC	5	0605	1100	email, webpage, sms, fax	Yes
	Media	NTWC	5	0605	1100	email, webpage, sms, fax	Yes
	Public	-	5	0605	1100	email, webpage, sms, fax	Yes
SA	NDMO	NTWC and CGS	3	0618	0706	email, mobile phone, whatsapp txt messaging	Yes
	LDMO-P	NDMO	-	-	-	-	n/a
	LDMO-C	LDMO-P	-	-	-	-	n/a
	Media	NDMO	-	-	-	-	n/a
	Public	NDMO	-	-	-	-	n/a
TAN	NDMO	NTWC	6	0421	1214	email	Yes
	LDMO-P	NDMO	14	0500	1222	sms alert	Yes
	LDMO-C	NDMO, LDMO-P	11	0513	1212	sms alert	Yes
	Media	NDMO, NTWC	5	0616	1222	sms alert	Yes
	Public	NDMO, NTWC	6	0528	1222	sms alert	-
YEM	NDMO	General Directorate of Emergency and Environmental Disaster	7	0610	1810	Whatsapp, email, sms, fax	Yes
	LDMO-P	Meteorological Authority	5	0615	1800	Whatsapp, fax	Yes
	LDMO-C	Meteorological Authority	5	0615	1800	Whatsapp, fax	Yes
	Media	Meteorological Authority	5	0615	1800	Whatsapp, fax	Yes
	Public	Meteorological Authority	5	0615	1800	Whatsapp, fax	Yes

Table X-2. Tsunami Warning and Information Generation and Dissemination to Disaster Response Agencies, Media and the Public during the Makran Scenario*

AUS=Australia, COM=Comoros, IN=India, IND=Indonesia, IR=Iran, MAD=Madagascar, MAU=Mauritius, MZ=Mozambique, OM=Oman, PK=Pakistan, SA=South Africa, TAN=Tanzania, THA=Thailand, YEM=Yemen

● = Accessed, ○ = Not accessed, - = did not anwer the question

ANNEX XI

SOP PERFORMANCE FOR GENERATION AND DISSEMINATION OF TSUNAMI WARNINGS IN COUNTRY

How well did your SOPs perform for generating and disseminating tsunami warning within your country?	Tot	Yes	%	AUS	BAN	COM	FR	IN	IND	IR	KN	MAD	MAL	MD	MAU
Extemely Well	23	1	4%											•	
Very Well	23	10	43%	•				•	•		•		•		
Well	23	11	48%		•	•	•			•		•			•
Poor	23	1	4%												

How well did your SOPs perform for generating and disseminating tsunami warning within your country?	Results are included with the above statistics	MZ	MM	OM	PK	SY	SIN	SA	SLK	TAN	THA	TL	YEM
Extemely Well												-	
Very Well				•				•	•		•	-	•
Well		•	•		•		•			•		-	
Poor						•						-	

Table XI-1. SOP Performance for Generation and Dissemination of Tsunami Warnings in Country *

AUS=Australia, BAN=Bangladesh, COM=Comoros, FR=France (La Reunion), IN=India, IND=Indonesia, IR=Iran, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, SLK=Sri Lanka, TAN=Tanzania, THA=Thailand, TL=Timor-Leste, YEM=Yemen

● = Agree, - = did not anwer the question

Comments

- Australia: In general the NTWC SOPs for issuing warnings performed very well. However, some SOP issues were identified which will require follow up. In addition, the LDMO evacuation notification was issued in a timely manner.
- Iran: The first warnings were sent by SMS, fax and phone call at the right times that have been planned. The organisations have tested their SOPs properly.

- Kenya: We lacked adequate resources to cover a wider area hence capacity building is too low only few experts were involved. More workshop/seminars are required in Kenya.
- Mauritius: It was difficult to follow and adhere to the time line SOP.
- Mozambique: Tsunami is not usually or frequently at Mozambique, so we are in the process to disseminate the phenomenon as well as involve the…
- Seychelles: Although every agency is aware of SOP and was brushed up on updates, not all followed through the SOP much.
- South Africa: SOP followed closely at national level, although provincial participation should ideally be considered during the December 2016 test.
- Tanzania: After the exercise, there is need for SOP update. SOPs need to specify exactly who will do what and when.
- Yemen: The group of WhatsApp help us to improve our SOPs performance and we can send the warning very fast to all of our stakeholders.

ANNEX XII

ISSUING OF PUBLIC SAFETY MESSAGES, EVACUATION ORDERS AND ALL-CLEAR MESSAGES

Both Scenarios	Tot	Yes	%	AUS	BAN	COM	FR	IN	IND	IR	KN	MAD	MAL	MD	MAU
Were public safety messages issued during the exercise?	24	11	46%	•	o	•	o	•	•	o	•	o	o	o	•
Were evacuation orders issued during the exercise?	24	13	54%	•	o	•	o	•	•	•	•	o	o	o	o
Were all clear messages issued during the exercise?	24	17	71%	o	•	•	•	•	•	•	•	•	o	o	o

Both Scenarios	Tot	Yes	%	MZ	MM	OM	PK	SY	SIN	SA	SLK	TAN	THA	TL	YEM
Were public safety messages issued during the exercise?	Results are included with the above statistics			•	o	o	•	•	o	o	o	o	o	•	•
Were evacuation orders issued during the exercise?				•	o	•	•	•	o	o	•	•	o	•	o
Were all clear messages issued during the exercise?				o	•	•	•	•	o	o	•	•	•	•	•

Table XII-1. Issuing of Public Safety Messages, Evacuation Orders and All-Clear Messages *

AUS=Australia, BAN=Bangladesh, COM=Comoros, FR=France (La Reunion), IN=India, IND=Indonesia, IR=Iran, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, SLK=Sri Lanka, TAN=Tanzania, THA=Thailand, TL=Timor-Leste, YEM=Yemen

● = Yes, o No

ANNEX XIII

PUBLIC SAFETY MESSAGES

	Name of agency/ authority that issues pubic safety messages	Agency type	Time message issued (UTC)	Communication method	Were there any communications problems?	Content of message	Reason message issued	Comments
AUS	Emergency Management Committee, Christmas Island	LDMO-P	0332	Facebook - Community page	No	Exercise commencement message	Initial marine warning received	-
	Emergency Management Committee, Christmas Island	LDMO-P	0341	Facebook - Community page	No	Land inundation warning	Land warning received	-
	Emergency Management Committee, Christmas Island	LDMO-P	0403	Radio	No	General advice that the IOWave exercise was occurring and that road closures were in effect whilst the evacuation was conducted	Land warning received	-
	Emergency Management Committee, Christmas Island	LDMO-P	0440	Facebook - Community page	No	End exercise message	End of exercise for Christmas Island	-
COM	DGSC	NDMO	-	-	-	-	-	-
IN	Tamil Nadu	LDMO-P	0308	phone, fax, sms, whatsapp	No	Earthquake information with tsunami evaluation and advise	Potential threat of tsunami	Though many districts participated in the drill, feedback received from very few until now in each province.
	Andhra Pradesh	LDMO-P	0314	phone, fax, sms	No	Earthquake information with tsunami evaluation and advise	Potential threat of tsunami	Though many districts participated in the drill, feedback received from very few until now in each province.
	Odisha	LDMO-P	0306	phone, fax, sms, whatsapp	No	Earthquake information with tsunami evaluation and advise	Potential threat of tsunami	Though many districts participated in the drill, feedback received from very few until now in each province.
	West Bangal	LDMO-P	0306	phone, fax, sms	No	Earthquake information with tsunami evaluation and advise	Potential threat of tsunami	Though many districts participated in the drill, feedback received from very few until now in each province.
	Andaman & Nicobar Islands	LDMO-P	0307	phone, fax, sms	No	Earthquake information with tsunami evaluation and advise	Potential threat of tsunami	Though many districts participated in the drill, feedback received from very few until now in each province.
IN	Gujarat	LDMO-P	0608	phone,sms, fax, whatsapp	No	Earthquake information with tsunami evaluation and advise	Potential threat of tsunami	Though many districts participated in the drill, feedback received from very few until now in each province.
	Karnataka	LDMO-P	0610	phone, sms, fax, whatsapp	No	Earthquake information with tsunami evaluation and advise	Potential threat of tsunami	Though many districts participated in the drill, feedback received from very few until now in each province.
	Kerala	LDMO-P	0612	phone, sms, fax	No	Earthquake information with tsunami evaluation and advise	Potential threat of tsunami	Though many districts participated in the drill, feedback received from very few until now in each province.

	Name of agency/ authority that issues pubic safety messages	Agency type	Time message issued (UTC)	Communication method	Were there any communications problems?	Content of message	Reason message issued	Comments
IND	BMKG (Agency for Meteorology, Climatology and Geophysics)	NTWC	0304	email, fax	No	For Tsunami MAJOR WARNING levels, local government is recommended to do a comprehensive evacuation of communities immediately. For Tsunami WARNING levels, local government is recommended to evacuate communities immediately. For Tsunami ADVISORY levels, local government is recommended to direct communities to stay away from the shore.	Help local governments to interpret and respond to the message	Public safety messages are shown in every long message (fax and email)
KN	KMD	NTWC	0302	email, sms, mobile phone	Yes	Earthquake of magnitude 8.5 has occurred off southern Sumatra, Indonesia. Possibility of a destructive local tsunami along kenyan coastline. Be alert for further communication and safety order.	For public awareness	not all contacted received the information on time
	NDOC	NDMO	0303	email, sms, mobile phone	Yes	Earthquake of magnitude 8.5 has occurred off southern Sumatra, Indonesia. Possibility of a destructive local tsunami along kenyan coastline. Be alert for further communication and safety order.	For public awareness	not all contacted received the information on time
	KPA	Other	0303	sms, mobile phone	Yes	Earthquake of magnitude 8.5 has occurred off southern Sumatra, Indonesia. Possibility of a destructive local tsunami along kenyan coastline. Be alert for further communication and safety order.	For public awareness	not all contacted received the information on time
	KMA	Other	0305	sms, mobile phone	Yes	Earthquake of magnitude 8.5 has occurred off southern Sumatra, Indonesia. Possibility of a destructive local tsunami along kenyan coastline. Be alert for further communication and safety order.	For public awareness	not all contacted received the information on time
	NPS	Other	0306	face-to-face	Yes	Keep off the coastline an earthquake has occurred in Sumatra and has a potential of a destructive tsunami on our coastline.	For public awareness and safety	dialogue with residents ensured.
MAU	Meteorological Services	NTWC	0642	email, fax, phone	No	POTENTIAL THREAT OF TSUNAMI IN THE INDIAN OCEAN TSUNAMI WATCH	To inform the NDRRMC and other	-
	NEOC	NDMO	0821	fax, (tv, radio, media simulated)	No	Tsunami Warming for the Republic of Mauritius The Mauritius Meteorological	Inform first responders and the public	-

Table XXX-1. Public Safety Messages

MZ	National Emergencie Operative Center Institude For Disaster Management	NDMO	0700	Fax, email, sms, phone, tv, radio	No	Information about occurance of tsunami confirmed	Disseminating and Response Prepardness	-
	National Institute of Meteorological	NTWC	0745	Fax and email	No	Information about occurance of tsunami confirmed	Be informed	-
	Provincial Emergencie Operative Center Institude For Disaster Management Emergencie Operative Center Institude For Disaster Management	LDMO-P	0815	sms, phone, Provincial-tv, Provincial radio	No	Information about occurance of tsunami confirmed	Be informed	-
	Distrital Emergencie Operative Center Institude For Disaster Management	LDMO-C	0830	sms, phone, Local radio	No	Information about occurance of tsunami confirmed	Disseminating and Response Prepardness	-
PK	PMD's National Seismic Monitoring and Tsunami Early Warning Centre, Karachi	NTWC	0605	email, webpage, sms, fax	Yes	Earthquake parameters, tsunami threat evaluatino, evacuation ordered	Potential Tsunami Threat on the basis of earthquake parameters	Sending messages through fax failed in most cases.
SEY	Division of Risk and Disaster Management	NDMO	0517	phone, sms, Facebook, WhatsApp, Media	-	Where waves were expected to hit, possible height of waves, what first responders are doing.	so everyone has a clear picture pf what to do and what is going on.	We did not practise with a lot of communities for the general public and private estates we had liaison person that we communicated mostly to and same with other agencies, hospital and hotels.
YEM	Office of the ministry of Health in the local areas	LDMO-C	0700	Radio, papers , Group of Whats up, Facebook	Yes	How can you help your self from tsunami	improving the method of helping people to be safe	the have problem of finance
	Civil Defence	NDMO	0700	whats up Group , website , papers, TV , Radio	Yes	Guidance to the community on how to keep themselves, and where are the safe places	this is one of its jobs	there is no enough police in all the coastal area.
	Ministry of Telecommunications	NDMO	0700	SMS	No	Issuing the warning of exercise	as a member of Emergency group	-
	General Directorate of Emergency and Environmental Disaster	NDMO	0630	Fax, Whats up group , Emails , Calling	Yes	We have exercise and every Agency should be active	to support the working of the Emergency team	-

AUS=Australia, BAN=Bangladesh, COM=Comoros, FR=France (La Reunion), IN=India, IND=Indonesia, IR=Iran, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, SLK=Sri Lanka, TAN=Tanzania, THA=Thailand, TL=Timor-Leste, YEM=Yemen

- = did not anwer the question

ANNEX XIV

EVACUATION ORDERS

	Name of agency/ authority that issues evacuation orders	Agency type	Time message issued (UTC)	Communication method	Were there any communications problems?	Content of message	Reason message issue	Comments
AUS	Australian Federal Police	LDMO-P	0342	face to face	No	Order to evacuate	Land inundation warning	-
COM	DGSC	NDMO	-	-	-	-	evacuation	-
IN	Tamil Nadu	LDMO-C	0400	siren, public announcement, police, door-to-door, chruch bell	No	Tsunami threat information in district level	Potential threat of tsunami	-
	Andhra Pradesh	LDMO-C	0402	siren, public announcement, door-to-door	No	Tsunami threat information in district level	Potential threat of tsunami	-
	Odisha	LDMO-C	-	phone, sms, public radio, tv, website, siren, public alert system, mega phone, vhf	No	Tsunami threat information in district level	Potential threat of tsunami	-
	West Bangal	LDMO-C	0503	phone, sms website, public announcement, police, door-to-door	No	Tsunami threat information in district level	Potential threat of tsunami	-
	Andaman & Nicobar Islands	LDMO-C	-	sms, siren, public alert system, police, door-to-door, vhf	No	Tsunami threat information in district level	Potential threat of tsunami	-
IN	Gujarat	LDMO-C	0700	phone, sms, tv, sirens, public announcement, public call centre, police, door-to-door	No	Tsunami threat information in district level	Potential threat of tsunami	-
	Karnataka	LDMO-C	0655	phone, sms, sirens, public announcement, public call centre, police, door-to-door, vhf	No	Tsunami threat information in district level	Potential threat of tsunami	-
	Kerala	LDMO-C	0830	phone, sms, tv, sirens, public announcement, public call centre, police, door-to-door	No	Tsunami threat information in district level	Potential threat of tsunami	-

	Name of agency/ authority that issues evacuation orders	Agency type	Time message issued (UTC)	Communication method	Were there any communications problems?	Content of message	Reason message issue	Comments
IND	BPBD Padang	LDMO-C	0308	sirens, HT radio	No	People near coastal area should be evacuated immediately	Major warning for Padang coastal area was issued by NTWC	-
	BPBD Pangandaran	LDMO-C	0313	sirens, HT radio	No	People near coastal area should be evacuated immediately	Warning for Pangandaran coastal area was issued by NTWC	-
	BPBD Pacitan	LDMO-C	0315	HT radio	No	People near coastal area should be evacuated immediately	Warning for Pacitan coastal area was issued by NTWC	-
IR	Chabahar Disaster Management Organisation	LDMO-C	0608	sirens, public speakers	No	Follow the evacuation routes or go to high places to be safe from tsunami waves	To evacuate people from the inundated regions	-
KN	NDOC	NDMO	0404	email, sms	Yes	Earthquake of magnitude 9.2 has occurred off southern Sumatra Indonesia. Possibilities of a destructive local tsunami along Kenya coastline. Evacuate immediately. Move to the higher grounds or tall strong buildings	to initiate evacuation to higher grounds	message received
	KMA	Other	0405	email, sms	Yes	Earthquake of magnitude 9.2 has occurred off southern Sumatra Indonesia. Possibilities of a destructive local tsunami along Kenya coastline. Evacuate immediately. Move to the higher grounds or tall strong buildings	to initiate evacuation to higher grounds	message received
	Mombasa country inspectorate	LDMO-P	0405	mobile siren	Yes	Evacuate immediately. Move to the higher grounds or tall strong building. Tsunami Tsunami Tsunami	to initiate evacuation to higher grounds	message received
	Kenya police, navy and administration police	Other	0404	face to face with communities arouch shelly beach	Yes	Evacuate immediately. Move to the higher grounds or tall strong building. Tsunami Tsunami Tsunami	to initiate evacuation to higher grounds	message received
	Shelly Beach community authority	LDMO-C	0410	face to face with communities arouch shelly beach	Yes	Evacuate immediately. Move to the higher grounds or tall strong building. Tsunami Tsunami Tsunami	to initiate evacuation to higher grounds	message received

	Name of agency/ authority that issues evacuation orders	Agency type	Time message issued (UTC)	Communication method	Were there any communications problems?	Content of message	Reason message issue	Comments
MZ	Protection Civil Unit on bealf of CENOE	NDMO	0200	sms, fax, phone, tv, radio	No	Evacuation Order to a safe location	Rapid Response and move on to a safety place	-
	Protection Civil Unit on bealf of COE	LDMO-P	0230	sms, fax, phone, tv, radio	Yes	Evacuation Order to a safe location	Rapid Response and move on to a safety place	-
	Protection Civil Unit on bealf of COE	LDMO-C	0245	sms, fax, phone, tv, radio	Yes	Evacuation Order to a safe location	Rapid Response and move on to a safety place	-
OM	NCCD	NDMO	1030	all media	No	-	-	-
PK	PMD's National Seismic Monitoring and Tsunami Early Warning Centre, Karachchi	NTWC	0605	email, webpage, sms, fax	Yes	Earthquake parameters, tsunami threat evaluation, evacuation ordered	Potential Tsunami Threat on basis of earthquake parameters	Sending messages through fax failed in most cases.
SEY	Division of Risk and Disaster Management	NDMO	0551	phone, sms	No	Red Alert: Tsunami iminent. Evacuation order issued on coastline areas. Police secure critical areas. Wave height 6 m. Refracted waves affecting all areas	To get everyone to move away from the coast.	Practised only with SMS and phone calls to some
SLK	NTWC	NTWC	0847	fax, ign, tel, vhf, hf	No	Alert	Earthquake	-
	NDMO	NDMO	0853	tel, fax, ew towers, sirens, vhf, hf, media, police and military	No	Alert	Earthquake	-
	NTWC	NTWC	0854	fax,ign, tel, vhf, hf	No	Evacuation	Evacuation	-
	NDMO	NDMO	0903	tel, fax, ew towers, sirens,vhg, hf, media, police and military	Yes	Evacuation	Evacuation	-
	LDMO	LDMO-C	0910	tel, fax, ew towers, sirens, vhf, hf, media, police and military	Yes	Evacuation	Evacuation	-

	Name of agency/ authority that issues evacuation orders	Agency type	Time message issued (UTC)	Communication method	Were there any communications problems?	Content of message	Reason message issue	Comments
TAN	Disaster Management Department	NDMO	0739	sms to the Media	-	Evacuation NOTICE. PMO-DMD is requesting the public living near the beaches to evacuate order as soon as possible due to tsunami that will be arriving in Tanzania from 3:00p.m. Evacuation notice is targeted to people living in Dar es salaam, Tanga, Pemba and Bagamoyo. The public is advised to follow instructions offered by Police officers and other emergency responders who are there to guide them.	Tsunami waves are confirmed that they will arrive in Tanzania	-

Table XIV-1. Evacuation Orders

AUS=Australia, BAN=Bangladesh, COM=Comoros, FR=France (La Reunion), IN=India, IND=Indonesia, IR=Iran, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, SLK=Sri Lanka, TAN=Tanzania, THA=Thailand, TL=Timor-Leste, YEM=Yemen

- = did not anwer the question

ANNEX XV

ALL-CLEAR MESSAGES

	Name of agency/ authority that issues all clear messages	Agency type	Time message issued (UTC)	Communication method	Were there any communications problems?	Content of message	Reason message issued	Comments
BAN	NTWC	NTWC	1350	email, fax, phone	No	According to the TSP tsunami threat is passed withdrawn tsunami warning and no further bulletin will be issued in this series.	TSP like INCOIS, InaTEWS and Australia	n/a
	DDM	LDMO-C	1355	email, fax, phone	No	According to the TSP tsunami threat is passed withdrawn tsunami warning and no further bulletin will be issued in this series.	NTWC	n/a
	CPP	Other	1355	email, fax, phone	No	According to the TSP tsunami threat is passed withdrawn tsunami warning and no further bulletin will be issued in this series.	NTWC	n/a
COM	Agence Nationale de l'Aviation Civile et de la Meteorologie	NTWC	0700	radio	No	that is an exercise	reassure the population	-
FR	Prefecture	NDMO	0322	email, phone, fax	No	arrival time	-	-
IN	Tamil Nadu	LDMO-C	1510	siren, public announcement, police, door-to-door, church bell	No	Tsunami all clear and public can move back	Tsunami threat subsided	-
	Andhra Pradesh	LDMO-C	1209	siren, public announcement, door-to-door	No	Tsunami all clear and public can move back	Tsunami threat subsided	-
	Odisha	LDMO-C	-	phone, sms, public radio, tv, website, siren, public alert system, police, door-to-door, mega phone, vhf	No	Tsunami all clear and public can move back	Tsunami threat subsided	-
	West Bangal	LDMO-C	1500	phone, sms, public radio, tv, website, siren, public alert system, police, door-to-door	No	Tsunami all clear and public can move back	Tsunami threat subsided	-
	Andaman & Nicobar Islands	LDMO-C	-	sms, siren, public alert system, police, door-to-door, vhf	No	Tsunami all clear and public can move back	Tsunami threat subsided	-

	Name of agency/ authority that issues all clear messages	Agency type	Time message issued (UTC)	Communication method	Were there any communications problems?	Content of message	Reason message issued	Comments
IN	Gujarat	LDMO-C	1805	phone, sms, tv, sirens, public announcement, public call centre, police, door-to-door	No	Tsunami all clear and public can move back	Tsunami threat subsided	-
	Karnataka	LDMO-C	1030	phone, sms, sirens, public announcement, public call centre, police, door-to-door, vhf	No	Tsunami all clear and public can move back	Tsunami threat subsided	-
	Kerala	LDMO-C	-	phone, sms, tv, sirens, public announcement, public call centre, police, door-to-door	No	Tsunami all clear and public can move back	Tsunami threat subsided	-
IND	BMKG (Agency for Meteorology, Climatology and Geophysics)	NTWC	0855	sms, fax, email	No	Tsunami threat (by earthquake M9.2, 7-Sep-16 03:00:00 UTC) is over	Based on the tide observatuion, there were no more tsunami threat in Indonesia area caused by the Sumatra earthquake	-
	BPBD Padang	LDMO-C	0902	ht radio	No	Tsunami threat for Padang area is over. The situation has been declared safe, now people may return home.	All clear message were issued by NTWC	-
	BPBD Pangandaran	LDMO-C	0856	ht radio	No	Tsunami threat for Pangandaran area is over. The situation has been declared safe, now people may return home.	All clear message were issued by NTWC	-
	BPBD Pacitan	LDMO-C	0900	ht radio	No	Tsunami threat for Pacitan area is over. The situation has been declared safe, now people may return home.	All clear message were issued by NTWC	-
IR	INIOAS	NTWC	0700	fax, sms, phone	No	The threat of tsunami waves has ended. This is a declaration of "all clear" situation.	To send back the evacuees to their previous residence	-
	Chabahar Disaster Management Organisation	LDMO-C	0701	sirens, public speakers	No	The threat of tsunami waves has ended. This is a declaration of "all clear" situation.	To send back the evacuees to their previous residence	-

	Name of agency/ authority that issues all clear messages	Agency type	Time message issued (UTC)	Communication method	Were there any communications problems?	Content of message	Reason message issued	Comments
KN	KMD	NTWC	1001	email, sms	Yes	Threat of destructive local tsunami cancelled. Kenya coastline now safe.	To signify end of local tsunami threat and end of exercise.	Message received
	NDOC	NDMO	1003	email, sms	Yes	Threat of destructive local tsunami cancelled. Kenya coastline now safe.	To signify end of local tsunami threat and end of exercise.	Message received
	KPA	Other	1004	email,sms	No	Threat of destructive local tsunami cancelled. Kenya coastline now safe.	To signify end of local tsunami threat and end of exercise.	Message received
	KMA	Other	1004	email, sms	Yes	Threat of destructive local tsunami cancelled. Kenya coastline now safe.	To signify end of local tsunami threat and end of exercise.	Message received
	NPS	Other	1003	face to face announcement	No	Threat of destructive local tsunami cancelled. Kenya coastline now safe.	To signify end of local tsunami threat and end of exercise.	Message received
MAD	NTWC	NTWC	1510	sms, email, phone	No	Threat is over along the coasts. There is no more message after this.	To inform that there the threat is over.	-
MM	Relief and Resettlment Department	NDMO	0909	email, fax	No	Tsunami Warning Cancellation	To return home	-
OM	NTWC	NTWC	1200	-	-	-	-	-
PK	PMD's National Seismic Monitoring and Tsunami Early Warning Centre, Karachchi	NTWC	1100	email, webpage, sms, fax	Yes	Cancellation of Tsunami Warning, all clear left to local authorities	Sea-level observations show that the condition has become normal	Sending messages through fax failed in most cases
SEY	Seychelles Meteorological Authority	NTWC	1212	Phone call to DG of DRDM	Yes	All Clear	No more waves coming	Other communication system was not working
SLK	NTWC	NTWC	1120	tel, fax, ign, vhf	No	All Clear	All Clear	-
	NDMO	NDMO	1125	tel, fax, ew towers, sirens, vhf, hf, media, police and military	Yes	All Clear	All Clear	-

	Name of agency/ authority that issues all clear messages	Agency type	Time message issued (UTC)	Communication method	Were there any communications problems?	Content of message	Reason message issued	Comments
KN	KMD	NTWC	1001	email, sms	Yes	Threat of destructive local tsunami cancelled. Kenya coastline now safe.	To signify end of local tsunami threat and end of exercise.	Message received
TAN	Disaster Management Department	NDMO	1221	sms to the Media	No	PMO DMD has received the latest tsunami wave arrival update from TMA. According to the analysis the last waves will have no threat to our coastline. A safe to return order is issued for public from 7:00pm PMO DMD insists all ERs to assist public for a safe return. All ERs note that it is necessary to conduct field assessment before the response operations cease. It is my hope that you're few remaining field teams will pass nearby the beaches to asses if there is any damage.	A confirmation from NTWC that the next coming waves will not have any impacts to the people away from beaches	-
	Disaster Management Department	NDMO	1222	sms alert to Emergency Responders and media	-	Based on the latest update from TMA, Tsunami Warning has been cancelled, we call for standoff.	To stop all emergence operations and to close emergency shelters	-
THA	NDWC	NTWC	0724	sms, fax, phone, warning tower system	No	Cancellation of national warnings	Tsunami has passed	-
YEM	General Directorate of Emergency and Environmental Disasters	NDMO	0530	WhatsApp group, phone	No	to be ready of start to apply the exercise	to be perfect at this exercise	-
	Meteorological Authority	NTWC	0610	WhatsApp group, phone	No	start the IOWave16 exercise	to let the stake holders ready to receive the warning	-

Table XV-1. All-Clear Messages

AUS=Australia, BAN=Bangladesh, COM=Comoros, FR=France (La Reunion), IN=India, IND=Indonesia, IR=Iran, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, SLK=Sri Lanka, TAN=Tanzania, THA=Thailand, TL=Timor-Leste, YEM=Yemen

- = did not anwer the question

ANNEX XVI

PRE-EXERCISE COMMUNITY PREPAREDNESS ACTIVITIES

	Tot	Yes (•)	%	AUS	BAN	COM	FR	IN	IND	IR	KN	MAD	MAL	MD	MAU
Have there been any pre-exercise preparedness activities?	22	14	64%	•	o	o	o	•	•	•	•	•	•	o	•
Tsunami exercise	22	5	23%	o	o	o	o	o	•	o	•	o	o	o	•
Tsunami education in schools	22	7	32%	•	o	o	o	•	•	o	o	•	o	o	o
Participatory evacution planning	22	8	36%	•	o	o	o	•	•	o	•	•	o	o	•
Community education seminars	22	10	45%	•	o	o	o	•	•	•	•	•	•	o	o
Evacuation maps	22	3	14%	o	o	o	o	•	•	o	o	o	o	o	o
Evacuation signage	22	4	18%	o	o	o	o	o	•	•	•	o	o	o	o
Shelter facilities	22	3	14%	o	o	o	o	•	•	o	o	o	o	o	o
Other	22	4	18%	o	o	o	o	o	o	•	o	o	o	o	o

	MZ	MM	OM	PK	SA	SY	SIN	SLK	TAN	THA	TL	YEM
Have there been any pre-exercise preparedness activities?	•	•	•	•	o	•	o	-	o	o	-	•
Tsunami exercise	o	•	•	o	o	o	o	-	o	o	-	o
Tsunami education in schools	o	•	•	•	o	o	o	-	o	o	-	o
Participatory evacution planning	o	•	o	•	o	o	o	-	o	o	-	o
Community education seminars	o	•	o	•	o	o	o	-	o	o	-	•
Evacuation maps	o	•	o	o	o	o	o	-	o	o	-	o
Evacuation signage	o	•	o	o	o	o	o	-	o	o	-	o
Shelter facilities	o	•	o	o	o	o	o	-	o	o	-	o
Other	•	o	o	o	o	•	o	-	o	o	-	•

Results are included with the above statistics

Table XVI-1. Pre-Exercise Community Preparedness Activites

AUS=Australia, BAN=Bangladesh, COM=Comoros, FR=France (La Reunion), IN=India, IND=Indonesia, IR=Iran, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, SLK=Sri Lanka, TAN=Tanzania, THA=Thailand, TL=Timor-Leste, YEM=Yemen, ● = Yes, ᵒ No, - = did not answer the question

ANNEX XVII

GOVERNMENT SUPPORTED ACTIVITES PRIOR TO THE EXERCISE

	Tot	Yes (•)	%	AUS	BAN	COM	FR	IN	IND	IR	KN	MAD	MAL	MD	MAU
Have there been any pre-exercise government support in tsunami preparedness initiatives?	12	8	67%	•	o	o	o	•	•	•	•	•	•	o	•
Tsunami signage	12	4	33%	o	o	o	o	o	•	•	•	o	o	o	•
Vertical evacuation shelters	12	3	25%	o	o	o	o	•	•	o	o	o	o	o	•
Hazard mapping	12	6	50%	•	o	•	o	•	•	o	o	•	o	o	•
Tsunami inundation mapping	12	5	42%	•	o	o	o	•	•	o	o	•	o	o	•
Evacutation route mapping	12	3	25%	o	o	o	o	•	•	o	o	o	o	o	•
Other	12	5	42%	o	o	o	o	o	•	•	•	o	•	o	•

		MZ	MM	OM	PK	SA	SY	SIN	SLK	TAN	THA	TL	YEM
Have there been any pre-exercise government support in tsunami preparedness initiatives?	Results are included with the above statistics	•	•	•	•	o	•	•	-	•	•	-	•
Tsunami signage		o	•	•	•	o	o	o	-	o	•	-	o
Vertical evacuation shelters		•	•	•	•	o	o	o	-	•	•	-	o
Hazard mapping		•	o	•	•	•	o	•	-	o	•	-	o
Tsunami inundation mapping		o	•	•	•	o	•	•	-	o	•	-	o
Evacutation route mapping		o	•	o	•	o	o	•	-	o	•	-	o
Other		o	o	•	•	o	•	o	-	•	o	-	•

Table XVII-1. Government Supported Activities Prior to the Exercise

AUS=Australia, BAN=Bangladesh, COM=Comoros, FR=France (La Reunion), IN=India, IND=Indonesia, IR=Iran, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, SLK=Sri Lanka, TAN=Tanzania, THA=Thailand, TL=Timor-Leste, YEM=Yemen, ● = Yes, ◦ No, - = did not answer the question

ANNEX XVIII

PREPAREDNESS OF COMMUNITIES THAT EVACUATED

	Tot	Rank or %	AUS	COM	IN	IND	IR	KN	MAU	OM	PK	SY	SLK	TL
Availability of tsunami risk assessment information such as inundation/evaction maps	10	2.5	3	2	3	3	3	1	3	3	2	2.25	-	-
The level of community awareness of the local tsunami risk	10	2.5	3	2	3	3	2	2	3	2	3	2.25	-	-
Have community members received prior evacuation training	10	60%	o	o	•	•	•	•	•	•	o	o	-	-
Are there SOPs for community evacuation in place?	10	60%	•	o	•	o	•	o	•	•	o	•	-	-

Table XVIII-1. Preparedness of Communities that Evacuted

AUS=Australia, COM=Comoros, IN=India, IND=Indonesia, IR=Iran, KN=Kenya, MAU=Mauritius, OM=Oman, PK=Pakistan, SY=Seychelles, SLK=Sri Lanka, TL=Timor-Leste

● = Yes, o No, - = did not answer the question

ANNEX XIX

METHODS USED TO NOTIFY COMMUNITIES OF THE EVACUATION ORDER

Notification Method	Tot	Yes (•)	%	AUS	COM	IN	IND	IR	KN	MAU	OM	PK	SY	SLK	TL
Siren	10	6	60%	o	o	•	•	•	•	o	•	o	•	-	-
Door-to-door	10	7	70%	•	•	•	•	•	•	o	o	o	•	-	-
Pubic announcement	10	7	70%	o	•	•	•	•	•	o	•	•	o	-	-
Radio / TV	10	5	50%	•	o	•	•	o	o	o	•	•	o	-	-
Mobile Phone / Social Media	10	5	50%	•	o	•	•	o	•	o	•	o	o	-	-
Evacuation time set up prior to exercise	10	2	20%	o	o	o	•	o	o	•	o	o	o	-	-
Other - Loud speakers, Megaphone	10	2	20%	o	o	•	o	o	o	o	o	o	•	-	-
Other - Fire Alarm	10	1	10%	o	o	o	o	o	o	o	o	o	•	-	-
Other - Public call centre	10	1	10%	o	o	•	o	o	o	o	o	o	o	-	-

Table XIX-1. Methods Used to Notify Communities of the Evacuation Order

AUS=Australia, COM=Comoros, IN=India, IND=Indonesia, IR=Iran, KN=Kenya, MAU=Mauritius, OM=Oman, PK=Pakistan, SY=Seychelles, SLK=Sri Lanka, TL=Timor-Leste

● = Yes, ᵒ No, - = did not answer the question

ANNEX XX

PEOPLE WHO EVACUATED

Evacuees	Tot	Yes (•)	%	AUS	COM	IN	IND	IR	KN	MAU	OM	PK	SY	SLK	TL
Beachgoers	10	6	60%	o	•	•	o	•	•	•	o	o	•	-	-
Boat Users	10	6	60%	o	•	•	o	•	•	•	o	o	•	-	-
Home Residents	10	8	80%	•	•	•	•	•	o	•	o	•	•	-	-
Businesses	10	3	30%	o	o	•	o	o	•	o	o	o	•	-	-
Schools	10	5	50%	o	•	•	•	o	o	o	•	•	o	-	-
Hospitals	10	4	40%	o	o	•	o	o	•	o	o	•	•	-	-
Elderly Peoples Homes	10	3	30%	o	•	•	o	o	o	o	o	o	•	-	-
Hotels	10	3	30%	o	o	o	o	o	•	•	o	o	•	-	-
Other - the Harour Master	10	1	10%	•	o	o	o	o	o	o	o	o	o	-	-
Other - Redcross, ambulance	10	1	10%	o	o	o	o	o	•	o	o	o	o	-	-
Other - County inspectorate	10	1	10%	o	o	o	o	o	•	o	o	o	o	-	-

Table XX-1. People who Evacuated

AUS=Australia, COM=Comoros, IN=India, IND=Indonesia, IR=Iran, KN=Kenya, MAU=Mauritius, OM=Oman, PK=Pakistan, SY=Seychelles, SLK=Sri Lanka, TL=Timor-Leste

● = Yes, o No, - = did not answer the question

ANNEX XXI

IMPROVMENTS FOR FUTURE EVACUATIONS

Australia

- Enhancing localized warning infrastructure such as a remotely activated siren within the risk areas would be a significant improvement. Also the evacuation of elderly/disabled residents was not attempted in this exercise but might be attempted in future.

Comoros

- By training local people how to evacuate

India

- Through frequent trainings and mock drills
- Regular exercises
- Awareness programs/campaigns at village level in a regular manner
- Required workshop and training at field level.

Indonesia

- Evacuation exercise should be conducted frequently with expanded to other risk city in Pandung.
- Evacuation excercise in the coming year should be more well prepared, primarily in the implementation oguidelines and stages of training exercises.

Iran

- The number of evacuees should increase
- The messges and bulletins should be received more on time
- The messges and bulletins should be sent automatically by devices and not by human interference.
- The number of organisations involved should be increased.
- Ask some expert observers to evaluate all steps.

Kenya

- By conducting awareness training to the entire coeast line which is 600 kms with 5 counties.
- By having inundation maps in place.
- Route maps
- Resource mobilsation assistance for local drils

Mauritius

- Exact number of people at risk need to be made available with responsible person for each group to ensure monitoring and reporting back.

Oman

- Another exercise

Pakistan

- If owned and organised by local DMOs

Seychelles

- With evacuation SOPs in place, with risk mapping being updated and so puttting street signs and with more simulation exercises for practice
- All institutions have to have a plan and have an evacuation procedure or SOP to follow.
- Use of siren or having the alarm in areas that everyone will hear, more practice
- To have an emergency plan for the hospital and the regional home of the elderly.

ANNEX XXII

GENERAL QUESTIONS

ACTIVITY	Average	AUS	BAN	COM	FR	IN	IND	IR	KN	MAD	MAL	MD	MAU	MZ	MM	OM	PK	SY	SIN	SA	SLK	TAN	THA	TL	YEM
Exercise planning and communication with Member States: Timeliness and usefulness of information provided by the ICG/IOTWMS Secretariat	3.6	4	4	4	4	4	3	3	4	3	4	4	4	4	3	4	4	4	3	3	4	3	3	-	3
Exercise Documentation: Manual, websites, bulletins	3.6	4	4	3	4	4	3	3	4	4	3	3	4	4	3	4	4	4	3	3	4	3	4	-	3
Exercise format and style: Real-time operation, exercise messages simiar to real event	3.5	3	4	4	3	3	3	3	4	4	3	3	3	4	3	4	4	4	3	4	4	3	3	-	4
Exercise Evaluation	3.2	3	4	3	2	3	3	3	4	3	3	3	3	3	3	4	4	4	3	4	4	3	3	-	2

Table XXII-1. General Questions: Member States ranked the activities from 4 (extremely good), 3 (very good), 2 (good) to 1 (poor)

AUS=Australia, BAN=Bangladesh, COM=Comoros, FR=France (La Reunion), IN=India, IND=Indonesia, IR=Iran, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MD=Maldives, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, SLK=Sri Lanka, TAN=Tanzania, THA=Thailand, TL=Timor-Leste, YEM=Yemen

ANNEX XXIII

BENEFITS OF FUTURE EXERCISES

Australia

1. Testing SOPs at the NTWC, NDMO, other national agencies and several LDMOs.
2. Testing the communication systems used for the dissemination of tsunami warnings.
3. Testing emergency service response in general and public response on Christmas Island in particular including Australia's first live evacuation drill.

Bangladesh

1. From this exercise the country is benefited because we NTWC communicate with DDM, CPP and Media.
2. We discuss each other where our lack and obstruction, what to do in case of real event.
3. This exercise makes us more efficient to monitor real tsunami event.

Comoros

1. Testing SOP in almost real situation
2. Involving the local disaster management organisation
3. Achieving the evacuation phase

France (La Reunion)

1. Tests of transmission
2. Contacts with NDMO
3. Exercise with the forecasters

India

1. Evaluating end-to-end SOPs at warning centre and relevant emergency response agencies. Able to understand the level of community awareness and preparedness.
2. Evaluating end-to-end communications methods from dissemination of tsunami advisories at warning centre to reception at National/Province/Local DMOs.
3. Identified the gaps at several levels which need to be addressed.

Indonesia

1. Examine the warning chain from TSP to NTWC, NTWC to DMO, and DMO to community. Table Top exercise (TTX) in the ground control centre at National Disaster Management Organization (NDMO), Local DMO of Padang city, Pangandaran district, Pacitan district, Pandeglang district and media can examine the SOP at each institutional in generating and disseminating tsunami warnings to the community.
2. Examine the SOP of DMO for issuing of public warning and/or evacuation order. Tsunami drill and evacuation training for Padang , Pangandaran and Pacitan community can be used as a tool to measure the success of tsunami evacuation plan at the region.
3. Tsunami evacuation drill and training for community of Padang , Pangandaran and Pacitan can raise awareness of the tsunami threat at their region.

Iran

1. The exercise helped organizations to improve their communication protocols between each other.
2. Increasing the awareness and preparedness of some parts of coastal community in Iran
3. Finding the gaps in the communication system between organisations.

Kenya

1. Practicing our Tsunami SOPs
2. Testing local preparedness at the Kenyan coastline
3. Awareness creation and need for preparedness

Madagascar

1. SOP
2. Time management
3. Skill improvement

Malaysia

1. Testing our SOPs.
2. Testing our lines of communication.
3. Identifying weaknesses in the SOPs and rectifying it.

Maldives

1. Testing communication system
2. n/a
3. n/a

Mauritius

1. Strengthening of our tsunami awareness, preparedness and response.
2. Identify our weakness so that these shortcomings do not occur in real events
3. Improve communication and coordination among our local stakeholders

Mozambique

1. For us it is a very good experience, because Tsunami effects in Mozambique is not very well known and widespread
2. Make us be more alert about the phenomena and alert us to be more engage and organized regard of SOP and strategical plans and preparedness
3. Lessons learning about the importance of training and simulation

Myanmar

1. Aung Hlaing Village
2. –
3. –

Oman

1. Public awareness
2. Testing the dissemination and communication system
3. Dealing with media.

Pakistan

1. Improving awareness level in community
2. Media participation
3. Testing SOP and TSPs products

Seychelles

1. Testing the Tsunami SOP
2. Practicing emergency plans of each organizations
3. Testing Communication modes

Singapore

1. The exercise provided us an opportunity to strengthen and improve our communication link with relevant agencies or ministries for crisis/hazards handling.
2. The exercise also allow us to test and carry out our internal SOPs and responses during national crisis/hazards.
3. The exercise also allow us to become more familiar with the available products from the TSPs which we made used of and draft our own advisories for our own needs.

South Africa

1. Identifying strengths (good communication/interaction between national agencies) and weaknesses in our SOP
2. The realisation that our country ideally needs to embark on public education and outreach programmes to educate the general coastal population regarding tsunami-related risks. Such programmes or initiatives do not yet exist at the current time.
3. –

Sri Lanka

1. 100% benefited by all the process
2. Early warning process

3. Connection with the actual times

Tanzania

1. Identified gaps in our Tsunami Response Standard Operating Procedures and validating our Tsunami Response standard Operating Procedures by checking their adequacy
   NTWC SOPs were tested and indicated to be adequate in the provision of Tsunami Warning
2. Identify new way of communication during emergency; Social media like WhatsApp Groups can be very effective way of communication among emergence stakeholders. And that media is very important actor issuing warning and evacuation order to the public
3. Learning that there are number of tsunami response key issues that need to be done before Tsunami happen; these include having well labelled and easily identifiable tsunami Evacuation routes as well as well labelled and easily identifiable tsunami evacuation centres and shelters

Thailand

1. Use TSPs Products
2. Test our SOP
3. Prepare for real Tsunami event

Timor-Leste

1. –
2. –
3. –

Yemen

1. Increasing the experiences for stuff in Yemen's authorities
2. Improving the contact method between all stakeholders in Yemen.
3. Learning more persons in Yemen about how to apply this exercise.

ANNEX XXIV

IMPROVEMENTS FOR FUTURE EXERCISES

Australia

1. Public awareness campaigns including greater media involvement.
2. Further development of inundation mapping, evacuation planning and route mapping.
3. Greater involvement from LDMOs and local communities and further testing of live evacuation procedures.

Bangladesh

1. From this exercise we learned many things this lesson learned will help to conduct future exercise too.
2. This exercise also helps us to mitigate tsunami disaster because here involved NTWC, DDM/CPP, and Media.
3. TSP, NTWC, DDM/CCP, Media is the main parameter to mitigate tsunami disaster and this exercise makes good links to each other.

Comoros

1. The reception of notification messages by SMS
2. Using observers in the exercise
3. Effectively testing the hospital structures

France (La Reunion)

1. Tests of transmission
2. Contacts with NDMO
3. Exercise with the forecasters

India

1. Awareness programs at field level
2. Regular exercises
3. Capacity building material for all kind of stake holders.

Indonesia

1. Sharing the evaluation among TSPs (Australia, India, Indonesi) and NTWCs (in Indian Ocean) as well.
2. Involving more agencies, army, Indonesian red cross, local authorities ect and more communities as well.
3. Preparing more ripe of implementation guidelines and exercises stage.

Iran

1. Conducting some pre-tabletop exercises in our country
2. Holding more training workshops
3. Participation of more organizations in this kind of exercise

Kenya

1. Early sourcing of funds to enable wide coverage of the exercise
2. Availability of external evaluators and observers
3. Organizing regional seminars/trainings

Madagascar

1. Communication between stakeholders
2. Evacuation drill
3. -----

Malaysia

1. Testing the "status response" to the webpage of the TSPs one or two weeks before the exercise.
2. Nil.
3. Nil.

Maldives

1. did not participate IOWAVE 2016

2. n/a
3. n/a

Mauritius

1. Better local preparation
2. Involve a larger number of people
3. Involve the media

Mozambique

1. On preparedness processes more support bring with much time a team to training the local and the early warning
2. More Illustrated material and training about tsunamis exercises
3. Continuous cooperation and provide advocacy works, to the member state as a program

Myanmar

1. Aung Hlaing Village
2. –
3. –

Oman

1. Experience
2. Early preparing.
3. Budget

Pakistan

1. Active participation of disaster management organizations
2. Nominating two country contacts one from NTWC and one from National Disaster Management organizations
3. Extending evacuation drills at other locations

Seychelles

1. Communication modes being increased in numbers and types, if one fails the other will go through. E.g. cannot rely on Fax machine only
2. Having more than one contact with some agencies, if a person is off sick or out of country, we can ensure that the work will be done and communication goes through.
3. Having full corporations with everyone internally in each agency with the same vision and thus well defining each and everyone's roles clearly.

Singapore

1. Bulletin number issued by TSPs should preferably be kept in running order and avoid e.g. duplicates as it might cause potential confusion.
2. NIL
3. NIL

South Africa

1. More holistic, inclusive participation by (South African) disaster management structures at provincial level. Whilst our inter-agency SOP functions well at national level, our country has yet to embark on such exercises at coastal level
2. targeted evacuation exercises at pre-selected coastal sites (especially vulnerable settlements/communities)
3. –

Sri Lanka

1. Considering the night time rehearsals
2. –
3. –

Tanzania

1. Developing a tsunami evacuation plan
2. NDMC should be informed early of the exercise so that the exercise preparations activities are reflected in the Government budget.
3. n/a

Thailand

1. The tool of communications ; FAX SMS.
2. To prove the data before sending because some bulletin from GTS not only contain tsunami data but also contain weather data.
3. Require more information of CFZ , CFP in Thailand

Timor-Leste

1. –
2. –
3. –

Yemen

1. Support from UNISCO to our country by some Technic of communication between all stakeholders.
2. Training to our staff will be good to improve their skills.
3. Support UN to our country to stop war in order to support the development in Yemen, because we can't improve and increase the development in Yemen while the war destroys everything.

ANNEX XXV

OBSERVER REPORTS

Tsunami Readiness put to Test in India

By Christa von Hillebrandt-Andrade, US NOAA National Weather Service Caribbean Tsunami Warning Program

Christa von Hillebrandt-Andrade is the Manager of the Caribbean Tsunami Warning Program of the US National Weather Service. She also serves as Chair of the Intergovernmental Coordination Group for Tsunami s and Other Coastal Hazards for the Caribbean and Adjacent Regions. She visited the Indian Tsunami Early Warning Centre in Hyderabad, the Odisha State Disaster Management Authority and the village of Patisunapur, Ganjam District, Odisha, as an Observer of the IOWave16 drill on September 7, 2016.

On September 7 and 8, 2016 the UNESCO IOC Indian Ocean Tsunami Warning and Mitigation System (IOTWMS) conducted the regional tsunami exercise, IOWAVE 16. All the Member States of the IOTWMS were encouraged to test their end to end tsunami warning systems. This testing included the dissemination and receipt of the IOTWMS simulated international tsunami exchange bulletins, the preparation and dissemination of national and local alerts and where possible, evacuation drills in coastal communities. Within this context, with the support of UNISDR, I had the opportunity to visit the Indian Tsunami Early Warning Center (ITEWC) and the Odisha State Disaster Management Agency (OSDMA), as well as observe the Mock Drill in the Village of Patisunapur in the State of Odisha. In all these activities I was able to observe the readiness of government authorities, volunteers and local to respond to tsunami events. The residents of Patisunapur demonstrated they were ready, the challenge for Patisunapur and all stakeholders of the Indian Tsunami Early Warning System is to Stay Ready. The lessons from India are valuable for all at risk tsunami states and communities, everyone, every community can be Tsunami Ready.

INCOIS/ITEWC

The ITEWC was established in 2007 after the Indian Ocean Tsunami in 2004. It is located in a modern, state of technology building of INCOIS in Hyderabad, India. It serves as both a National Tsunami Warning Center and as a Tsunami Service Provider within the framework of UNESCO/IOC/IOTWMS. Dr. Srinivasa Kumar, the Warning Centre in-charge, gave an overview of the operations and the plans for IOWAVE 16. It is staffed by seismologists, geologists, oceanographers and engineers who monitor 24x7 national and regional seismic stations and rapidly detect, locate and inform of earthquakes and their tsunami potential. For the forecasting of tsunami waves, they have developed a precomputed database. Nationally, they are responsible for issuing tsunami watches, alerts and warnings. For the exercise on September 7 a total of 15 bulletins were

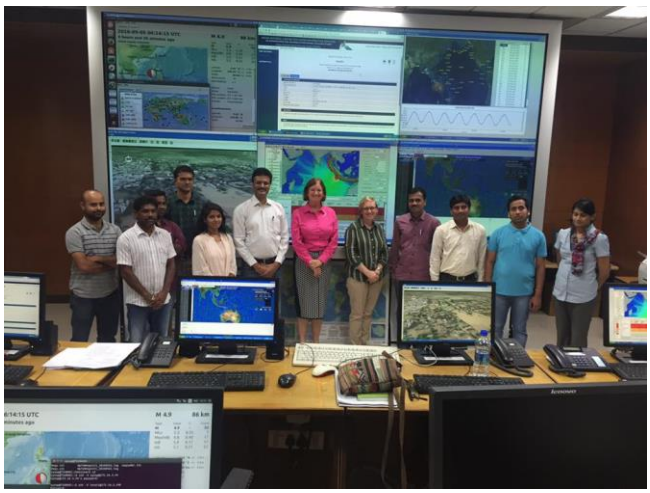


Figure 1. Staff of the INCOIS Indian Tsunami Early Warning Centre with Christa von Hillebrandt-Andrade (Observer) and Sarah Wade-Apicella (ISDR)

issued over the web, by email, fax and text messages to government authorities and other key stakeholders of the tsunami warning system in India.

Odisha State Disaster Management Agency (OSDMA)

The Odisha State Disaster Management Agency in Bhubaneswar is responsible for disaster management and risk reduction for the state of Odisha. The mantra of OSDMA is: "Save lives, 0 mortality". As an Observer I participated in both a Pre and Post (hot wash) meeting at OSDMA. The first meeting (Figures 2 and 3) focused on the arrangements for the exercise, while the hot wash focused on lessons learned. OSDMA has a newly refurbished EOC, with the latest technology for communication. In the tsunami warning chain, they are responsible for receiving the alerts from the ITEWC and communicating with the districts which further disseminate the messages down to the blocks and villages. For message receipt from the ITEWC they use FAX and Email and have access to the ITEWC website, while phone messaging and WhatsApp are used for dissemination. Given that the ITEWC are in English and that in the villages most people do not speak this language, the authorities of the EOC and District have the responsibility of adapting the information for the local area, as well providing information in the local language. Just like in the Caribbean where there is the threat of tsunamis and hurricanes, OSDMA has successfully linked tsunami typhoon and storm surge education and planning. For example, they have incorporated some of the lessons learned from the successful evacuation of 1 million people from coastal villages in 2013 for Cyclone Phailin.

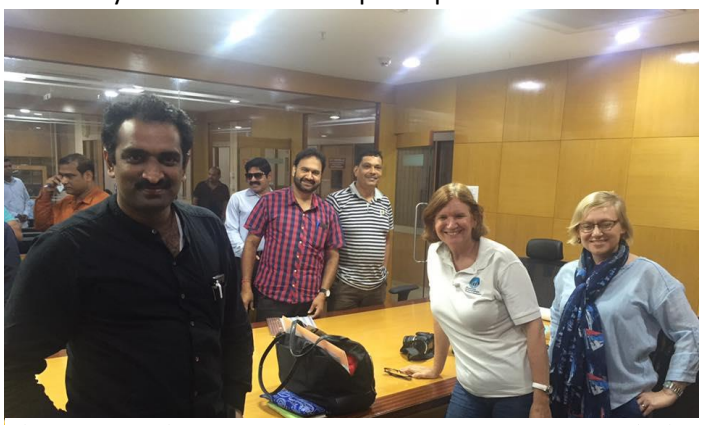


Figure2. Meetings at OSDMA EOC. INCOIS/ITEWC (Sri Ravichandra), OSDMA (Dr. Kamal Lochan Mishra), UNISDR Observer (Christa von Hillebrandt-Andrade) and UNISDR Communications Specialist (Sarah Wade-Apicella).

Figure 3. Christa von Hillebrandt with staff of Odisha State Emergency Operations Centre

For IOWAVE 16 OSDMA decided to conduct the mock drill in all the 328 tsunami prone villages located within 1.5 km for the coast in six coastal districts, which is considered the tsunami hazard zone. In preparation for the exercise, a Facilitator Guidebook was prepared, an orientation program was conducted, tsunami posters in the local language were printed and distributed , schools conducted rallies and the media was engaged.

On September 8, a hot wash was convened by Dr. Mishra and his senior staff at the OSDMA headquarters. During the two hour meeting, impressions were exchanged on the exercise and the tsunami warning system in general. This was a very important part of any exercise.
Tsunami Mock Drill Patisunapur, Odisha, September 7, 2016

Tsunami mock drills were conducted in 328 villages along the coast of Odisha. I was an observer at the exercise in the coastal village of Patisunapur in the Chikiti Block of the Ganjam district. The community is located on the end of a peninsula with the Bay of Bengal to the East and an estuary to the west. The access to the community is by a boat or along a road that runs parallel to the coast. Therefore they are very vulnerable to tsunamis. For the exercise the district and the Mandal had conducted information sessions and the villagers demonstrated awareness and engagement. The Director of OSDMA, Dr. Kamal Lochan Mishra, and other state and district disaster management authorities, as well as Sarah Wade in representation of UNISDR also participated in the drill. The scenario simulated a tsunami generated by a M 9.2 earthquake off the south coast of Sumatra. Under this type of scenario the tsunami would take just three hours to hit Patisunapur. During the exercise tsunami watch, alert and warning levels were simulated. The alert messages were sent to the village contacts thru the district EOC, which had received the message from the OSDMA and they received from the ITEWC. The village elders received the messages as texts on their cell phones and used coloured flags, a siren and megaphone to alert the population. As soon as the elders received notification of the Watch, the village disaster management committee met (Figure 5) and reviewed the response procedures. Once the Alert was issued, they began informing the villagers, while the full evacuation began once the Warning was received, 45 minutes after the simulated EQ and over 2 hours before the expected arrival time.

Figure 4. Cyclone Evacuation Structure. Note yellow flag on the roof (depending on the threat a green, yellow or red flag is exhibited)

For the exercise, the participants were evacuated to the cyclone shelter, a two story structure (Figure 4). The Village leaders took on roles of Rescue and First Aid and had vests identifying their roles. It took less than half an hour for the evacuation (Figure 6). After the evacuation was completed a community meeting was held with all the participants and first aid demonstrations were given and the representative of ITEWC gave a short talk on tsunamis. There was very broad and enthusiastic participation of the community from young children, students and teachers, adults and seniors. The organizers estimated that up to 3,000 people participated in the exercise. Women and men took an active role and the shelter was prepared to accommodate the needs of the people.

Figure 5. Meeting of the village Disaster Management Committee.

Figure 6. Arrival of villagers to the Evacuation Site as Dr. Kamal Lochan Mishra, Director OSDMA, observes.

Exercise Observations

The following observations are based on the different activities that I participated during my visit to India in Hyderabad, Bhubaneswar and Patisunapur.

- The INCOIS/ITEWC and OSDMA have the Standard Operating Procedures for generating, receiving, processing and disseminating tsunami alerts.
- SMS and WhatsApp are used for the dissemination of the public safety message from the State, District and Block level.
- The village also demonstrated well established procedures, from the meeting of the Village Council once the alert message was received. Both men and women, young and old participated and contributed to the discussion and decision making process. Teams responsible for evacuation, first aid and search and rescue were established.
- The use of megaphone, siren and flags were effectively used to alert villagers (Figure 7).

Figure 7. Flags used to indicate to the community the threat level.

- The local alert system will be further strengthened with the installation of 122 tone/voice multi hazard sirens. This is especially important as it is most likely that the population will NOT feel the earthquakes that generate tsunamis that can affect them, so the local communities require the alerts to become aware of imminent threats.
- The

Figure 8. School girls with their teacher participating in the drill.

- There was a broad participation and interest of school community (teachers and students) before and during the drill. Maintaining their engagement is very important (Figure 8).
- The education and outreach BEFORE the exercise seemed to have been comprehensive as there were NO FALSE ALARMS reported.

- The villagers evacuated with their critical belongings as well as their livestock, these are two elements that are often overlooked
- District and Blocks play a critical role in getting the messages in the appropriate language.
- The exercise was indeed a great success in Odisha with a participation of over 30,000 people resulting in a greater awareness and readiness of coastal inhabitants. The inhabitants became familiar and practiced the protocols, from the council meeting to the evacuation itself.
- In Patisunapur there was a very broad participation of the community in the mock drill, although for many it meant a lost day of income.
- In Patisunapur the Tsunami Early Warning System of India was validated, the residents of Patisunapur demonstrated they were ready, the challenge is to Stay Ready.

Acknowledgements

I thank the authorities and staff of INCOIS/ITEWC and the OSDMA for all their coordination and excellent attention to details and logistics in support of my participation. Despite the visit and exercise taking place during one of India's most important festivities, everything was conducted according to schedule. I thank the UNISDR for covering my air travel and the US NWS for providing the funds for the Lodging. I would also like to acknowledge my exercise international partner, Sarah Wade-Apicella, we made a good team covering each bringing their science and technical expertise and the Sendai Platform and public communications.

Observing Report on Exercise Indian Ocean Wave 2016
7 September 2016 in Seychelles

By Mr. Kazuya Sugiyasu from Tohoku University

1. Exercise Purpose

The purpose of Exercise Indian Ocean Wave 2016 (IOWave16) is to evaluate and improve the effectiveness of the IOTWMS, through its operational TSPs, NTWCs, NDMOs and LDMOs, in responding to a potentially destructive tsunami. The exercise will provide an opportunity for Indian Ocean countries to test their operational lines of communications, to review their tsunami warning and emergency response SOPs, and to promote emergency preparedness. Regular exercises are important for maintaining staff readiness for real events. This is especially true for tsunamis, which are infrequent but require rapid response when they occur. The pre-exercise planning and post-exercise evaluation process is as important as the actual exercise, because it brings together all stakeholders to closely coordinate their actions. Every Indian Ocean country is encouraged to participate, down to the community level wherever possible.

2. Detail of Exercise Process in Seychelles

IOWave16 in Seychelles was hold at 7:00 a.m.-3:00 p.m. 7th September based on the scenario 1 – Sumatra. And the Level of Participation was joined with National disaster management organizations (NDMOs) and some organizations (hotels, hospitals and companies) conducted the public evacuation drills. The process of exercise is follows.

Table 1: Scenario Details and Country Information of Seychelles

Scenario 1 – Sumatra		 The map downloaded from ReliefWeb (http://reliefweb.int/)	Country Information GDP 2007: 542.5 million USD Population: 86.6 thousand
Date:	Wednesday 7 September 2016		
Time:	0300 UTC		
Magnitude:	9.2 Mw		
Depth:	10 km		
Latitude:	1.93 S		
Longitude:	99.22 E		
Location:	Southern Sumatra, Indonesia		

Day 7 Sept

7:00 a.m. At the National Meteorological Authority's (Seychelles NTWC) office in Seychelles International Airport as they received the TSPs bulletins of earthquake at that time.

8:00 a.m. 1 hour after the earthquake the Met office (NTWC) sent stakeholders the confirmation of a tsunami being generated that will affect Seychelles according to the Standard Operating Procedures (SOP). So, The National Emergency Operation Centre (NEOC) of Division of Risk and Disaster Management (DRDM) as it was activated.

8:10 a.m. The Evacuation Order gave according to the SOP. And the Eden Island that a resort hotel area of Seychelles conducted the evacuation with guests. The Seychelles Broadcasting Corporation (TV crew from SBC) team do coverage for the North East Point Hospital at that time and the Public Utilities Corporation. Plus the SBC team on Praslin Island covers a hotel/guest house.
During the Evacuation Order time, DRDM was under full operating situation with all the liaison

officers of first responders and some agencies. They also gave some extra injects to test their own plans and protocols. This was like a mix table top with the others on the field doing their evacuation same time, as they need to also provide injects for agencies that were only doing table top. All those that were out of DRDM were receiving SMS alerts and all those that were in the DRDM were receiving both the SMS and injects on paper.

3:00 p.m. all hotels did their own debriefing with their own teams, the Port Authority along with the Seychelles Maritime Agency was doing the debriefing together as they both were in the same room doing the table top of the exercise as they actually were located in the same building in reality, although they had different mandates.
At the DRDM, all observers, first responders and agency liaisons were present for the debriefing at 3:00 p.m.
3.30 p.m. Debriefing, interviews

Participant's list was:

1. Ports Authority (Table Top)
2. Seychelles Maritime Safety Authority (Table Top)
3. Eden Island (Full Scale - Evacuation)
4. North East Point Hospital (Full Scale - Evacuation)
5. Public Utilities Corporation (Full Scale - Evacuation)
6. Zil Air (Table Top)
7. Seychelles Petroleum Company (Table Top)
8. Hotels (Mahe island, Praslin, La Digue and Silhouette island) - (Full Scale - Evacuation)
9. Seychelles Public Transport Company

First Responders participating were:

1. Police
2. Seychelles Fire and Rescue Services Agency
3. Ministry of Health
4. Seychelles Land Transport Agency
5. Seychelles Coast Guard
6. National Meteorological Authority
7. Ministry of Land Use and Habitat
8. Climate Adaptation Affairs – Environment Office
9. DRDM

3. Results of Observations

3.1 Progress of Exercise

1. Provide a chronology of the events and actions that you observed.

At this Exercise, I observed actions of 3 organizations (Meteorological office (NTWC), DRDM office (NDMO) and Police office) and examined how they collected or sent the TSP. In addition, I visited 2 places (Eden Island and Bel Eau School) to check the evacuating operation of visitors who stayed at hotels. The evacuation of these visitors was guided by hotel staffs and supported by a large number of employees of public transportation companies.

Table 2: Chronology of observed events and Actions

Day 7 Sept	
Time	Events and Actions
7:00 a.m.	Exercise started. At Seychelles International Airport-Meteorological office (NTWC) to check the TSPs bulletins and the location of NTWC
8:00 a.m.	At DRDM office (NDMO) to check the information of national warning from NTWC

9:00 a.m.	At Eden Bleu hotel in Eden Island to observe the evacuating operation for guest by hotel staff.
10:30 a.m.	At Bel Eau School on the hill that the evacuation site for employees of Public Utilities Corporation. To observe the evacuating operation by Seychelles Public Transport Company.
11:00 a.m.	At Police office
12:00 p.m.	At DRDM office
15:00 p.m.	Cancellation at DRDM office

3.1.1 Operating Room of Exercise

Figure 1: The photos show scenery of the operation room of Meteorological office (NTWC). The officers received the TSPs bulletins and made reporting the national warning status in Seychelles. Their office locates at the ground floor of the building around the Seychelles International Airport. It locates near the coastal line. However, it has a risk to be directly affected by tsunami.

Figure 2: The photos were taken by the observer at the operation room of DRDM office (NDMO). The observer checked information of national warnings from NTWC. They were sending the updated Tsunami Warning Information and gathering the Tsunami situation report.

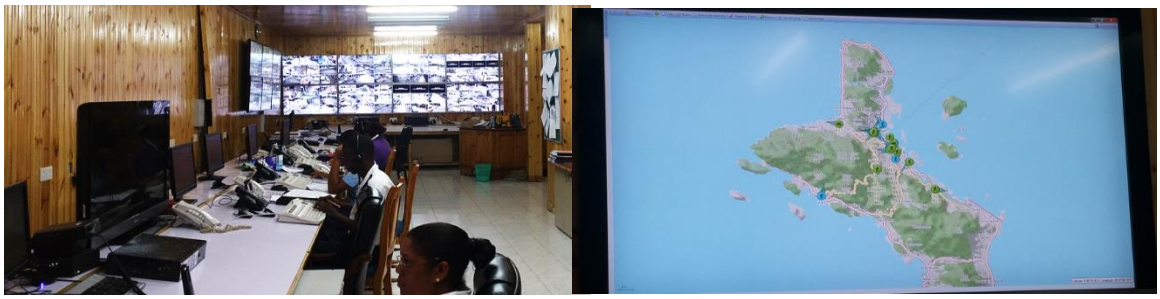


Figure 3: The photos show the operation room of the Police office. In order to respond to the Tsunami warning situation, the operation room deployed police officers. The operation room gave instructions to the police officers on the locations that they should go and make actions.

Figure 4: Evacuating operation at Eden Bleu Hotel. The Chief hotel staff gave instructions to the hotel's visitors and the staffs to evacuate out of the hotel after they get the Red Alert message.

3.1.2 Tsunami Evacuation Drill for Visitors and Employees

Figure 5: Evacuating operation at the Eden Bleu hotel. The first assembly point for the hotel's guests and the staffs was parking place of the hotel. The second assembly point was inland areas over the bridge. In the drill, only the hotel staffs evacuated to the second assembly point to check the location.

3.2 The Core Exercise Objectives

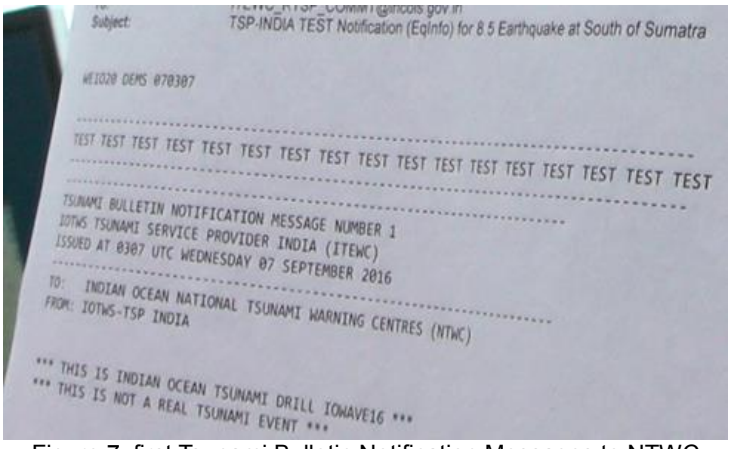
2. Where appropriate, provide a statement of your observations in relation to each of the core exercise objectives 1-6 (as provided below).

Exercise objective 1: Validate the dissemination by TSPs of Tsunami Bulletin

Notification Messages to NTWCs via Tsunami Warning Focal Points (TWFPs) of Indian Ocean countries and the reception by NTWCs of the TSP messages.

The Republic of Seychelles is a nation located near equator of the Indian Ocean, distant from either of India, Indonesia, or African Continent. Thus, when earthquake/tsunami occurs in the Indian Ocean countries, the seismic motion does not directly reach to the Seychelles, so that it is difficult for the Seychelles to obtain tsunami information by itself. In 2004 Indian Ocean Earthquake and Tsunami, Sri Lanka, which was placed in the similar condition (a difficult condition for obtaining earthquake information happened in other country), suffered great casualties. Therefore, it is reasonable for Met office (NTWC: National Tsunami Warning Centres) to communicate with TWFG via TSP messages to comprehend the tsunami occurrence condition in the Indian Ocean.

Figure 6: Evacuating operation at the Bel Eau School. To evacuate employees of companies in coastal area, the large-scale transportation, such as big buses, is required to be mobilized. In the drill, a public utilities corporation cooperated (locating in coastal area) with Seychelles Public Transport Company and evacuated to the Bel Eau School, which locates on a hill.



Subject: TSP-INDIA TEST Notification (EqInfo) for 8.5 Earthquake at South of Sumatra

WEIO28 DEMS 070307

TEST TEST TEST TEST TEST TEST TEST TEST TEST TEST TEST TEST TEST TEST TEST

TSUNAMI BULLETIN NOTIFICATION MESSAGE NUMBER 1
IOTWS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)
ISSUED AT 0307 UTC WEDNESDAY 07 SEPTEMBER 2016

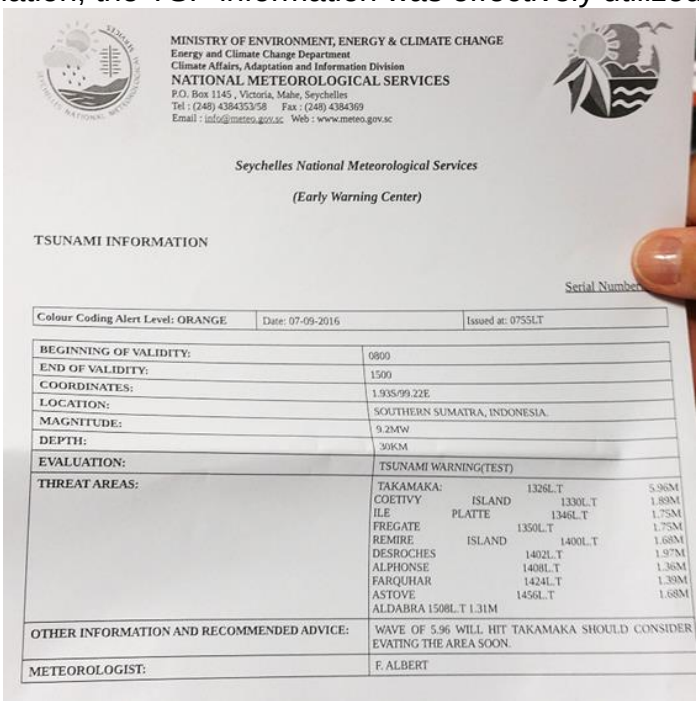
TO: INDIAN OCEAN NATIONAL TSUNAMI WARNING CENTRES (NTWC)
FROM: IOTWS-TSP INDIA

*** THIS IS INDIAN OCEAN TSUNAMI DRILL IOWAVE16 ***
*** THIS IS NOT A REAL TSUNAMI EVENT ***

Figure 7: first Tsunami Bulletin Notification Messages to NTWC

Exercise objective 2: <u>Validate the access by NTWCs to the tsunami bulletins and other products on the TSP websites, and the use of that information for the production of national warnings.</u>

The Met office (NTWC: National Tsunami Warning Centres) obtains information including earthquake locations and magnitudes through the TSP websites, and issues the national warnings with adding expected flooding areas (Threat areas). On forming such warning information, the TSP information was effectively utilized.



MINISTRY OF ENVIRONMENT, ENERGY & CLIMATE CHANGE
Energy and Climate Change Department
Climate Affairs, Adaptation and Information Division
NATIONAL METEOROLOGICAL SERVICES
P.O. Box 1145 , Victoria, Mahe, Seychelles
Tel : (248) 4384353/58 Fax : (248) 4384369
Email : info@meteo.gov.sc Web : www.meteo.gov.sc

Seychelles National Meteorological Services

(Early Warning Center)

TSUNAMI INFORMATION

Serial Number

Colour Coding Alert Level: ORANGE	Date: 07-09-2016	Issued at: 0755LT

BEGINNING OF VALIDITY:	0800
END OF VALIDITY:	1500
COORDINATES:	1.93S/99.22E
LOCATION:	SOUTHERN SUMATRA, INDONESIA.
MAGNITUDE:	9.2MW
DEPTH:	30KM
EVALUATION:	TSUNAMI WARNING(TEST)
THREAT AREAS:	TAKAMAKA: 1326L.T 5.96M COETIVY ISLAND 1330L.T 1.89M ILE PLATTE 1346L.T 1.75M FREGATE 1350L.T 1.75M REMIRE ISLAND 1400L.T 1.68M DESROCHES 1402L.T 1.97M ALPHONSE 1408L.T 1.36M FARQUHAR 1424L.T 1.39M ASTOVE 1456L.T 1.68M ALDABRA 1508L.T 1.31M
OTHER INFORMATION AND RECOMMENDED ADVICE:	WAVE OF 5.96 WILL HIT TAKAMAKA SHOULD CONSIDER EVATING THE AREA SOON.
METEOROLOGIST:	F. ALBERT

Figure 8: The information of national warning form NTWC

Exercise objective 3: <u>Validate the reporting by NTWCs to the TSPs of their National Tsunami Warning Status.</u>

The Met office (NTWC: National Tsunami Warning Centres) occasionally reported the current condition in Seychelles via the website of TSPs (Tsunami Service Providers). The format for inputting the condition of own country with selective items and additional information in a free space as required was a usable system able to correspond various situations.

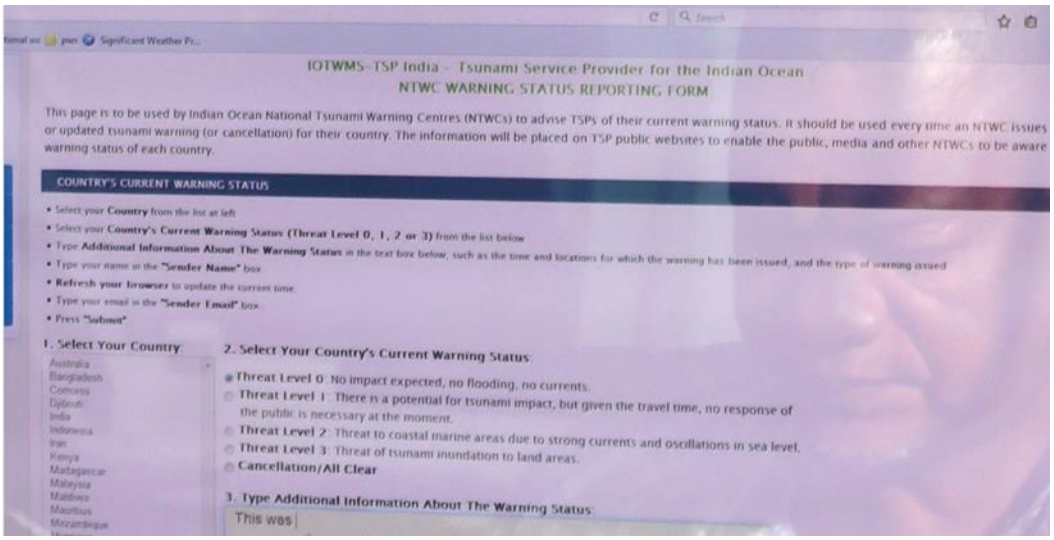


Figure 9: The reporting by NTWC to the TSP of their National Tsunami Warning Status

Exercise objective 4: Validate the SOPs within countries for generating and disseminating tsunami warnings to their relevant emergency response agencies, media and the public.

In operation of SOP (Standard Operating Procedures) in Seychelles, the information obtained from TSPs is transferred to media, the public, public transportation system SPA, etc. via NTWC and DRDM (Divisions of Risk and Disaster Management). In many cases, not only facsimile and e-mail but SMS were used as means for conveying the information. Thus, the combined use of various communication means enabled secure delivery of the information. However, more examination is required whether current SOP operation is possible when either NTWC (National Tsunami Warning Centres) or DRDM does not function well.

Exercise objective 5: Validate the SOPs within countries for the issuing of public safety messages, ordering evacuations and where possible issuing all-clear messages.

When seeing the alert messages in Figure 4, only the information about tsunami height is displayed. When receiving the safety information about tsunami height and evacuation order via SMS, excessively detailed information may prevent swift decision-making for evacuation because information on next actions taken by the refugees will not clearly be delivered. Accordingly, when delivering such safety information and evacuation order, it is tactically necessary to clearly describe the next actions (for example, “evacuate now”, “report surrounding conditions”, etc.) and then describe the detailed information. The intention of a message sender cannot be delivered to receivers by just “please take necessary steps”.

Figure 10 Example of Tsunami threat area info and red alert message by SMS

Divisions of Risk and Disaster Management, Seychelles

Standard Operating Procedures for Tsunamis Early Warning

Event	Time	Activity	Authority	Mode	Target	Remarks
Earthquake Occurs	.10	Bulletin No. 1	TSP	Fax, Mail, GTS	NTWC	
	.15	Issue advisory	NTWC	Fax, SMS, E-mail, Call	DRDM, Senior officials, IDC, SBC-All Media	Note: NTWC should be reporting at the same time back to the TSP regarding the national warning status. Note: The officers on duty will be following the sites of the TSP's closely at this point and also observing all water gages websites of the Indian Ocean and the Pacific Ocean also.
	.20	Issue advisory	DRDM	Call, SMS	PS's, NDC, ELO's; First Responders & focal persons of SMSA, SPA, IDC, Media liaisons	SMS send from location E.g. of ELO'S - Local Community, Health, Fire Brigade, Tourism Ministry, Defence Forces, Port, Airport, Private Sector, Police, Red Cross ... etc...
Confirmation	.20	Bulletin No.2	TSP	Fax, GTS, E-mail	NTWC	
	.25	Maintain Advisory	NTWC	Fax, SMS, E-mail	DRDM	And the NTWC should be reverting to TSP regarding national status.
	1.10	Warning	NTWC	Fax, GTS, E-mail	DRDM	
	1.15	Warning	DRDM	Fax, SMS, E-mail	NDC, ELO's, Media, Public, SMSA, IDC, SPA	Issue code RED ALERT: Communication to the public by Media, SMS, DRDM WhatsApp, DRDM Facebook, Church bells, Mosques Speakers, Police Megaphone announcements.
		Issue Evacuation Order	DRDM	Fax, SMS, E-mail	ALL	-DA to do door to door to inform and guide with Police and District Brigade members assisting. -Police to Evacuate – town in the first hour. -Districts –during second and third hour should have been evacuated. -Port, Airport, and Providence during third. -First Responders e.g. fire brigade, NTWC (Met), Police that are along the shore - fourth hour. Note: To activate Shelter and SPTC to be requested for transporting facility. Note: To evacuate with Emergency Kit and minimum baggage possible.
	To Note	Update of Warning every hour	From TSP to NTWC and from NTWC to DRDM and DRDM to ALL	Call, SMS, E-Mail, Fax, VHF	NDMO and from NDMO to all First Responders, High Officials, to the public	Note: Everyone is advised to keep listening to the radio and stay with all other means of communication possible.
	1H to ETA	Issue Brace up Warning	DRDM	Fax, SMS, Call, E-mail, VHF	All	Move to safe zone
Impact	1H after 1st w	Request rapid assessment	DRDM	SMS, Call, E-mail, VHF	ALL	RAT to proceed with caution remaining in touch with NTWC

	Every Hour	Updates of Warning	NTWC	Fax, GTS, E-mail	DRDM	
	5 min. after receipt of updates	Issue information (updates)	DRDM	Fax, SMS, E-mail, VHF radio, Call	All	By whichever means are available
	Every hour	Executive brief	DRDM	Fax, SMS, E-mail, VHF radios	Executive Cadres	To note: There might be communication issues with land lines and cell phones after the tsunami has hit and same for Fax and Email.
Cancellation	**1H r**	Bulletin No. 12	TSP	Fax, GTS, E-mail	NTWC	
	2Hrs	All Clear	NTWC	Fax, SMS, E-mail	DRDM	Note: All clear means that no more waves will be coming. But not a Stand down for responders.
	2.10Hrs	Communiqué	DRDM	Fax, SMS, call, E-mail, VHF	ALL	All clear given to First responders to organise for Damage needs Assessment and to Establish safe zones.
	2.15Hrs	Communiqué	DRDM	Fax, SMS, Call, E-mail, VHF	ALL	Coordination of all First Responders with DRDM for the Damage needs Assessment and to Establish safe zones before anyone moves down.
Stand Down	**5Hrs after cancellation**	Communiqué	DRDM	Fax, SMS, Call, E-mail, VHF	ALL	Stand down after safe zones have been established and the damage needs assessment has been done. To start relief/recovery operation of country.

Figure 11: Standard Operating Procedures for Tsunamis Early Warning was designed by DRDM

Exercise objective 6: Validate the level of community awareness, preparedness and response.

Main disasters in Seychelles are flood and landslide, so that the people have few experience of earthquake. In 2004 Indian Ocean Tsunami, the Seychelles suffered damage in coastal areas by tsunami, where a part of geographical features were altered in the coast. However, the common citizens were hardly aware that it was a “disaster”. According to the persons concerned in local governments, most people do not take evacuating actions, and they stay at home even in the time of flooding.
Thus, for the common citizen level, it is necessary to:

- Establish disaster risk reduction measures focusing on not only citizens but also foreign tourists (The main industry of the nation is tourism, having many tourists throughout year. Main tourists come from European countries. Chinese is major in the Asian countries.);
- Estimate damages expected to happen by earthquake and tsunami;
- Comprehend the evacuation places near the base of citizen’s life (prepare the hazard maps for tsunami evacuation).

3.3 Communication Protocols

3. Comment on the testing and understanding of communication protocols between the TSPs, NTWCs, TWFPs and information dissemination points within countries.

Respective organization in Seychelles positively offered and received information based on DRDM (Divisions of Risk and Disaster Management). However, some national organizations offering/receiving information in Seychelles have an operation office on the first floor in the coast (Seychelles International Airport – Meteorological office). Regarding the current conditions of this airport facility, no tide embankment, bank, buffering woods zone, or similar

facilities are prepared though the runway of the airport is located near sea with almost the same as the sea level. Besides, passengers should walk from an aircraft to the airport facility, and there is no evacuation places such as evacuation building or rooftop when disaster happens. In other words, the first floor may suffer flooding caused by tsunami, showing incompetence against disaster response. The facility is planning to transfer the function to a neighbouring facility when the current base becomes unusable, but it is necessary to transfer the office to upper floors if possible, when considering the case that tsunami reaches in a short time.

3.4 Strengths in the Tsunami Warning

4. Identify strengths in the tsunami warning and response chain.

(1) In Seychelles having poor internet environment, the information was occasionally delivered via SMS to the staff members of DRDM (Divisions of Risk and Disaster Management) and those who in charge of evacuation guidance.

(2) It was great to actually practice the evacuation to a higher place from the companies located in the coast having great number of employees in cooperation with public transportation system (bus companies). After reaching the evacuation places, the buses were parked by the road so as not to block other cars by stationing guiding personnel to avoid congestion.

(3) In the tourist hotels accommodating many foreign tourists, the hotel staffs who can obtain local information took initiatives for leading evacuation for visitors. The observer consider that the fact that tourists actually stayed the hotel joined the evacuation practice was a valuable experience for the hotel staffs to verify the problems during evacuation.

3.5 Improvement in the Tsunami Warning

5. Identify areas of potential improvement in the tsunami warning and response chain.

(1) Information during evacuation is offered by a staff responsible for guidance. However, when the people reached the evacuation places, it was difficult for the people having no information terminals including cell phone to get the latest information by themselves. This was because the evacuation places in this practice were designated to an open space (field) such as parking lots and school grounds based on the concept of evacuation for fire, etc. The case of evacuation actions inside the building having information terminals such as TV and radio could not be applied.

(2) In this practice, existence of guiding personnel for refugees (employees, tourists) is a premise for evacuation both in the companies and hotels. However, considering the town layout of Seychelles, it is difficult to find optimal evacuation places against the nearest tsunami by themselves if citizens, not only employees and tourists, voluntarily started evacuation before evacuation guidance started. The reason is that no signs or signboards indicating the nearest optimal evacuation places are provided on the roads and buildings. In the capital city Victoria, there are some 3-story or higher buildings in a part along the coast, so that they may be designated as the tsunami evacuation buildings.

3.6 Participants of local communities

6. Comment on the extent that local communities participated in the exercise.

(1) During the evacuation in the companies and hotels, people were not so confused until reaching the evacuation places. However, most people had nothing to do and killed the time after reaching the places because they had no particular roles assigned.
It is necessary to consider how effectively utilize the time binding many personnel after reaching the evacuation places, not just to reach the places. It may be useful, for example, to provide education about disaster prevention, that “what will happen after evacuation”, “how to behaviour from now” and so on. Concrete solutions will be mentioned in the next section.

(2) The evacuation practice of this time was intended to the whole nation of the Seychelles.

However, except for a part of companies and tourist hotels positively joined the practice, it is unknown to what level the common citizens joined the practice. It is necessary to provide campaigns encouraging the citizens to join the practice and to cooperate with new companies and organizations that are strongly involved with the citizens. Concrete solutions will be mentioned in the next section.

3.7 Lessons from the other cases

7. Provide examples of how community knowledge of tsunami preparedness and response has been increased as a result of the exercise.

(1) Education for disaster risk reduction after reaching the evacuation places

For example, the following lectures and trainings can be considered for the education for disaster prevention after reaching the evacuation places.

- How to unlock the buildings in the evacuation place
- How to obtain information at the evacuation place
- Places for obtaining water and foods, location of toilets
- Behaviours in rainy weather
- Measures when long-term evacuation is expected

(Move to buildings, prepare temporal tents, etc.)

- A standard to end the actions for evacuation, etc.

(2) It is necessary for the educational institutions such as elementary, junior high, and high schools to join the organizations cooperating in the evacuation practice. By this, younger people including students can be called for joining the practice. Most of the institutions also own buildings and spaces for the evacuation places, so that it is also a good training for the institutions receiving refugees during actual tsunami evacuation.

(3) The observer suggests that it is necessary to provide opportunities of educational programs on disasters to local residents. Additionally, information which enables local residents to proactively examine their own evacuation behaviour should be provided. Developing sign boards for evacuation directions and tsunami-hazard maps can strengthen community knowledge of tsunami preparedness and response.

4. Concluding the observation of the exercise

The observer suggests some elements to improve the response against tsunami disasters in the Seychelles. First, awareness of disaster risk reduction amongst local residents should be raised. Second, urban planning in the Seychelles should be connected with disaster risk reduction, and the planning needs to contribute smooth and proactive evacuation of local residents and tourists. Third, evacuation centres should be considered in accordance with evacuation situations in tsunami disasters. Forth, multiple scenarios of evacuation drill should be prepared. Especially, it should be taken into consideration that evacuation takes a long time in tsunami disasters due to destruction of houses and it causes a long stay at evacuation centres. Fifth, the facilities, which play central functions in response phase and are relevant to disaster risk reduction, should be strengthened.

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 Interealibration 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 Bathymerographs 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 *Pacem in Maribus* 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 1'exploitation des pêcheries maritimes au Cameroun et leur gestion intégrée dans la sous-région du Golfe de Guinée *(cancelled)*	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 (8th 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 (9th 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 (10th 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 (11th 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 (12th training-through-research cruise, June-August 2002). 2003	E only
68	Interdisciplinary Studies of North Atlantic and Labrador Sea Margin Architecture and Sedimentary Processes (13th 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 (14th 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 (2nd Revision). 2009	E only
72	Deep-water Cold Seeps, Sedimentary Environments and Ecosystems of the Black and Tyrrhenian Seas and the Gulf of Cadiz (15th 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 *(electronic only)*	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 (16th 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.	*Cancelled*	
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	*Electronic publication*

(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	*Under preparation*
92.	27 February 2010 Chile Earthquake and Tsunami Event – Post-Event Assessment of PTWS Performance (Pacific Tsunami Warning System). 2010	E only
93.	Exercise CARIBE WAVE 11 / LANTEX 11—A Caribbean Tsunami Warning Exercise, 23 March 2011	
	Vol. 1 Participant Handbook / Exercise CARIBE WAVE 11 —Exercice d'alerte au tsunami dans les Caraïbes, 23 mars 2011. Manuel du participant / Ejercicio Caribe Wave 11. Un ejercicio de alerta de tsunami en el Caribe, 23 de marzo de 2011. Manual del participante. 2010	E/F/S
	Vol. 2 Report. 2011	E only
	Vol. 3 Supplement: Media Reports. 2011	E/F/S
94.	Cold seeps, coral mounds and deep-water depositional systems of the Alboran Sea, Gulf of Cadiz and Norwegian continental margin (17th training-through-research cruise, June–July 2008)	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 Educations 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, 2nd edition: revised and expanded. 2016	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.	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	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 Vol 2: Areas Beyond National Jurisdiction	E only
120.	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	*In preparation*
121.	Exercise Indian Ocean Wave 14, an Indian Ocean wide Tsunami Warning and Communications Exercise, 9–10 September 2014	*In preparation*
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)	*In preparation*
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

(continued)

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	E only
132.	*In preparation*	
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	E only